HealthMED

Journal of Society for development in new net environment in B&H

HealthMED

Journal of Society for development in new net environment in B&H

Sadržaj / Table of Contents

Sadržaj / Table of Contents

Sadržaj / Table of Contents

Alarmingly high metabolic syndrome prevalence in Hatay region of Turkey

Ihsan Ustun[1], Cumali Gokce[1], Kursat Gundogan[2], Vedia Tonyukuk Gedik[3], Ahmet Kaya[4], Fahri Bayram[5], Nazan Savas[6]

[1] Department of Endocrinology, Mustafa Kemal University Faculty of Medicine, Hatay, Turkey,
[2] Department of Internal Medicine, Erciyes University Faculty of Medicine, Kayseri, Turkey,
[3] Department of Endocrinology and Metabolism, Ankara University Faculty of Medicine, Ankara, Turkey,
[4] Department of Endocrinology and Metabolism, Selcuk University Faculty of Medicine, Konya, Turkey,
[5] Department of Endocrinology and Metabolism, Erciyes University Faculty of Medicine, Kayseri, Turkey,
[6] Department of Public Health, Mustafa Kemal University Faculty of Medicine, Hatay, Turkey.

Abstract

Background: The aim of this study is to assess the prevalence of metabolic syndrome (MetS) by National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III) criteria and its associations with a number of risk factors in a sample of population in Hatay region, which is a province in southern Turkey.

Methods: A sample of 353 individuals were (227 females and 126 males) enrolled in this study. All the components of NCEP ATP III criteria are recorded.

Results: The overall prevalence of MetS was 46.7%: 54.2% (n=123) in women and 33.3% (n=42) in men (p<0001). The most prominent components of MetS in our study were hypertriglyceridemia (84%) and abdominal obesity (84%) followed by, hypertension (70%), low high-density lipoprotein cholesterol (57%) and hyperglycemia (51%).

Conclusion: There is a very high prevalence of MetS in Hatay region of Turkey which should lead us to take urgent steps for cardiovascular prevention.

Key words: Metabolic syndrome, prevalence, Turkish population, Hatay.

Introduction

The aggregation of multiple cardiovascular risk factors in adults renewed attention. Therefore, several terms including Metabolic Syndrome (MetS) have been proposed to describe the association in terms of obesity, insulin resistance, hypertension, dyslipidemia(1).The importance of MetS is due to increased risks for the development of type 2 diabetes (2) cardiovascular disease (CVD)(3). It also causes high mortality and morbidity in aspect of coronary heart disease (CHD) (4) and stroke (5).

There are number of clinical criteria for the MetS defined by World Health Organization (WHO), the European Group for the Study of Insulin Resistance (EGIR), the National Cholesterol Education Program – Third Adult Treatment Panel (NCEP ATP III), the American Association of Clinical Endocrinologists (AACE 2003), the International Diabetes Federation (IDF 2005) and the Joint Statement of the International Diabetes Federation Task Force on Epidemiology and Prevention(6-11). However, they agree for the major components of the MetS consisting obesity, insulin resistance, dyslipidemia and hypertension.

The prevalence of MetS in adult population worldwide varies from 3.2% (12) to 40.4% (13-15) in males and from 7.2% (12) to 59.6% (13-15) in females. There are few studies performed in Turkey that shows the prevalence of MetS which varies from 10.1% (16) to 27% (17-19) in men and from 27.3(16) to 38.6% (17-19) in women, respectively. The prevalence in West Anatolia according to ATPIII and IDF criteria was 38.1% and 41.4%, respectively (20).

While the AACE, WHO and the EGIR definitions are largely focused on insulin resistance, the NCEP (ATPIII) and IDF focused specifically on waist circumference. In the current study, our aim is to investigate the prevalence of MetS in Hatay region (Figure 1) by ATP III criteria This criteria has better definition in terms of cardiovascular morbidity and mortality in comparision to the other definitions(8, 21). To the best of our knowledge, this is the first study investigating the prevalence of MetS in this population.
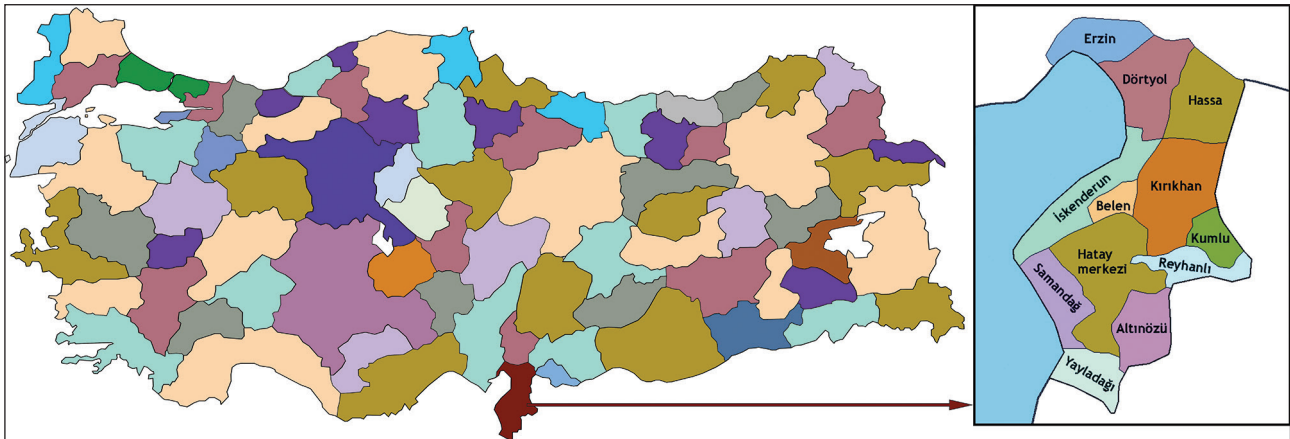
Figure 1. Region of the study performed (Hatay)

Materials and methods

A community based cross-sectional study was done between March 2003 and May 2005 in city center, district centers and villages located in Hatay which is a province in southern Turkey, on the Mediterranean coast, with Syria to the south and east and the Turkish provinces of Adana and Osmaniye to the north. Hatay is one of the most cosmopolitan provinces of Turkey, in which the various background and religions including Sunni Muslims, Alawi Muslims, Syriac Orthodox, Syriac Catholics, Maronites, Arab (Greek-Orthodox) and Armenian communities live together. The towns of Iskenderun, Kırıkhan and Yayladagı and Antakya city center were selected. Selection of the towns was based on geographic distribution and logistics considerations. Multistage random sampling was used for selection of study subjects. Approval from Ministry of Health was obtained and the household identification form (HIF) data from the primary health care centers of Provincial Health Directorates, affiliated to the Ministry of Health were employed. A total of participants' males and females between the ages of 20 and 83 years were enrolled in our study. The populations of the province were obtained from results of the 2000 census. Populations of city center, district centers and villages were classified using the stratified sampling method and were then selected from the HIF data by use of the random sampling method. The age groups were also subdivided into the results from the 2000 census, as 20-29 years, 30-39 years, 40-49 years, 50-59 years, 60-69 years 70 and above. An invitation was sent 2 weeks before the survey. Power analysis is found to be 0.96. The participants were told to be fast for 8-12 hours prior to the sampling. In health units (primary health care centers, hospital and health houses) affiliated to the Ministry of Health about 100 people were evaluated daily, between 7-10 am in comfortable waiting rooms which were provided during the study. The questionnaires were completed with face-to-face interviews. The study was conducted in accordance with the Declaration of Helsinki. Informed consents of the all participants were obtained. A sample of 353 individuals were (227 females, 126 males) enrolled in this study.

Study Protocol

Specialist nurses and physicians obtained the medical history and measurements. The ages, genders, personal and family histories of hypertension, diabetes, coronary artery disease and other chronic diseases of the participants were recorded. Weights, heights, waist circumferences (WC) and hip circumferences were measured. Body mass index (BMI) was calculated as the ratio of body weight to square of body height (kg/m^2). Central obesity was defined as WC 102 cm in men and 88 cm in women. WC was calculated as the average of 2 measurements taken after inspiration and expiration at the midpoint between the lowest rib and iliac crest.

Participants were recommended for avoiding smoking, alcohol, caffeinated beverages, and exercise for at least 30 min before their blood pressure (BP) measurement. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured twice with an interval of 15 minutes

in sitting position with a random zero mercury sphygmomanometer, following a rest period for 30 min. BP ≥130/≥85 mmHg or drug treatment for previously diagnosed hypertension were considered to be hypertensive.

Blood samples were obtained in the morning after 8-12 hours of fasting. The serum samples were obtained by centrifugation at room temperature for 10 min at 3000 rpm and were stored in ice bags which were transferred into deep freezes at -70 ºC on the same day. Kone Lab autoanalyzer (Thermo Clinical Lab systems Oy Vantaa, Finland) using the enzymatic spectrophotometric method calculated the glucose, total cholesterol, high-density lipoprotein cholesterol (HDL-C) and triglyceride (TG) levels. In those with TG level of below 400 mg/dL, low-density lipoprotein cholesterol (LDL-C) levels were calculated with the Friedewald formula. In 1997, the Expert Committee of the American Diabetes Association (ADA) reported the recommendations for the classification and diagnosis of diabetes (22). In 1999, WHO adopted further recommendations regarding criteria for the diagnosis of diabetes and prediabetic conditions (23). Impaired fasting glucose (IFG) is defined as fasting plasma glucose levels between 110mg/dl and 125mg/dl, 100mg/dl and 125mg/dl by WHO (1999) and ADA, respectively (24).

The 2001 NCEP-ATP III definition requires the presence of three or more of five components:

1. WC ≥102 cm in men and ≥88 cm in women,
2. TG ≥150 mg/dL (1.69 mmol/L) or drug treatment for elevated TG,
3. HDL-C <40mg/dL (1.04 mmol/L) in men and <50mg/dL (1.29 mmol/L) in women or drug treatment for reduced HDL-C,
4. BP ≥130/≥85 mmHg or drug treatment for previously diagnosed hypertension,
5. FBG ≥110mg/dL (6.1 mmol/L) or drug treatment for elevated glucose.

Statistical Analysis

χ^2 tests were used to determine significant differences in proportions among categorical variables, Student's t test were used to determining grouped differences of continuous variables. All statistical analyses were calculated by Statistical Package for the Social Sciences (SPSS) (version 13.0; SPSS Inc., Chicago, IL, USA). Two-tailed p-values of <0.05 were considered to be significant.

Results

A total of 353 people 227 female (64.3%), 126 male (35.7%) participated to the study from the 3 towns and the Antakya (city center): Antakya, 97 (27.5%), Iskenderun, 76 (21.5%), Kirikhan 101 (28.6%), Yayladagi 79 (22.4%) (Figure 1). Twenty eight percent (n=99), 28.9% (n=102) and 43.1% (n=152) of the participants were in city centers, towns and villages, respectively.

Table 1. Demographic characteristics of subjects with and without metabolic syndrome

Parameter	Total (n=353) mean±SD	Gender			Metabolic Syndrome (ATPIII)		
		Males (n=126) mean±SD	Females (n=227) mean±SD	pᵃ	Absent (n=188) mean±SD	Present (n=165) mean±SD	pᵃ
Age (years)	51.1±14.2	51.6±15.3	50.9±13.6	0.659	49.3±15.2	53.2±12.6	<0.01
BMI (kg/m²)	30.9±6.1	28.2±4.86	32.4±6.3	<0.001	28.8±6.4	33.2±4.9	<0.001
WC (cm)	97.1±12.3	96.1±11.2	97.6±12.9	0.261	92.8±12.3	101.9±10.5	<0.001
SBP (mmHg)	143.3±30.2	140.5±31.6	144.9±29.3	0.184	132.4±25.9	155.7±29.9	<0.001
DBP (mmHg)	83.7±14.7	82.9±15.6	84.2±14.2	0.401	78.8±13.3	89.3±14.2	<0.001
FBG (mg/dL)	122.6±69.6	112.3±46.3	128.4±79.1	0.037	104.4±42.6	143.3±86.6	<0.001
Total-C (mg/dL)	211.8±44.3	210.7±45.6	212.5±43.7	0.710	208.3±44.3	215.8±44.0	0.116
HDL-C (mg/dL)	53.3±13.0	51.2±13.2	54.3±12.8	0.024	58.4±13.1	47.3±10.1	<0.001
LDL-C (mg/dL)	119.5±38.3	121±42.3	117.8±36.0	0.315	120.8±38.1	117.8±38.1	0.348
Triglycerides (mg/dL)	200.0±122.3	196.1±109.9	202.0±128.8	0.659	150.9±83.6	256.0±134.9	<0.001

ᵃStudent's t test
ATP, adult treatment panel; SD, standard deviation; BMI, body mass index; WC, waist circumference; SBP, systolic blood pressure; DBP, diastolic blood pressure; FBG, fasting blood glucose; Total-C, total cholesterol; HDL-C, high-density lipoprotein cholesterol, LDL-C, low-density lipoprotein cholesterol.

The overall prevalence of MetS was 46.7%: 54.2% (n=123) in women and 33.3% (n=42) in men. Prevalence of MetS was higher in women when compared with men (p<0.0001). Age, BMI, WC, SBP, DBP, FBG, TG were higher but HDL-C was lower in the MetS group (p<0.05). The metabolic and clinical parameters of MetS are shown in Table 1. Among the participants BMI, FBG, HDL-C were higher in women (p<0.05).

The mean age of participants was 51.1±14.2years (20-83) with males 51.6±15.3 years and females' 50.9±13.6 years. When participants with MetS are evaluated the mean of the age of the males was 55.1± 12.5 years (36-80) and the mean age of the women was 52.6 ± 12.6 years (27-83). Number of participants according to the decades is: 20-29 years (n=20) 5.7%, 30-39 years (n=58) 16.4%, 40-49years (n=82) 23.2%, 50-59 years (n=96) 27.2%, 60-69 years (n=49) 13.9%, over 70 years (n=48) 13.6%. The MetS prevalence increased with the ages until the age of 59 but after the 69, the prevalence decreased. The highest prevalence was seen at the ages of 50-59 in men and women. Prevalence of MetS in genders, age decades, BMI groups, towns and locations are shown in Table 2.

MetS components in genders, age decades, BMI groups, towns and locations are presented in Table 3. Among the participants with MetS 8(4.8%) had normal body weight, 28 (16.9%) were overweight and 129 (78.1%) were obese. Obesity prevalence was significantly higher in females (n=101, 81.1%) than males (n=28, 66.7%) (p<0.05). In men, obesity was higher at ages of 40-49 while in women it was higher at the ages of 50-59. The number of participants who had abdominal obesity was 140(84.8%): 26 (61.9%) in men and 114 (92.7%) in women.

The percentage of abdominal obesity was higher at the ages 50-59 and more prevalent in women. The percentage of obesity among the participants with abdominal obesity was 87.1% (n=122). Abdominal obesity was higher in Kırıkhan (n=43, 30.7%) and in villages (n=58, 41.4%) (Table 3).

Among the participants with MetS 23(13.9%) had diabetes; 6 in men and 17 in women.

There was no statistical difference in terms of hyperglycemia between males (n=42, %47.6) and females (n=123, 52.8%). Hyperglycemia was also more prominent, at the ages of 50-59(34.1%), in

obese (81.2%), in Kırıkhan (32.9%) and in villages (42.4%)

Table 2. Prevalence of metabolic syndrome in genders, age decades, body mass index groups, towns and locations

Parameters	Metabolic Syndrome		p[a]
	Absent (n=188)	Present (n=165)	
Gender			
Males	84 (66.7%)	42 (33.3%)	<0001[a]
Females	104 (45.8%)	123 (54.2%)	
Age Groups			
20-29	16 (80.0%)	4 (20.0%)	0.024[b]
30-39	38 (65.5%)	20 (34.5%)	
40-49	43 (52.4%)	39 (47.6%)	
50-59	41 (42.7%)	55 (57.3%)	
60-69	23 (46.9%)	26 (53.1%)	
≥70	27 (56.3%)	21 (43.8%)	
BMI (kg/m²)			
Normal (≤24.99)	53 (86.9%)	8 (13.1%)	<0001[a]
Overweight (25.0-29.9)	58 (67.4%)	28 (32.6%)	
Obese (≥30.0)	77 (37.4%)	129 (62.6%)	
Towns			
Antakya	57 (58.8%)	40 (41.2%)	0.002[a]
Iskenderun	29 (38.2%)	47 (61.8%)	
Kırıkhan	49 (48.5%)	52 (51.5%)	
Yayladagı	53 (67.1%)	26(32.9%)	
Location			
City center	55 (55.6%)	44 (44.4%)	0.142[a]
District center	46 (45.1%)	56 (54.9%)	
Village	87 (57.2%)	65 (42.8%)	

[a]χ^2 test
[b]linear by linear association
BMI, body mass index.

Hypertension prevalence was not significantly different between males and females.

Hypertension was seen in 117 of the participants; 32 (76.2%) in men and 85 (69.1%) in women (p>0.05). It was more prominent at the ages of 50-59 (n=40, 34.2%), in obese (n=87, 74.4%), in Kırıkhan (n=44, 37.6%) and in villages (n=47, 40.2%).

There was no statistical difference in aspect of hypertriglyceridemia between males and females.

Hypertriglyceridemia was seen in 140 of the participants; 39 (92.9%) in men and 101 (82.1%) in women (p>0.05). It was higher at the ages of 50-59(n=45, 32.1%), in obese (n=111, 79.3%), in Kırıkhan (n=44, 31.4%) and in villages (n=55, 39.3%).

Table 3. Metabolic syndrome components in genders, age decades, body mass index groups, towns and locations

Parameters	Metabolic Syndrome Components (n=165)				
	Hypertension n=117 n (%ᵃ)	Abdominal Obesity n=140 n (%ᵃ)	Hyperglycemia n=85 n (%)	Hypertriglyceridemia n=140 n (%)	Low HDL-C levels n=95 n (%ᵃ)
Gender					
Males (n=42)	32 (27.4)	26 (18.6)	20 (23.5)	39 (27.9)	19 (20.0)
Females (n=123)	85 (72.6)	114 (81.4)	65 (76.5)	101 (72.1)	76 (80)
Age Groups					
20-29 (n=4)	3 (2.6)	3 (2.1)	2 (2.4)	2 (1.4)	2 (2.1)
30-39 (n=20)	12 (10.3)	17 (12.1)	9 (10.6)	18 (12.9)	14 (14.7)
40-49 (n=39)	25 (21.4)	32 (22.9)	21 (24.7)	34 (24.3)	22 (23.2)
50-59 (n=55)	40 (34.2)	50 (35.7)	29 (34.1)	45 (32.1)	33 (34.7)
60-69 (n=26)	19 (16.2)	22 (15.7)	16 (18.8)	24 (17.1)	12 (12.6)
≥70 (n=21)	18 (15.4)	16 (11.4)	8 (9.4)	17 (12.1)	12 (12.6)
BMI					
Normal (n=8)	8 (6.8)	0	4 (4.7)	7 (5.0)	4 (4.2)
Overweight (n=28)	22 (18.8)	18 (12.9)	12 (14.1)	22 (15.7)	19 (20.0)
Obese (n=129)	87 (74.4)	122 (87.1)	69 (81.2)	111 (79.3)	72 (75.8)
Towns					
Antakya (n=40)	21 (17.9)	35 (25.0)	26 (30.6)	37 (26.4)	24 (25.3)
Iskenderun (n=47)	34 (29.1)	40 (28.6)	19 (22.4)	38 (27.1)	26 (27.4)
Yayladagı (n=26)	18 (15.4)	22 (15.7)	12 (14.1)	21 (15.0)	21 (22.1)
Kırıkhan (n=52)	44 (37.6)	43 (30.7)	28 (32.9)	44 (31.4)	24 (25.3)
Location					
City center (n=44)	29 (24.8)	36 (25.7)	18 (21.2)	36 (25.7)	28 (29.5)
District center (n=56)	41 (35.0)	46 (32.9)	31 (36.5)	49 (35.0)	31 (32.6)
Village (n=65)	47 (40.2)	58 (41.4)	36 (42.4)	55 (39.3)	36 (37.9)

ᵃχ² test

Low HDL-C was seen in 95 of the participants; 19 (45.2%) in men and 76 (61.8%) in women (p>0.05). It was higher at the ages of 50-59 (n=33, 34.7%), in obese (n=72, 75.8%), in Iskenderun (n=26, 27.4%), and in villages (n=36, 37.9%).

Among the participants with MetS, 35.1 % (n=26) were smokers and 49.8% (n=139) were nonsmokers. Prevalence of MetS was lower in smokers (p=0.024).

In the study population, among the subjects without MetS, 36 (19%) had none, 64 (34%) had one, 88 (46.8%) had two components of MetS. However, of the patients with MetS, 79 (47.8%) had three, 68 (41.3%) had four and 18 (10.9%) had five criteria.

Discussion

This study reports the prevalence of MetS in Hatay region according to the NCEP-ATPIII criteria. In our study the total prevalence of MetS was 46.7% with 33.3% in men and 54.2% in women which is the highest prevalence when compared with the previous studies performed in Turkey. The prevalence of MetS according to ATP III was reported to be between 26.9%-38.1% in previous studies from Turkey. Onat et al. (17) reported that prevalence of MetS in a Turkish adult population of 786 inhabitants was 32.8% (38.6% for women and 27% for men) in a study performed in 1997–1998 (the Turkish Adult Risk Factor Study). Sanisoglu et al. (16) reported the MetS prevalence as 10.09% and 27.33% in men and women, respectively in Turkey between the years 2000-2002.

The overall prevalence of MetS was 26.9%: 31.3 in women and 21.7% in men in a study performed in the central province of Trabzon city and its nine towns located in the northeastern part of Turkey between 2003-2005(18). In another study performed by Ozsahin et al. (25), the prevalence of MetS was 33.4% (39.1% for women and 23.7% for men), in an adult population of 1637 inhabitants in Adana which is a southern province of Turkey. The prevalence of MetS in a rural village in West Anatolia by using ATPIII definitions was found to be 38.1% (20). According to a study performed by Gundogan et al. (19), the prevalence of MetS in Mediterranean region was found to be 28.8% (23.1% male and 33.5% female) and when the subgroups are analyzed 36.5% at Hatay in a smaller number of participants.

There are number of studies performed to determine the prevalence of MetS in different regions of the various countries. When compared with the studies done in other countries our prevalence is again very high. The prevalence of MetS in Norway (14) was 25.9% (26.8% in men and 25.0% in women), in Latin America (15), 20% in men and 22% in women, in North India, 38.5% (39.5% in men and 44.8% in women), in China, 9.8% in men and 17.8% in women (26), in United States (27) 23.7% (24% in men and 23% in women), in Greece (28), 23.6% (24.2% in men and 22.8% in women), in Gulf Cooperative Council (29) (GCC; Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates)-countries, 20.7% to 37.2% in men and 32.1% to 42.7% in women, in Iran (30), 23.7% (23.1% in men and 24.4% in women).

In our study, there was a predominance of women (54.2%) when compared with men (33.3%) among the participants with MetS. This is also seen in previous studies in Turkey (16-19, 25). In most of the studies (12-13, 15, 27, 31-32) done in other countries the prevalence of MetS is higher in women, only few studies show no difference or men predominance (33-35). The difference between the genders may be due to genetic predisposition, physical activity, and lifestyle. In Turkey, most of the women are housewives and this condition may lead to less physical activity and more time in kitchen.

We found the MetS prevalence highest at the ages of 50-59 in both genders. There are many studies that showed the increments of MetS prevalen-

ce with age (14, 16, 18-20, 25, 30-31). Accordingly, aging might be a risk factor for MetS. In our study, all of the MetS components were highest at the ages of 50-59 which may be the cause of the high prevalence. After the age of 60 the MetS prevalence started to decline. This may be due to chronic diseases such as diabetes, hypertension, CVDs, cerebrovascular diseases and decrease in the degree of physical activity and nutritional intake. One reason for the decrease of the prevalence of MetS after the age of 60 could be the fact that many subjects having MetS die by this age due to cardiovascular problems.

The most prominent components of MetS in our study were hypertriglyceridemia (84%) and abdominal obesity (84%) followed by, hypertension (70%), low HDL-C (57%) and hyperglycemia (51%). In different studies from Turkey, the range of the components changes which may be due to geographical differences of nutritional intake and genetics.

Kozan et al. revealed that the most frequent component of MetS is hypertension, and the others were HDL-C, abdominal obesity, high TG and high FBG, respectively (36). The MetS components are ranged as hypertension, abdominal obesity, hypertriglyceridemia, low HDL-C and high FBG in a study by Erem et al. (18). In a another study from Turkey, the most prevalent components of the MetS were found to be high TG, low HDL-C, high BP, abdominal obesity and high FBG by Soysal et al. (37).

High prevalence of abdominal obesity was also reported by Ford et al. (27) in US and by Athyros in Greece (28). In our study high prevalence of abdominal obesity and hypertriglyceridemia may be related to too much consumption of red meat and desserts in Hatay region (high fat and high carbohydrate diet) as well as to the genetic factors. Higher red meat consumption is associated with a significantly higher prevalence and incidence of MetS and central obesity in individuals at high risk for CVD (38). In our study, abdominal obesity among the MetS group was found to be 61.9% in males and 92.7% in females. It's well known that there is a strong correlation between central obesity and CVD (39). Generally, central obesity is correlated with overeating and a sedentary lifestyle and plays a central role in the prevention of MetS. Central obesity is also correlated with both

insulin resistance and type 2 diabetes mellitu. There is no published data but generally Turkish population does not exercise regularly and it's well known that moderate exercise with dietary modification can cause weight loss in obese individuals with improving insulin sensitivity.

Conclusions

In conclusion, our study is the first study that shows the MetS prevalence defined by NCEP-ATP III comprehensively in Hatay region. At the present report in comparison to the previous studies performed in Turkey, the highest prevalence of MetS was found in Hatay. This may be due to high consumption of red meat, physical inactivity and genetic predispositions. Alarmingly high MetS prevalence in this region needs urgently a public health program containing an education, diet and exercise program. Public should be informed about MetS and its clinical implications by conferences and local media.

References

1. James PT, Rigby N, Leach R. The obesity epidemic, metabolic syndrome and future prevention strategies. Eur J Cardiovasc Prev Rehabil. 2004; 11:3-8

2. Laaksonen DE, Lakka HM, Niskanen LK, Kaplan GA, Salonen JT, Lakka TA. Metabolic syndrome and development of diabetes mellitus: application and validation of recently suggested definitions of the metabolic syndrome in a prospective cohort study. Am J Epidemiol. 2002; 156:1070-7

3. Mente A, Yusuf S, Islam S, McQueen MJ, Tanomsup S, Onen CL, et al. Metabolic syndrome and risk of acute myocardial infarction a case-control study of 26,903 subjects from 52 countries. J Am Coll Cardiol. 2010; 55: 2390-8

4. Lakka HM, Laaksonen DE, Lakka TA, Niskanen LK, Kumpusalo E, Tuomilehto J, et al. The metabolic syndrome and total and cardiovascular disease mortality in middle-aged men. JAMA. 2002; 288:2709-16

5. Gupta AK, Dahlof B, Sever PS, Poulter NR. Metabolic Syndrome, Independent of Its Components, Is a Risk Factor for Stroke and Death But Not for Coronary Heart Disease Among Hypertensive Patients in the ASCOT-BPLA. Diabetes Care. 2010; 33:1647-51

6. Einhorn D, Reaven GM, Cobin RH, Ford E, Ganda OP, Handelsman Y, et al. American College of Endocrinology position statement on the insulin resistance syndrome. Endocr Pract. 2003; 9:237-52

7. Organization WH. Definition, diagnosis and classification of diabetes mellitus and its complications. Report of a WHO consultation 1999;

8. Executive summary of the third report of the national cholesterol education program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III). JAMA. 2001; 285:2486-97

9. Balkau B CM. Comment on the provisional report from the WHO consultation. Diabetic Medicine. 1999; 16:442-3

10. Alberti KG ZP, Shaw J IDF Epidemiology Task Force Consensus.The metabolic syndrome: a new worldwide definition. Lancet. 2005; 366:1059 -62

11. Alberti KG, Eckel RH, Grundy SM, Zimmet PZ, Cleeman JI, Donato KA, et al. Harmonizing the metabolic syndrome: a joint interim statement of the International Diabetes Federation Task Force on Epidemiology and Prevention; National Heart, Lung, and Blood Institute; American Heart Association; World Heart Federation; International Atherosclerosis Society; and International Association for the Study of Obesity. Circulation. 2009; 120:1640-5

12. Feng Y, Hong X, Li Z, Zhang W, Jin D, Liu X, et al. Prevalence of metabolic syndrome and its relation to body composition in a Chinese rural population. Obesity (Silver Spring). 2006; 14:2089-98

13. Mangat C, Goel NK, Walia DK, Agarwal N, Sharma MK, Kaur J, et al. Metabolic syndrome: a challenging health issue in highly urbanized Union Territory of north India. Diabetol Metab Syndr. 2010; 2:19

14. Hildrum B, Mykletun A, Hole T, Midthjell K, Dahl AA. Age-specific prevalence of the metabolic syndrome defined by the International Diabetes Federation and the National Cholesterol Education Program: the Norwegian HUNT 2 study. BMC Public Health. 2007; 7:220

15. Escobedo J, Schargrodsky H, Champagne B, Silva H, Boissonnet CP, Vinueza R, et al. Prevalence of the metabolic syndrome in Latin America and its association with sub-clinical carotid atherosclerosis: the CARMELA cross sectional study. Cardiovasc Diabetol. 2009; 8:52

16. Sanisoglu SY, Oktenli C, Hasimi A, Yokusoglu M, Ugurlu M. Prevalence of metabolic syndrome-related disorders in a large adult population in Turkey. BMC Public Health. 2006; 6:92

17. Onat A, Ceyhan K, Basar O, Erer B, Toprak S, Sansoy V. Metabolic syndrome: major impact on coronary risk in a population with low cholesterol levels--a prospective and cross-sectional evaluation. Atherosclerosis. 2002; 165:285-92

18. Erem C, Hacihasanoglu A, Deger O, Topbas M, Hosver I, Ersoz HO, et al. Prevalence of metabolic syndrome and associated risk factors among Turkish adults: Trabzon MetS study. Endocrine. 2008; 33:9-20

19. Gundogan K, Bayram F, Capak M, Tanriverdi F, Karaman A, Ozturk A, et al. Prevalence of metabolic syndrome in the Mediterranean region of Turkey: evaluation of hypertension, diabetes mellitus, obesity, and dyslipidemia. Metab Syndr Relat Disord. 2009; 7:427-34

20. Gemalmaz A, Serpil A, Basak O, Discigil G, Karul A. Prevalence of the Metabolic Syndrome in a Rural Turkish Population: Comparison and Concordance of Two Diagnostic Criteria. Turk J Med Sci. 2008; 38 159-65

21. Kassi E, Pervanidou P, Kaltsas G, Chrousos G. Metabolic syndrome: definitions and controversies. BMC Med. 2011; 9:48

22. Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care. 1997; 20:1183-97

23. World Health Organization: Definition, diagnosis and classification of diabetes mellitus and its complications: Report of a WHO Consultation. Part 1. Diagnosis and classification of diabetes mellitus Geneva, World Health Organization. 1999;

24. Diagnosis and classification of diabetes mellitus. Diabetes Care. 2005; 28 Suppl 1:S37-42

25. Ozsahin AK, Gokcel A, Sezgin N, Akbaba M, Guvener N, Ozisik L, et al. Prevalence of the metabolic syndrome in a Turkish adult population. Diabetes Nutr Metab. 2004; 17: 230-4

26. Gu D, Reynolds K, Wu X, Chen J, Duan X, Reynolds RF, et al. Prevalence of the metabolic syndrome and overweight among adults in China. Lancet. 2005; 365: 1398-405

27. Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among US adults: findings from the third National Health and Nutrition Examination Survey. JAMA. 2002; 287: 356-9

28. Athyros VG, Bouloukos VI, Pehlivanidis AN, Papageorgiou AA, Dionysopoulou SG, Symeonidis AN, et al. The prevalence of the metabolic syndrome in Greece: the MetS-Greece Multicentre Study. Diabetes Obes Metab. 2005; 7: 397-405

29. Mabry RM, Reeves MM, Eakin EG, Owen N. Gender differences in prevalence of the metabolic syndrome in Gulf Cooperation Council Countries: a systematic review. Diabet Med. 2010; 27: 593-7

30. Sharifi F, Mousavinasab SN, Saeini M, Dinmohammadi M. Prevalence of metabolic syndrome in an adult urban population of the west of Iran. Exp Diabetes Res. 2009; 2009: 136501

31. Sidorenkov O, Nilssen O, Brenn T, Martiushov S, Arkhipovsky VL, Grjibovski AM. Prevalence of the metabolic syndrome and its components in Northwest Russia: the Arkhangelsk study. BMC Public Health. 2010; 10:23

32. Ramachandran A, Snehalatha C, Satyavani K, Sivasankari S, Vijay V. Metabolic syndrome in urban Asian Indian adults--a population study using modified ATP III criteria. Diabetes Res Clin Pract. 2003; 60:199-204

33. Al-Lawati JA, Mohammed AJ, Al-Hinai HQ, Jousilahti P. Prevalence of the metabolic syndrome among Omani adults. Diabetes Care. 2003; 26:1781-5

34. Al-Daghri NM, Al-Attas OS, Alokail MS, Alkharfy KM, Sabico SL, Chrousos GP. Decreasing prevalence of the full metabolic syndrome but a persistently high prevalence of dyslipidemia among adult Arabs. PLoS One. 2010; 5:e12159

35. Lin JW, Caffrey JL, Chang MH, Lin YS. Sex, menopause, metabolic syndrome, and all-cause and cause-specific mortality--cohort analysis from the Third National Health and Nutrition Examination Survey. J Clin Endocrinol Metab. 2010; 95:4258-67

36. Kozan O, Oguz A, Abaci A, Erol C, Ongen Z, Temizhan A, et al. Prevalence of the metabolic syndrome among Turkish adults. Eur J Clin Nutr. 2007; 61: 548-53

37. Soysal A, Demiral Y, Soysal D, Ucku R, Koseoglu M, Aksakoglu G. The prevalence of metabolic syndrome among young adults in Izmir, Turkey. Anadolu Kardiyol Derg. 2005; 5:196-201

38. Babio N, Sorli M, Bullo M, Basora J, Ibarrola-Jurado N, Fernandez-Ballart J, et al. Association between red meat consumption and metabolic syndrome in a Mediterranean population at high cardiovascular risk: Cross-sectional and 1-year follow-up assessment. Nutr Metab Cardiovasc Dis. 2010;

39. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet. 2004; 364: 937-52

Corresponding Author
Ihsan Ustun,
Department of Endocrinology,
Mustafa Kemal University,
Faculty of Medicine,
Hatay,
Turkey,
E-mail: iustun@yahoo.com

Evaluation of two molecular methods for the detection of Beijing strains of Mycobacterium tuberculosis in pulmonary tuberculosis patients

Somayeh Jahani Sherafat[1,2], Hossein Goudarzi[1], Parisa Farnia[2], Mohammad Rostami Nejad[3]

[1] Microbiology Dep, Shahid Beheshti University of Medical Sciences, Tehran, Iran,
[2] Mycobacteriology Research center, Masih Daneshvari Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran,
[3] Gastroenterology and Liver diseases Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Abstract

Objective: The Beijing genotype of Mycobacterium tuberculosis (MTB) has attracted special attention due to association with multi drug resistance and rapid transmission. Although Spoligotyping is the gold standard for the identification and classification of Beijing strains of MTB, but this technique need to apply special equipment that there are not in clinical laboratory. In this study we compare two fast and cost-effective methods for rapid identification of this genotype to identify better methods for prevent of spread of this genotype in the community.

Materials and methods: DNA from positive culture specimens in tuberculosis patients were extracted using CTAB) cetyltrimethyl ammonium bromide) method. Then, different strains of MTB was determined by spoligotyping, and using multiplex PCR with 3 set of PCR primers (BjF- BjR/ nBjF- nBjR / IS59-IS60). Also for investigation the number of IS6110 in dnaA-dnaN regain, Ar-Af primers were used.

Results: Total 200 MTB isolates were genotyped by spoligotyping, multiplex PCR and PCR. Nineteen isolates were determined to be Beijing strain and the remaining isolated (181 isolates) were non Beijing strains.

Conclusion: Both examined methods to distinguish Beijing strain have same detection power and can be used in clinical laboratories settings, but Multiplex PCR is most cost effectiveness and by using internal control for MTB, we can distinguish Beijing from non Beijing in one reaction compare with another PCR method.

Key words: Mycobacterium tuberculosis, Beijing genotype, spoligotyping, Multiplex PCR.

Introduction

Mycobacterium tuberculosis (TB) still remains a major public health problem in the world, especially in developing countries (1,2). In 2008, there were an estimated 8.9–9.9 million incident cases and 9.6–13.3 million prevalent cases of TB according to WHO report and 28 per 100,000 in 2006 for Iranian population (3, 4). The increasing number of drug-resistant TB isolates, including multidrug-resistant TB (MDR-TB) creates serious problems in the world (5). Consequently, based on high levels of resistance, particularly to multiple drugs and rapid transmission, identification of different strains is important. There are several genotypes of MTB with different prevalence in various regains of the world. In 1995, a large proportion of MTB strains in the Beijing area of China were reported to have mutually highly similar multi-banded *IS6110* restriction fragment-length polymorphism (RFLP) patterns who named Beijing strain (6). This strain has attracted special attention recently because of its global emergence and resistance to multiple drugs (7). This Beijing family is more predominant in South–East Asia countries, and also more prevalent in those Iranians people who are living or working and/or traveling to these countries (8).

There are several methods to identification of Beijing strain, such as RFLP analysis with highly discriminatory power and spoligotyping who is widely used to differentiate strains belonging to the MTB complex. Spoligotyping has been particularly useful for strains identification belonging to the Beijing family of MTB because of the characteristic spoligotyping pattern with the absence of spacers 1–34 in the direct repeat (DR) region

of the MTB genome (9-11). These techniques, however, needs special equipment and also is time-consuming (7). Consequently, we need the rapid and easy methods that does not need to special equipment. Therefore, for achieving to this goal, we compare three methods including PCR, multiplex PCR and spoligotyping to identify the Beijing strains.

Material and methods

Primary isolation and culturing of *Mycobacterium* isolates from sputum specimens were performed according to manual procedures (12). All isolates were identified as MTB complex firstly confirmed by using biochemical tests, including production of niacin, catalase activity, nitrate reduction, pigment production and growth rate. Drug susceptibility testing against isoniazid (INH), rifampicin (RIF), streptomycin (SM) and ethambutol (ETB) were evaluated by proportional method on Lowenstein–Jensen media at a concentration of 0.2, 40, 4.0 and 2.0 mg/ml, respectively. Finally, DNA was extracted from positive culture specimens using CTAB (cetyltrimethyl ammonium bromide) method (13).

Spoligotyping Method

This method was performed as previously described by Kamerbeek et al. (10). In brief, DR region was amplified by PCR using primers derived from the DR sequence. The amplified DNA was hybridized to a set of 43 immobilized oligonucleotides derived from the spacer sequences of *M. tuberculosis* H37Rv and *M. bovis* BCG P3 by reverse line blotting.

PCR technique

Multiplex PCR

For multiplex PCR, 3 sets of PCR primers were used to distinguish between Beijing and non-Beijing strains according to Sun et al. study (table 1) (7). These primers were used in the same multiple PCR mixture. A Beijing strain was expected to produce two amplicons: 523-bp internal control product and 129-bp product. A non-Beijing strain was expected to produce 523-bp internal control product and 105-bp products. Multiplex PCR was performed in a total volume of 25 μl, containing 0.5μM dNTP, 0.75 μl MgCl2, 0.1 μ l of smartaq enzyme, 2 μl of each primer, and 1.5 μl of template DNA in 2.5 μl 10 x buffers. Temperature cycling conditions included 96°C for 5 min, followed by 35 cycles of 96°C for 30 s, 58°C for 20 s, 72°C for 1 min, and a final extension at 72°C for 7 min. The PCR products were analyzed by electrophoresis on 8% polyacrylamide gel.

PCR assay

In PCR for investigation the number of *IS6110* in dnaA-dnaN regain, we used Ar-Af primers (table 1) (14). The Beijing strain expected to produce 2000bp band because of one *IS6110* in dnaA-dnaN regain, but the standard strain produced 537bp product because there is no any mutation in this strain. PCR was performed in a total volume of 25 μl, containing 0.5μM dNTP, 1 μ l MgCl2, 0.2 μ l of smartaq enzyme, 0.4 μ l primer, and 1.5 μl of template DNA in 2.5 μ l 10 x buffers. Temperature cycling conditions included 94°C for 5 min, followed by 30 cycles of 94°C for 30 s, 60°C for 30 s, 72°C for 1 min, and a final extension at 72°C for 10 min. The PCR products were analyzed by electrophoresis on 2% agarose gel with 100bp ladder.

Table 1. The characters of primers that used for PCR

Primer name	Sequence	Molecular weight
BjF	CTCGGCAGCTTCCTCGAT	129bp
BjR	CGAACTCGAGGCTGCCTACTAC	
nBjF	AAGCATTCCCTTGACAGTCGAA	105bp
nBjR	GGCGCATGACTCGAAA GAAG	
IS59	GCGCCAGGCGCAGGTCGATGC	523bp
IS60	GATCAGCGATCGTGGTTCCTGC	
Ar	**GCCAACTCTTGTCGTAGCCG**	**Beijing:2000**
Af	**CGCATCCGTCAGCGCTCCAA**	**H37Rv:573bp**

Statistical analysis

Data were analyzed with SPSS 13.0 (SPSS Inc., Chicago, IL, USA). Categorical variables were compared by Fisher's exact test. Significance was defined as a *P* value of <0.05.

Results

In total 200 MTB isolated were genotyped by spoligotyping and also by two PCR methods. Nineteen (9.5%) isolates were shown the spoligotyping pattern with the absence of spacers 1–34 in the direct repeat (DR) region of the *M. tuberculosis* genome and determined as Beijing strains. These samples contained the Beijing-specific A1 insertion band by PCR. By multiplex PCR the Beijing isolate showed both 523-bp internal control and 129-bp product (Figure 2). Therefore, these two PCR methods indicated the same result. The remaining 181 (90.5%) isolated did not have this pattern and were so called as non-Beijing strains (Figure 1).
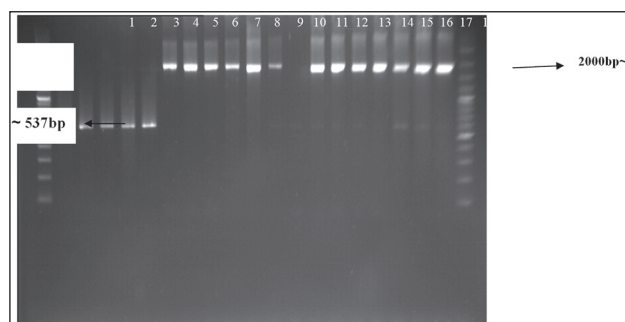
Figure 1. Electrophoresis results of IS6110 polymerase chain reaction (PCR) products in dnaA-dnaN regain on a 2% agaros gel. Beijing strains generated 2000-bp fragments. Non-Beijing strains generated 537-bp fragments. Lanes 2 to 6: Non-Beijing strains lane 7 to 20: Beijing strain; lane 13: lake of DNA; lane 1, 21: 100-bp DNA ladder
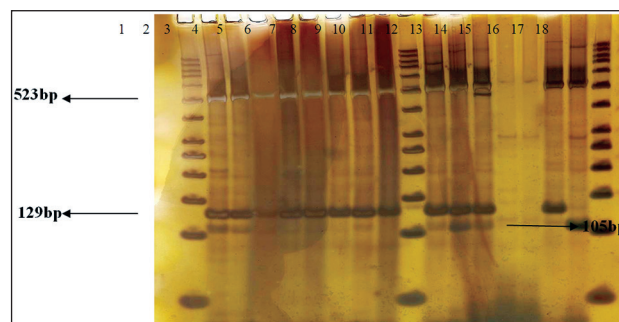
Figure 2. Electrophoresis results of the multiplex polymerase chain reaction (PCR) products on a 8% polyacrylamide gel. Beijing strains generated 129-bp and 523-bp fragments. Non-Beijing strains generated 105-bp and 523-bp fragments. Lanes 2 to 9 and11, 12, 13, 16: Beijing strains lane 17: a non-Beijing strain; lane 14, 15: lake of DNA; lane 1, 10: 50-bp DNA

In this study, 29 isolates were MDR-TB and 10 of them were belonged to the Beijing family. Statistically significant differences were found between MDR or drug resistance in the Beijing family compare to non-Beijing family (P<0.05) (Table 2).

Discussion

The Beijing family of *M. tuberculosis* strains may have been endemic in China for a long time (11) and is now emerging in other parts of the world. This family is dominant in Asian countries such as China (86%), Japan (73%), Indonesia (34%), Thailand (44%), and Korea (72%) (15-18). This strain also is present in Iran (19). Farnia et al. in 2006 reported 20.5% of tested strains of MTB were belonged to Beijing family (8). The result of current study is compatible with this study. Different studies show Beijing family has a higher rate of drug resistance (19). Our study confirms this subject and 53% of them were MDR.

On the other hands, several methods have also been developed for the identification of the Beijing strain. The high discriminatory power of

Table 2. Drug resistance in 200 M. tuberculosis clinical isolates

Spoligotype	No. of isolates (%)	MDR (%)
Beijing family	19 (9.5)	10.6 (53)
Non-Beijing family	181 (90.5)	18 .4(10)
Total	200 (100)	29 (14.5)

MDR: multi-drug resistant.

RFLP analysis based on the insertion sequence is one of them. Unfortunately, this technique is time-consuming, technically demanding, and insufficiently discriminating when used alone with isolates containing <5 *IS6110* sequences in the genome and its specificity is depends on the number of bands obtained (9). Isolates with low numbers of copies account for as much as 20% of TB isolates were found in some populations (10). Techniques based on PCR amplification of repetitive sequences are more rapid than RFLP, but their discriminatory power is usually lower. Among these techniques, spoligotyping is widely used to differentiate strains belonging to the *Mycobacterium tuberculosis* complex. This technique, however, is time-consuming and needs special equipment (7). Another PCR-based genotyping technique is VNTR (Variable Number Tandem Repeat) analysis. This method uses small quantities of crude bacterial lysates, it is less labor-intensive than RFLP-*IS6110* typing and automation is relatively straightforward (20). However, it is not suitable for demonstrating the population of Beijing strains because it cannot provide any information regarding the distinguishing Beijing from non-Beijing family strains (19, 20).

There is another PCR method who described by Rao et al. (21) this method is based on amplifies the mycobacterial interspersed repetitive unit (MIRU) locus 26, but some non-Beijing MTB isolates also have the same number of MIRU repeats (5). Another PCR method which amplifies MIRU loci 26 and 31 and the ETR-A region has a sensitivity of 94.7% and a specificity of 98.5% in the identification of Beijing strains of MTB. However, this method relies on multi-locus analysis, and the results are difficult to interpret (9). Hillemann et al. developed a multiplex real-time PCR which allows the identification of Beijing and non-Beijing strains in a one-tube reaction (6). Unfortunately, real-time PCR is cost-prohibitive for large-scale screens.

IS*6110* insertion was found only between the *dnaA* and *dnaN* genes of Beijing genotype (22). Therefore, this method demonstrates 100% specificity and its applicability for robust, rapid, and reliable identification of Beijing family strains.

In conclusion, considering the same detection power of two methods to distinguish Beijing strain, and higher cost effectiveness in comparison

to spoligotyping, both PCR methods can be used in clinical laboratories settings but in Multiplex PCR method there is internal control for MTB and BjF and BjR primers is specific for Beijing strain. Therefore it could determine the MTB and Beijing or non-Beijing strain in one reaction of PCR. As a result we can conclude that this method could be more specific and reliable for identification of Beijing family strains compare to PCR assay (23).

Reference

1. World Health Organization. Global tuberculosis control: a short update to the 2009 report. Available at http://www.who.int/tb/publications/ global_report/en/ [accessed on July 1, 2010].

2. Abakay A, Tanrikulu AC, Abakay O, Selimoglu Şen H. Tuberculosis as an occupational disease: based on health care centers in Turkey. HealthMED. 2011; 5 (6): 1558-1564

3. Wei-wei J, Igor M, Gui-zhi S, Mo L, Jia-wen L, Olga N, et al. Molecular characteristics of rifampin and isoniazid resistant Mycobacterium tuberculosis strains from Beijing, China. Chin Med J 2007; 120(9):814-819

4. Chen J, Tsolaki AG, Shen X, Jiang X, Mei J, Gao Q Deletion-targeted multiplex PCR (DTM-PCR) for identification of Beijing/W genotypes of Mycobacterium tuberculosis. Tuberculosis (Edinb) 2007;87(5):446–449

5. Koksalan OK. Use of mycobacterial interspersed repetitive unit locus 26 for rapid identification of Beijing genotype Mycobacterium tuberculosis strains. J Clin Microbiol 2006; 44(4): 1612–1613

6. Hillemann D, Warren R, Kubica T, Rüsch-Gerdes S, Niemann S. Rapid detection of Mycobacterium tuberculosis Beijing genotype strains by real-time PCR. J Clin Microbiol 2006; 44(2):302– 306

7. Sun JR, Lee SY, Dou HY, Lu JJ. Using a multiplex polymerase chain reaction for the identification of Beijing strains of Mycobacterium tuberculosis. Eur J Clin Microbiol Infect Dis. 2009;28(1):105-7.

8. Kong P, Qingyue M, Xufeng B. An economic evaluation of China's new cooperative medical scheme onTB health care: a case study in vecounties in Ningxia province, China. HealthMED. 2011;5(Suppl. 1): 1909-1911

9. Chin PJ, Chiu CC, Jou R Identification of Beijing lineage Mycobacterium tuberculosis with combined mycobacterial interspersed repetitive unit loci 26, 31, and ETR-A. J Clin Microbiol 2007; 45(3):1022–1023

10. Kanduma E, McHugh TD, Gillespie SH. Molecular methods for Mycobacterium tuberculosis strain typing: a users guide. J Appl Microbiol 2003; 94: 781–91.

11. van Soolingen D, Qian L, de Haas PE, Douglas JT, Traore H, Portaels F et al. Predominance of a single genotype of Mycobacterium tuberculosis in countries of east Asia. J Clin Microbiol 1995; 33(12): 3234–38

12. Kent PT, Kubica GP. Public health mycobacteriology: a guide for level III laboratory. 1985; Centers for Diseases Control

13. Canetti G, Fox W, Khomenko A, Mahler HT, Menon NK, Mitchison DA, Rist N, Smelev NA. Advances in techniques of testing mycobacterial drug sensitivity, and the use of sensitivity tests in tuberculosis control programmes. Bull World Health Organ 1969; 41: 21-43.

14. Mokrousov I, Jiao WW, Valcheva V, Vyazovaya A, Otten T, Ly HM et al. Rapid detection of the Mycobacterium tuberculosis Beijing genotype and its ancient and modern sublineages by IS6110-based inverse PCR. J Clin Microbiol 2006; 44(8): 2851–2856

15. Van Soolingen D, Qian L, de Haas PE, Douglas JT, Traore H, Portaels F, et al. Predominance of a single genotype of Mycobacterium tuberculosis in countries of east Asia. J Clin Microbiol 1995; 33: 3234-8.

16. Prodinger WM, Bunyaratvej P, Prachaktam R, Pavlic M. Mycobacterium tuberculosis isolates of Beijing genotype in Thailand. Emerg Infect Dis 2001; 7: 483-484.

17. Choi GE, Jang MH, Song EJ, Jeong SH, Kim JS, Lee WG et al. IS6110-restriction fragment length polymorphism and spoligotyping analysis of Mycobacterium tuberculosis clinical isolates for investigating epidemiologic distribution in Korea. J Korean Med Sci 2010; 25(12): 1716-1721

18. Nagorni-Obradovic L, Vukovic D, Denic Markovic L, Pesut D, Vukovic G. Knowledge and awareness of tuberculosis amongmedical and dental students in Belgrade, Serbia. HealthMED. 2012; 6(6): 1791-1801

19. Rohani M, Farnia P, Nasab MN, Moniri R, Torfeh M, Amiri MM. Beijing genotype and other predominant Mycobacterium tuberculosis spoligotypes observed in Mashhad city, Iran. Indian J Med Microbiol. 2009; 27(4): 306-10.

20. Supply P, Lesjean S, Savine E, Kremer K, van Soolingen D, Locht C. Automated high-throughput genotyping for study of global epidemiology of Mycobacterium tuberculosis based on mycobacterial interspersed repetitive units. J Clin Microbiol 2001; 39: 3563–71.

21. Rao KR, Ahmed N, Srinivas S, Sechi LA, Hasnain SE Rapid identification of Mycobacterium tuberculosis Beijing genotypes on the basis of the mycobacterial interspersed repetitive unit locus 26 signature. J Clin Microbiol 2006; 44(1): 274–77

22. Nikolayevskyy V, Gopaul K, Balabanova Y, Brown T, Fedorin I, Drobniewski F. Differentiation of tuberculosis strains in a population with mainly Beijing-family strains. Emerg Infect Dis. 2006; 12(9): 1406-1

23. Warren RM, Victor TC, Streicher EM, Richardson M, Beyers N, Gey van Pittius NC et al. Patients with active tuberculosis often have different strains in the same sputum specimen. Am J Respir Crit Care Med. 2004; 169(5): 610–614

Corresponding Author
Hossein Goudarzi,
Microbiology Department,
Shahid Beheshti University of Medical Sciences,
Tehran,
Iran,
E-mail: jahani_somayeh@yahoo.com

A comparison of critical thinking disposition among nurses in Turkey

Oznur Sarioglu[1], Yasemin Yildirim Usta[2], Yurdanur Dikmen[3], Frank D. Hicks[4], Medet Korkmaz[5]

[1] Uludag University of the Faculty of Medicine, Bursa, Turkey,
[2] Abant Izzet Baysal University, Bolu School of Nursing, Department of Medical Nursing, Bolu, Turkey,
[3] Abant Izzet Baysal University, Bolu School of Nursing, Department of Fundamental Nursing Bolu, Turkey,
[4] Rush University College of Nursing, Chicago, IL, United States of America,
[5] Suleyman Demirel University Faculty of Health Sciences, Department of Medical Nursing, Isparta, Turkey.

Abstract

Background: Critical thinking is an important phenomenon in nursing science because of its implications for education, practice and the advancement of nursing knowledge.

Objective: To identify and compare the critical thinking disposition (CCTDI) of the critical care nurses with that of clinic nurses and to find some factors which affect their critical thinking disposition.

Method: This analytical study was conducted between March and May 2009 in the intensive care units and clinics of the Uludağ University in Turkey. The participants were 170 nurses with 107 general care nurses and 63 critical care nurses. Data was collected with the California Critical Thinking Disposition Inventory (CCTDI) and Ouestionnaire Form. Data were analyzed used Independent t-test, Kruskal-Wallis Test, Pearson Correlation Test and Mann Whitney U test.

Results: The total years of nursing experience ranged from 1 to 33 years, with mean of 7.97±6.72 years. Time in their current position ranged from 1 to 25 years, with a mean of 7.05±5.04 years. In this study, the average CCTDI scores of the total sample of nurses was 258.62±24.7, meaning that the CCTDI scores were at an "average" level. The results showed that there was no statistically significant difference between the CCTDI scores of the clinic nurses (257.94±4.8) and that of critical care nurses (259.77±24.71) (p>0.05). Age and years of experience of nurses affects critical thinking disposition. CCTDI scores for critical care nurses increased with attendance at scientific meetings.

Conclusion: In this study the results were indicated as weakness disposition toward CT of nurses. In additon, there was no significant differences in CCTDI scores between critical care nurses and clinic nurses. Development of critical thinking disposition in nursing must be provided educational opportunities of the institutional and outside the institution.

Key words: California Critical Thinking Disposition Inventory, critical thinking, critical care nurses, clinic nurses, Turkey, A Comparison of Critical Thinking Disposition among Nurses in Turkey.

Introduction

In clinical nursing practice, critical thinking (CT) promotes problem solving and decision-making that improves the quality of patient care (1). CT is a higher level reasoning process that is formed by one's worldview, knowledge and experience with skills, attitudes and standards as a guide for rational judgment and action. CT is an essential component of professional accountability and quality nursing care (2). Nurses use clinical reasoning and clinical decision-making to ensure safe practices and effective nursing care, to improve clinical systems and to decrease errors in clinical judgments (3). Therefore, patient safety may be directly affected by the critical thinking ability of a nurse. Nurses must have the ability to recognize changes in conditions of patients, perform independent nursing interventions anticipate orders and prioritiz (4). These actions require critical thinking ability, advanced problem-solving skills and the ability to communicate clearly (5).

Critical thinking is an important phenomenon in nursing science because of its implications for education, practice and the advancement of nursing knowledge (6). In recent years, nursing care has become more complex, thereby, highlighting the increasing importance of CT in nursing prac-

tice. Changes in the organization of health care and the cultural aspects of nursing education have led to recognition of nursing as a profession that requires superior cognitive and psychomotor ability. Considering these points, we suggest that it is crucial to implement certain changes in critical approaches and clinical practice (7). Therefore, by developing CT skills and attitudes, nurses will move toward the establishment of best practices in an evidence-based healthcare environment (8). According to the American Association of Colleges of Nursing (AACN), "Critical thinking underlies independent and interdependent decision-making (9). Critical thinking includes questioning, analysis, synthesis, interpretation, inference, inductive and deductive reasoning, intuition, application, and creativity". It is regarded as the basis of professional judgment and has the potential to improve the quality of judgments and decisions in clinical practice (10,11).

Seriously ill patients in intensive care units (ICUs) are closely monitored and when vital functions change, complex medical treatments can be implemented immediately. Therefore, staff working in an ICU require nurses who are able to make rapid and accurate decisions, knowledgeable about complex scenarios and in general have greater responsibility (12,13). Nurses working in ICUs are adept at identifying instantaneous changes in the condition of patients, even when conditions are quite complex (13). Timely and correct decisions are the foundation of intensive patient care. Therefore, it is critical that ICU nurses make correct decisions using the power of critical thinking based on science specific and conceptual knowledge (12). The literature includes studies investigating critical thinking among nurses in Turkey and world-wide (1,14,15,16,17,18,19,20) with some focused on critical care nurses in ICUs or other specific fields, but such studies are limited in number (12,13). Furthermore, in an extensive literature review, numerous studies were found examining the concept of CT in nurses, but no studies were found that compared critical thinking levels of clinic nurses to critical care nurses, or that investigated factors affecting critical thinking disposition (CTD). Identifying critical thinking dispositions during employee orientation can help individualize orientation programs that nurture critical thinking in clinical practice. However, much more information is required to research results about CTD related to nurses in Turkey.

To our knowledge, there is no study in Turkey investigating this relationship. Therefore, this study was undertaken to compare critical thinking levels of clinic nurses to ciritcal care nurses and to investigate factors affecting CTD. The study questions were as follows:
1. What are the dispositions of nurses towards critical thinking?
2. Is there a difference in critical thinking disposition between clinic nurses and critical care nurses?
3. What characteristics of nurses effect critical thinking disposition (age, education, length of experience, attending scientific activities)?

Method

Design and sampling

Data for this cross-sectional study were collected from March to May 2009 during face-to-face meetings with the nurses. Before data collection, the necessary approval was obtained from the Ethics Committee of the Faculty of Medicine at Uludağ University. Inclusion criteria included nurses who had been employed for at least 6 months in direct patient care. The study was conducted at a large metropolitan academic hospital in northwestern Turkey. The institution has a 750-bed capacity with 240 nurses in various clinical fields. Our intention was to collect the data from 102 critical care nurses and 237 clinic nurses at a hospital in Turkey. A total of 63 (68.1%) critical care nurses and 107 (70.6%) clinic nurses were included in the final sample *(n=170 nurses)*.

Data collection

The study data were collected with a Questionnaire Form and The California Critical Thinking Disposition Inventory (CCTDI).

Questionnaire Form: It includes some questions inquiring about their gender, age, education, length of experience, attending scientific activities.

California Critical Thinking Disposition Inventory (CCTDI): Nurses` critical thinking dispositions were measured by the CCTDI. The CCTDI, developed by Facione and Facione (1994), is a 75

item Likert scale tool with seven sub-scales: truth-seeking (12 items), open-mindedness (12 items), analyticity (11 items), systematicity (10 items), critical thinking and self-confidence (10 items), inquisitiveness (10 items) and maturity (10 items). The CCTDI is composed of 75 items that use a 6-point Likert scale (1=disagree strongly to 6=agree strongly). Initial internal consistency (Cronbach's alpha) estimates for the seven subscales in the initial study ranged from 0.72 to 0.80 and the total instrument score for critical thinking disposition was 0.90.21 Cronbach's alpha reliabilities for the subsequent studies have ranged from 0.60 to 0.78 on the subscales and 0.90 on the overall score (21).

CCTDI has been translated and adapted for use in the Turkish culture (23). Validity and reliability studies were conducted by Kökdemir in 2003, in which 51 items and 6 subscales *(open-mindedness, critical thinking self-confidence, analyticity, systematicity, inquisitiveness, and truth-seeking)* For the Turkish version, the total Cronbach's alpha coefficient was 0.88 and Cronbach's alpha coefficients for the subscales were found to be as follows: truth-seeking, 0.61;open-mindedness,0.75;analyticity, 0.75;systematicity, 0.75; critical thinking self-confidence, 0.77; and inquisitiveness, 0.88. In conclusion, the Turkish version of the CCTDI has shown statistically acceptable levels of reliability and validity.23 Scores of 239 or below obtained from the scale show low levels of critical thinking skills, while scores between 240-299 show average levels and scores of 300 and higher show high levels of critical thinking disposition. Whereas, the subscale scores range from 0 to 60 (23). The total Cronbach's alpha coefficient for the CCTDI in this study was 0.82 and subscale values ranged between 0.55-0.80.

Data Analysis

The statistical analysis used 2 primary sources of data: 1) Questionnaire Form, which was developed by taking into consideration the literature on this topic,was used to collect demographic data; and, 2) CCTDI scores.

All variables were initially analyzed descriptively. The Kolmogorov- Smirnov test was used to examine whether the distribution of a continuous outcome follows a normal pattern. Demographic data were analyzed and compared for equivalence using the independent t-test, Kruskal-Wallis Test,

Pearson Correlation Analyses and Mann-Whitney U Test. This study compared differences in CTD between critical care nurses and clinic nurses using the Independent t-test. The Pearson Correlation coefficient was used to test the relationship between the CCTDI scores and professional information such as age and years of experince of nurses. All data were analyzed using the Statistical Package for the Social Sciences (SPSS) Version 17.O, Chicago, IL. A significance level of 0.05 was used for all statistical tests.

Ethical Considerations

This study was conducted according to the principles expressed in the Declaration Helsinki and was approved by the Ethics Committee of the Faculty of Medicine at Uludağ University. Written permission was obtained from the institutions involved. The participants were informed that their participation was voluntary and that all responses would be kept confidential. Written consent was obtained from all participants.

Results

The clinic nurses in the study were all women (100%). Nearly half (n=51, 47.7%) had a BSN as their highest degree. Their age ranged from 20 to 55 years, with a mean of 30.15±6.56 years. The total years of nursing experience ranged from 1 to 33 years, with a mean of 7.97±6.72 years. Time in their current position ranged from 1 to 25 years, with a mean of 7.05±5.04 years. The demographic profile of the critical care nurses in the study was similar to that of the clinic nurses for age, gender and education. The critical care nurses were also all women (100%), and nearly half held a BSN (n=30, 47.6%). More of the critical care nurses had an associate degree (46%) than did the clinic nurses (38.3%). The average age of the critical care care respondents was 30.15±6.56 years, with an average of 7.97±6.7 years of nursing experience and an average of 5.19±4.87 years in their current position.

The descriptive statistics for the subscales and the composite scores are displayed in Table 1. The CCTDI subscales scores of the critical care nurses and clinic nurses in the study were similar. The CCTDI subscales of the clinic nurses and the critical care nurses were examined for five

subscales *(analyticity, open-mindedness, inquisitiveness, truth-seeking and systematicity)* with high scores in the particular CCTDI. The total CCTDI scores were 257.94±4.8 for clinic nurses and 259.77±24.71 for critical care nurses. There was no significant difference between the total CCTDI scores of clinic nurses and critical care nurses ($t=0.466$, $p>0.05$) (Table 2).

There was a meaningful relationship between the ages and total CCTDI scores of both the clinic nurses ($r=0.296$, $p<0.05$) and critical care nurses ($r=0.315$, $p<0.05$); the age of critical care nurses and truth-seeking subscale scores ($p<0.05$) and also for the age of clinic nurses and subscale scores for inquisitiveness and systematicity ($p<0.05$) (Table 3). Furthermore, we found that in the criti-

Table 1. Distribution of the Scores and Standard Deviations by Subscales of Nurses on the CCTDI

CCTDI Scale	Critical Care Nurses (n=63)				Clinic Nurses (n=107)			
	Minimum	Maximum	Mean	SD	Minimum	Maximum	Mean	SD
Analyticity	39.00	53.82	48.07	4.79	38.05	53.00	47.28	6.01
Open-mindedness	35.00	51.00	43.73	6.70	34.00	50.00	43.52	5.57
Inquisitiveness	36.37	52.70	45.53	6.21	35.13	50.01	43.87	7.74
CT* self-confidence	30.00	48.80	39.18	6.33	30.00	47.00	38.35	7.28
Truth-seeking	31.20	48.00	40.04	7.63	30.00	49.00	40.30	7.63
Systematicity	35.00	51.00	43.20	7.32	36.00	51.58	44.59	6.58
Total CCTDI	207.57	305.33	259.77	24.71	203.57	302.33	257.94	24.87

CT= critical thinking*

Table 2. Comparison of CCTDI Scores and Subscale Mean Scores for Critical Care Nurses and Clinic Nurses

CCTDI Scale	Critical care nurses (n=63)	Clinic Nurses (n=107)	t*	p**
	X±SD	X±SD		
Analyticity	48.07±4.79	47.28±6.01	0.900	0.370
Open-mindedness	43.73±6.70	43.52±5.57	0.212	0.833
Inquisitiveness	45.53±6.21	43.87±7.74	1.452	0.148
CT self-confidence	39.18±6.33	38.35±7.28	0.748	0.455
Truth-seeking	40.04±7.63	40.30±7.63	0.216	0.829
Systematicity	43.20±7.32	44.59±6.58	1.278	0.203
Total CCTDI	**259.77±24.71**	**257.94±24.87**	**0.466**	**0.642**

*Independent t test, **p>0.0, . SD=standard deviation, CT= critical thinking.*

Table 3. Comparison of Critical Care Nurses to Clinic Nurses in Relation to Age and Average CCTDI Scores

CCTDI Scale	Critical care nurses (n=63)		Clinic Nurses (n=107)	
	r*	P	r*	P
Analyticity	0.048	0.710	0.160	0.100
Open-mindedness	0.233	0.066	0.162	0.095
Inquisitiveness	0.222	0.080	0.256	0.008**
CT self-confidence	0.042	0.744	0.172	0.076
Truth-seeking	0.332	0.008**	0.185	0.057
Systematicity	0.317	0.011**	0.200	0.039**
Total CCTDI	0.296	0.019**	0.315	0.001**

*Pearson correlation, **p<0.05, CT= critical thinking*

Table 4. Comparison of critical care nurses with clinic nurses in length of years experience according to CCTDI mean scores

CCTDI Scale	(n=63)		(n=107)	
	r*	p	r*	p
Analyticity	0.053	0.679	0.102	0.294
Open-mindedness	0.287	0.022**	0.109	0.262
Inquisitiveness	0.148	0.246	0.167	0.086
CT self-confidence	0.139	0.278	0.123	0.207
Truth-seeking	0.393	0.001**	0.187	0.054
Systematicity	0.335	0.007**	0.166	0.088
Total CCTDI	0.341	0.013**	0.289	0.023**

*Pearson correlation, **p<0.05, CT= critical thinking*

cal care nurses, the total CCTDI scores increased in a statistically significant manner as the level of education increased (KW=6.402, p=0.041<0.05). However, there were no meaningful differences among subscale mean scores for critical care nurses (p>0.05) when compared to level of education nor of the total CCTDI mean scores for clinic nurses when compared to level of education (KW=4.153, p=0.125>0.05) and subscale mean scores (p>0.05).

The dispositions of critical care nurses who attended scientific meetings at least once a year had a statistically higher total CCTDI score than nurses who did not attend any scientific meetings (264.0±24.9 vs. 246.0±18.7, U=2.375, p=0.018<0.05). The subscale analysis revealed that the inquisitiveness level of the critical care nurses who attended scientific meetings was significantly higher than the inquisitiveness level of the critical care nurses who did not attend any scientific meetings (U=2.300, p=0.021<0.05). However, no statistically significant relationships were found between the total CCTDI scores and subscale mean scores of clinic nurses who attended scientific meetings compared to the nurses who did not attend any scientific meetings (U=0.143, p=0.886>0.05).

Discussion

In this study, the average CCTDI scores of the total sample of Turkish nurses was 258.62±24.7, meaning that the CCTDI scores were at an "average" level. However, Park and Kim (16) reported "higher" level CCTDI scores among Korean nurses, while Zori et al., (24) reported "higher" level CCTDI scores (320.41±23.70) among American nurses. In their studies, Arslan et al., (15) reported "low" level CCTDI scores (200.8±21.95), while Dirimeşe (14) reported "average" level CCTDI scores (261.1±23.4). Eşer et al., (13) found that the average CCTDI scores of the critical care nurses are at a "low" level (191.01±30.14), as did Hicks et al., (12) (295.4±19.9). The CCTDI levels of the nurses in previous studies (13,14,15) were reported at undesired levels, similar to the results of our present study. This may be related to factors, such as differences in educational systems, heavier workloads, differences in organizational operations, workplace dissatisfaction and the fact that there are limited management policies to support and stimulate critical thinking. In addition, individual differences among nurses and expectations of some nurses, who only focus on performance of the task given to them without CT, may also be factors causing undesired CCTDI scores.

In our study, we found that the CCTDI subscale scores of both the critical care nurses and the clinic nurses were similar to each other. This study found a similarity in both groups for the analyticity, open-mindedness, inquisitiveness, truth-seeking and systematicity subscales, which indicated a higher disposition toward CT. Moreover, we found in both groups that the analyticity subscale had a higher average than the other subscales (Table1). The analyticity subscale addresses being alert to problems, using evidence to solve problems, anticipating consequences and intervening promptly when a problem is evolving (21). Nurses strong in analyticity may be better able to effectively and promptly solve clinical, interpersonal, knowledge deficit or process-related problems. The CT self-confidence was lower (for the group

as a whole), which indicated a weak disposition toward CT (Table 1). The persons with strong CT confidence demonstrate the ability to make sound decisions, believe that others rely on them to solve problems and decide what to do (22). Therefore, there should be a relationship between self-confidence and autonomy. Cajulis et.al., (25) showed that the majority of the nurse practitioners (41%) had very high levels of autonomy and 31% had extremely high levels of autonomy. Whereas, a study conducted by Karadag et al., (26) Turkey reported a low level of autonomy in nursing. It is suggested that this low level is caused by the laws and regulations concerning nursing and that the existing law on nursing prevents nurses from making decisions and acting independently. In the current Turkish healthcare system, there are many challenges that influence nurses' autonomy. A study carried out by Tastan et al., (27) to determine the autonomy levels of military nurses showed that the important factors that negatively affected nurses' autonomy were overloading, other activities and management.

Our study results showed that there is a statistically significant positive relationship between total CCTDI scores when analyzed according to age and their inquisitiveness, truthseeking and systematicity subscale's scores (p<0.05). In contrast, studies undertaken by (14,15,17) found no significant relationship between critical thinking disposition and ages of nurses. Similar to the results of our study, Martin (28) found that increasing age in nurses brought improved critical thinking and decision-making. Rodrigues (18) identified a meaningful relationship between CCTDI total scores according to age and the subscales of open-mindedness and analyticity.

As the educational level of the critical care nurses increased, the total CCTDI scores increased (p<0.05), but when the educational level of the critical care nurses and subscale scores were analyzed, there were no significant differences. There also was no statistically significant difference between educational level of the clinic nurses and total CCTDI scores (p>0.05). Empirically, the influence of professional nursing education on nurses' clinical decision-making is controversial. Whereas Girot (20) and Feng et al., (1) found that nurses with higher levels of education made better

decisions. Although Hicks et al., (12) found that educational level and clinical experience do not affect the CCTDI of nurses. Kataoka-Yahiro and Saylor (29) emphasized the importance of clinical experience in the development of critical thinking skills in their model developed for nursing decisions. Effective critical thinking and problem-solving actually depends on relevant knowledge and previous experience (30). Based on these findings, there was a statistically significant positive relationship between the level of experience and total CCTDI scores for both clinic nurses and critical care care (p>0.05) in this study (Table 3).

Examination of the subscale results shows no statistically significant relationships between length of experience and subscale mean scores for clinic nurses. However, the self-confidence and adherence to systematic thinking subscale scores increased in critical care nurses with increased experience (p<0.05). The reason for this result may be related to the fact that working in ICUs requires rapid, yet accurate decision-making and analytical, systematic thinking to solve complex cases. Critical thinking, which requires being analytical and systematic, plays an important role in the effective functioning of the nurses in intensive care environments where complex patient care is administered (12).

Participation in scientific educational activities is presumed to increase CT dispositions, help motivate nurses and to ensure accessibility of these activities (14). According to the American Nurses Association (ANA) (31) one of the professional performance standards of nurses is "the nurse integrates research findings into practice". In this study, at least th CCTDI scores of critical care nurses who attended scientific meetings (congress, symposium, conference, etc.) were significantly higher (p<0.05). We therefore conclude that attending scientific meetings positively contributes to nurses' CCTDI scores. The subscale score for the inquisitiveness level of nurses who attended scientific meetings at least once is significantly higher than for those who did not attend. There was no statistically significant relationship between the average CCTDI scores and the subscales for the clinic nurses who attended or did not attend scientific meetings. Eşer et al., (13) found that the total CCTDI scores for open-mindedness and self-confidence of nurses who attended scientific meetings

was significantly higher than those who did not. The main aim of scientific meetings is to present new developments to nurses and to resolve deficiencies in other areas of nursing.

This study found that two-thirds of the critical care nurses and 74.8% of the clinic nurses who participated in the study did not belong to any professional nursing association. This may be because nurses find that the activities of these associations are inadequate or not relevant to their nursing practice, that the activities are not accessible, or that nurses cannot reasonably follow their recommendations. In Turkey, the percentage of nurses having membership in these professional associations was reported to be between 11-38% (32,33,34). All of these studies stated that membership rates were very low, despite the fact that awareness of nursing associations and the percentage of nurses who believed that association membership was important, was very high. These studies imply that there has not been a significant change in nurses' views of professional nursing organizations during the past 25 years. Hence, it is important for associations and health care facilities to work together to organize meetings, to support participation in national/international level scientific activities and to develop awareness of the importance of membership in these associations.

Conclusion

Overall, in this study the results were indicated as weakness disposition toward CT of nurses. In additon, there was no significant differences in CCTDI scores between critical care nurses and clinic nurses. On the other hand, age and years of experience of nurses affects critical thinking disposition. Although critical thinking disposition scores of the critical care nurses increased with their level of education, this was not found among the clinic nurses. Although the CCTDI scores for critical care nurses increased with attendance at scientific meetings, the scores are still not at the optimal level. This suggests that educational policies, which provide opportunities for nurses to think critically and increase autonomy, should be encouraged. To strengthen clinical competence in nurses, the development and enhancement of critical thinking should be emphasized at the college level and nurses should be empowered to make a clinical decisions. Development of critical thinking disposition in nursing must be provided educational opportunities of the institutional and outside the institution. In the future, qualitative studies, which start from the beginning of nursing education, should be conducted to investigate the factors affecting critical thinking, so that improved solutions can be proposed.

Limitations

The use of these scales to determine CCTDI scores of nurses in this study is somewhat limited by the adequacy of responses given to expressions that were used in the scale. This study was only conducted in an academic hospital in northwestern Turkey and may not be representative for the entire population of clinic nurses and their respective critical care nurses. Only the nurses who voluntarily chose to answer the CCTDI were included in the study. A variable that may influence the critical thinking disposition of clinical nurses is the type of patient care unit in which the nurses worked, but it was not examined in this study. These and other potential predictor variables may be considered in future studies. Interpretation of the results of this study, should take into consideration the the limitations cited above.

References

1. Feng, R.C, Chen M.J, Chen M.C, Pai, Y.C. (2010). Critical thinking competence and disposition of clinical nurses in a medical center. Journal of Nursing Research. 18(2): 77–87.

2. Zimmerman, D., Pilcher, J. (2008). Implementing NICU critical thinking programs: one unit's experience. Neonatal Network. 27(4): 231–238.

3. Toofany, S, (2008). Critical thinking among nurses. Nursing Management. 14(9): 28–31.

4. Buerhaus, P.I., Donelan, K., Ulrich, B.T, Norman, L., Williams, M., Dittus, R.(2005). Hospital RNs' and CNOs' perceptions of the impact of the nursing shortage on the quality of care. Nursing Economics. 23(5): 211, 214–221.

5. National Advisory Council on Nurse Education and Practice (NACNEP). (1996). Report to the Secretary of the Department of Health and Human Services on the basic registered nurse workforce. Rockville, MD: United States Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions, Division of Nursing.

6. Hicks, F.D. (2001). Critical thinking: toward a nursing science perspective. Nursing Science Quarterly. 4(1): 14–21.

7. Daly, W.M. (2001). The development of an alternative method in the assessment of critical thinking as an outcome of nursing education. Journal of Advanced Nursing. 36(1): 120–130.

8. Berman, A.J, Snyder, S. Kozier B.J., Erb, G. (2010). Fundamentals of nursing: Concepts, process, and practice, (9nd ed). Upper Saddle River, New Jersey: Pearson.

9. American Association of Colleges of Nursing. The essentials of baccalaureate education for professional nursing practice. Washington: DC, Author.1998.

10. Hwang, S.Y., Yen, M., Lee, B.O., Huang, M., Tseng, H.F. (2010). A critical thinking disposition scale for nurses: Short form. Journal of Clinical Nursing. 19(21-22): 3171–3176.

11. Fesler-Birch, D.M. (2005). Critical thinking and patient outcomes: a review. Nursing Outlook. 53(2): 59–65.

12. Hicks, F.D., Merritt, S.L., Elstein, A.S. (2003). Critical thinking and clinical decision making in critical care nursing: A pilot study. Heart & Lung. 32(3): 169–180.

13. Eser, I., Khorshid, L., Demir, Y. (2007). A survey of the factors effecting critical thinking dispositions of intensive care nurses. (In Turkish), Journal of the Cumhuriyet University Nursing School of Higher Education. 11(3): 13–22.

14. Dirimese, E. (2006). Evaluation of nurses and nursing student's critical thinking dispositions. Unpublished master's dissertation, (In Turkish), Dokuz Eylül University, Institute of Health Sciences, Izmir.

15. Arslan, G.G., Demir, Y., Eser, I., Khorshid, L., (2009). A study of the factors influencing critical thinking dispositions in nurses. (In Turkish), Journal of the Atatürk University Nursing School of Higher Education.2: 72–80.

16. Park, J.A., Kim, B.J. (2009). Critical thinking disposition and clinical competence in general hospital nurses, Journal of Korean Academic Nursing. 39(6): 840–850.

17. Howenstein, M.A., Bilodeau, K., Brogn, M. J. (1996). Factors associated with critical thinking among nurses. Journal of Continuous Education Nursing. 27(3): 100–103.

18. Rodrigues, G.(2000). Demographics and disposition as predictors of the application of critical thinking skills in nursing practice. Dissertation Abstracts International . 62(1):(UMI No. AAT 0022095).

19. Hawley, D.A. (1998). The measurement of critical thinking disposition among practicing registered nurses. Las Cruces, NM: New Mexico State University.

20. Girot, E.A. (2000). Graduate nurses: critical thinkers or better decision makers? Journal of Advanced Nursing. 31(2): 288–297.

21. Facione, N.C., Facione, P.A., Sanchez, C.A. (1994). Critical thinking disposition as a measure of competent clinical judgment: the development of the California critical thinking disposition inventory. The Journal of Nursing Education. 33(8): 345–350.

22. Facione, N., Facione, P. (2007). The California critical thinking disposition inventory: A test of critical thinking disposition test manual. Millbrae, CA: Insight Assessment, The California Academic Press LLC.

23. Kökdemir, D. (2003). Decision-making and problem solving under uncertainty. Unpublished doctoral dissertation, (In Turkish). Ankara University, Institute of Social Sciences, Department of Social Psychology, Ankara.

24. Zori, S., Nosek, L.J., Musil, C.M. (2010). Critical thiking of nurse managers related to staff RNs' perceptions of the practice environment. Journal of Nursing Scholarship. 42(3): 305–313.

25. Cajulis, C.B., Fitzpatrick., J.J., Kleinpell, R.M. (2007). Levels of autonomy of nurse practitioners in an acute care setting. Journal of the American Academy of Nurse Practitioners. 19(10): 500–507.

26. Karadag, A., Hisar, F., Elbas, N.O.(2007). The level of professionalism among nurses in Turkey, Journal of Nursing Scholarship. 39(4): 371–374.

27. Tastan, S., Kilic, A., Vural, H., Karakacan, N., Erdogdu, H., Tabak, F. (2006). Determine the autonomy of the military nurses. (In Turkish). Paper presented at the International Nursing Management Conference, Aydin, Turkey.

28. Martin, C. (2002). The theory of critical thinking in nursing. Nursing Education Perspectives. 23(5): 243–247.

29. Kataoka-Yahiro, M., Saylor, C. (1994). A critical thinking model for nursing judgment. The Journal of Nursing Education. 33(8): 351–356.

30. McKeachie, WJ. (Ed.). (1999). Teaching tips. strategies, research, and theory for college and university teachers (10th ed.). Boston, MA: Houghton Mifflin Company.

31. American Nurses Association. Nursing: Scope and standards of practice. Washington, DC: Author.2003.

32. Abay, F., Algier, L., Bingöl, B., Doğanci, H., Güçsavaş, N., Platin, N., Yazici, G. (1985). A study of the views of nurses concerning the Turkish Nurses Association. (In Turkish). Journal of Turkish Nurses. 35:19–26.

33. Oktay, S., Baykal, U. (1995). Evaluation of the participation of health personel in organization activities. (In Turkish). Nursing Journal. 9(36): 1–10.

34. Ulusoy, H., Kukus, B., Topal, P.,Urak, Z. (2006). Views of nurses concerning professional organizations. (In Turkish). In 5th Nursing Students Congress: Congress Summary Book, 79.

Corresponding Aurthor
Yurdanur Dikmen,
Abant Izzet Baysal University,
Bolu School of Nursing,
Department of Fundamental Nursing,
Bolu,
Turkey,
E-mail: nurdem35@gmail.com,
        yndemir@hotmail.com

Amphetamine poisoning and stereotypic behaviors in a 18 months infant: The first case report from Iran

Nader Mostafavi [1], Reza Bidaki[2], Seyyed Mohammad Mahdy Mirhosseini[3], Hamid Ostadebrahimi[4]

[1] Shahid Sadoughi of Yazd University of Medical Sciences, Iran,
[2] Rafsanjan University of Medical Sciences, Rafsanjan Moradi hospital, Iran,
[3] Medical Students Research Center, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran,
[4] Rafsanjan University of Medical Sciences, Iran.

Abstract

Acute crystal poisoning is commoner than reports suggested in around the world.

The present report concerns about a 18 months infant that was poisoned by opium and crystal passively.

An infant referred to pediatric emergency with agitation, vomiting, myotic pupils, self-scratching, high pitch crying, insomnia, banging, stereotypic behavior, red eye, Abdominal distention, Paroxysmal cough, Sniffing, nagging and poor feeding.

At the beginning of poisoning he was hospitalized in pediatrics service to have access to essential facilities for resuscitation.

We faced with serious problems like poly drug dependency of father, domestic violence, child abuse (emotional abuse), poor family support and pregnancy of mother.

Treatment is conservative. The lavage was been him and diazepam was been prescribed for agitation.

He followed 48 hours. At the time of discharge, he was no symptomatic.

Prognosis highly depends on the family planning and support after discharging from the hospital.

The clinical risks of fetal and postnatal exposure to crystal and opium for the emotional and somatic development of children were been considered. The main intention to report this the case is to raise the awareness of acute intoxication as a differential diagnosis in a child who presents with acute confusion.

Key words: Crystal, child abuse, intoxication, Amphetamine.

Introduction

A group of drugs that stimulate the central nervous system(CNS) are amphetamines that used in the treatment of depression, attention-deficit disorder, obesity, and narcolepsy. Amphetamines are usually given orally and their effects can last for hours by altering chemicals that transmit nerve messages in the body. Stimulants produce considerable side effects and are especially toxic in large quantities and commonly are abused recreational drugs and are highly addictive. Mechanisms of toxicity about amphetamines principally by stimulating the enhanced release of catecholamines from sympathetic nerve terminals, particularly of dopamine in the mesolimbic, mesocortical, and nigrostriatal pathways. This can cause detrimental neuropsychological, cardiovascular, and other systemic effects, and, following long-term abuse, neuronal apoptosis and nerve terminal degeneration (1) and acute amphetamine intoxication induces massive and wide-spread heat shock protein(HSP) expression in neural and glial cells(2)The clinical effects of amphetamine poisoning depended on dose, route, duration, and frequency of use ; Include the increased blood pressure, dizziness, insomnia, restlessness, headache, shakiness, dry mouth, metallic taste, diarrhea, constipation, and weight loss development of an irregular heartbeat, increased heart rate. Changes in sexual drive, nausea, vomiting, allergic reactions, chills, depression, irritability can be other side effects of amphetamines. In high doses, These can cause dependency, aggression, and, in some cases, psychotic episodes.(3, 4, 5, 6, 7)

Small doses of amphetamines can cause a positive stimulating effect, improving certain cognitive functions, such as vigilance, but it decreases when they are overused and combined with alcohol.(8) Ikeda said in his study that the brain possesses a reward system which produces positive emotion. To reveal the mechanisms of the brain reward system, investigation of mechanisms un-

derlying actions of substances of abuse can be one of the promising research approaches. Various behavioral tests using animals and methods in genomic science are also useful for these studies. I introduce our findings obtained by these ideas and techniques as follows: (i) Inhibition of amphetamine preference by G-protein activated inwardly rectifying potassium (GIRK) channel inhibitors. (ii) Essential role of NMDA receptor channel GluN2D subunit in phencyclidine effects on animal behavior. (iii) Association of polymorphisms in the mu-opioid receptor and GIRK genes with opioid sensitivity.(9)

Given in high dose amphetamines is clearly neurotoxic in laboratory animals damage both the serotonergic and dopaminergic systems.(10)

Amphetamine was one of the earliest pharmacological interventions and continues to show promising results as an adjuvant treatment for recovery of function in pre-clinical animal studies. This drug is a potent modulator of neurological function and cortical excitation, acting primarily through norepinephrine and dopamine mechanisms to enhance arousal and attention, and thus, to facilitate learning of motor skills.(11)

Emergency stabilization of vital functions and supportive care is essential. Benzodiazepines alone may adequately relieve agitation, hypertension, tachycardia, psychosis, and seizure, though other specific therapies can also be required for sympathomimetic effects and their associated complications.(1) The main intention to report this the case is to raise the awareness of acute intoxication as a differential diagnosis in a child who presents with acute confusion.

Case presentation

An infant 18 months referred to pediatric emergency with agitation, vomiting, miotic pupils(Her pupils were dilated but equal and sluggishly reactive), self-scratching, high pitch crying, insomnia, banging, stereotypic behavior, red eye, Abdominal distention, Paroxysmal cough, Sniffing, nagging and poor feeding. He had no neck stiffness and rest of the systemic examination was unremarkable. The main differential diagnoses at this stage were probable encephalitis and acute poisoning. Stereotypic behaviours were interet" He was am-

bivalent, take his dresses and wear it again and repeated this operation frequently.

At the beginning of poisoning he was hospitalized in pediatrics service to have access to essential facilities for resuscitation.

We faced with serious problems like poly drug dependency of father, domestic violence, child abuse (emotional abuse), poor family support and pregnancy of mother.

Treatment is conservative. The lavage was been him and diazepam was been prescribed for agitation.

He followed 48 hours. At the time of discharge, he was no symptomatic prognosis highly depends on the family planning and support after discharging from the hospital.

He was visited by a pediatrics and psychiatrist. Mother was a passive personality and father was punishing .Mother was pregnant. Child abuse and domestic violence were designed.

Discussion

Mother was exposed to opium and crystal passively and continuously. Therefore it maybe affect fetal growth and development.

There have been a few reports indicating that severe sympathetic hyperactivity may occur either independently, or accompanied by central nervous system disturbances including coma and convulsions. (3-5) Children who live around crystal suffer the usual neglect/abuse found in many drug-abusing homes. The kids 's nutritional needs usually are not achieved and they might witness violence or be victimized by aggression or abuse.

So, the mother should monitored during pregnancy and delivery. Her newborn should assessed for withdrawal symptoms and how feeding and growth. If the father continue this behavior, he should been separated from his family. This case was been reported for the first time in Iran. We purpose inform physicians for probable crystal poisoning in children. Crystal use is progressing that this problem involve the families and their children.We suggest to Health systems corresponders that need really planning for prevention of stimulants use quickly and guideline for managing of its intoxication in kids.

Conclusion

Methamphetamine may cause severe sympathomimetic effects in the intoxicated patient. However, with appropriate, symptom-directed supportive care, patients can be expected to make a full recovery. It is necessary and important that we educate families about harmful effects of stimulants on children.

The main intention to report this the case is to raise the awareness of acute intoxication as a differential diagnosis in a child who presents with acute confusion and warn to parents and physicians about side effects of amphetamines.

References

1. Schep LJ, Slaughter RJ, Beasley DM. The clinical toxicology of metamfetamine. Clin Toxicol (Phila). 2010 Aug;48(7): 675-94.

2. Kiyatkin EA, Sharma HS. Expression of heat shock protein (HSP 72 kDa) during acute methamphetamine intoxication depends on brain hyperthermia: neurotoxicity or neuroprotection?. J Neural Transm. 2011 Jan;118(1):47-60. Epub 2010 Oct 8.

3. Consumer Reports staff. Consumer Reports Complete Drug Reference. 2002 ed. Denver: Micromedex Thomson Healthcare, 2001.

4. Ellsworth, Allan J. and others. Mosby's Medical Drug Reference, 2001–2002. St. Louis: Mosby, 2001.

5. Hardman, Joel G. and Lee E. Limbird, eds. Goodman & Gilman's The Pharmacological Basis of Therapeutics. 10th ed. New York: McGraw-Hill, 2001.

6. Mosby's GenRx Staff. Mosby's GenRx. 9th ed. St. Louis: Mosby, 1999.

7. 7.Venes, Donald and Clayton L. Thomas. Taber's Cyclopedic Medical Dictionary. 19th ed. Philadelphia: F. A. Davis, 2001.

8. Drabek M, Andysz A. Effects of marijuana and amphetamine (and its derivatives on driving performance based on the driving simulator studies. Med Pr. 2011; 62(5): 551-63.

9. Ikeda K. Molecular mechanisms of the brain reward system. Nihon Shinkei Seishin Yakurigaku Zasshi. 2011 Nov; 31(5-6): 263-6.

10. Gouzoulis-Mayfrank E, Daumann J. Neurotoxicity of drugs of abuse--the case of methylenedioxyamphetamines (MDMA, ecstasy), and amphetamines. Dialogues Clin Neurosci. 2009; 11(3): 305-17.

11. Barbay S, Nudo RJ. The effects of amphetamine on recovery of function in animal models of cerebral injury: a critical appraisal. NeuroRehabilitation. 2009; 25(1): 5-17.

Corresponding Author
Seyyed Mohammad Mahdy Mirhosseini,
Medical Students Research Center,
School of Medicine,
Isfahan University of Medical Sciences,
Isfahan,
Iran,
E-mail: mahdy_mir2005@yahoo.com

Effect of low level laser therapy on managing oral mucositis in rats

Ufuk Sezer[1], Tuncer Demir[2], Suna Erkilic[3], Mutan Hamdi Aras[4], Saim Yanik[4]

[1] Department of Periodontology, Gaziantep University, Dentistry Faculty, Gaziantep, Turkey,
[2] Department of Physiology, Gaziantep University, Medicine Faculty, Gaziantep, Turkey,
[3] Department of Pathology, Gaziantep University, Medicine Faculty, Gaziantep, Turkey,
[4] Department of Oral and Maxillofacial Surgery, Gaziantep University, Dentistry Faculty, Gaziantep, Turkey.

Abstract

Purpose: The aim of this study was to evaluate the effect of Low Level Laser Therapy (LLLT) on 5-Fluorouracil (5-FU) induced-oral mucositis in rats.

Methods: Twenty-four male wistar albino rats injected with 5-FU on day 1 and 3. Superficial scratching on the right (laser group (LG), n = 24) and left cheek pouch mucosa (control group (CG), n = 24) was carried out in order to initiate mucositis on 3rd and 5th days. On LG, right cheek mucosa was irradiated with Ga-Al-As diode laser at a spot size of 1 cm^2 (808 nm) daily from the 1st to 4th days. Laser energy was exposed at 250 mW for 20 s totally (0.25Wx20 s=5 J (5 J/cm2)). The animals were euthanized on 3rd (n =8), 6th days (n=8), day 10 (n =8), and the both cheek pouches were collected for histological purposes.

Results: On the 3rd day both sides presented necrosis but mild active inflammation was observed in LG only. On 6th day both LG and CG sides showed necrosis and there was moderate inflammation in CG side; LG side also presented granulation tissue around the necrosed area. On 10th day, LG side showed complete re-epithelization. Re-epithelization of CG side was not complete and showed moderate inflammation and/or granulation tissue.

Conclusion: LLLT may have beneficial effects on improving wound healing process on oral mucositis. Our findings also prove that LLLT may be an indispensable part of the therapy in managing oral mucositis patients in the future.

Key words: Biostimulation, low level laser therapy, oncology, oral mucositis.

Introduction

Oral mucositis is a painful and often debilitating side effect of radiation therapy and chemotherapy occurring in oncologic patients. Patients' nutrition, daily functioning, and quality of life can be significantly affected by this condition. It may be a predisposing factor for infection initiation. It may also increase hospitalization time, treatment costs and as a result of these sequelae, disease remission and survival period may be shortened [1,2]. In a multicenter study of patients undergoing hematopoietic stem-cell transplantation (SCT), patients with little or no mucositis had a mortality of 1%, whereas those with the most severe ulcerations had a death rate of 40% [3].

Despite the fact that many agents and strategies have been used in the treatment of mucositis there are no universal accepted protocols. Oral mouthwashes, basic oral care, antibiotics, analgesics, local anesthetics, growth factors and cytokines and biologic mucosal protections are some of these treatment modalities [4]. New treatment protocols are of interest, in consequence of lack of efficient treatment modality for oral mucositis.

The application of low-energy lasers in the field of dentistry and oral surgery has been popular since the 1970s. Low Level Laser Therapy (LLLT) was defined as biostimulation with a low energy output that does not give rise to an increase in tissue temperature of the treated region above the normal body temperature. LLLT has been used for several treatment modalities such as the prevention of swelling and trismus after the removal of impacted third molars for pain reduction after dental treatment, providing a more favorable periodontal healing, treating mucositis, herpes simplex ulcers and for sensory aberrations in the inferior alveolar nerve [5-7].

The aim of this study was to evaluate the effect of LLLT on 5-fluoracil induced-oral mucositis in rats.

Material and methods

Twenty six male wistar albino rats with a weight of 250-300 g body mass and 5 months old were used. All animals were kept in the laboratory in order to make them orientate to the laboratory conditions for at least 5 days prior to the study. At the beginning of the experiment, two of the rats were sacrificed in order to obtain excisional biopsies of the normal cheek mucosa. All animal was intraperitoneally injected with 100 mg/kg of 5-Fluorouracil (5-FU) on the 1st day and 65 mg/kg of 5-FU on the 3rd day. The tip of an 18-gauge needle was used in order to develop a superficial scratching on the right and left cheek pouch mucosa by dragging twice in a linear movement on 3rd and 5th days. This technique has been repeatedly used to develop an ulcerative mucositis, which is similar to the human oral mucositis. The animals were anesthetized with Xylazine hydrochloride (XylazineBio) 3 mg/kg and Ketamine hydrochloride (Ketasol) 90 mg/kg previously performing these procedures [8-9]. Right cheek pouch mucosa of the rats (n = 24) were used for laser group (LG), whereas the left mucosa (n = 24) were used as controls (CG).

After ulcerative mucositis were clinically detected on the animals' right and left cheek pouch mucosa, the laser therapy was started. On Laser Group, right cheek pouch mucosa of the animals were irradiated with Ga-Al-As diode laser (model; Fotona XD-2 diode laser, Fotona, Ljubljana, SLOVENIA) daily from the 1st to the 4th days. The diode laser device with a continuous wavelength of 808 nm was used, and the laser therapy was applied at a spot size of 1 cm² a handpiece. Laser energy was exposed at 250 mW (0.25 W) for 20 s totally (0.25 W x 20 s =5 J). The mucositis region in the laser group received 5 joule (5 J/cm²) low level laser irradiation intraorally one cm far from target tissue. No treatment was performed for the controls. After the laser therapy started, the animals were euthanized on the 3rd day (n = 8), day 6 (n = 8), day 10 (n = 8), and the both cheek pouches was collected for histological purposes.

Histological analysis was performed on specimens from the cheek pouch mucosa to verify the effect of low level laser therapy on the course of mucositis (Figure 1). After the sacrifice, wounds containing mucosa were collected and fixed by immersion in % 10 formaldehyde for at least 24 hours after these sections were obtained from the tissues. The specimens were placed into automatic tissue processor and thereafter embedded in paraffin to provide transversal sections of the tissue. Five-micron sections were stained with hematoxylin/eosin (HE). Stained sections were observed with an optical microscope. The histological evaluation was performed according to inflammation degree, presence of necrosis, granulation tissue and re-epithelization. Healthy mucosa was also evaluated for comparing ulcerative mucositis.

Figure 1. Clinical view of the 5-FU induced mucositis of the rat oral mucosa

Results

Histological analysis

As shown in the Figure 2 healthy mucosa of rat shows normal epithelium and connective tissue without inflammatory infiltration. On the 3rd day both sides presented necrosis but mild active inflammation was observed in only LG (Figure 3). These characteristics indicated a more advanced healing process in laser side, which was started on the 3rd day. On the 6th day both LG and CG sides showed necrosis and there was moderate inflammation in CG side and hence LG side also presented granulation tissue around the necrosis area (Figure 4). On the 10th day, LG side showed complete re-epithelization where the re-epithelization of CG side was not complete and showed moderate inflammation and/or granulation tissue (Figure 5).
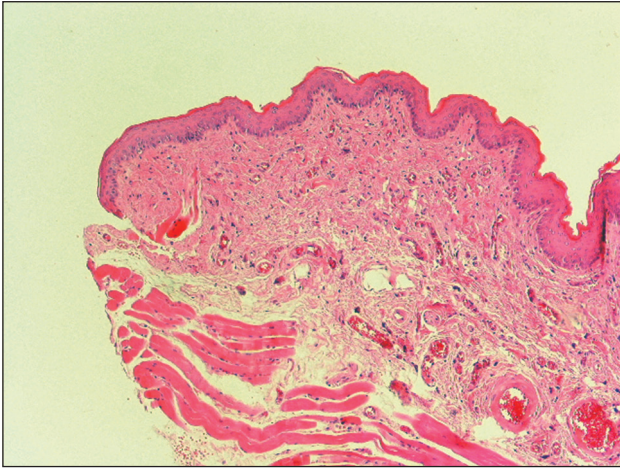
Figure 2. Histologic view of healthy rat mucosa (HEx100).
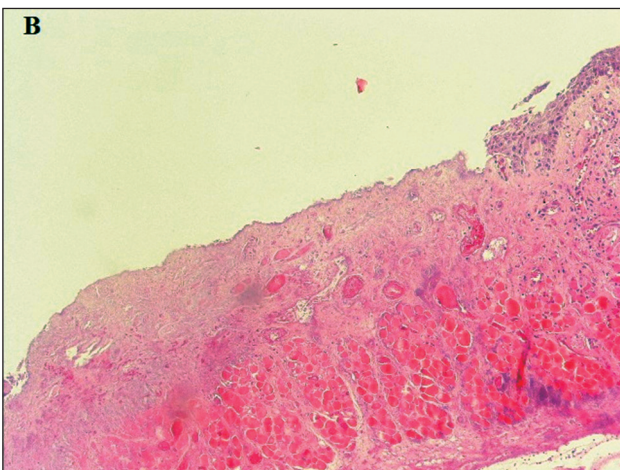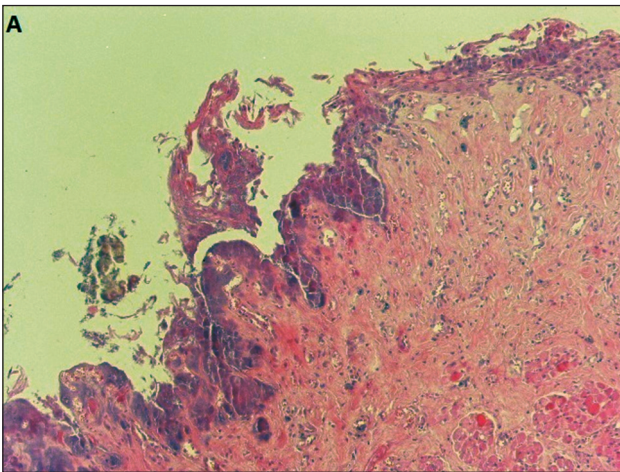
Figure 3. Histopathological view of right (A) and left (B) oral mucosa of rats in day 3. (A) LG side: Necrosis and mild inflammation. (B) CG side: Necrosis without inflammation. (HEx100).
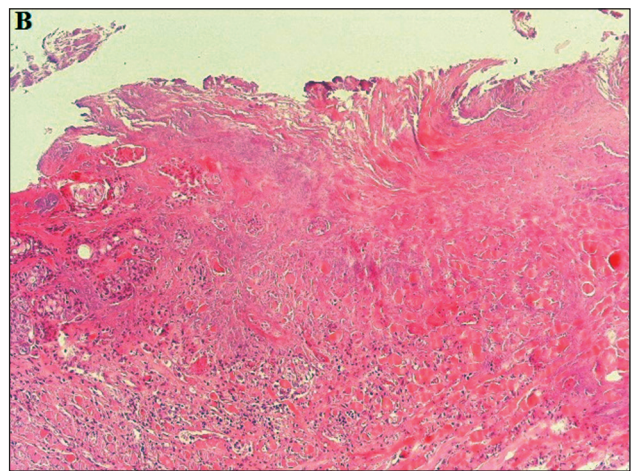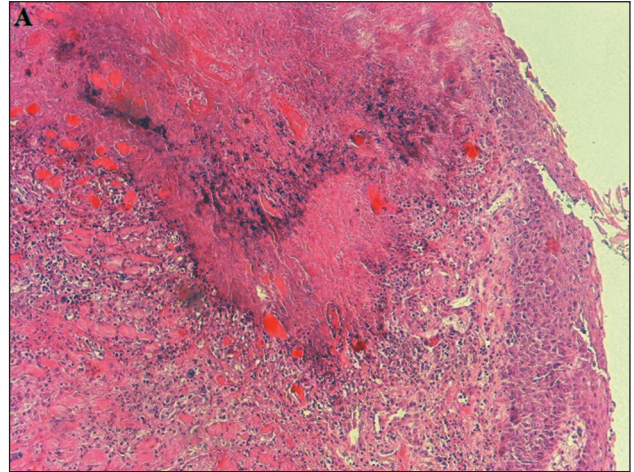
Figure 4. Histopathological view of right (A) and left (B) oral mucosa of rats in day 6. (A) LG side: Granulation tissue surrounding necrosis. (B) CG side: Mild inflammation and necrosis. (HEx100).
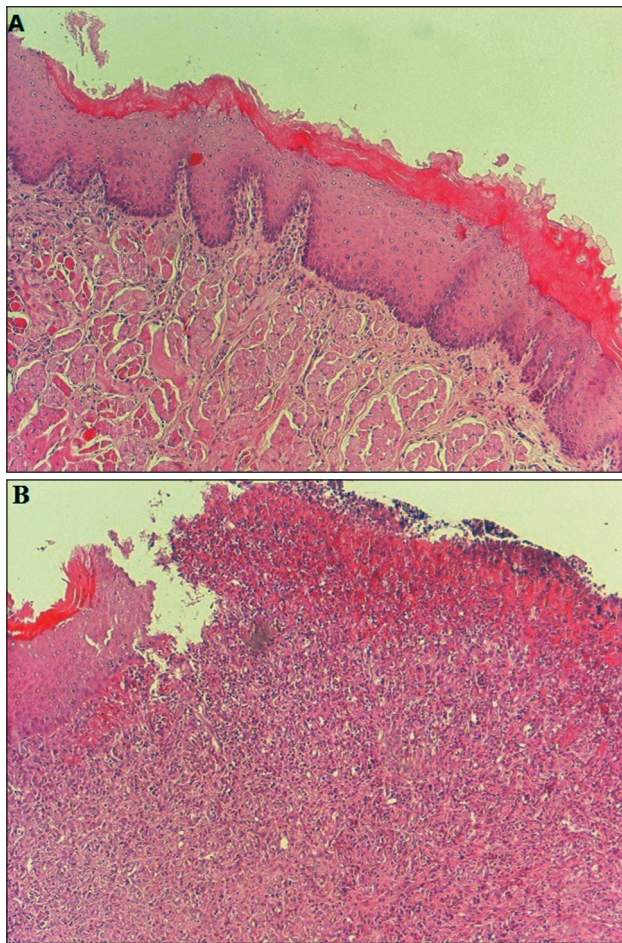
Figure 5. Histopathological view of right (A) and left (B) oral mucosa of rats in day 10. (A) LG side: Complete re-epithelization. (B) CG side: Partially re-epithelization and granulation tissue. (HEx100).

Discussion

Chemotherapy and radiotherapy-induced-oral mucositis cause significant morbidity and may postpone the treatment plan in cancer patients. The number of studies with different treatment modalities has increased making the treatment of mucositis one of the most researched fields in supportive care in cancer. Some of these treatment modalities are allopurinol mouthwashes, cryotherapy, mouthwashes with mixed actions (benzydamine hydrochloride, corticosteroids and chamomile) immunomodulatory agents (Granulocyte-macrophage colony stimulating factor (GM-CSF), granulocyte colony stimulating factor (G-CSF), interleukin- II, transforming growth factor- keratinocyte growth factor), topical anaesthetics (Viscous lignocaine, xylocaine, dyclonine), antiseptic solutions (chlorhexidine, povidone iodine,

hydrogen peroxide), antibacterial, antifungal and antiviral agents (nystatin, clotrimazole, PTA lozenges, acyclovir), mucosal barriers and coating agents, cytoprotectants (beta-carotene (pro-vitamin A), vitamin E, oxpentifylline), analgesics and mucosal cell stimulants (LLLT) [10-11]. However, there has not been established any effective intervention for the management of oral mucositis so far. In this study we also analysed a new different treatment modality with lasers for precipitating the wound healing in chemotherapy-induced oral mucositis by using a different laser protocol.

After injury mucosa repairs itself with an intricate process [12]. The wound healing has formed into three phases [13]: (1) inflammatory, (2) proliferative and (3) remodelling [14]. Bacteria and debris are phagocytised and removed in the inflammatory phase where proliferative phase is the stage that factors are released that causes the migration and division of cells. This phase is characterized by angiogenesis, collagen deposition, granulation tissue formation, epithelialization, and wound contraction. By excreting collagen and fibronectin, fibroblasts grow and form a new, provisional extracellular matrix (ECM), in this way granulation tissue is formed [15]. Concurrently, re-epithelialization occurs, in which epithelial cells proliferate and 'crawl' atop the wound bed, providing cover for the new tissue [16]. Several studies suggest that LLLT stimulates wound healing by stimulation of specific metabolic processes [5]. Bisht et al. [17] reported that major changes seen in wounds treated with LLLT include increased granulation tissue, early epithelization, increased fibroblast proliferation and matrix synthesis, and enhanced neovascularization. Animal model of the healing of wounds by secondary intention and daily LLLT during the postoperative period has shown to stimulate collagen formation and increase the strength of the healing tissue [18]. In addition, some authors claimed that daily treatment with LLLT is required to provide the maximal benefit [19,20]. In our study, the beneficial effect of LLLT was significant histologically on the LG side on the 3rd day. On the 3rd day also there was mild active inflammation on LG side where no inflammation was observed on CG side. Also there was moderate inflammation in CG side and hence LG side also presented granulation tissue around the necrosed area and it was accompanied

by the increase of the connective tissue the 6th day. In addition, on the 10th day, re-epithelization of the CG side was not completed where LG side showed complete re-epithelization. As a result, these histological findings showed that the LLLT improved the wound healing and shortened the healing period in 5-FU induced oral mucositis in rats.

Lasers may be used with high and low doses for therapeutic purposes, and low doses of laser therapy stimulate the wound healing, where high doses are suppressive [21,22]. Previous studies indicated that laser irradiation at energy densities up to 4 J/cm2 had stimulating effects whereas higher energy fluencies had rather inhibitory characteristics [5,23,24]. However, Kreisler et al. reported that this stimulation effect occurs between 2-8 J/cm^2 [25]. In another study Bolton et al. [26]. suggest that the laser therapy with doses between 2-16 J/cm^2 was effective for improve the wound healing, although doses higher than 16 J/cm^2 may suppressive [26,27]. In our study we applied 5 J/cm^2 laser energy with 808 nm wavelengths and this energy doses also improve the wound healing.

In this study, we evaluated the effect of LLLT on oral mucositis reduction. So far some other authors also studied the effect of LLLT on oral mucositis. Franca et al. [9] reported that phototherapy had a positive effect in reducing mucositis severity and a more pronounced effect in treating established mucositis. They applied GaAlAs in-touch laser device to the oral mucositis region with a density of 1.2 J/cm2, and 660 nm wavelength 4 day daily. In another study, Kuhn et al. [28] suggest that laser therapy in addition to oral care can decrease the duration of chemotherapy induced oral mucositis in pediatric patients. Patients receiving 5 day intervention were enrolled in this study. The LLLT group was treated with laser GaAlAs, wavelength (l): 830nm, dose: 4 J/cm2,. The GaAlAs laser application protocol in our study was 808 nm with a wavelength of 5 J/cm2, 4 day daily. Our results were similar to previous studies if only the laser parameters were different. Major differences between our study and the studies before were laser density and the application method (by means of not in-touch).

Conclusion

The variety of laser systems and experimental conditions make the comparison of the results confusing. However our results support the biostimulation effect of LLLT with a different radiation protocol on the wound healing of 5-FU induced oral mucositis. As a result, within the limitations of this study, it can be concluded that LLLT may be beneficial in improving wound healing process on oral mucositis. It seems that LLLT will be an indispensable part of therapy in managing oral mucositis in oncologic patients in the future.

References

1. *Pico JL, Avila-Garavito A, Naccache P (1998) Mucositis Its Occurrence, Consequences, and Treatment in the Oncology Setting. Oncologist 3:446-451.*

2. *Sonis ST (2004) Oral mucositis in cancer therapy. J Support Oncol 2:3-8.*

3. *Sonis ST, Oster G, Fuchs H et al (2001) Oral mucositis and the clinical and economic outcomes of hematopoietic stem-cell transplantation. J Clin Oncol 19: 2201-5.*

4. *Worthington HV, Clarkson JE (2002) Prevention of oral mucositis and oral candidiasis for patients with cancer treated with chemotherapy: cochrane systematic review. J Dent Educ. 66:903-11.*

5. *Walsh LJ (1997) The current status of low level laser therapy in dentistry. Part 1. Soft tissue applications. Aust Dent J 42:247-54.*

6. *Aras MH, Gungormus M (2009) The effect of low-level laser therapy on trismus and facial swelling following surgical extraction of a lower third molar. Photomed Laser Surg 27:1-4.*

7. *Aras MH, Gungormus M (2010) Placebo-controlled randomized clinical trial of the effect two different low-level laser therapies (LLLT)--intraoral and extra-oral--on trismus and facial swelling following surgical extraction of the lower third molar. Lasers Med Sci 25:641-5.*

8. *Lara RN, da Guerra EN, de Melo NS (2007) Macroscopic and microscopic effects of GaAIAs diode laser and dexamethasone therapies on oral mucositis induced by fluorouracil in rats. Oral Health Prev Dent 5:63-71.*

9. *Franca CM, Nunez SC, Prates RA, Noborikawa E, Faria MR, Ribeiro MS (2009) Low-intensity red laser on the prevention and treatment of induced-oral mucositis in hamsters. J Photochem Photobiol B 94:25-31.*

10. Ertekin MV, Koç M, Karslioglu I, Sezen O (2004) Zinc sulfate in the prevention of radiation-induced oropharyngeal mucositis: a prospective, placebo-controlled, randomized study. Int J Radiat Oncol Biol Phys 58:167-74.

11. Herrstedt J (2000) Prevention and management of mucositis in patients with cancer. Int J Antimicrob Agents 16:161-3.

12. Nguyen DT, Orgill DP, Murphy GF (2009) The Pathophysiologic Basis for Wound Healing and Cutaneous Regeneration. Biomaterials For Treating Skin Loss. Cambridge/Boca Raton, Woodhead Publishing (UK/Europe) & CRC Press (US) 25-57.

13. Stadelmann WK, Digenis AG, Tobin GR (1998) Physiology and healing dynamics of chronic cutaneous wounds. Am J Surg 176:26-38.

14. Quinn JV (1998) Tissue Adhesives in Wound Care. Hamilton/Ontario, Ont B.C. Decker, Inc.

15. Midwood KS, Williams LV, Schwarzbauer JE (2004) Tissue repair and the dynamics of the extracellular matrix. Int J Biochem Cell Biol 36:1031-7.

16. Garg HG (2000) Scarless Wound Healing. New York Marcel Dekker, Inc. 34-78.

17. Bisht D, Gupta SC, Misra V, Mital VP, Sharma P (1994) Effect of low intensity laser radiation on healing of open skin wounds in rats. Indian J Med Res 100, 43-6.

18. Tolstykh PI, Gertsen AV, Eliseenko VI, Sarasek IuK (1991) Stimulation of the healing of aseptic wounds using laser irradiation. Khirurgiia (Mosk) 7:36-40.

19. Chentsova OB, Prokof'eva GL, Mozherenkov VP, Kharchenko LN, Balarev A, Sergushev SG (1991) Low-intensity helium-neon laser irradiation in multimodal treatment of corneal injuries. Vestn Oftalmol 107: 23-6.

20. Kuliev RA, Babaev RF (1991) Therapeutic action of laser irradiation and immunomodulators in purulent injuries of the soft tissues in diabetic patients. Probl Endokrinol (Mosk) 37:31-2.

21. Hall G, Anneroth G, Schennings T, Zetterqvist L, Ryden H (1994) Effect of low level energy laser irradiation on wound healing. An experimental study in rats. Swed Dent J 18:29-34.

22. Talar J, Radziszewski K, Bryndza E (1993) Laser biostimulation. Wiad Lek 46:683-6.

23. Conlan MJ, Rapley JW, Cobb CM (1996) Biostimulation of wound healing by low-energy laser irradiation. A review. J Clin Periodontol 23:492-6.

24. Basford JR (1995) Low intensity laser therapy, still not an established clinical tool. Lasers Surg Med 6:331-42.

25. Kreisler M, Christoffers AB, Al-Haj H, Willershausen B, d'Hoedt B (2002) Low level 809-nm diode laser-induced in vitro stimulation of the proliferation of human gingival fibroblasts. Lasers Surg Med 30:365-9.

26. Bolton P, Young S, Dyson M (1995) The direct effect of 860 nm light on cell proliferation and on succinic dehydrogenase activity of human fibroblasts in vitro. Laser Therapy 7:55-60.

27. Schindl A, Schindl M, Pernerstorfer-Schon H, Schindl L (2000) Low-intensity laser therapy: a review. J Investig Med 48:312-26.

28. Kuhn A, Porto FA, Miraglia P, Brunetto AL (2009) Low-level infrared laser therapy in chemotherapy-induced oral mucositis: a randomized placebo-controlled trial in children. J Pediatr Hematol Oncol 31:33-7.

Corresponding Author
Ufuk Sezer,
Department of Periodontology,
Gaziantep University,
Dentistry Faculty,
Gaziantep,
Turkey,
E-mail: ufuxezer@yahoo.com

The model of computer medical system for the collection of scientific information in the Serbian health care system

Milan Miladinovic[1], Branko Mihailovic[1], Nebojsa Kavaric[2]

[1] Dentistry Clinic, Faculty of Medicine, University of K. Mitrovica, Serbia,
[2] Primary Health Care Center Podgorica, Montenegro.

Abstract

The paper presents the model of computer-assisted medical system which in standard situations in health care institutions collects medical information about patients and health of the population. At the same time, the system serves as an electronic medical card file containing patient data. Owing to the design of this data base and application layer organizing the sorting of data, the data thus obtained can be processed in various ways using the methods of artificial intelligence, and new knowledge can thus be gained via the process of automated scientific research process. The whole process markedly reduces the costs of investment into the scientific-technologic processes in health care systems, multiplying simultaneously new medical knowledge. We suggest that the model should be used for the collection of scientific information in the Serbian health care system.

Key words: Health information system, artificial intelligence, data base, data mining.

Introduction

Every day, in the health care system of Serbia only, more than 23.000 doctors of medicine and dentistry perform tens of thousands patient examinations, make tens of thousands diagnoses, and consider the similar number of treatments in 344 health care institutions in Serbia (1). We should add to this number more than 5.000 private practices with their own physicians and dentists performing the same procedures (2). Huge human and financial resources are engaged, i.e. a huge amount of energy is invested into the health care of Serbian population. Regretfully, our poor and undeveloped country is not able to financially support the whole of the population's needs in health care, the consequence being that the budget of the Mini-

stry of Health amounted 3,7 billion dinars in 2011 − only half of the budget in 2007 (3).

On the other hand, the country makes efforts, as much as possible, to stimulate and support financially the reasearch projects aimed to improve general health of the population; however, all that is far from sufficient and cannot be sustained long-term. The Ministry of Science and Technology has summarized the situation in the best way in the strategy of scientific and technologic development from 2010 to 2015: „We do not play any major role in any of the branches of science, either in Europe or worldwide. Undisputable individual talents cannot substitute for the fact that none of our universities has been placed in the Shangai list of 500 best universities throughout the world. Globalization has led to the multiplication of centers of technology and science. Together with traditional Western Europe, United States of America, Japan, and Canada, in the last 20 years, in addition to now recovered Russia, there have emerged India, China, Brasil, and even the Near East countries. They all significantly invest in science and technology" (4). In the above Ministry document, the way out was seen in the symbiosis of two processes: increased investments in science and focusing on certain priorities. In general, the idea could be seen as adequate, lacking the results, nevertheless. In the period of two years since the realization of this plan, we can only say that wishes are one thing, but the reality is something completely different.

We should perhaps wait – forty days, forty years, four hundred years. What can be done now? The country, or the government to be more precise, should listen and watch what is being suggested as the solution. If the solutions are deemed to be bad, we should say so; if not, we should approve of, accept widely, and start to implement them.

We just must not look indifferently at the situation and wait for the salvation from outside.

The paper aims to present an original model of collection of relevant research data in the area of health care in a simple, cost-effective way, operational simultaneously as electronic patient files. We will present the model in which the above human resources in health care, doing their regular, everyday work, become investigators by way of simple recording of what they have done.

Serbia, become an eye to see what is being shown to you; become an ear to hear what is being told to you.

Methods

Model core – software-hardware architecture

The core of the system consists of a bunch of personal computers under the Microsoft Windows Server 2008 operative system and Microsoft SQL Server 2008 R2 data base. A portion of this „farm of computers" is equipped with computers for external communication, with the software interface for external communication under the Microsoft .Net Framework 4.0 platform (middle layer).
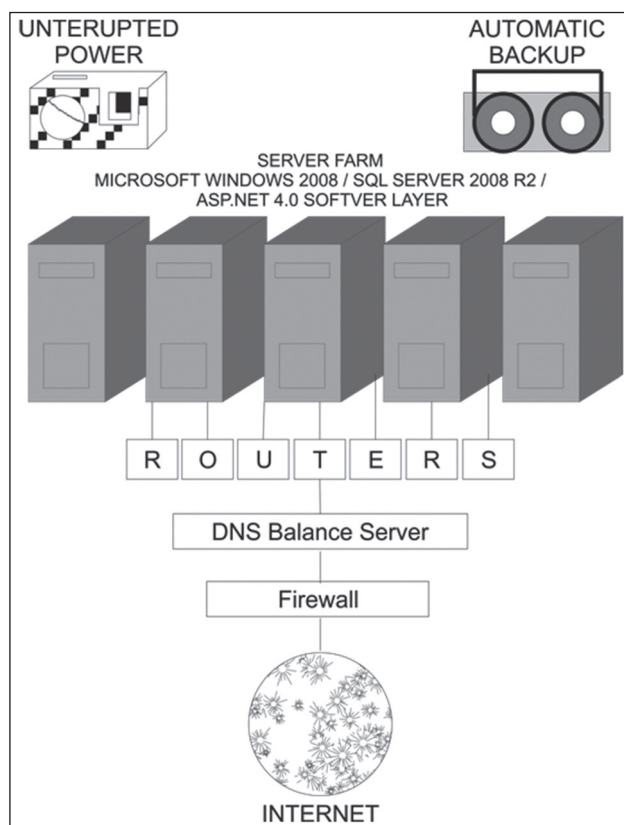
Figure 1. Model core

Protected by a series of routers and firewalls, the core has two ultra fast Internet access points via an optical cable. The core contains a series of uninterruptable power supply (UPS) devices and electrical power sources. Continual, automated backup of data is provided, manned by system engineers (for Microsoft Windows systems) for 24 hours a day (Figure 1).

Data base (DataSet) design

One of essential differences in the design of this data base compared to those that have been developed so far (and still active) is the organization of data, taking the structure of the human body as the principal criterion. It has been customary so far that when a diagnosis or a therapy is concerned, that diagnosis or treatment is first recorded, and only then (if at all) the bodily location. We are now setting the things differently. Precise anatomical site or sites of interest are the first to be recorded, followed by diagnosis and possibly treatments used (Figure 2). The generic design of data about organ(s), system of organs, and effects of substances upon them, is realized as an object tree. Similar to object oriented programming (OOP), an object is here the anatomical region of organ(s), organ or organ systems, continuing to organ parts and even single cells. It contains diagnosed diseases or successful treatments, and upon it the substrata act. Object inheritance is integrated. Such a data design enables their proper analysis by artificial intelligence systems. We should observe, for instance, diabetes mellitus, supposing that we do not know possible causes of the disease. The disease is much more complex than in our example, but for the purpose of illustration we should simplify as much as possible the procedure the multiplication of which could lead to the complete resolution of this complex disease:

1. Increased blood glucose is detected, to be entered as:
- Location: Organ circulation system/blood/ blood serum;
- Available location status: Measured glucose value, with other available data, if there are any (values of proteins, electrolytes, antibodies, antigens, hormones, etc.);
- Dijagnosis: Diabetes melitus, Associated phenomena: diabetic foot;

- Therapy: Insulin (type of therapy, agent – with detailed characteristics and all ingredients, manufacturer), application route, etc.);
- Note: Other unclassified information, if there are any, such as: detected presence of medicaments, microorganisms, and similar.

If we project the base to accept data organized and distributed/classified in such a manner, we end up with the master/detail relationship as in Figure 3

Entry of obtained medical information in the data base

In the previous section, the architecture of data base is explained, adjusted for subsequent formation of virtual tables, so called View, sorting, and data processing via queries to the data base (Query). The discontinuity with earlier medical registry applications is the complete avoidance of textual documents in their original form, including specialist reports, hospital discharge lists, interpretations of x-rays and other findings, histopathologic findings, and especially patient histories with all their constituent elements and collected information. This portion will be performed by physicians' minds individually. Extracted and processed data from these documents, as well as any other obtained data, should be entered in the above form adjusted to the presented base design.

User interface for data entry

As an interface between physicians (or other medical staff) or authorized users who enter data and data bases, there is an application interface written in Microsoft .NET Framework, to be executed directly in the Internet browsers in the
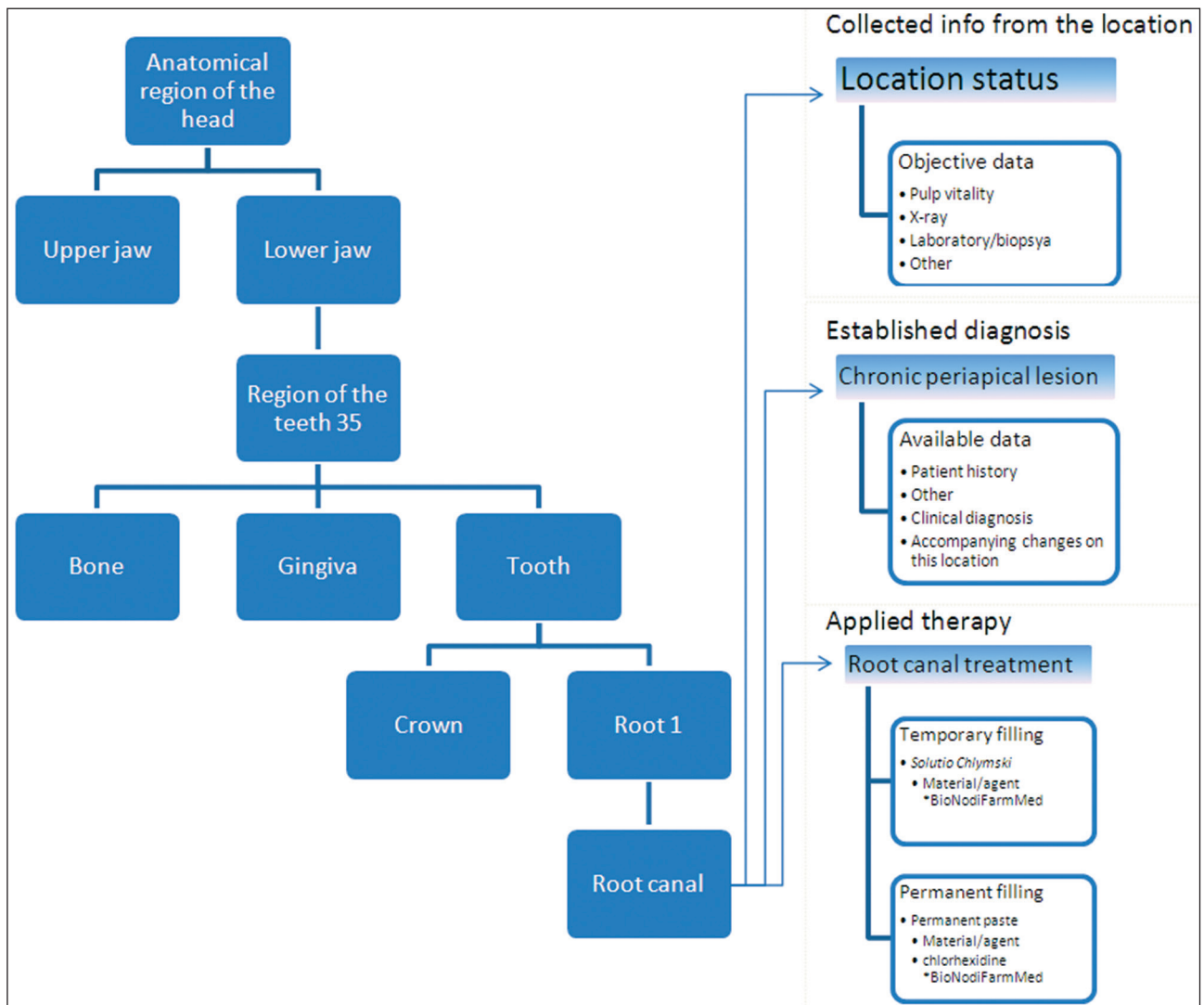
Figure 2. Interactions of organs and substrata. Example of dental canal treatment, explaining the organization and design of data in all branches of medicine. *BioNodiFarmMed is an imaginary manufacturer
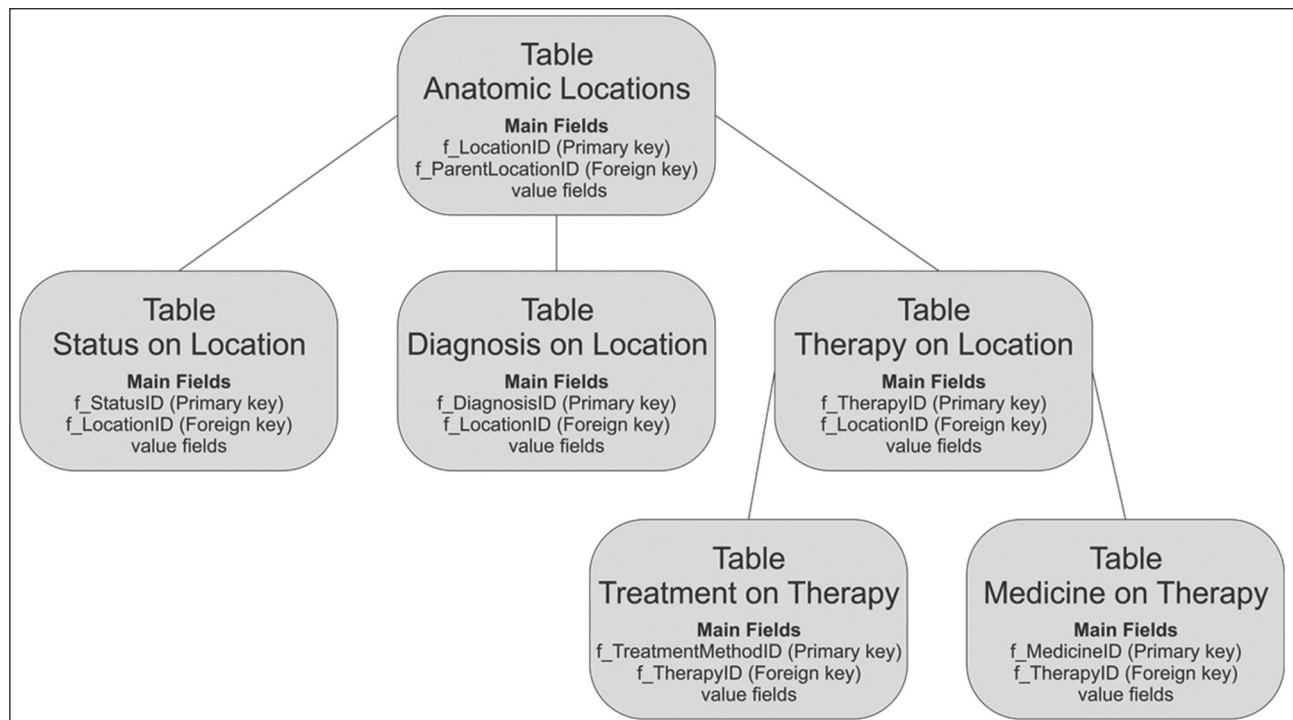
Figure 3. Master/Detail table relationship in the data base, adjusted to system requirements
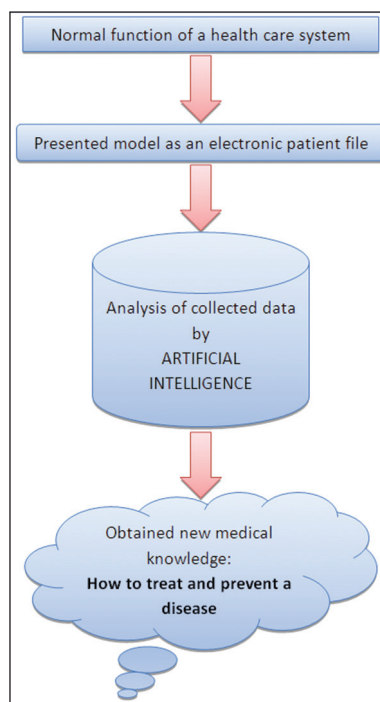
Figure 4. Diagram of an automated scientific process

form of ASP.NET platform, .NET or ActiveX or Adobe Flash controls, and if needed in specialized Desktop applications for Microsoft Windows, Linux, and mobile platforms as well, such as Android and similar. The role of the interface is to simplify the entry of data in the complex Master/Detail base, replacing direct typing as much as possible with the selection of items from drop-down lists. The layer has to be adjusted to allow entry of new Master entries in the table, if the desired list items are missing.

Who and where should enter the data?

In general, the information obtained from patients should be entered by doctors or authorized medical personnel during the examination or intervention, or immediately after that. However, the middle application layer has to have the option by which any citizen could enter his own personal data, including disease(s), living conditions, specifics related to personal preferences, habits, experiences, etc. Although the information obtained in this way have to be classified as less reliable or relevant, they can be crucial in the detection of possible non-medical influences regarding the presence or absence of particular diseases/conditions.

The system has to allow each and every individual to enter the relevant information in the system (from his point of view) before the visit to his doctor.

Each doctor should be allowed to formulate his own online patient questionnaire, containing the pertinent questions, the answers to which should

be automatically classified and placed directly in the data base. Perhaps only one in ten or fifty patients will comply and fill the questionnaire, but regardless of the percentage of responders, in view of the huge sample of Serbian general population, the questionnaire will certainly be more comprehensive and more representative than any of the questionnaires organized so far.

Education of the staff

One of key tasks of education of the staff to be involved in the system is raising the awareness of the significance of a collective endeavor like this. Every physician involved in the process of collection of data has to understand that conscientious work and entry of obtained data in the system have a direct impact on saving patients' lives and contribute to disease prevention and cure. It is of utmost importance that appropriate education and stimulation of doctors should be introduced or that measures to discourage negligent work should be undertaken. For those that cannot be easily accommodated to use advanced technologies, it is necessary to provide other medical staff for data entry based on their findings.

Guidelines and user support

The whole system has to be accompanied by well documented textual and audio-visual guidelines, and support staff always ready to provide explanation and help to the users in their work with the system.

Discussion

The principal purpose of our model is to replace millions hours of research work in the areas of finding out novel therapies, prevention of diseases, and improvement of general health of human population, similar to the way we are able to extract energy from sunlight and water power. The system will work to sustain and save human lives.

The data collected will be analyzed using the automation methods of artificial intelligence. The process of analysis itself goes beyond the scope of this paper (it is elaborated in the author's doctoral thesis). In short, the methods of artificial intelligence are able to find out correlations and interdependences among two or more variables in a well organized DataSet, providing new insights and new knowledge. For the process to be successful, it is necessary to exclude traditional textual documents mentioned above (patient histories, reports, etc.) and that the information from them should be immediatelly classified by human mind. Artificial intelligence analysis of such textual documents is possible to a certain point, and the process may involve the methods the most important of which are Text Mining (5), Fuzzy Logic (6) , and so on. However, the results of classification and meanings obtained using these mechanisms are not satisfactory – in fact, they are far from those required for adequate distribution and classification of data.

The ultimate result of the process should be that during every physical examination and intervention performed by Serbian doctors, the process of automated analysis and research is taking place simultaneously in order to prevent diseases in the healthy and cure the sick.

The existance of a system such as this is essential for Serbia. The savings made in the area of scientific research exceed tens of thousands of times the investment in the creation and maintenance of the system. The speed with which new discoveries are made is the speed of light compared to individual, manual research projects, not to mention the reputation of our country worldwide with such a system.

The Holy Spirit should open our eyes and ears to see and comprehend the significance of the model of such a computer medical system.

Conclusion

Twenty first century brings about the new technologies we could only dream of in not so distant past. Adequate use of our original model for the collection of health-related data for research purposes would enable Serbia to make enormous savings in health-realated research projects, conspicuous progress in new scientific developments in health care, becoming the first country in the world dedicated completely to Life.

References

1. *Institute of Public Health of Serbia, „Dr Milan Jovanović Batut". „Health Statistics Annual of the Republic of Serbia 2010". Belgrade 2011.*

2. *Knežević T. HEALTH OF SERBIAN POPULATION – an analytical study 1997–2007. Institute of Public Health of Serbia, „Dr Milan Jovanović Batut", Belgrade 2008.*

3. *Government of the Republic of Serbia. Health care budget for 2012 at the level of this year's budget. (http://www.srbija.gov.rs/vesti/vest.php?id=165135 accessed: 23.5.2012.)*

4. *Republic of Serbia, Ministry of Science and Technologic Development. Strategy of Scientific and Technologic Development of the Republic of Serbia in the period from 2010 to 2015 – Focus and partnership. (http://www.mpn.gov.rs/userfiles/nauka-pravna_akta/strategija_prelom.pdf).*

5. *Gajendran VK, Lin JR, Fyhrie DP. An application of bioinformatics and text mining to the discovery of novel genes related to bone biology. Bone. 2007 May;40(5):1378-88. Epub 2007 Jan 20.*

6. *Wang X, Ling J. Multiple valued logic approach for matching patient records in multiple databases. J Biomed Inform. 2012 Apr;45(2):224-30.*

Corresponding Author
Milan Miladinovic,
Dentistry Clinic,
Faculty of Medicine,
University of K. Mitrovica,
Serbia,
E-mail: milanbetter@gmail.com

Evaluation of the sexual and reproductive health problems of University students attending the youth friendly center and the importance of counseling: Cross sectional and case management techniques

Sinan S. Ozalp[1], Ozgul Orsal[2], Ozlem Orsal[3]

[1] Eskisehir Osmangazi University, Faculty of Medicine, Department of Obstetrics and Gynecology, Eskisehir, Turkey,
[2] Eskisehir Osmangazi University, Centre of Medico social, Department of Youth Friendly Center, Eskisehir, Turkey,
[3] Eskisehir Osmangazi University, Eskisehir Higher School of Health, Eskisehir, Turkey.

Abstract

Objective: University students encounter many health problems during their years of education. In this study, health problems of students were evaluated and necessary steps were taken according to the needs of the students mainly related to reproductive health, including sexual transmitted diseases. This study planned to evaluate the sexual health and reproductive health problems of the university students and determine high-risk groups for planning preventive health services.

Methods: The study group consisted of 2401 students who attended the Youth Friendly Center (YFC). The study was conducted with cross sectional and case management techniques. For statistical evaluation, proportional analysis and Chi square test was used.

Results: Among the students, 52.5% attended only for counseling while the rest (47.5%,) attended for counseling together with other problems. The reasons for counseling were sexual and reproductive health problems (100.0%), problems of adolescence (46.0%) and contraception (49.6%). The reasons for attending the YFC, except for counseling, were mainly gynecological complaints (56.6%) in females and urological complaints (19.3%) in males, psychological complaints (11.1%), and suspicion of HIV/AIDS (7.6 %) in both females and males.

Conclusion: While the minimal-risk group might only demand simple guidance and support from parents and the school system at nominal cost, the high-risk group requires intensive multi-faceted development oriented programmes, possibly at higher cost. Youth centers and youth friendly approach is a necessity for knowing and solving the health problems of young people and for counseling them.

Key words: Reproductive health, counseling, services-based research, risk behavior, youth, adolescent, experiential learning, program evaluation.

Introduction

The World Health Organization (WHO) defines 10-19 year-olds as "adolescent", 15-24 year-olds as "young", and 10-24 year-olds as "young people". Twenty-nine percent of the whole world's population is young people. Providing health and educational needs for this group is essential for social and economical development of a country [1,2].

In the last twenty years, very important social, political and economical changes have influenced the health of young people. Healthcare services for young people are not at the desired level. Termination of unwanted pregnancies in unhealthy conditions, sexually transmitted diseases [STD], HIV/AIDS, tobacco use and attempting suicide are the important health problems of young people [2 ,3, 4,5].

Turkey has almost two million university students. In Turkey by law, Medico Social Centers are organized to give services for the health, psychiatric, and social problems of the university students.

University students encounter many health problems during their years of education. In this study, health problems of students were evaluated and necessary steps were taken according to the needs of the students.

Methods

The cross sectional and case management techniques together in this study was conducted on the medical records of university students who were attending to Youth Friendly Center (YFC) were evaluated.

Eskisehir is a city, which has two universities, namely Anadolu and Eskisehir Osmangazi. Eskisehir Osmangazi University (EOU) has almost fifteen thousands students. The YFC honours privacy and confidentiality, offers convenient hours and locations, and keeps fees affordable, among other features. Promising approaches include peer outreach, which is available in university [6,7,8]. The study was conducted at students who attended the YFC constituted the target group. The study population consisted of 2401 students who attended the YFC between 1 April 2003 and 1 January 2012. The students were interviewed in an YFC rooms. A inquiry including questions to determine socio-demographic variables and complaints were applied by face to face interview method to collect data, and these data was recorded by researcher. For the students who did not have any medical complaint, counseling was given, and for this reaching, we arranged seminars and conferences at the different faculties of the university. If the student had health problems, medical care was given to him / her together with counseling. If an advanced evaluation and treatment was necessary, it was provided by the EOU Hospital.

SPSS version 13.0 for windows was used to evaluate these recorded data and proportional analysis and Chi square test were used to determine significance. Rejection of the null hypothesis was set at p<0, 05.

Results

According to Table 1, the percentage of the female students who came to the YFC is higher than that of the male students. The majority of the students who came were in the second year of their studies. Most of the students had no history of health problems.

Table 1. Demographic Characteristics of the Students

		Number	Percentage
Gender	Female	1194	49.7
	Male	1207	50.3
Age	19 and below	961	40.0
	20-24	1408	58.7
	Over 24	32	1.3
Faculties	Faculty of Science and Literature	716	29.8
	Faculty of Architecture and Engineering	557	23.2
	Faculty of Business and Administration	378	15.7
	Faculty of Education	375	15.6
	Eskisehir Higher School of Health	121	5.0
	Vocational School of Health Science	115	4.8
	Faculty of Medicine	90	3.7
	Faculty of Agriculture	31	1.3
	Other	18	0.7
Class	1st year	655	27.3
	2st year	922	38.4
	3st year	454	19.0
	4st year and over	368	15.3
History of medical problems	None	2333	97.2
	İnternal disease (Cardio vascular, neurological problems, chest, psychiatric etc.)	51	1.3
	Surgical disease (Ca, polikistik over, etc)	17	0.7
Total		2401	100.0

Table 2. Distribution of the Variables Related to the Services

Variable		Number	Percentage
Number of Visits	One	1781	**74.2**
	Two	462	19.2
	Three and more	158	6.6
Reason for Visit	Counseling	1261	**52.5**
	Counseling + medical	1140	47.5
Subject of Counseling	Sexual health / Reproductive health	2401	**100.0**
	Contraceptive methods	1189	49.6
	Adolescence problems	1107	46.0
	Psychological complaints	262	10.9
	Cigarette, Alcohol, Drug Addiction	116	4.8
	Breast self-examination + testicular self-examination	66	2.8
	Others (Hygiene + nutrition)	63	2.6
Printed material	Given	1831	**76.3**
	Not given	570	23.7
Reasons for visit other than counseling*	Gynecological complaints of females (n:1194)	235	**56.9**
	Psychological complaints (n:2401)	268	11.1
	Urological complaints of males (n:1207)	101	8.4
	HIV/AIDS suspicion (n:2401)	183	7.6
Diagnosis and/ or services given (n: 2401)	Vaginitis treatment of females (n:1194)	183	**15.3**
	o Vaginal candidiasis	90	7.5
	o Nonspecific Vaginitis	48	4.0
	o Trichomanas Vaginitis	26	2.2
	o Gonore	14	1.2
	o Clamidia	5	0.4
	Menstrual disorder and dysmenorrhea (n:1194)	209	**8.4**
	Emergency contraception (n:2401)	91	**3.8**
	Treatment of gonorrhea suspicion (Male n:1207)	24	2.0
Laboratory tests	Pregnancy test (n:1194)	138	**5.7**
	Rapid pre-test HIV/AIDS (n: 2401)	172	7.1
Satisfaction from the health personnel*	Nurse	2076	**99.1**
	Doctor	475	98.7
	Psychological counselor	206	95.6

The majority of the students had come to the YFC for the first time. Almost two thirds of the students came only for counseling. The counseling topics were mainly sexual health and reproductive health (SH/RH), contraceptive methods, and problems of adolescence. Printed materials were also given to the students.

The reasons for attending the YFC except counseling were mainly gynecological complaints in females and urological complaints in males, and psychological complaints and suspicion of HIV/ AIDS both in females and in males. The main gynecological complaints were vaginitis followed by menstrual disorders and dysmenorrhea.

Among laboratory tests the pregnancy test was the one most often used, and emergency contraception was the most often given service. If an advanced diagnosis and/or treatment was necessary, the EOU hospital provided necessary care for these students. In 2.2% of the students seen, tertiary care center service was needed and students were referred to the university hospital. In order to determine the quality of the service, a questionnaire was given to the applicants. The majority of the students were satisfied by the service given at the YFC.

Table 3. Relation of Substance Abuse and the Place of the Residence of the Students

Smoking	Place of Residence								Statistical assessment
	With the family		In dormitory		In house with friends		Total		
	n	%	n	%	n	%	n	%	
Do not smoke	164	62.1	686	70.6	481	41.3	1331	55.4	x²=1.894 df=2
Smoke	100	37.9	286	33.3	684	**58.7**	1070	**44.6**	**P=0,000**
Alcohol									x²=1.766
Do not use	170	64.4	742	76.3	563	48.3	1475	61.4	df=2
Use	94	35.6	230	23.7	602	**51.7**	926	**38.6**	**P=0,000**
Reasons for attending YPC									x²=11,321
Counseling	160	60.6	573	59.0	528	45.3	1261	52.5	df=2
For other services Including counseling	104	39.4	399	41.0	637	**54.7**	586	47.5	**P=0,003**
Total	254	100.0	972	100.0	1165	100.0	2401	100.0	

Alcohol consumption, cigarette smoking and attending for health service/ counseling were statistically higher for students who were living with their friends.

Discussion

According to our study (Table 1), the number of girls (49.7%) who came to the YFC was higher than that of the boys. This ratio was close to the Hacettepe University (59.9%) YFC and higher than that of Dicle University (36.9%) [9]. The reason for the higher number of the second year students coming to our YFC may be due to the difficulty of the students' adaptation to university life in the second year.

Most of the university students (97.2%) have no history of medical problems. For this healthy group, public health services are very important. This group may risk having problems related to substance abuse, STD and termination of unwanted pregnancies. For this reason, counseling and services given to reduce the risk is very important for this group [10,11].

Evaluation of the reasons of the students attending the YFC is very important for the organization of services. In our study, the main reason for attending the YFC was counseling (Table 2). The main topics of counseling were SH/RH (100.0%), contraceptive methods (49.6%), and problems of adolescence (46.0%). Counseling was also supported by giving printed materials to the students.

In this study, the most common complaint of the girls was vaginal infections (15.3%). Increasing rates of STD among adolescents is an important health problem. The most common STDs among teenagers are gonorrhea, chlamydia, syphilis, herpes, genital warts, and HIV. Both men and women may suffer from asymptomatic STDs. Young people are especially reluctant to seek care when they know that they have an STD. Girls are more susceptible to STD than boys, because they are less informed, and developing cervical anatomy makes them prone to infection. Some STDs like cervical gonorrhea and chlamydia cause pelvic inflammatory disease, resulting in infertility, increased risk of ectopic pregnancy and secondary infertility. In addition, HPV infection in the vulva, vagina and the cervix results in pre-invasive (VIN, VAIN, and CIN) and invasive squamous cancer in those areas [10,11,12]. In a study from Hacettepe University, STD was diagnosed in 7.2% of the students [13]. Another study from the YFC of a university revealed that university students have little knowledge about STD and students from the same university got counseling related to STD [14].

Menstrual disturbances are the second most common complaint among girls. For this reason, preparation of a brochure related to menstrual disorders is planned.

Supply and counseling related to emergency contraception is the important part of our services (3.8%). For the students who get emergency contraception pills from the YFC, it is a good opportunity to give them counseling related to use of effective contraception. Other studies also stressed the importance of emergency contraception for unwanted pregnancies [15,16,17,18].

Pregnancy tests were offered to 5.7% of the students. One hundred eight out of 138 test results were positive for pregnancy. Of these, four terminations were done with the students' informed consent. Pregnancies among university students are usually unwanted pregnancies. The impact of unwanted pregnancy on the well-being of young girls is immense. If they decide to terminate an unwanted pregnancy, they often seek unsafe abortion often by means of abortifacients. This often leads to hemorrhage, septicemia, and internal organ damage that result in significant morbidity and mortality. Long-term sequelae include ectopic pregnancy, pelvic infection, and, subsequently, secondary infertility [10,18]. The YFC has an important role in reducing the number of unwanted pregnancies by offering effective contraceptives, and to help in the termination of unwanted pregnancies under healthy conditions [1, 2, 6, 7].

Laboratory test for HIV/AIDS was demanded by 7.1% of the students. This rate seems to be very high, and emphasizes that unprotected sexual intercourse between young people is a reality among university students.

According to our study, 44.6% of the students smoke, and 38.6% use alcohol. Smoking among students is very high. Even higher rates of smoking among students are reported by other universities in Turkey [19,20,21]. Smoking and alcohol use have very important health consequences. In our study, the place of residence of the students has an important effect on smoking, alcohol use and going to the YFC (Table 3). From this study, we understand that the YFC's services should also include activities related to the reduction of substance abuse. This is more important for students who are living in houses with their friends.

Most of the students were pleased with the service given at the YFC. This may be related to the quality of services given to the students at this center.

Conclusion

In every area of medicine, preventive measures are very important. For university students, preventive measures related to STD, unwanted pregnancies, and substance abuse are of utmost importance. For this special group, services must be given at special centers. Our YFC is organized for this kind of service with a qualified staff. Printed materials must also support every service given. We must also make use of the other ways of reaching university students.

The use of pyramidal concept to formulate programme priorities for young people is a key practical message of this study. For example, the range and intensity of the programmes targeting the high-risk group cannot be similar to the minimal-risk group. While the minimal-risk group might only demand simple guidance and support from parents and the school system at nominal cost, the high-risk group requires intensive multifaceted development oriented programmes, possibly at higher cost. People working with young people must understand the SH/RH needs.

Finally, youth issues have gained importance during recent years all over the world. In this study, our main aim was to show the effectiveness of the YF approach and the YFC in our university. This study covers only the university students for the reason youth studies must be conducted to reveal importance of counseling and YF approach for the young people out of school. The results of the study will provide important information about future projects and programmes, as this was a model study, which has been established and introduced to university youth in Turkey.

References

1. WHO. Adolescent Friendly Health Services an Agenda for Change. WHO/FCH/CAH/02.14. Genava, Switzerland, 2002.

2. Dehne K, Riedner G. Sexually Transmitted Infections among Adolescents the Need for Adequate Health Services. World Health Organization, 2005: 1: 26-38. Available at http://www.who.int/reproductivehealth/publications/2005

3. UNFPA. Study on the Sexual and Reproductive Health of Adolescents / Young People in Turkey (Türkiye Gençlerde Cinsel Sağlık ve Üreme Sağlığı Araştırması). 2007.

4. Blum RW, Nelson-Mmari K. The Health of Young People in a Global Context. J Adolesc Health, 2004; 35: 402-418.

5. International Planned Parenthood Federation (IPPF). 2007. Youth Manifesto, available from htpp://www.ifppf.org/en/resources/reports-reviews/ippfyouth.htm.

6. WHO. Integrating Sexual Health Into Primary Health Care Services, Progress 67. 2004.

7. UNFPA. Supporting Adolescent and Youth. 2008. available at http://www.unfa.org./adölescents/ındex.htm, 25.11.2010.

8. Project introduction of model youth reproductive health services in selected universities. Bulletin of the International Children's Center (ICC). 2003; Jan: 33-36, 37-40

9. Akın A, Ozvarış SB. Study on the Influential Factors of Sexual and Reproductive Health of Adolescents / Young People in Turkey (Executive Summary). Hacettepe Universities Faculty of Medicine Department of Public Health and WHO, Meteksan A.Ş. Ankara; 2004.

10. Özalp S, Tanır HM. Reproductive Health Risk of Adolescents, Adolescence and Adolescent Reproductive Health. International Children's Center (ICC), Bilkent University, Meteksan A.Ş., Ankara; 2003; 33-36.

11. Creatsas G, Elsheikh A. Adolescent pregnancy and its consequences. Eur J Contracept Reprod Health Care. 2002; Sep;7(3): 167-72.

12. Akın L. The Transmission and Control of STI/HIV, Adolescence and Adolescent Reproductive Health. International Children's Center (ICC), Bilkent University, Meteksan A.Ş. Ankara; 2003; 43-51.

13. Mıhçıokur S, Akın A. Use of contraceptive methods among students consulted with the Beytepe Student's Health Center of Hacettepe University's in Ankara, Turkey. Eur J Contracept Reprod Health Care. 2006; 11 (Suppl 1); 82 -83

14. Gökengin D, Yamazhan T, Ozkaya D, Aytuğ S, Ertem E, Arda B, Serter D. Sexual knowledge, attitudes, and risk behaviors of students in Turkey. J Sch Health. 2003;Sep; 73 (7): 258-63.

15. Bozkurt N, Korucuoğlu U, Aksakal FN, Biri A, Ciftçi B, Maral I, Tiraş B. Turkish adolescents' knowledge on and attitude toward emergency contraception. J Pediatr Adolesc Gynecol. 2006; Dec 19(6):391-5.

16. Velacsco Sanchez E, De La Torre Gonzalez AJ. Profile a user of the emergency pill in a city. Eur J Contracept Reprod Health Care. 2006; 11 (Suppl 1); 116-117.

17. Sahin NH. Male university students' views, attitudes and behaviors towards family planning and emergency contraception in Turkey. J Obstet Gynaecol Res. 2008; Jun; 34 (3): 392-8.

18. Donmez Kesim M, Atis A, Aydın Y, Ozdemir G, Ozdemir S, and Aki G. A general look to adolescent contraception. Eur J Contracept Reprod Health Care. 2006; 11 (Suppl 1): 96-97

19. Metintaş S, Sarıboyacı MA, Nuhoğlu S. Smoking patterns of university students in Eskisehir, Turkey. Public Health. 1998; 112: 261-264.

20. Steptoe A, Wardle J, Cui W, Baban A, Glass K, Pelzer K, Tsuda A, and Vinck J. An international comparison of tobacco smoking, beliefs and risk awareness in university students from 23 countries. 2002; Addiction, 97: 1561–1571.

21. Ergüder T, Soydal T, Ugurlu M, Çakır B, Warren CW. Tobacco use among youth and related characteristics, Turkey. Soz Praventiv Med. 2006; 51: 91–98.

Corresponding Author
Ozlem Orsal,
Eskisehir Osmangazi University,
Eskisehir Higher School of Health,
Eskisehir,
Turkey,
E-mail: ozlorsal@yahoo.com,
        ozlorsal@gmail.com,
        ozlemorsal@hotmail.com

Anthropometrical and physiological profiles of the sportsmen from Vojvodina

Miodrag Drapsin[1,3], Nebojsa Vujkov[2], Sandra Vujkov[3], Slavko Molnar[3], Patrik Drid[3], Izet Radjo[4]

[1] Faculty of Medicine, University of Novi Sad, Serbia,
[2] Laboratory of Provincial Institute for Sport, Novi Sad, Serbia,
[3] Faculty of Sport and Physical Education, University of Novi Sad, Serbia,
[4] Faculty of Sport and Physical Education, University of Sarajevo, Bosnia and Herzegovina.

Abstract

The aim of this study was to identify the profile and differences of elite athletes of Vojvodina in anthropometric, aerobic and anaerobic capabilities from individual and team sports.

Six groups of athletes (144 all together) from different sport disciplines participated in the study: 30 sprinters, 23 wrestlers, 12 kayakers, 31 football players, 18 basketball players and 30 handball players.

There were 21 anthropometric parameter taken which are part of the International biological programm (IBP). Indicators of aerobic capacity was analysed: absolute and relative oxygen uptake, speed of running at anaerobic treshold, maximal velocity during test, speed of running at maximal oxygen uptake and maximal heart rate. Wingate anaerobic test used for assesment of anaerobic capacity.

Significant differences appeared in median values of *absolute* and *relative* VO_{2max} among tested groups. Adequate aerobic endurance is necessary, in team sports as well as in individual ones, because it allows relatively fast recovery between anaerobic activities in sport games just like between fights in wrestling. Statistically significant differences appeared between kayakers and all other sport groups for the parameters *absolute* and *relative* VO_{2max}, *anaerobic treshold* (T_{vent}), in *running velocity during anaerobic treshold*, *running velocity during maximum oxygen consumption*. Kayakers also had significantly lower heart rate during *anaerobic treshold*.

Key words: wrestling, sprint, kayak, football, basketball, handball

Introduction

Fitness and conditioning training represents a good indicator of well-trained athletes, and is crucial for obtaining top sports achievements. Constant monitoring is very important for the sport result, from where, in relation to the cycle and calendar of events, timing of the sports form is performed. Up to date knowledge reveals that the steady development of accomplishment in any sport can be achieved with use of scientific research. Afterall, the ultimate meaning and the main goal of any fitness training is assuming that the athletes can manifest their specific sports skills in the situational conditions as well as improvement of sport performance.

To optimise the process of sports conditioning the scientists and the experts attempt to collect as many pieces of information as possible about the sports activity in question (Jukic et al., 2002; Drid et al., 2010; Radjo et al., 2011). Such analyses may have various characteristics. For high-level competition efficiency, athletes have to achieve an excellent level of physical fitness (adequate motor abilities, cardio respiratory functions) during training, whether it is individual, or team sport. Importance of these information's varies from sport to sport, because they should correspondent to the demands of a given sport (Sporis et al., 2010).

For basketball may be said (Gabrijelic, 1977) to be a complex sport comprised of the units of simple or complex movements executed in cooperation between the members of a team during the game. Handball is a complex activity in which success depends on a series of versatile factors, defined primarily as endogenous ones, as represented in interrelated abilities, characteristics and net of technical-tactical knowledge, and various exogenous ones, which can either facilitate or interfere with sport achievements (Vuleta et al., 2002). Football

is an intermittent sport in which the aerobic energy system is highly demanded. On the other hand, elite soccer players perform 150 – 250 brief intense actions during a game (Mohr et al., 2003) which indicates that the rate of anaerobic energy turnover is high at certain times (Bangsbo et al., 2006). As a combative sport, wrestling imposes unique stress to the body and requires high level of metabolic demands, strength, and power (Kreamer et al., 2004), whereas successful sprint running performance requires good starting ability, highest maximum velocity, and endurance of that velocity capacity (Kale et al., 2009). For kayaking it was reported that in flat water highly trained subjects spend the majority of their race time at or around VO_2 peak, taking advantage of the aerobic system (Zamparo et al., 1999), but also demands a high level of anaerobic fitness (Van Someren and Palmer, 2003). Gathering information and profiling the athletes in various sports represents the key point in further planning and programming, thus leading to sport success.

The aim of this study was to identify the profile and differences of elite athletes of Vojvodina in anthropometric, aerobic and anaerobic capabilities from individual and team sports.

Methodology

Six groups of athletes (144 all together) from different sport disciplines participated in the study: 30 sprinters (18.5±3.5 years), 23 wrestlers (21.2±2.5 years), 12 kayakers (20.2±4.3 years), 31 football players (19.4±2.8 years), 18 basketball players (20.6±3.4 years) and 30 handball players (22.3±1.6 years). There were 21 anthropometric parameter taken which are part of the International biological programm (IBP) (Lohman, Roche i Matorell, 1988). Following parameters were measured: body height, arm span, diameters of the elbow, wrist, knee and ankle, body weight, circumferences (chest, weist, upper arm, forearm, thigh and lower leg), skin folds (biceps, triceps, forearm, thigh, lower leg, subscapular, abdominal and pectoral). Body mass index (BMI) was calculated as well as percent body fat (PMT).

We have analyse following indicators of aerobic capacity: absolute and relative oxygen uptake, speed of running at anaerobic treshold, maximal velocity during test, speed of running at maximal oxygen uptake and maximal heart rate.

Aerobic capacity was assessed with treadmill (COSMED model T-170-Italy), and the data were collected with a gas analyzer (CPET breath-by-breath method). Briefly, expiratory airflow was measured by gas turbine with a mask and expired gases were analysed for O_2 with a parametric analyser and for CO_2 with an infrared analyser. Before each test, the volume was calibrated by five inspiratory and expiratory strokes at different flows with a three-litre pump; the gas analyser was calibrated with two mixtures of gases of known oxygen and carbon dioxide concentrations (20.9% O_2, 0.03% CO_2, and then 16.0% O_2, 5.0% CO_2). The FSPE1 protocol itself included measurements of ventilatory and metabolic parameters at rest for one minute, and then for one minute at speed of 3 km/h. Afterwards, subjects took progressive increments of workload at the rate of 0.5 km/h every 30 seconds (started to run at 7km/h) until exhaustion. The inclination was constant at 2%. The test was considered completed when the VO_2 reached plateau, and respiratory and ventilatory quotient reached reference values, while the subjective state of each participant was monitored during the protocol.

We used Wingate anaerobic test for assesment of anaerobic capacity. Anaerobic capacity measures taken were: Peak power, Mean power and Peak power/BM. Testing was conducted at the Laboratory for functional diagnostics, Department of physiology, Medical Faculty, Novi Sad. Wingate test (WanT) is "all-out" cycle ergometer test lasting for 30seconds. Maximal load is achieved by air braked flywheel calibrated previously (Dotan i Bar-Or, 1983). All testing were performed in the same way by the same person in the morning sessions (Bernard et al., 1997). Data collecting and analisys was performed via the PC (MacIntosh et al., 2003).

Data analysis

All statistical analysis were performed by the SPSS 17.0 software (SPSS Inc., USA). Results are presented as means with standard deviation (mean ± SD). Student t-test for small independent samples was applied to determine between-group differences in fitness indicators. Differences between groups were also analyzed by the canonic discriminative analysis. Differences were considered statistically significant at $p<0.05$.

Results

In Table 1, results are presented anthropometric characteristics of the athletes.

Aerobic and anaerobic properties of the athletes are shown in Table 2.

Table 1. Anthropometric characteristics of the athletes (±SD)

Parameter	Sprint (N=30) AS (S)	Wrestling (N=23) AS (S)	Kayak (N=12) AS (S)	Football (N=31) AS (S)	Basketball (N=18) AS (S)	Handball (N=30) AS (S)
Body height (m)	1.85 (0.05)ww k ff	1.77 (0.07)	1.80 (0.06)	1.79 (0.07)	1.93 (0.10)aa ww kk ff h	1.86 (0.08)ww k ff
Arm span (m)	1.89 (0.06)ww ff	1.83 (0.08)	1.86 (0.07)	1.82 (0.08)	1.96 (0.10)aa ww kk ff	1.94 (0.09)a ww kk ff
Elbow diameter (cm)	7.57 (0.46)ff	7.58 (0.41)ff	7.90 (0.70)ff	7.26 (0.44)	7.77 (0.60)ff	7.87 (0.49)a r ff
Wrist diameter (cm)	5.52 (0.42)	5.96 (0.38)aa ff	5.80 (0.25)a	5.65 (0.32)	6.10 (0.51)aa ff	5.91 (0.41)aa ff
Knee diameter (cm)	10.14 (0.52)k ff	9.94 (0.46)	9.71 (0.55)	9.79 (0.36)	10.40 (0.58)ww kk ff	10.49 (0.71)a ww kk ff
Ankle diameter (cm)	7.38 (0.42)	7.47 (0.41)	7.54 (0.29)	7.59 (0.38)	7.72 (0.56)a	7.76 (0.53)aa r
Body weight (kg)	78.22 (9.63)	83.45 (12.45)ff	76.94 (8.96)	74.18 (9.71)	91.05 (14.95)aa kk ff	86.31 (14.74)a k ff
Chest circumference (cm)	94.56 (6.44)	102.65 (6.30)aa ff	100.67 (5.42)aa ff	94.36 (6.22)	102.83 (6.62)aa ff	100.10 (8.19)aa ff
Abdominal circumference (cm)	81.26 (4.93)	85.17 (6.41)a f	82.38 (6.30)	81.26 (6.41)	87.50 (6.44)aa k ff	85.73 (10.32)a f
Forearm circumference (cm)	28.88 (2.46)	32.73 (2.52)aa ff hh	31.79 (2.23)aa ff	27.76 (2.31)	31.63 (2.63)aa ff	30.23 (3.63)ff
Lower arm circumference (cm)	27.11 (1.72)ff	29.08 (2.52)aa ff b hh	28.58 (1.59)a ff	25.34 (1.76)	27.91 (1.94)ff	27.53 (2.13)ff
Thigh circumference (cm)	56.68 (3.97)k	58.46 (3.82)kk ff	53.83 (3.26)	55.37 (3.62)	60.32 (4.55)aa kk ff	58.66 (5.32)
Lower leg circumference (cm)	38.41 (1.83)kk ff	38.37 (2.75)k f	36.33 (1.64)	37.15 (1.82)	40.00 (2.89)a kk ff	38.71 (2.92)kk f
Biceps skinfold (mm)	3.51 (0.70)	3.76 (0.69)	3.41 (0.64)	3.79 (0.89)	3.91 (0.86)	3.65 (0.77)
Triceps skinfold (mm)	4.66 (0.66)	5.16 (0.97)a k f	4.35 (0.88)	4.62 (0.55)	4.71 (0.72)	4.79 (1.20)
Lower arm skinfold (mm)	3.89 (0.49)	4.71 (0.60)aa ff hh	4.42 (0.83)a	4.17 (0.51)a	4.52 (0.64)aa f	4.21 (0.63)a
Thigh skinfold (mm)	6.73 (1.33)	7.42 (1.55)	6.76 (1.59)	6.91 (1.63)	6.72 (1.48)	6.81 (1.17)
Lower leg skinfold (mm)	3.19 (0.66)hh	3.07 (0.43)h	2.88 (0.54)	3.06 (0.68)	2.95 (0.47)	2.78 (0.38)
Subscapular skinfold (mm)	8.39 (1.66)	10.00 (2.42)aa k	7.97 (2.08)	8.89 (3.01)	10.10 (2.48)aa k	10.94 (4.80)aa k f
Chest skinfold (mm)	3.11 (0.56)	3.16 (0.52)	3.01 (0.61)	3.36 (0.80)	3.17 (0.70)	3.17 (0.95)
Abdominal skinfold (mm)	8.44 (3.17)	8.97 (4.43)	6.87 (1.75)	9.09 (3.20)k	10.80 (5.94)k	11.83 (7.70)a k
ITM	21.05 (2.22)	23.43 (2.65)aa k ff	21.25 (2.07)	20.59 (2.17)	23.38 (2.81)aa k ff	23.02 (3.23)aa ff
PMT	10.10 (1.46)	10.79 (1.84)	9.75 (1.28)	10.54 (1.52)	11.09 (2.10)	11.61 (2.71)a k

Legend: aa *statistically higher (p<0.01) than the athletes,* a *statistically higher (p<0.05) than the athletes;* ww *statistically higher (p<0.01) than the wrestlers,* w *statistically higher (p<0.05) than the wrestlers;* kk *statistically higher (p<0.01) than kayakers,* k *statistically higher (p<0.05) than kayakers;* ff *statistically higher (p<0.01) than football players;* f *statistically higher (p<0.05) than football players;* hh *statistically higher (p<0.01) than handball players;* h *statistically higher (p<0.05) than handball players.*

Table 2. *Aerobic and anaerobic properties of the athletes (±SD)*

Parameter	Sprint (N=30)	Wrestling (N=23)	Kayak (N=12)	Football (N=31)	Basketball (N=18)	Handball (N=30)
	X (±SD)	X (±SD)	X (±SD)	X (±SD)	X (±SD)	X (±SD)
VO$_2$max (l/min)	4.15 (0.60)	4.22 (0.67)	5.03 (0.71)[aa ww ff b h]	3.97 (0.59)	4.42 (0.72)[f]	4.36 (1.08)
VO$_2$/kg (ml/min/kg)	52.61 (4.11)	51.45 (4.18)	59.63 (4.20)[aa ww ff bb hh]	53.63 (4.94)[b h]	49.16 (8.04)	49.77 (7.57)
Speed of running at anaerobic treshold (km/h)	13.69 (1.03)	14.00 (1.11)[b]	15.13 (1.17)[aa ww ff bb hh]	14.05 (1.00)[b h]	13.41 (1.15)	13.21 (1.62)
Maximal speed of running (km/h)	16.06 (1.21)	15.72 (1.25)	18.13 (0.98)[aa ww ff bb hh]	16.42 (1.13)[r h]	16.44 (1.29)[h]	15.56 (1.47)
HR$_{max}$ (bpm)	194.40 (7.56)[ww bb hh]	188.04 (9.84)[b h]	192.75 (10.31)[bb hh]	194.68 (8.98)[r bb hh]	181.11 (8.59)	182.70 (9.49)
Speed of running at VO$_2$max (km/h)	14.94 (1.14)	14.74 (1.17)	17.13 (0.85)[aa ww ff bb hh]	15.45 (1.07)[r]	15.82 (1.26)[ww a h]	14.87 (1.43)
Peak power (W)	710.57 (196.87)	880.70 (145.01)[aa kk ff hh]	699.17 (130.86)	646.00 (150.38)	938.56 (193.22)[aa kk ff hh]	765.93 (159.26)[ff]
Peak power/BW (W/kg)	9.02 (2.09)	10.61 (1.24)[aa kk ff hh]	9.08 (1.36)	8.64 (1.50)	10.31 (1.29)[a k ff hh]	8.88 (1.17)
Mean power (W)	501.86 (114.70)	662.27 (93.28)[aa kk ff hh]	583.29 (85.22)[a ff]	461.10 (105.83)	652.57 (102.76)[aa ff hh]	539.85 (91.03)[ff]
Peak power start (s)	7.03 (0.69)	7.20 (1.04)	6.93 (1.05)	7.61 (1.62)	7.72 (1.72)	7.35 (1.15)
Peak power end (s)	12.13 (2.81)	11.72 (1.46)	11.18 (1.00)	13.19 (2.05)[ww kk]	12.27 (2.52)[ww]	12.20 (2.52)

Legend: [aa] statistically higher ($p<0.01$) than the athletes; [a] statistically higher ($p<0.05$) than the athletes; [ww] statistically higher ($p<0.01$) than the wrestlers; [w] statistically higher ($p<0.05$) than the wrestlers; [kk] statistically higher ($p<0.01$) than kayakers; [k] statistically higher ($p<0.05$) than kayakers; [ff] statistically higher ($p<0.01$) than football players; [f] statistically higher ($p<0.05$) than football players; [hh] statistically higher ($p<0.01$) than handball players; [h] statistically higher ($p<0.05$) than handball players.

Table 3. *Values of the discriminating functions and their significance*

Function	% variance	Kanonic corelation	χ^2	P
2.961	37.2	0.865	565.178	0.000
1.600	20.1	0.784	395.863	0.000
1.291	16.2	0.751	278.321	0.000
1.154	14.5	0.732	176.359	0.000
0.947	11.9	0.697	81.972	0.000

Analysis of differences in anthropometric characteristics, aerobic and anaerobic capacities between subjects who are engaged in various sports revealed that there are signitficant differences between some of the sports included.

All of the five isolated discriminant function reached the statistically significant level with the estimation of p <0.01 (Table 3). Whereas, first two functions include less than 60% of the variance system of applied variables and largely defining the differences between the groups.

Discusion

In our study we measured anthropometric, anaerobic capacity and aerobic capacity data on different sport disciplines of athletes from Vojvodina. We included sprinters, wrestlers, kayakers, football, basketball and handball players in this research. All subjects were ranked as top level athletes. According to the collected data we were able to make sport specific profiles of athletes. Two anthropometric characteristics *body height* and *arm span* which we used to identify longitudinal dimensionality of the body basketball and handball palyers presented the highest values and compared with other sports observed differences were statistically significant (p<0.01).

Analysing parameters that depicture transversal dimensionality of the body we have noticed that the same two groups of sportsmen differ from the others by the parameters of *knee* and *ankle diameter*. The parameter *wrist diameter* was found high in wrestlers, basketball and handball palyers. Kayakers have the highest values for parameter *elbow diameter* while the football players presented the lowest values for this parameter.

For the parameters *volume* and *body mass* we found that basketball players have the highest and the footballers have the smalest values. Sprinters and football players have also the lowest *body weight* and *circumference of chest* while kayakers and wrestlers have significantly higher value of *diameter of forearm* and *lower arm*. Basketball players have significantly higher *abdominal circumference* as well as *thigh* and *lower leg* circumference. In estimation of subcutaneous adipose tissue the results are somwhat more eaqualy distributed among the measured groups of athletes. However, the

wrestlers have higher values for following skinfold parameters: *lower arm, forearm* and *subscapular*. This finding could be misleading since it would be normal to have such result due to subcutaneous adipose tissue. We are asuming that the reason is thickenning of the skin in above mentioned regions. The proof of such statement is found in the structure of sporting activity where two wrestlers oppose each other, griping with the arms, have the highest energy exchange in theese parts of the body. Outcome is cutaneous tissue hipertophy.

In analysis of aerobic capacity parameters in all measured groups we have found that kayakers have the highest values except for the parameter HR_{max}. Lowest results are found in the group of basketball players (49.16±8.04 ml/kg/min). This result for basketball players in our study is even lower than the result measured in the group of yunior players in the study of Apostolidis et al. (2004). In the previous study of Ostojić et al. it was found that maximal oxygen uptake depends on the playing position (Ostojić et al., 2006). Namely, the center players have significantly lower values of this parameter compared with playmaker and wing position players.

In our research significant differences appeared in median values of *absolute* and *relative* VO_{2max} among tested groups. Parameter *speed of running at anaerobic treshold* is making the difference among the tested group as well. Kayakers (15.13km/h) and football players (14.05km/h) presented the highest values. Crossing of anaerobic treshold at higher speed of running together with lower HR is the typical marker of endurance induced by specific training (Jones and Carter, 2000) and are parameter of aerobic capacity of an athlete (Viru et al., 1995).

Authors in this reserach consider that adequate aerobic endurance is necessary, in team sports as well as in individual ones, because it allows relatively fast recovery between anaerobic activities in sport games just like between fights in wrestling. High aerobic capacity also provides faster recovery during and after training. It is also known that fast recovery allows athletes to reduce (low down length duration) a brake and continue on activities with higher intensity, especially in sports which require multiply repetition of specific sport knowledge (Bompa, 1999) (skill, technique). Si-

gnificance of difference in running velocity, in anaerobic capacity, indicates that the difference in aerobic performance is more real than practical significance. Maximum running velocity achieved during a progressive treadmill test is statistically the most important for kayakers (18.13km/h), while for basketball players (16.44km/h) and football players (16.42km/h) is slightly lower but significantly higher from the rest of the athlete groups. This parameter does not indicate maximum performance at the expense of aerobic resynthessis of ATP (Viru, 1995). In conclusion, anaerobic lactic capacity has more significant effect on measured physiological parameters.

For determination of anaerobic capacity Wingate anaerobic test had been used. WAnT belongs to a group of tests which reliably determines the parameters of anaerobic capacity (Bulbulian et al., 1986; Bar-Or, 1987; Klasnja et al., 2010). According to the standard protocol it is being performed in duration of 30 sec. All the energy required for muscle work achieved during WAnT had been received from anaerobic sources. It has been considered earlier that contribution of energy from aerobic sources is higher (30%), but some of the published works shows that only 18% of energy is being received during the WAnT through aerobic glycolisis. Alactic component of anaerobic sources which consists of high-energy phosphates participates with 31% (Bogdanis et al., 1996), while lactic part of anaerobic sources provides 50% of energy necessary for performing this test (Beneke et al., 2002). Outcome of this research showed that, statistically, most significant results have been achieved by basketball players (peak power 938.6W, PP/BW 10.3W/kg) and wrestlers (peak power 880.7W, PP/BW 10.6W/kg), compared with football players (peak power 646W, PP/BW 8.6W/kg), kayakers (peak power 699.2W, PP/BW 9.1W/kg), sprinters (peak power 710.6W, PP/BW 9.1W/kg) and handball players (peak power 765.9W, PP/BW 8.9W/kg). The results indicate that wrestling is a sport where strength is predominant for sportive result with predominance of anaerobic energy sources. In the study of Ponorac et al. (2007) the research results revealed that football players achieve noticeably better results (max. strength 763W, 9.7W/kg) unlike football players during our research, while rowers achieved similar results (max. strength 691W, 8.8W/kg) just like kayakers in our research. It is important to emphasize that during the Wingate test, verbal support has utmost importance (Karaba-Jakovljevic et al., 2007) in achieving maximum results. Athletes from our study have expressed body height and range of hands and strong knee knuckle. They have average extent and body weight with a minimum of subcutaneous fat. This group of athletes from Vojvodina presented good aerobic capacity (52.6±4.11 ml/min/kg). Football players had significantly higher maximum heart rate from the rest of the sports groups. Relatively weak anaerobic capacity of sprinters is a bit surprising, since they have been measured the highest value of ergomertic parameter ''peak power'' (710.6 W), just like relative values of this parameter (9.1 W/kg). For achieving better competitive results, more trainning hours is advised to athletes and trainers on improving anaerobic abilities which are significant while accomplishing high results in sprinting. Our research verified that wrestlers have more expressed wrist and elbow joints. They have average body height and expressive volume of the circumferences of the chest, upper arm, lower arm. Wrestlers are trying to maximize fat-free body mass and to minimalize fat mass in order to achieve better performances. Wrestler from out studies showed that they have excellent aerobic capacity (51.5±4.2 ml/min/kg). Adequate aerobic endurance is a necessity because it provides relatively fast recovery between rounds and fights. High aerobic capacity also allows faster recovery during and after training. Comparing test results from athletes in our study we found different values of anaerobic capacity between some sports are obtained. Wrestlers presented the highest values for both ergometric parameter „peak power" (880.7W) and relative values of this parameter (10.6W/kg). Wrestling with new rules for this sport, introduced couple of years ago, has predominate anaerobic characteristics. Training and competing characterize short-term, explosive activities, with significant anaerobic energy production which reflects long time specific sport training (Trivic et al., 2011). Quantification of these adaptations allowed us Wingate parameter ''peak power'' which relates to decomposition of high energy phosphates. It shows statistically significant difference regar-

ded on sprinters, kayakers, football players and handball players (p<0.01). Unlike some other authors where a bit higher values of parameter „peak power" are presented in groups of wrestlers and rowers, (10.2W/kg, 11.6W/kg) (Inbar et al., 1996) our research did not recorded maximal values of this parameter. This gives us the right to connote the trainers to direct their training on improving anaerobic abilities so that wrestlers from Vojvodina could be closer to normative values of world class wrestlers. This group of athletes and their trainers should less pay attention on percentage of fat tissue and pay a lot more attention to percentage of non-fat tissue which is in a lot stronger relation with anaerobic parameters.

Statistically significant differences appeared between kayakers and all other sport groups for the parameters *absolute* and *relative* VO_2max, *anaerobic treshold* (T_{vent}), in *running velocity during anaerobic treshold*, *running velocity during maximum oxygen consumption*. Kayakers also had significantly lower heart rate during *anaerobic treshold*. All these differences (transit of anaerobic capacity during higher running velocity with lower heart rate) represent typical markers for endurance induced with adaptation (Jones and Carter, 2000) and indicate the level of aerobic performance of an individual athlete (Viru, 1995). Maximum running velocity has been achieved during a progressive treadmill test, and is statistically the most significant on kayakers compared with other athletes. This parameter does not indicate ones maximum performance on behalf of anaerobic resynthesis of ATP (Viru, 1995). In that way we can conclude that anaerobic lactate capacity has significant influence on physiological parameters. Kayakers, in our research, expressed less absolute anaerobic strength but they distinguished themselves in relative anaerobic strength just like in medium value of achieved muscle force.

Statistically, unlike the other researched groups of athletes, football players from our study have significantly lower values of mentioned parameters. However, the best football players, according on their body height and mass, in average, do not differ so significantly from young and healthy men (Markovic and Bradic, 2008). Football players from our study proved to own excellent aerobic capacity (53.6±4.9 ml/min/kg). However, when we compare those results with results of German

first-class players (average 67 ml/min/kg, Verheijen et al., 1998) where in both groups of athletes achieved maximum value of heart frequency 185-190/minute, we can say that football players from our study are far below the norm for highly trained players. Aerobic endurance is commonly considered as the ability to sustain the certain acvity by introducing the large number of musclesnecessary to overcome given load as longer as possible, while the energy is provided in aerobic way. Even though it is expected from football players to carry out a huge physical job during 90 minutes, his goal is not to run a longest distance possible. Football player also does not moves cyclically with the same velocity, but constantly changes the direction and speed of his movement in accordance with tactical role in the game and the situation on the field at that time. Therefore, there is an important difference between cyclic and acyclic aerobic endurance. It also means that a football player does not need to develop aerobic endurance up to his maximum, unlike in typical endurance sport. Finally, there is a big correlation between maximum consumption of oxygen and total distance exceeded during the game. Those data clearly reveals us that aerobic ability represent a very important component of success in football. They also add to the player faster recovery between anaerobic activities of higher intensity, and faster recovery between training and a match. High energy phosphates are one of two energetic systems to contribute. ATP amount in the muscle provides the football player the activity with maximum intensity in duration of 2-3 seconds (Viru et al., 1995). After the depletion of ATP creatine phosphate (CP) extends the time of work at high intensity up to 10-15 seconds in alactic conditions. Regeneration of these energy sources lasts for 60 − 90 seconds (Viru et al., 1995). Renewing process is going on while the football player is standing, walking or hopping because the energy for operating those actions draws from carbohydrates and fats. Anaerobic or velocity endurance presents the ability of the football player to work as long as possible during the intensity which is close to the maximum (for example sprint on 400m). However, football players rarely manifest that type of continuous form of anaerobic endurance. Instead, in football we are meeting an acyclic type of anaerobic en-

durance which includes repetitive performance of explosive activities like sprinting with total duration of 30 – 40 seconds. Although the most part of the energy necessary for work of football players during the match is being given in aerobic way, the most important activities (sprints with the ball and without it, jumps, change of the movement direction, hits, duels, and such) have anaerobic characteristics and the football player has to repeat them during the match. Football players from our study showed relatively modest results of the highest value of ergometric parameter „peak power" (646W), and relative values of this parameter (8.64W/kg). In order to achieve better results, this group of athletes have to change the improve training system significantly.

Basketball is a sport which is characterized with periods of high intensity, discontinous relatively short periods of recovery. If the players are not on the high level of physical preparedness, technique will progressively get worse with appearance of fatigue during the match. Basketball players have to be able to move on the court efficiently, make a fast and explosive moves, calculate the opponent's next move and react quickly, to move in every direction and jump high and fast continuously during the match. To achieve this, basketball players have to own a high level of general and specific physical abilities (Abdelkrim et al., 2007). Only those athletes who own high level of physical ability will be able to achieve the biggest effects using sport specific resources for developing their physical preparedness. Goal of this research was to describe anthropometric characteristics and functional characteristics of top basketball players from Vojvodina. Eighteen basketball players took part in this research, which competed in first national league. Basketball players were taller and had more weight unlike the other groups of athletes who participated in this research which was expected due to sport specific anthropometric demands (p<0.01). Basketball players had higher parameter of *hand reach* (p<0.01) compared with sprinters, wrestlers, kayakers and football players. They also had significantly higher values of parameter diameter of *wrist* and *knee*, and *abdominal* skinfold and of *lower leg*. Parameter of absolute and relative *consumption of oxygen* are excellent, but slightly lower from the rest of analyzed gro-

ups. Basketball players had significantly higher *running velocity during maximum consumption of oxygen* which indicate on very good economy of movement. Statistically, anaerobic strength of basketball players of Vojvodina is on a very high level and significantly higher from sprinters, kayakers, football, and handball players (p<0.01).

Handball players from our study possess high values of parameter of body height and weight, and outstanding range of hands. Our research confirmed that handball players have very high values for parameter diameter of wrists, elbow, and knee. Research showed that handball players have high aerobic capacity (49.8±7.6 ml/min/kg). Handball players presented the highest values of ergometric parameter *„peak power"* (765.9W) and relative value of this parameter (8.88 W/kg). It is well known that handball is a sport with typical short periods of activities with high intensity, with short alternating pause periods, where anaerobic metabolism is proved to be a very important element of sport success.

References

1. *Abdelkrim, N.B., El Fazaa, S., El Ati, J. (2007). Time-motion analysis and physiological data of elite under-19-year-old basketball players during competition. British Journal of Sport medicine, 41(2), 69-75.*

2. *Apostolidis, N., Nassis, G.P., Bolatoglou, T., Geladas, N.D. (2004). Physiological and technical characteristcs of elite young basketball players. Journal of Sports Medicine and Physical Fitness, 44(2), 157- 163.*

3. *Bangsbo, J., Mohr, M., Krustrup, P. (2006). Physical and metabolic demands of training and match-play in the elite football player. Journal of Sports Sciences, 24(7), 665-674.*

4. *Bar-Or, O. (1987). The Wingate anaerobic test. An update on methodology, reliability and validity. Sport Medicine, 4(6), 381-394.*

5. *Beneke, R., Pollmann, C., Bleif, I., Leithauser, R.M., Hutler, M. (2002). How anaerobic is the Wingate Anaerobic Test for humans? European Journal of Applied Physiology, 87(4-5), 388-392.*

6. *Bernard T, Giacomoni M, Gavarry O, Seymat M, Falgairette G. (1997). Time-of-day effects in maximal anaerobic leg exercise. European Journal of Applied Physiology, 77(1/2), 133-8.*

7. *Bompa, T.O. (1999). Strength and power development. In :Periodization: Theory and Methodology of Training, 4th edition. Champaign: Human Kinetics.*

8. Bogdanis, G.C., Nevill, M.E., Boobis, L.H., Lakomy, H.K.(1996). Contribution of phosphocreatine and aerobic metabolism to energy supply during repeated sprint exercise. Journal of Applied Physiology, 80(3), 876-884.

9. Bulbulian R., Wilcox, A. R., Darabos, B. L. (1986). Anaerobic contributions to distance running performance of trained cross-country athletes. Medicine and Science of Sports and Exercise, 18(1), 107-113.

10. Dotan, R., Bar-Or, O. (1983). Load optimization for Wingate anaerobic test. European Journal of Applied Physiology, 51(3), 409-417.

11. Drid, P., Majstorović, N., Drapšin, M. (2010). The effects of different exercise workloads on visual perception skills in elite serbian female judokas. Kinesiology, 42(2), 201-207.

12. Gabrijelić, M. (1977). Manifest and latent dimensions of top athletes in some team sports in motor, cognitive and conative area. Doctoral thesis. Zagreb: Faculty of Physical Culture.

13. Inbar, O., Bar-Or, O., Skinner, S. (1996). The Wingate Anaerobic Test.Champaign, IL: Human Kinetics.

14. Jones, A.M., Carter, H. (2000). The Effect of Endurance Training on Parameters of Aerobic Fitness. Sports Medicine, 29(6), 373-386.

15. Jukic, I., Milanovic, D., Vuleta, D. (2002). Characteristics of the basketball conditioning process and preparedness - latent structure. In 3rd International Scientific Conference, Kinesiology – New Perspectives. Zagreb: Faculty of Kinesiology.

16. Kale, M., Asci, A., Bayrak, C., Acikada, C. (2009). Relationship Among Jumping Performances and Sprint Parameters During Maximum Speed Phase in Sprinters. The Journal of Strength and Conditioning Research, 23(8), 2272-2279.

17. Karaba-Jakovljević, D., Popadić-Gaćeša, J., Grujić, N., Barak, O., Drapšin, M. (2007). Motivacija i motorički testovi u sportu. Med. Pregled, LX(5-6), 231-236.

18. Kreamer, W., Vescovi, J. And Dixon, P. (2004). The Physiological Basis of Wrestling: Implications for Conditioning Programs. In Strength and Conditioning Journal, 26(2), 10-15.

19. Klasnja, A., Drapsin, M., Lukac, D., Drid, P., Obadov, S., Grujic, N. (2010). Comparative analysis of two different methods of anaerobic capacity assessment in sedentary young men. Vojnosanitetski pregled, 67(3), 220-224.

20. Lohman, A., Roche, F. and Martorell, R. (1988). A Review of: Anthropometric Standardization Reference Manual. Champaign, IL.: Human Kinetics Books.

21. MacIntosh, B.R., Rishaug, P., Svedahl, K. (2003). Assesement of peak power and short-term work capacity. European Journal of Applied Physiology, 88(6), 572-579.

22. Markovic, G., Bradic, A. (2008). Nogomet-integralni kondicijski trening. Zagreb: Udruga "Tjelesno vezbanje i zdravlje".

23. Mohr, M., Krustrup, P., Bangsbo, J. (2003). Match performance of high-standard soccer players with special reference to development of fatigue. Journal of Sports Sciences, 21(7), 519-528.

24. Ostojic, S.M., Mazic, S., Dikic, N. (2006). Profiling in basketball: Physical and physiological characteristics of elite players. J. Strength Cond Res, 20(4), 740-744.

25. Ponorac, N., Matavulj, A., Rajkovača, Z., Kovačević, P. (2007). Analiza anaerobnog kapaciteta sportista koji se bave različitim sportovima. Med. Pregled, LX(9-10), 427-430.

26. Radjo, I., Mekic, A., Drapsin, M., Trivic, T., Kajmovic, H., Drid, P. (2011). Isokinetic strength profile of shoulder rotators and thigh muscle torques in elite judokas and soccer players. TTEM, 6(3), 631-635.

27. Sporis, G., Milanovic, L., Jukic, I., Omrcen, D. and Molinuevo, J.S. (2010). The effect of agility training on athletic power performance. Kinesiology 42(1), 65-72.

28. Trivic, T., Drid, P., Drapsin, M., Ostojic, S., Obadov, S., Radjo, I. (2011). Strenght and endurance training does not lead to changes in major markers of oxidative stress. HealthMED, 5(3), 616-620.

29. Van Someren, K.A. and Palmer, G.S. (2003). Prediction of 200-m sprint Kayaking Performance. Can J Appl Physiol, 28(4), 505-517.

30. Verheijen R. (1998). The complete handbook of conditioning for soccer. Rochester, Michigan: Data Reproductions.

31. Viru, A. (1995). Adaptation in sports training. Boca Raton, FL: CRC Press.

32. Vuleta, D., Jukić, I. and Sertić, H. (2002). Changes of anthropological attributes in senior male handball players induced by training. In 3rd International Scientific Conference, Kinesiology – New Perspectives. Faculty of Kinesiology.

33. Zamparo, P., Capelli, C., Guerrini, G. (1999). Energetics of kayaking at submaximal and maximal speeds. Eur J Appl Physiol Occup Physiol, 80(6), 542-548.

Corresponding Author
Miodrag Drapsin,
Department of Physiology,
Medical Faculty,
University of Novi Sad,
Serbia,
E-mail: minja.drapsin@gmail.com

Adult dental anxiety and its relationship to demographic and sociocultural characteristics

Servet Kesim¹, Demet Unalan², Ferhan Elmali³, Cagri Esen⁴

¹ Erciyes University, Faculty of Dentistry, Department of Periodontology, Kayseri, Turkey,
² Erciyes University, Halil Bayraktar Health Services Vocational Collage, Kayseri, Turkey,
³ Erciyes University, Faculty of Medicine, Department of Biostatistics, Kayseri, Turkey,
⁴ Erciyes University, Faculty of Dentistry, Department of Periodontal Diseases, Kayseri, Turkey.

Abstract

Objective: In this study we aimed to establish the level of dental anxiety in adults and investigate its relationship to demographic and sociocultural characteristics.

Material-method: This cross sectional study was performed upon 151 patients, out of 180 patients (81.2%), aged 18 and above, who referred for the first time to the Periodontology Clinic, Dental Faculty, Erciyes University, between January- March 2008, and had appropriately answered DAS. A questionnaire, prepared by the investigators, and DAS were used as data gathering tools.

Results: The mean age of the patients who participated in the study was 38.3±12.5, 55.6% were females, 35.8% were housewives, and 41.1% had a poor income level. 29.1% of the patients were smokers. 94.0% stated that they went to a dentist when they had complaints, 63.6% stated that their general dental health was medium, 58.3% stated that they very much needed treatment, and 66.9% stated that they brushed their teeth every day. The mean DAS score of the individuals in the study group was 9.39±3.52. When the DAS scores were classified according to severity, it was found that 41.1% of the patients scored < 9, 40.4% scored between 9-12 points (moderate anxiety), 10.6% scored between 13-14 points (high anxiety), and 7.9% scored between 15-10 (severe anxiety or phobia). In our study, dental anxiety was found to be significantly higher in female patients, young patients, and patients who do not go to a dentist on a regular basis (p<0.05).

Conclusion: The most important risk factors affecting the state of dental anxiety were, female gender, young age, and not going to a dentist on a regular basis.

Key words: Anxiety, dental fear, periodontology.

Introduction

Anxiety, is a subconscious intense state of restlessness and concern towards an unknown danger, whereas, fear is the reaction to an obvious danger (1-4). Extreme dental fear is a worldwide issue affecting a wide portion of the population (4-6). There are many people who neglect their oral-dental treatments due to this dental anxiety (7), it has been reported worldwide, that approximately 6-15% of the individuals avoid their dental examinations due to their severe dental fear (8). Compared to previous years, today, there are many alternatives a dentist can use aiming to reduce a patient's dental anxiety (9). Nevertheless, there has been no improvement at all in the past 50 years, regarding dental anxiety, in spight of all the head spinning developments in dental treatment and analgesia (10). In his study Locker has established the psychosocial effects of dental anxiety and fear (11).

Dental anxiety patients are not an ethiologically homogenous group, dental anxiety arises through different mechanisms (12). Among these; negative information, witnessing or having a bad experience and negative conditioning can be listed. A bad experience with a dentist is a major contributor in the negative conditioning in dental anxiety (13). Although more frequent in children, dental anxiety has a high incidence in the population (14). Corah Dental Anxiiety Scale (DAS) (15) comprises questions that establish the patient's anxiety level the day before going to the dentist, in the dentist's waiting room, and just before the dentist's treatment.

In this study, the aim was to establish the dental anxiety level in adults, and its relationship to demographic and sociocultural cahracteristics.

Materials and method

This cross-sectional study was performed between January-March 2008, upon 186 patients, 18 years old and above, who referred for the first time to the Periodontology Clinic, Dentistry Faculty, Erciyes University, and 151 (81.2%) of the patients who answered the Corah dental Anxiety Scale (DAS) appropriately were included into the study. The data gathering tools were; a questionnaire prepared by the investigators, inquiring about the demographic and sociocultural characteristics, such as smoking, how often they visit their dentists, their perception of their general oral state, and the need for treatment, and the Corah Dental Anxiety Scale (DAS) to establish the level of dental anxiety.

Exclusion criteria: Being less than 18 years old and older than 65, being illiterate, having mental retardation, or any mental disorder, using psychotrophic medicine at the time, or alcohol and drug addiction, constituted our criteria of exclusion.

Inclusion criteria: The patients who had referred to Periodontology Clinic, Dentistry Faculty, Erciyes University for the first time, those that filled the informed written consent, and those 18 years old and above, and below 65 years old were included into the study.

Corah Dental Anxiety Scale (DAS)

Psychometric scales that measure dental anxiety are limited. One of the most common scales used to measure dental anxiety in dentristy is the Corah Dental Anxiety Scale (DAS) (15). In the scale Corah developed in the year 1969, there are four questions, the answers range from 1 (no anxiety) to 5 (severe anxiety), a=1, b=2, c=3, d=4, and e=5, with a total possible score of 20. The anxiety rating is: < 9 = normal, 9 - 12 = moderate anxiety but there are specific stressors that should be discussed and managed, 13 - 14 = high anxiety, 15 - 20 = severe anxiety (or phobia). This scale aimes to establish the subjective reaction of the patient towards going to a dentist. The validity and reliability study of the scale, for the Turkish population was performed by Ilguy et.al.(16). The study was performed according to the Helsinki Declaration, consent was obtained from the Ethical Committee of Dentistry Faculty, Erciyes University, and written informed consent was obtained from the participants.

Statistical analysis

Differences between categorical variables were compared using the chi-squared test and unpaired student's t test was used to compare continuous variables. The DAS scores were grouped according to anxiety existence and severity as <9 and ≥9. In order to establish the factors affecting the DAS scores ≥9, univariate and multiple binary logistic regression (backward stepwise procedure) analysis were used. Two-tailed p-values of <0.05 were considered statistically significant. Statistical analysis were calculated by IBM SPSS Statistics 20 Version.

Results

The mean age of the participants was 38.3±12.5, 55.6% were female, 35.8% were housewives, 41.1% had a bad income level. 29.1% of the patients were smokers, 12.6% of the smokers smoked 1-9 cigarettes/day. 94.0% of the patients stated that they referred to a dentist when they had complaints, 63.6% stated that their oral health was medium, 58.3% that they very much needed treatment, 66.9% stated that they brushed their teeth every day, and 29.8% stated that they brushed their teeth once a day.

The mean DAS score of the participants was 9.39±3.52. The distribution of the DAS scores according to severity was; 41.1% <9 points, 40.4% 9-12 points (moderate anxiety), 10,6% 13-14 points (high anxiety), 7.9% 15-20 score (severe anxiety or phobia).

In our study, dental anxiety was found to be signficantly higher at young age, in females, and in those not referring to a dentist regularly (p<0.05) (Table 1).

According to the logistic regression analysis, the most important risk factors affecting dental anxiety were; age (young age), gender (female), and frequency of dental visits (Table 2).

Discussion

The patients in the the study had a mean das score of 9.39, which indicates that they had a moderate level of dental anxiety. When the DAS scores were classified according to severity, it was found that 18.5% of the people referring for dental examination had high anxiety, and severe anxiety or phobia. There are many national (17,18) and international studies

Table 1. Comparison of mean Corah Dental Anksiyete Scale scores among subjects showing dental anxiety

Variables	Corah's Dental Anxiety Scale scores		
	DAS≥9) (n=76)	DAS<9 (n= 75)	p
Age (median (min-max))	33.50 (18-63)	42.00 (18-67)	0.037*
Income Level (median (min-max)/TL	900.00 (300-5000)	1000.00 (300-4300)	0.475
Number of people living at home (median (min-max)	4.00 (2-13)	4.00 (1-7)	0.342
Gender Male female	26 (38.2 %) 50 (60.2 %)	42 (61.8 %) 33 (39.8 %)	0.006*
Occupation Civil servant Self-employed Housewife Student Retired	15 (46.9 %) 11 (39.3 %) 33 (60.0 %) 10 (58.8 %) 7 (36.8 %)	17 (53.1 %) 17 (60.7 %) 22 (40.0 %) 7 (41.2 %) 12 (63.2 %)	0.478
Smoking habits Yes No	26 (59.1 %) 50 (46.7 %)	18 (40.9 %) 57 (53.3 %)	0.285
Number of cigarettes 1-9 10-19 20 and above	13 (61.9 %) 7 (63.6 %) 7 (58.3 %)	8 (38.1 %) 4 (36.4 %) 5 (41.7 %)	0.501
Regular Dental Visits Yes No (In case of complaints)	1 (10.0 %) 75 (53.2 %)	9 (90.0 %) 66 (46.8 %)	0.008*
Evaluation of general mouth health Good Medium Bad	4 (33.3 %) 51 (52.6 %) 21 (50.0 %)	8 (66.7 %) 46 (47.4 %) 21 (50.0 %)	0.344
Need for treatment Little Much	33 (51.6 %) 43 (49.4 %)	31 (48.4 %) 44 (50.6 %)	0.462

*p<0.05

Table 2. Results of univariate and multivariate binary logistic regression (Backward Wald Method) analysis of Corah Dental Anksiyete Scale scores related factors

Variations	Univariational logistic regression	P	Multi-Logistic Regression	P
	OR (95% CI)		OR (95% CI)	
Age	0.973 (0.948-0.998)	0.037	0.975 (0.948-1.002)	0.070
Gender (Male)* Female	1 2.448 (1.268-4.724)	0.008	1 2.494 (1.272-4.892)	0.008
Frequence of dental visits (referring to a dentist every 6 months-one year)* In case of complaint	1 10.227 (1.262-82.877)	0.029	1 10.630 (1.285-87.956)	0.028

OR: Odds Ratio, CI: Confidence Interval

(19-21) investigating dental anxiety. In the Turkish population, the prevalence of dental anxiety has been reported as 21.3%-23.5% (17,18), Doerr et. al.. (19) in their study reported a prevalence of 10%. In a study made in Sri Lankada (20) the severe anxiety rate was reported as 12%; and in another study performed in Canada (21) the rate of patients with severe or very severe anxiety was reported as 15%. Our results are similar to the results in literature. These results imply that dental anxiety is a universal issue.

In our study we established that as the age of the patients increased, the anxiety level decreased. Multiple logistic regression analysis showed that, one of the most important risk factors affecting dental anxiety was age (young age). In many studies investigating dental anxiety (22-25), it was reported that anxiety decreased as age increased. The reason dental anxiety is higher at young age is the reflection of fear of dental treatment (this fear is most probably due to the previously used instruments and local anaesthetics which resulted in painful interventions), but in time, as people get older and with all the developments in technology and dental treatments, people realise and experience that fearing is irrational, and thus the dental anxiety is decreased. Also, as people get older the pain threshold increases due to some physiological changes, and also there is an increase in endurance, so these may also contribute to this result.

In our study the dental anxiety level of the female was found to be significantly higher. Multiple logistic regression analysis showed that, one of the most important risk factors affecting dental anxiety was gender (female). There are studies in literature reporting that dental anxiety levels are higher in females compared to males (19,24-28). Ay et.al. (29) in the study they performed using Modified Dental Anxiety Scale, have reported that females have a statistically higher anxiety score compared to males. Marakoglu et.al. (30) in their study established that both circumstancial and persistant anxiety mean scores were statistically higher in females compared to males. Based on our and literature results, it can be concluded that the sensitivity to dental pain is higher in females compared to males, and therefore their pain threshold is lower. Another fact is that, teeth are important components of facial esthetics, and women have more esthetical concerns compared to men, which can be related to these results.

In our study the dental anxiety scores were found to be significantly higher in those that did not go for dental visits regularly. Logistic regression analysis showed that, one of the most important risk factors affecting dental anxiety was the frequency of dental visits. Our results are similar to literature (19,24). Hangglin et al. (23) in their study stated that the individuals with high dental anxiety avoided dental treatment and postponed their dental interventions. Thomson et.al. (31) found that the dental anxiety levels were lower in those that went regularly to dental visits, compared to those that did not. In people who do go regularly to dental visits, development of any problem can be prevented, and any existing problem can be solved easier (without any radical or painful interventions) and as a result of this knowledge due to experience, dental anxiety decreases.

In a questionnaire study performed by Samorodnitzky and Levin in 2005 (6) the participants with anxiety stated that they very much needed dental treatment, in our study the participants with anxiety stated their oral health as bad. High dental anxiety prevents the neccessary actions to acquire dental care and treatment, this on the other hand results in a deterioration in oral hygiene. So a vicious cycle develops.

Dental anxiety is a frequently encountered problem, specially in childhood, and this causes a setback in dental treatment, resulting in a greater need for radical treatment interventions, along with deterioration in oral hygiene, and thus leading to new dental problems. Dentists should evaluate their patients' mental state before treatment, and in cases of anxiety, panic, fear etc., they should help the patient overcome these emotions by reassuring and persuading the patient, and in severe cases, they should refer them for a psychiatric consultation. The main goal is to prepare them for dental treatment.

References

1. Kvale G, Berggren U, Milgrom P. Dental fear in adults: a metaanalysis of behavioral intervention. Community Dent Oral Epidemiol 2004; 32: 250-64.

2. Chadvick BL. Assessing the anxious patient. Dent Update 2002; 29: 448-54.

3. Morgan CT. Psikolojiye Giriş, 8. Baski, Ankara: Hacettepe Üniversitesi Yayinlari, Metaksan Ltd., 1991, s.223-9.

4. Meng X, Heft MW, Bradley MW, Lang PJ. Effect of fear on dental utilization behaviors and oral health outcome. Community Dent Oral Epidemiol 2007; 35: 292-301

5. Wogelius P, Poulsen S, Toft Sorensen H. Prevalence of dental anxiety and behavior management problems among six to eight years old Danish children. Acta Odontol Scand 2003; 61: 178-183

6. Samorodnitzky GR, Levin L. Self-Assessed Dental Status, Oral Behavior, DMF and Dental Anxiety. Journal of Dental Education 2005; 69: 1385-1389.

7. Ünlü İ, Bala O, Türköz E, Gürbüz F. The evaluation of effect of using fissur bur and sonic prep vario 60 during cavity preperation on the pain degree of the patients. GÜ Dişhek Fak Derg 2004; 21(3): 159-165.

8. Eli I. Oral psychophysiology: stress, pain and behavior in dental care. Boca Raton, FL: CRC Press, 1992.

9. Miller KR. Patient comfort. Registered dental hygienist 2006; 26(5): 80-102.

10. Woodmansey KF. The prevalence of dental anxiety in patients of a university dental clinic. Journal of American college health 2005; 54(1): 59-61.

11. Locker D. Psychosocial consequences of dental fear and anxiety. Community Dent Oral Epidemiol 2003; 23: 144-151.

12. Abrahamsson KH, Berggren U, Carlsson SG. Psychosocial aspects of dental and general fears in dental phobic patients. Acta Odontologia Scandinavica 2000; 58(1): 37-43.

13. Poulton R, Waldie KE, Craske MG, Menzies RG, McGee R. Dishabituation processes in height fear and dental fear: An indirect test of the non-associative model of fear acquisition. Behaviour Research and Therapy 2000; 38(9): 909-19.

14. Sohn W, Ismail AI. Regular dental visits and dental anxiety in an adult dentate population J Am Dent Assoc. 2005; 136(1): 58-66.

15. Corah NL. Development of a dental anxiety scale. J Dent Res 1969; 48: 596.

16. Ilgüy D, Ilgüy M, Dinçer S, Bayirli G. Reliability and validity of the Modified Dental Anxiety Scale in Turkish patients. J Int Med Res 2005; 33: 252-259.

17. Firat D, Tunç EP, Sar V. Dental anxiety among adults in Turkey. J Contemp Dent Pract 2006; 7: 75-78.

18. Tunç EP, Firat D, Onur OD, Sar V. Reliability and validity of the modified dental anxiety scale (MDAS) in a Turkish population. Community Dent Oral Epidemiol 2005; 33: 357-362.

19. Doerr PA, Lang WP, Nyquist LV, Ronis DL. Factors associated with dental anxiety. J Am Dent Assoc 1998; 129(8): 1111-1119.

20. Ekanayade L, Dharmawardena D. Dental anxiety in patients seeking care at the University Dental Hospital in Sri Lanka. Community Dent Health, 2003; 20: 112-116.

21. Maggirias J, Locker D. Psychological factors and perceptions of pain associated with dental treatment. Community Dent Oral Epidemiol. 2002; 30: 151-159.

22. Schwarz E, Birn H. Dental anxiety in Danish and Chinese adults- a cross-cultural perspective. Sos Sci Med 1995; 41: 123-130.

23. Ha¨gglin C, Hakeberg M, Ahlqwist M, Sullivan M, Berggren U: Factors associated with dental anxiety and attendance in middle-aged and elderly women. Community Dent Oral Epidemiol 2000; 28: 451–60.

24. Kumar S, Bhargav P, Patel A ve ark. Does dental anxiety influence oral health related quality of life? Observations from a cross-sectional study among adults in Udaipur district, India. J Oral Sci 2009; 51: 245-254.

25. Ragnarsson E. Dental fear and anxiety in an adult Icelandic population. Acta Odontol Scand 56: 100-4, 1998.

26. Hakeberg M, Berggren U, Carlsson SG. Prevalence of dental anxiety in an adult population in a major urban area in Sweden. Community Dent Oral Epidemiol 1993; 29: 97–101.

27. Bergdahl M, Bergdahl J. Temperament and character personality dimensions in patients with dental anxiety. Eur J Oral Sci 2003; 111: 93–98.

28. Hakeberg M, Cunha L. Dental anxiety and pain related to dental hygienist treatment. Acta Odontol Scand 2008; 66 (6): 374-379.

29. Ay ZY, Erdek Y, Ozturk M, Kilinc G, Bozkurt Y, Yilmaz R. The analysis of the dental fear levels of the patients attending Suleyman Demirel University Faculty of Dentistry. Journal of Cumhuriyet University Dentistry Faculty 2005; 8: 12-19

30. Marakoglu I, Demirer S, Ozdemir D, Sezer H. State and Trait Anxiety Level in Pre-Periodontal Therapy. Journal of Cumhuriyet University Dentistry Faculty 2003; 6(2): 73-79.

31. Thomson WM, Locker D, Poulton R. Incidence of dental anxiety in young adult in relation to dental treatment experience. Community Dent Oral Epidemiol 2000; 28: 289–294.

Corresponding Author
Servet Kesim,
Erciyes University,
Faculty of Dentistry,
Department of Periodontology,
Kayseri,
Turkey,
E-mail: kesimservet@gmail.com

Frequency and changes in trends in use of illegal drugs among students in Novi Sad

Dusica Rakic[1], Branislava Rakic[1], Milena Mikalacki[2], Branka Protic Gava[2], Damjan Jaksic[2], Izet Radjo[3]

[1] Faculty of Medicine, University of Novi Sad, Novi Sad, Serbia,
[2] Faculty of Sport and Physical Education, University of Novi Sad, Novi Sad, Serbia,
[3] Faculty of Sport and Physical Education, University of Sarajevo, Sarajevo, Bosnia and Hercegovina.

Abstract

Aim: The aim is to determine the frequency and changes in trends and extent of the use of illegal drugs among students in Novi Sad during period 2008-2012.

Method: This research has been conducted among students of the University of Novi Sad between 2008 and the end of 2012. The study included 383 students in 2008 and 373 students in 2012 (aged from 19 to 20) with both genders equally represented. Anonymous special questionnaire was used and a statistical analysis was performed in SPSS17. Correlation between parameters was evaluated by Pearson Chi-Square test, Wilcoxon Signed Ranks and Spearmans correlation method. Statistical significance was analysed by χ^2 test and starting level was p<0,05.

Results: The results have shown that the prevalence of the usage of illegal drugs has an increasing character (from 24% to 26%) and students frequently use them (from 9,50% to 15,10%). In both surveys the incidence of was statistically higher in males (p<0,000). The students had the first contact with illegal drugs later, from the age of 16 (2008) to the age of 19 (2012). Marijuana is most frequently used (86,5%). The prevalence of using illegal drugs was statistically higher among adolescents who live in disturbed families (p<0,05), have poor achievement in school and have best friends who use illegal drugs (p<0,01).

Conclusion: The frequency of use of illegal drugs shows an upward trend compared to the previous period. These results indicate the necessity of primary prevention and organized, comprehensive and preventive activities at adolescents and students.

Key words: Illegal drugs, marijuana, students.

Introduction

Marijuana, cocaine, crack, heroin, LSD, amphetamines and ecstasy stand under the term "illegal drugs". In most countries the use of illegal drugs is a serious public health challenge, and usually begins during adolescence. Thus, in all countries it is a public health imperative to assess the population rates of illegal drug use among adolescents. In addition, monitoring trends over time may reflect the net effects of activities and programs carried out to prevent adolescent from using these substances. (1).

The widespread abuse of illegal drugs represents very serious and socio-pathological problem of modern society, present from earlier in western, and more recently in the countries in transition (1,2,3).

During the last couple of years the usage of illegal drugs has got epidemic proportions, with tendency of increasing in the number of users (1).

Marijuana is the most used illegal drugs (2,3). According to World Health Organization (WHO) data on the use of illegal drugs, 20% adolescents try marijuana about the age of 18 (2). Among citizens, consumption of stimulants like amphetamines grows fast across Europe and Asia (4), with evident increase in the number of cocaine and crack addicts in Europe (5), South Africa (6) and the United States (7).

The data on the frequency of consumption of illegal drugs are very diverse and difficult to follow because of different research methods (8).

In the USA, the monitoring of the incidence of illegal drugs among younger population has been carried out since 1991, in the national study YRBS (Young Risk Behavior Survey) in 50 countries and every two years reports submitted to National Centre for Education Statistics, CDC (7).

Since 1995, every fourth year ESPAD study (European School Survey Project on Alcohol and Other Drugs) has been implemented in 35 Europe-

an countries, and it follows the frequency of using illegal drugs (8). Serbia participated in the research in 2005 for the first time (9).

One part of the Yugoslav study of atherosclerosis precursors (YUSAD studies) in young populations, was about the consumption of illegal drugs among adolescents from 1995 to 2008 year (10).

The investigations have shown that the use of illegal drugs in Europe has increased significantly over the past few decades (1,2,8). The substance abuse is moving towards increasingly younger age categories, and the addiction to illegal drugs is growing (1,2). Therefore it is important to conduct the comprehensive epidemiological studies that would give the guidelines for an organized and effective prevention.

The fact that in our region the comprehensive study (that would provide a true epidemiological picture of the use of illegal drugs has not been implemented yet, prompted us to investigate the extent of taking illegal drugs in Novi Sad.

The purpose of this study was to determine the frequency and changes in trends and the extent of the use of illegal drugs among students in Novi Sad during the period 2008-2012, following the adoption of strategies to combat drugs in Serbia.

Method and material

The research was planned as the prospective study, and has been conducted in the period from 2008 to 2012. The first survey was in 2008. The sample has been randomly selected, and the study included 383 students (male 198 or 51,75% and female 185 or 48,3%), with the average age of 19,82.

The second survey was in 2012. The sample was randomly selected, and the study included 373 students with the average age of 20,18. Both genders were equally represented (male 192 or 51,5% and female 181 or 48,5%).

The sample represents 5% of the students at the first year of studies of University of Novi Sad, mostly students of medicine, mathematics, technology, agriculture, economy, engineering and students of sport and physical education.

The original questionnaire was designed for collecting the research data. The research was approved by the Ethical Committee of the Faculty of Medicine in Novi Sad. All participants were informed about the purpose of the study (participation was voluntary and anonymous).

Each survey respondent was approached with possibility of voluntary withdrawal at any time. The improper and under-staffed polls were not taken into account. The survey contained the following questions: year of birth, gender, success in school, place of residence (city, village and suburbs), the family status (both parents, father, mother, with relatives and in boarding school), the economic status, and then the habit of the using of illegal drugs. The students explained that the illegal drugs include: marijuana, ecstasy, amphetamines (LSD), cocaine, heroin, glue and a combination of pills and alcohol.

The survey was conducted by using personal contact with respondents and thus the occurrence of logical errors was avoided. Then the data were computer processed. Statistical analysis was performed in SPSS17. For the statistical analyses absolute numbers and percentages, a Pearson Chi-Square test, Wilcoxon Signed Ranks test and Spearman's correlation test were used ($p<0,05$ was statistically significant).

Results

The prevalence of used illegal drugs among students in Novi Sad in both surveys is shown in the Table 1. In both surveys, the males have been using illegal drugs in higher percentage than females, and there was a statistically significant difference between gender ($p<0,000$).

Table 1. The distribution of illegal drugs usage among students by age

Gender	Yes	Not	Yes	Not
	n %	n %	n %	n %
Males	65 (32,8)*	133(67,2)	68 (35,4)*	124 (64,6)
Females	28 (15,1)	157 (84,9)	29 (16,0)	152 (84,0)
Total	93 (24,3)	290 (75,7)	97 (26,0)	276 (74,0)

statistically significant difference of the gender p<0,05

In the first survey, the students often had the first contact with illegal drugs at the age of 16 (24,1%), but in the second survey larger number of respondents made its first contact later, at the age of 19 (26,4%), and there was a statistically significant difference (Figure 1).
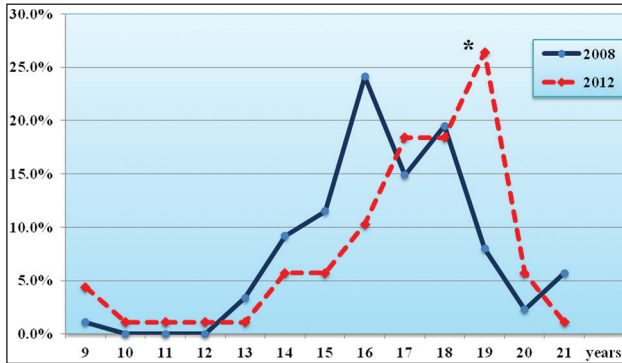
Wilcoxon Signed Ranks test *statistically significant difference p<0,042

Figure 1. The distribution of the usage of illegal drugs among students by age

Looking at types of illegal drugs, students have been using mostly marijuana, in 86%, and then by combination of pills and alcohol, hashish, LSD, ecstasy, heroin and cocaine. The similar situation **was in t**he study in 2012, but in addition to other types of illegal drugs marijuana has been used in a larger percentage. There was statistically significance difference for using hashish between surveys (Figure 2).
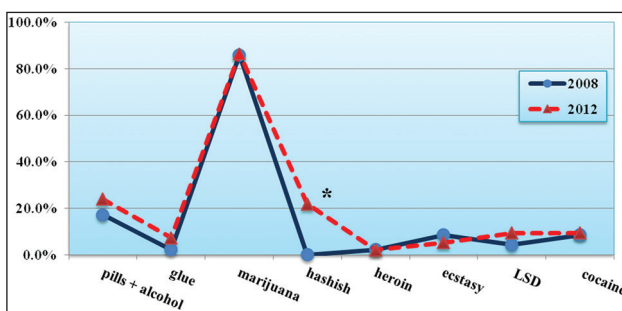
Wilcoxon Signed Ranks test *statistically significant difference p<0,03

Figure 2. The distribution of consumption of the types of illegal drugs among students

Students usually have used one type of illegal drugs. In the second survey, there were higher prevalence rates of students who have used more than 3 types of illegal drugs and this is a very serious problem (Figure 3).
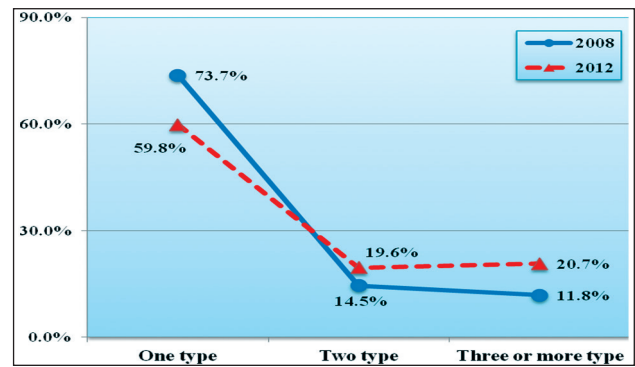
Figure 3. The distribution of respondents by number of types of used illegal drugs

The results of this study show the increase in the prevalence of respondents who have used illegal drugs more than 7 times (from 28% in 2008 to 42% in 2012) and there were statistically significant differences (Figure 4).
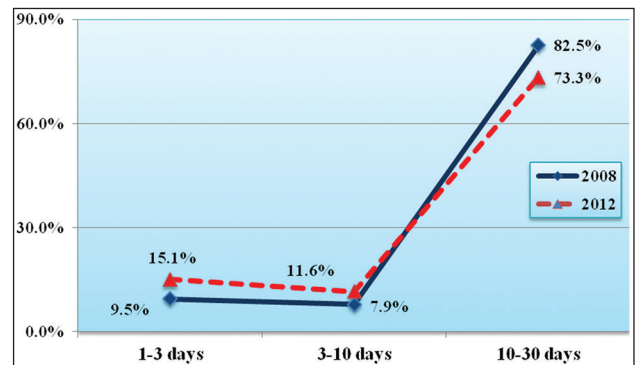
Wilcoxon Signed Ranks test *statistically significant difference p<0,05

Figure 4. The frequency of usage of illegal drugs among the students

The results of this study show the increase in the prevalence of students who frequently consumed illegal drugs (from 9,5% in 2008 to 15,1% in 2012) (Figure 5).
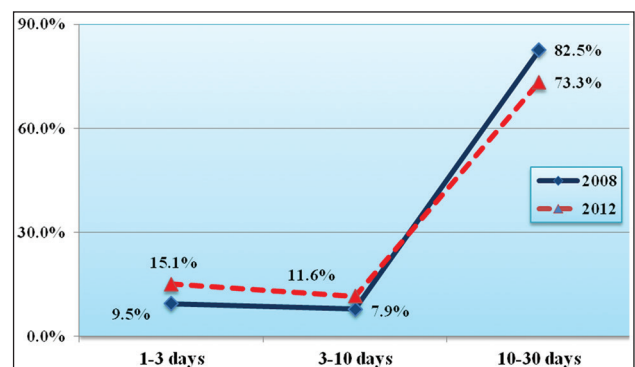
Figure 5. The distribution of respondents according to the last times of using of illegal drugs

The respondents have used illegal drugs in the street (57,1%), in the disco (15,5%), or in the other houses (11,9%), on the travelling (8,3%), at home (7,1%). It was the same in both studies.

We analysed the correlation between the usage of illegal drugs in students and some socio-economic parameters, in both studies. There was a statistically significant correlation between success in school and the usage of illegal drugs. The frequency of the usage of illegal drugs was statistically higher in respondents with poor success at school, so the excellent success is a good protective factor for the prevention of usage of the illegal drugs. There is a negative correlation between family status and the usage of the illegal drugs, so the respondents who live in disturbed families use drugs more frequently.

Students frequently used illegal drugs if they had the best friends who used illegal drugs. There was no statistically significant correlation between economic status and the usage of illegal drugs (Table 2).

Table 2. Correlation between used illegal drugs and some socio-economic the parameters

The investigated parameters	Tried illegal drugs	
	2008.	2012.
Success in school	,222**	,204**
Sig.(2-tailed)	,000	,000
Family status Sig.(2-tailed)	-,104* ,042	-0,65 ,209
Best friends used illegal PAS	.301**	,333**
Sig.(2-tailed)	,000	,005
Economic status	-,032	,044
Sig.(2-tailed	,535	,401

Pearson Correlation;
* Correlation is significant at the 0,01 level,*
* Correlation is significant at the 0,05 level

Discussion

In the first decade of the new millennium, an increasing prevalence of using illegal drugs among young people has gained epidemic proportions, with a tendency to increase in the next few years (1,11,12).

Our study shows that illegal drug usage is a widespread and probably expanding epidemic among students in Novi Sad. Boys are more vulnerable in comparison with girl's drug usage. The similar situation is in Italy (11,12).

According to the ESPAD studies (8) male students experiment more often with the illegal drugs than female students, which is the same as in our study. The results of this study have shown that the prevalence of illegal drugs usage among students in Novi Sad has an increasing character (from 24% to 26%) and it is very similar to the studies from Germany (23%). The abuse of illegal drugs is the most frequent in Czech Republic (46%) and lower than in our study is in Croatia (19%), Great Britain (18%) and in Ireland (14%).

We have noticed that students start using illegal drugs later between the age of 16 and the age of 19. According to WHO (2,3) the first data of illegal drugs usage in adolescents appear around the age of 18, which is very similar to our research.

In our study the students usually experiment with marijuana, but there was not difference between genders. Our results are very similar to the results in Russia, Bulgaria, Croatia, Slovakia and Slovenia (8). In the last seventeen years the consumption of marijuana in Novi Sad has an increasing character (from 12% in 1995 (14) to 47% in 2008(10) and now is 80% among students). The average European prevalence of marijuana consumption is 19% (boys more than girls) (8) and it is lower than the prevalence of marijuana usage in Novi Sad. The prevalence of marijuana consumption in Novi Sad is higher than the prevalence of marijuana consumption in Czech Republic 46%, France, Ireland, Swiss and Great Britain 38-40% (8) and in USA (7,15).

On the second place, the most commonly used illegal drugs are amphetamines (LSD) and ecstasy. Young people in Estonia, Germany and Ireland use amphetamines most, but in Czech Republic, Croatia, Estonia, Ireland and Great Britain they use ecstasy most. Our results for ecstasy and LSD consumption are similar to European average, which is 7% (8). Slightly lower prevalence of ecstasy and LSD usage is in USA (4.1%) (7,15). The number of illegal laboratories for production of synthetic substances is growing in the world, because the production is simple and cheap. There is a danger not only of the respective substance, but also of the synthesis and uncontrolled contamination of drugs (11,15). This makes production of synthetic substances relatively cheap and widely available, so possibility of increasing number of

addicts exists, and should be taken into account when planning prevention programs (7).

One of the new trends is combining illegal drugs. It was observed that the mostly used combination is alcohol with medicaments or with marijuana among the young people (17). In the last four years in Novi Sad the prevalence of using more types of illegal drugs has increased (from 12% to 21%) among students.

After using marijuana, most of our respondents used alcohol with pills (24%), which is higher than in the Czech Republic (18%). Significantly lower prevalence (8%) was in neighbouring Croatia (8).

The usage of illegal drugs among students is associated with several factors. The prevalence of using illegal drugs was statistically higher among students whose best friends consume illegal drugs, have poor achievement in school and live in disturbed families. The excellent success presents a good protective factor in the prevention of using illegal drugs as previous research which has been done in this area shows (12,14,18).

Students from disrupted families tend to start consuming illegal drugs later in comparison with students from undisturbed families. Backović mentions that marijuana abuse is more frequent in foster families (38,8%), compared with children from biological families (8,6%) and their first contact was earlier (aged from 11 to 14). Completed families are a protective factor in risky behaviour among young people (17).

Our results have not indicated a statistically significant correlation between the economic status and usage illegal drugs among students, as well as in previous studies (Rakić, 1995) made in these areas (14). The low socio-economic status is also significant predictor of illegal drugs abuse among young people (12,19).

The comparative analysis of our and European research of the usage of illegal drugs suggests that the prevalence rates in our country is similar to many countries in Europe but it is still significantly higher than those in the past.

During the period 2008-2012, following the adoption of strategies of Ministry of Health to combat illegal drugs in Serbia, the expected result was not obtained. The prevalence and frequency of usage illegal drugs is still significantly higher than those in the past.

There is an increasing concern about illegal drugs usage during adolescence, since the brain development during this period is more vulnerable to drug-related deficits (8). At the public health level, the large proportion of adolescents who misuse illegal drugs calls for more effective intervention strategies as well as better perception by politicians and decision makers of the seriousness and complexity of this issue (1,20,21,22,23).

Therefore it is important to implement integrated prevention and control measures. The measures in prevention and controlling must be organized and synchronized, and need to be participated by individuals, families, schools, health services and the society. Education is an important prerequisite for the promotion and preservation of health among young people (10,14).

Conclusion

A high incidence of illegal drugs was observed among students in Novi Sad. The frequency of usage of illegal drugs shows an upward trend compared with the previous period. Male students were more frequent consumers. Frequently abused illegal drugs were marijuana, pills and alcohol in combination, cocaine and amphetamines. These results indicate the necessity of primary prevention and organized, comprehensive and preventive activities among adolescents and students.

Acknowledgements

References

1. Michaud PA, Berchtold A, Jeannin A, Chossis I, Suris JC. Secular trends in legal and illegal substance use among 16–20-year-old adolescents in Switzerland. Swiss Med Wkly.2006; 136: 318–326.

2. HEALTH 21. The health for all policy framework for the WHO European Region. WHO Regioonal Office for Europe, Copenhagen, European Health for All Series No.6. 1999.

3. Rakić D, Petrović Đ. Health of Children and Adolescents - A Handbook for health monitoring and improving the health of children and adolescents. Novi Sad: 2006. p.11-50; p. 57-151.(Serbian)

4. Hall W, Doran C, Degenhardt L, Shepard D. Illicit opiate abuse. In: Disease Control Priorities in Developing Countries. 2nd edition. New York: Oxford University Press, 2006.

5. Vicente J, Wiessing L. European Monitoring Centre for Drugs and Drug Addiction annual report 2007: positive assessment of HIV in IDUs though hepatitis C still very high. Euro Surveill. 2007; 12(47).

6. Parry CDH, Plüddemann A, Myers BJ. Cocaine treatment admissions at three sentinel sites in South Africa: findings and implications for policy, practice and research. Subst Abuse Treat Pr. 2007; 2(32): 2-8.

7. Danice K. Eaton, Laura Kann, Steve Kinchen, Shari Shanklin, James Ross, Joseph Hawkins. Youth Risk Behavior Surveillance-United States, 2009. MMWR, Surveillance Summaries 2010; Vol. 59. No. SS-5.

8. Hibell B, Guttormsson U, Ahlström S, Balakireva O, Bjarnason T, Kokkevi A, et al. Substance Use Among Students in 35 European Countries. The 2007. ESPAD Report; 2009.

9. Serbian Ministry of Health and Public Health Institute of Serbia "Dr Milan Jovanović Batut". European research on the use of alcohol and other drug use among young people in Serbia. Beograd: 2009 (Serbian).

10. Rakić D, Rakić B, Stojšić Đ, Jakovljević Đ. Risky behaviour among youth in Novi Sad and the world. Nedeljković SI, editor. The Yugoslav Study of the Precursors of Atherosclerosis in School Children; Beograd: Faculty of Medicine; 2011. p.1062-72. (Serbian).

11. Molinaro S, Siciliano V, Curzio O, Denoth F, Salvadori S, et al. Illegal Substance Use among Italian High School Students: Trends over 11 Years (1999–2009). PLoS ONE. 2011; 6(6):e 20482.

12. Pavlović Z, Jakovljević B. Frequency and risk factors of the use of psychoactive substances among the young. Vojnosanit. Pregl. 2008; 65(6): 441–448. (Serbian)

13. Dimitrijević I. Synthetic drugs. Niš: Galeb; 2003. (Serbian)

14. Rakić Dušica. Smoking, alcohol drinking and physical activity among school children and adolescents (dissertation). Novi Sad: Faculty of Medicine;1996. (Serbian)

15. CDC. Youth Risk Behavior Surveillance-United States, 2009. MMWR June 4, 2010; 59 (No.SS-5): 1-142.

16. Bokan D, Bokan D, Rakić D, Budakov N. Consumption of psychoactive substances and energy drinks among students of the University of Novi Sad. South Eastern Europe Health Sciences Journal (SEEHSJ). May 2012;Vol. 2, Number 1,:38-43

17. Dušan Backović, Miloš Maksimović, Dejan Stevanović. Psychosocial risk factors and substance abuse in adolescents. Vojnosanit. Pregl. 2007;64(5):331–336. (Serbian).

18. Stojadinović A. Protective and risk factors for engagement of adolescents in risky behaviors: smoking, drinking and drugs use (dissertation). Novi Sad: Faculty of Medicine; 2004.(Serbian)

19. Galea S, Nandi A, Vlahov D. The social epidemiology of substance use. Epidemiol Rev 2004; 26: 36–52.

20. Beauvais F, Jumper-Thurman P, Helm H, Plested B, Burnside M. Surveillance of drug use among American Indian adolescents: patterns over 25 years. Journal of Adolescent Health.2004; 34: 493–500.

21. De Preux E, Dubois-Arber F, Zobel F. Current trends in illegal drug use and drug related health problems in Switzerland. Swiss Med Wkly.2004; 134: 313–321

22. Turnbull PJ. The great cannabis classification debacle: what are the likely consequences for policing cannabis possession offences in England and Wales? Drug Alcohol Rev. 2009; 28: 202–209.

23. De Preux E, Dubois-Arber F, Zobel F. Current trends in illegal drug use and drug related health problems in Switzerland. Swiss Med Wkly.2004; 134: 313–321.

Corresponding Author
Milena Mikalacki,
Faculty of Sport and Physical Education,
University of Novi Sad,
Novi Sad,
Serbia,
E-mail:

Endotracheal tube cuff pressure as a risk factor for laryngotracheal sequelae: A 5-years multicenter study

Ebrahim Alijanpour[1], Novin Nikbakhsh[2], Ali Jabbari[1,3], Fatemeh Adabi[4]

[1] Department of Anaesthesiology and intensive care, Babol University of Medical Sciences, Babol, Iran,
[2] Department of Surgery-thoracic surgery branch, Babol University of Medical Sciences, Babol, Iran,
[3] Department of Anaesthesiology and intensive care, Golestan University of medical sciences, Golestan, Iran,
[4] Babol University of Medical Sciences, Babol, Iran.

Abstract

Background: Tracheal intubations are commonly used for mechanical ventilation support in patients suffering from respiratory failure or for anaesthesia. Endotracheal tube cuff pressure must be kept within an optimal range that ensures ventilation and prevents aspiration. Over-inflation of the cuff can cause tracheal damage, especially in prone patients.

Aims: We hypothesized that efficient continuous control of endotracheal cuff pressure would reduce long term laryngotracheal sequelaes in patients admitted in intensive care units.

Materials and methods: In this multi centre case-control study, 1554 traumatic patients were enrolled with intubation endured more than 24 hours in intensive care units of hospitals affiliated to Babol University of Medical Sciences (North of Iran), March 2004 to March 2009.

Selected patients were divided into two groups: a single hospital with 752 patients was selected as case group and 802 patients admitted to three other hospitals as controls.

Cuff pressure was not measured or re-adjusted regularly in control group; but it was adjusted at 25-30 CmH_2O and monitored every 6 hours in cases. Complications of intubation were monitored and evaluated by bronchoscopy if needed.

Data were analyzed with Chi-square and Fisher-exact test. P-value less than 0.05 considered significant.

Results: The mean age of patients in case group was 45.36 years, and mean intubation period was 8.27 days. As for the control group, mean age was 50.23 years and mean intubation period was 9.03 days. There was no significant difference between the two groups regarding age, sex and intubation period.

There was a significant difference in tracheal intubation complications (P<0.05) between two groups (30 in controls vs. 6 in cases).

Conclusions: Endotracheal tube cuff pressure is a serious risk factor for laryngotracheal sequelae. Based on the present results, we recommended cuff pressure monitoring and adjusting. The effect of this intervention on other outcomes requires further study.

Key words: Endotracheal tube, laryngotracheal sequelae, cuff pressure, risk factor.

Introduction

Securing and maintaining airway by oral or nasal endotracheal tube (ETT) is common practice in operating room for general anesthesia and in Intensive Care Unit (ICU) for mechanical ventilation support in patients suffer from respiratory failure [1-2].

Most endotracheal tubes have a small inflatable balloon called "cuff", located at the distal end. The principle function of the cuff is to prevent leakage around the trachea during ventilation by ensuring proper sealing between the ETT cuff and the patient's trachea. ETT cuff over-inflation is the main risk factor of tracheal ischemia and subsequent complications [2-4].

ETT Cuff pressure should be maintained around 20-25 cm of H_2O to ensure tracheal mucosa perfusion. Over-inflamed ETT cuff can lead to tracheal injury, such as ciliary loss and mucosal injury to the basement membrane, post-extubation pain, tracheal necrosis, bleeding, tracheal rupture, stenosis, tracheoesophageal fistulae and laryngeal nerve palsy in about two hours after intubation [1-3, 5].

Endotracheal cuff pressure is rarely checked in many ICUs and is frequently over-inflated to prevent gas leakage and pulmonary aspiration by

associated caregivers [5-6]. International studies report a 55% to 62% incidence of cuff-over-inflation among ICU patients [2, 7]

In this study we have embarked on association of intermittent control of the ETT cuff pressure and substitution of NGT with PEG (percutaneous endoscopic gastrostomy) for feeding to evaluate tracheal ischemic lesions in patients with endotracheal tube. In addition, intubation complications were compared in patients with monitored cuff pressure versus control group.

Subjects and methods

This randomized blinded study was designed as a prospective 5-years study in traumatic patients who needed intubation longer than 24hours, admitted to ICU wards of hospitals affiliated to Babol University of Medical Sciences, from March 2004 to March 2009.

 The study protocol was confirmed by the ethical committee and informed consent was taken from each patient.

Study groups consisted of 752 patients admitted in hospital (A) as cases and the control group consisted of 802 patients admitted in three other hospitals (B, C and D).

Patient's information such as their name, hospital's name, registration code, phone number, age, sex, and intubation – extubation time, cuff pressure, times of cuff pressure readjustment and so on were recorded in a check list. The necessary information about alarm signs such as cough, dyspnea or hoarseness was given to all patients.

Patients with systemic medical disorders, pregnant women, predicted difficult intubation or history of intubation complications, patient's death during follow-up for any reason except intubation complications and uncooperative patients during follow up period were excluded from the study. Also, patients who subsequently underwent tracheostomy, history of previous intubation within 8 weeks, intubations done outside this hospital and accidental extubation were excluded from the study.

Disposable ETT with internal diameter 6.5-8.5 mm, high volume, low pressure cuff, was used in all patients.

In case group after intubation, cuff pressures were measured and adjusted at 20-25 cm H2O and

were monitored every 6 hours with cuff pressure monitor (VBM, Germany) and informally palpated on every shift by ICU nurses. We used an aneroid manometer for controlling and adjusting the endotracheal tube cuff.

Whenever cuff pressure varied from inspiration to expiration, the mean value was recorded and if found to be more than 25 cm H2O, was readjusted to the set point. Patients, who needed intubation for more than one week, underwent PEG for feeding.

In the control group, respiratory therapists routinely assessed cuff pressures by palpation, but not by direct measurement, once during every 6-hour shift and patients were fed by NGT, even during long intubation.

All patients were visited by the ICU physician at 1, 3 and 6 months after extubation and were referred to our hospital in case of any suspicious symptoms. (Schematic Subjects and Methods)
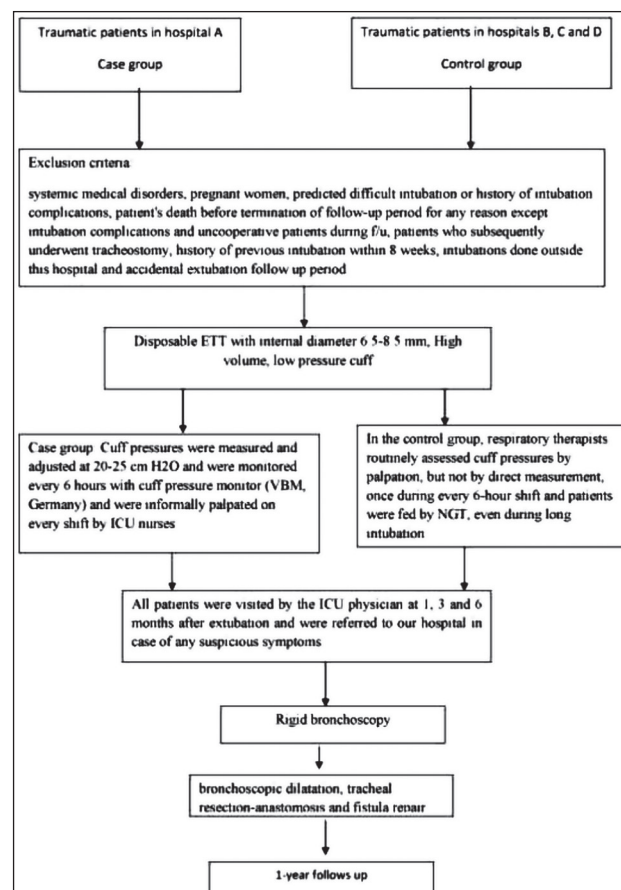
Figure 1. Schematic Subjects and Methods

To eliminate any doubt about intubation complications, we evaluated patients with rigid bronchoscopy to discover the probable airway granu-

lomas, vocal cord paralysis, tracheal stenosis and any other problems. In order to determine the diameter and length of the stenosis and its distance from the vocal cords, all patients underwent preoperative flexible bronchoscopy.

All patients were followed for at least 1 year after discharge. If needed, patients were treated in three manners: bronchoscopic dilatation, tracheal resection-anastomosis and fistula repair.

The result of treatment was considered as:
- Good: Patients who were able to return to normal life after discharge.
- Satisfactory: Patients who had mild symptoms but in their repeated bronchoscopy did not need any intervention.
- Failure: Patients who had symptoms at rest after discharge.

Continues covariates like age were compared using analysis of variance T-test. For categorical covariates, the comparison was done using chi-square test or Fisher's exact test. The significance level was defined as P value less than 0.05.

The results were analyzed using SPSS-17 software. Parametric (normally distributed) data were analyzed using t-test for group comparisons. Non-parametric (skewed) data were analyzed using Kruskal-Wallis test.

Results

The mean age of patients in case group was 45.36 years, consisting of 481(63.96%) men and 271(36.03%) women. The mean intubation period was 8.27 days. As for the control group, mean age was 50.23 years, consisting of 517 (46.64%) men and 285(35.53%) women. The mean intubation period was 9.03 days. There was no significant difference between the two groups regarding age, sex and intubation period. (Table 1)

Table 1. Demographic data of cases and controls

Variables	Mean± SD	
	Case Group (No=752)	Control Group (No= 802)
Age (years)	28.56±15.39	27.82±17.44
Weight (kg)	61.81±12.17	58.69±10.51
BMI (kg/m2)	21.47±3.16	19.13±2.77

In control group, 30 patients (3.74%) showed intubation complications during the follow-up, whereas 6 patients (0.8%) in the study group had such problems. This showed a significant difference between the two groups (P<0.05). (Figure 2)
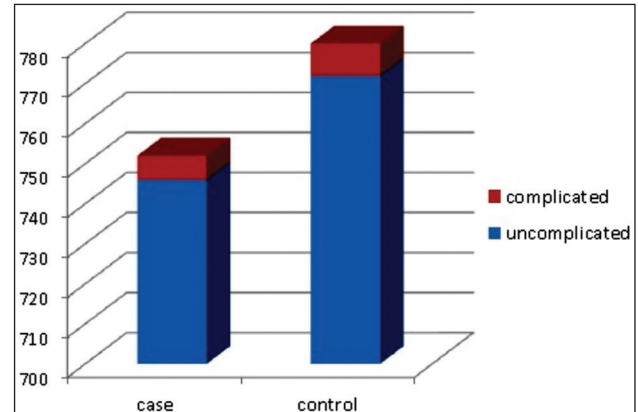
Figure 2. Comparison between frequency of case and control complications (persons)

Intubation complications in the control group were as followings:

Tracheal stenosis: 26 (3.24%), subglottic stenosis: 1 (0.12%), tracheal stenosis with tracheoesophageal fistula: 3 (0.36%) and in cases: tracheal granuloma in 4 patients (0.53%) and vocal cord granuloma in 2 patients (0.27%). (Figure 3)
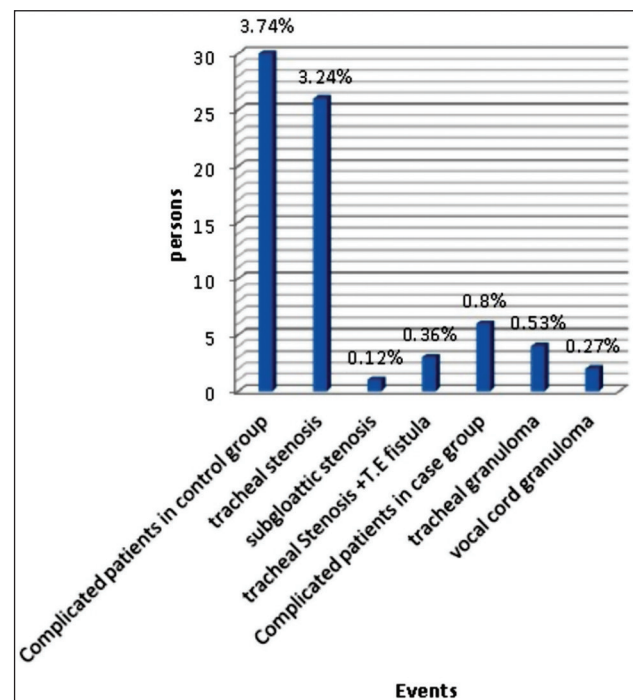
Figure 3. Comparison of Intubation complications in the case and control groups

Mean ETT cuff pressure at different times in case group is shown in Figure 4. This was increased during 54 hours of the study.
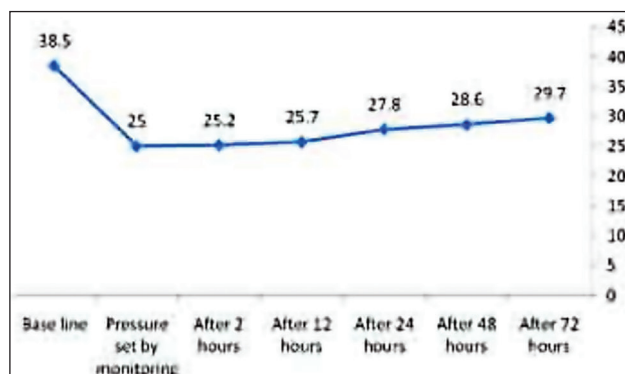
Figure 4. Mean ETTcuff pressure (Cm H₂O) at different time interval in Case group

The length of tracheal stenosis in control group ranged from 10 mm to 60 mm with a mean of 28.90 mm. Location of injury differed from 10 to 40 mm below the vocal cords with a mean of 27.66mm in case group.

Two patients (6.7%) did not need any treatment.

The treatment result in the control group was good in 14 patients (46.7%) and satisfactory in 16 patients (53.3%). In the study group none of the patients needs surgical intervention.

We observed 15 cases of hyposmia following uncomplicated nasotracheal intubation, and 7 cases of anosmia despite the use of preformed, warmed and lubricated nasotracheal tubes.

Discussion

Critically ill patients often require intubation with an endotracheal tube to provide an artificial airway for mechanical ventilation. Endotracheal tube cuffs could induce tracheal mucosa ischemia if inflated to a pressure greater than the capillary perfusion, which further could lead to ulceration, necrosis, and loss of structural integrity [2]. Erosion in paratracheal nerves may result in dysphonia, hoarseness, and laryngeal incompetence [2].

In this study, we evaluated intubated patients' characteristics and probable complications of intubation with or without cuff pressure monitoring. Our study results showed significant differences regards the intubation complications between cases and controls (3.74% in controls and 0.8% in cases).

Intubation complications in the control group included tracheal stenosis (3.24%), subglottic stenosis (0.12%), tracheal stenosis with tracheoesophageal fistula (0.36%). And in cases there were tracheal granuloma in 4 patients (0.53%) and vocal cord granuloma in 2 patients (0.27%).

Most papers considered high cuff pressure to be dangerous if inflated more than 30 cm H2O [2]. Nseir et al conducted a clinical trial on 12 piglets and mentioned that the group without cuff monitor group showed more ischemic lesions than the other piglets in electron microscopic investigations [1].

Wain et al reported ischemic lesion of tracheal mucosa few hours after intubation and considered cuff pressure as a main cause of complications instead of length of intubation [8].

Liu et al in China evaluated the correlation between controlled cuff pressure and post-procedure complications. The most reported complications in the study group were sore throat (34%), hoarseness (3%), and blood-streaked expectoration 24 hours after extubation (4%), respectively, which were significantly lower than 44%, 11%, and 11% in the control group. The rate of these complications was increased with the increase in duration of intubation. Fiberoptic bronchoscopy in the 20 patients showed tracheal mucosal injury in varying degrees in both groups, but the injury was more severe in the control group (9). One of the strengthen points of the present study was evaluating the exact underlying mechanism of causing the symptoms. Al-Metwalli et al in a study in Saudi Arabia, the incidence of sore throat was higher in those with finger palpation cuff pressure monitoring compared to the study group with a monitored cuff pressure. But dysphagia and hoarseness were similar in two groups (5).

In another study performed in patients with short duration of intubation and mechanical ventilation, higher cuff pressure was associated with a significantly higher rate of ischemic tracheal lesions [2, 10].

Some well known factors responsible for post-intubation tracheal stenosis are: cuff pressure, size of the tube relative to the tracheal lumen, duration of intubation, cardiovascular status during intubation, the movement of tube during the period of intubation, sex and age of the patient [11-12]. Patients usually remain asymptomatic until the trachea stenosis as much as 30% of the original diameter, and it may take as long as 2-4 months before the diagnosis [13].

We conclude that the maintenance of cuff pressure in the range of 25-30 cm H2O with regular monitoring and use of PEG in long term intubated patients can prevent cuff pressure complications, somehow. And also it could be suggested that manometry is a more reliable method of cuff assessment than digital palpation.

Continuous pressure monitoring and readjustment devices are developing. There are also endotracheal tube cuffs designed with pressure relief valves activated at 40 cm H2O. Until the technology arrives, our role as intensive care specialist is to prevent laryngotracheal sequelae in patients with endo-tracheal tube, by developing hospital-wide respiratory care protocols and training other health care professionals about the risk factors of overinflated tracheal tube cuffs.

Use of high-volume, low-pressure cuffs and regular monitoring of cuff pressures seems to decrease the laryngeal injuries secondary to prolonged intubation. Using appropriate tube size and monitoring the duration of intubation is of paramount importance. A systematic laryngeal examination after extubation, whenever indicated, decreases the secondary sequelae by initiating appropriate measures when necessary.

References

1. Nseir S, Duguet A, Copin MC, De Jonckheere J, Zhang M, Similowski T, et al. Continuous control of endotracheal cuff pressure and tracheal wall damage: a randomized controlled animal study. Crit Care. 2007; 11(5): R109.

2. Sole ML, Penoyer DA, Su XG, Jimenez E, Kalita SJ, Poalillo E, et al. Assessment of endotracheal cuff pressure by continuous monitoring: a pilot study. American Journal of Critical Care. 2009; 18(2): 133-43.

3. Vyas D, Inweregbu K, Pittard A. Measurement of tracheal tube cuff pressure in critical care. Anaesthesia. 2002; 57(3): 275-7.

4. Jaber S, El Kamel M, Chanques G, Sebbane M, Cazottes S, Perrigault PF, et al. Endotracheal tube cuff pressure in intensive care unit: the need for pressure monitoring. Intensive care medicine. 2007; 33(5): 917-8.

5. Al-metwalli RR, Al-Ghamdi AA, Mowafi HA, Sadek S, Abdulshafi M, Mousa WF. Is sealing cuff pressure, easy, reliable and safe technique for endotracheal tube cuff inflation?: A comparative study. Saudi journal of anaesthesia. 2011; 5(2): 185.

6. Mol D, De Villiers GDT, Claassen A. Use and care of an endotracheal/tracheostomy tube cuff—are intensive care unit staff adequately informed? South African Journal of Surgery. 2009; 42(1).

7. Duguet A, D'Amico L, Biondi G, Prodanovic H, Gonzalez-Bermejo J, Similowski T. Control of tracheal cuff pressure: a pilot study using a pneumatic device. Intensive care medicine. 2007;33(1):128-32.

8. Wain JC. Postintubation tracheal stenosis. Chest surgery clinics of North America. 2003;13(2):231.

9. Liu J, Zhang X, Gong W, Li S, Wang F, Fu S, et al. Correlations between controlled endotracheal tube cuff pressure and postprocedural complications: a multicenter study. Anesthesia & Analgesia. 2010; 111(5): 1133-7.

10. Combes X, Schauvliege F, Peyrouset O, Motamed C, Kirov K, Dhonneur G, et al. Intracuff pressure and tracheal morbidity: influence of filling cuff with saline during nitrous oxide anesthesia. Anesthesiology. 2001; 95(5): 1120.

11. Lee KH, Ko GY, Song HY, Sun Shim T, Sung Kim W. Benign tracheobronchial stenoses: long-term clinical experience with balloon dilation. Journal of vascular and interventional radiology. 2002; 13(9): 909-14.

12. Ulrich-Pur H, Hrska F, Krafft P, Friehs H, Wulkersdorfer B, Köstler WJ, et al. Comparison of mucosal pressures induced by cuffs of different airway devices. Anesthesiology. 2006; 104(5): 933.

13. Spittle N, McCluskey A. Tracheal stenosis after intubation. BMJ. 2000; 321(7267): 1000-2.

Corresponding Author
Ali Jabbari,
Department of Anaesthesiology and intensive care,
Rohani Hospital,
Babol City,
Iran,
E-mail: amir_a_78@yahoo.com

Evaluation of oxidative status and trace elements in patients with benign paroxysmal positional vertigo

Halil Kaya[1], Mehmet Tahir Gokdemir[1], Ozgur Sogut[1], Murat Ayan[2], Ferhat Bozkus[3], Ismail Iynen[3], Abdurrahim Kocyigit[4]

[1] Harran University, Faculty of Medicine, Department of Emergency Medicine, Sanliurfa, Turkey,
[2] Gaziosmanpasa University, Faculty of Medicine, Department of Emergency Medicine, Tokat, Turkey,
[3] Harran University, Faculty of Medicine, Department of Otolaryngology, Head and Neck Surgery, Sanliurfa, Turkey,
[4] Harran University, Faculty of Medicine, Department of Biochemistry, Sanliurfa, Turkey.

Abstract

Objective: This study was conducted with oxidant and antioxidant status of patients having BPPV in conjunction with trace elements and comparing them with those of age and sex matched healthy controls.

Materials and methods: Thirty-six consecutive adult patients with BPPV and 38 eligible healthy volunteers as control subjects were enrolled. We assessed the total antioxidant status (TAS) total oxidant status (TOS), iron (Fe), copper (Cu), zinc (Zn) and magnesium (Mg) of the plasma and the oxidative stress index (OSI) using a novel automated measurement method developed by Erel.

Results: Mean age of the patients with BPVV and the control group were calculated (45.75 ± 13.02 and 44.74 ± 13.56 years, respectively; *p > 0.05*). Compared to healthy controls, plasma TAS levels were markedly decreased in patients with BPPV (0.95 ± 0.015 vs. 1.09 ± 0.20 mmol Trolox equivalent/L; *p = 0.001*). However, TOS levels and OSI values did not show significant changes in BPPV patients compared with those in controls. Plasma Fe levels of patients with BPPV were significantly lower than those of healthy controls (81.75 ± 23.06 vs. 99.21 ± 31.89 mg/dL; *p < 0.01*) (Cu, Zn and Mg; not significantly related).

Conclusion: In this study, we demonstrated that both levels of total antioxidants and iron were decreased in patients with BPVV. These findings may be an evidence of significant deficiencies of antioxidant system and iron in BPVV patients. Further investigations are required to clarify the role of antioxidant status and trace elements in the etiopathogenesis of BPPV.

Key words: Oxidative Status, Trace Elements, Benign Paroxysmal Positional Vertigo

Introduction

Benign paroxysmal positional vertigo (BPPV) is one of the most common disorders causing dizziness (1). Although no general agreement exists, the incidence of the BPPV is reported to be 10 in 100 000 (2,3). The cause of BPPV is mostly unknown (idiopathic). Idiopathic BPPV is more prevalent in the elderly and in women, with a women-to-men ratio of 2-3: 1 and a peak age at onset in the sixth decade of life (4).

The underlying pathogenetic mechanism is almost generally accepted as the detachment of otoliths from the macula utriculi and their dislocation into the semicircular canals. The detached otolith debris could be either attached to the cupula (cupulolithiasis) or may be free-floating in the semicircular canals (canalolithiasis). BPPV is a mechanical problem of the inner ear caused by abnormal stimulation of a semicircular canal. Most BPPVs are thought to be caused by otoconia detaching from the otolithic membrane and moving to the lowest point of the inner ear, usually the posterior canal (PC). This is referred as canalithiasis or cupulolithiasis (1). The vestibule connects to the 3 semicircular canals (posterior canal, horizontal canal, and anterior canal). Each one of the semicircular canal is candidate of the lesion of BPPV.

It has been recently observed that ROS (reactive oxygen species) play an important microcirculatory role in the pathology of the inner ear and the peripheral and central pathways (5,6). A series of insults in the inner ear during the lifetime, such as the influence of drugs, exposure to noise, ear diseases and age-dependent degeneration, all against a specific genetic background, might cause increased ROS levels, in turn leading to hair-cell damage (7,8).

Oxidative stress may cause severe tissue damage including lipid peroxidation, enzyme inactivation and DNA damage (9). It is known that oxidative stress play some role in some of inner ear disease like sensorineural hearing loss due to aging. Radical scavengers and antioxidants play a role protecting the inner ear from oxidative stress. There are some basic data to indicate the relationship between oxidative stress and endolymphatic hydrops. The elevated oxidative stress can cause canalolithiasis, which is one of pathogenesis of BPPV as a result of otolith aberration to the canal organ (10). The elevated oxidative stress can provoke damage in vestibular organ (especially otolith dysfunction). The elevated oxidative stress can cause canalolithiasis, which is one of pathogenesis of BPPV as a result of otolith aberration to the canal organ. Free oxygen radicals are highly reactive molecules playing pivotal roles in the pathophysiology of such different diseases as neurodegenerative disorders, chronic inflammatory disease, and sleep apnea syndrome (11,12).

It is reported that psychological stress is closely related to the onset and course of Meniere's disease and BPPV (13,14). Oxidative stress and psychological stress are closely related (15,16). Based on these considerations, it is hypothesized that BPPV may be linked to increased oxidative stres (10).

Trace elements have important functions in the human body. The defense system includes ascorbic acid (vitamin C), a-tocopherol (vitamin E), vitamin A and elements such as zinc (Zn), copper (Cu) and magnesium (Mg). They are required in low concentrations for example as essential components of antioxidative enzymes.

Iron deficiency affects the production of other $Fe2+$ containing proteins such as cytochromes, myoglobin, catalase (CAT) and peroxidase (17).

The cytoplasmic Cu/Zn-superoxide dismutase (SOD) contains Cu and Zn as cofactors (18). Mg modulates ion transport pumps, carriers and channels, and the positively charged ion Mg^{2+} is able to bind to the negatively charged groups in membranes, proteins and nucleic acids (19).

To our best knowledge, oxidative status in BPPV subjects and its relation to the trace elements were not previously investigated using a measurement of total antioxidant status (TAS) along with oxidants and calculation of the oxidati-

ve stress index (OSI), indicators of oxidative stress that reflect the redox balance between oxidation and antioxidation.

Thus, in the present study, we aimed to evaluate the oxidative status and to determine whether there is any relationship between oxidative status and the relation of trace elements in BPPV patients using measurements of TAS and TOS level and calculation of OSI. OSI value is calculated as $OSI = TOS/TAS \times 10^{-1}$ and this value can be used as a marker of oxidative stres (20,21).

Materials and methods

Subjects

This prospective clinical study included 36 consecutive patients presenting to the Department of Emergency Medicine, Harran University Faculty of Medicine, with symptoms of BPPV. Of the 36 patients included, 13 (36.1 %) were males and twenty three (63.9 %) were females. None of the subjects had any history of endocrine, cardiovascular or gastrointestinal disorders, and none were receiving medication or taking any nutritional supplements.

Physical examination was performed for the evaluation of vertigo including pure tone audiometry and vestibular examination including positional nystagmus. Furthermore, an expert but independent otolaryngologist examined clinical findings regarding patients affected with positional vertigo to identify only those patients affected with idiopathic BPPV.

Patients with BPPV within 3 days of onset were analyzed. As a control group, we enrolled 38 age- and sex-matched healthy volunteers (mean age 44.74 ± 13.56 years, 26 females and 12 males). After vital functions were monitoring, written informed consent was obtained from patients directly. The patients were treated with the Epley repositioning maneuver and antivertiginous drugs (22). The healthy volunteers were informed about the study protocol, and written consent was obtained from all participants.

The study protocol was conducted in accordance with the 1989 Declaration of Helsinki and was approved by the Ethics Committee of Harran University, Faculty of Medicine.

Exclusion criteria

To investigate the isolated effects of BPPV on oxidative status, and plasma trace elements, subjects (patients with BPPV and controls) with conditions that may have potentially affected oxidative markers and trace elements such as chronic medical disorders (*i.e.* congestive heart failure, chronic obstructive lung disease, diabetes mellitus, chronic renal failure, hypertension or malignancy) and those who had coronary artery disease, peripheral vascular disease, and renal dysfunction; subjects using medications such as sedative–hypnotic drugs or stimulatory substances, smokers, subjects with measurable blood alcohol concentrations or who had consumed alcohol prior to the study; those following a special diet, subjects who were pregnant or had elevated human chorionic gonadotropin (hCG) levels detected by a quantitative hCG blood test (β-hCG) were excluded from the study. None of the subjects was taking drugs known to affect lipid or lipoprotein metabolism. Special care was taken to exclude subjects who were taking anabolic drugs, diuretics, vitamins, or other antioxidants such as vasoactive and beta-blocking agents.

Other parameters

Sample preparation

All of the materials (glass and plastic) employed were thoroughly cleaned with a hot solution of nitric acid (20% v/v) for 48 h and rinsed three times with ultra deionized water. In total, 10 mL of venous blood was drawn after overnight fasting and centrifuged at 3000 rpm for 10 min to separate the plasma from the erythrocytes. Plasma was stored at –80°C to determine iron, copper, zinc and magnesium concentration and oxidative levels. To obtain packed erythrocytes, the remaining erythrocytes washed repeatedly with an isotonic solution of NaCl (0.9%) until a colorless supernatant was observed.

Determination of TAS, TOS levels and OSI values

Measurement of total oxidant status

Serum TOS was determined using a novel automated measurement method developed by Erel (20). Oxidants present in the sample oxidise the ferrous ion-*o*-dianisidine complex to ferric ions. The oxidation reaction is enhanced by glycerol, which is abundantly present in the reaction medium. The ferric ions provide a coloured complex with xylenol orange in an acidic medium. The colour intensity, which can be measured spectrophotometrically, is related to the total amount of oxidant molecules present in the sample. This assay has been calibrated with hydrogen peroxide, and the results are expressed in terms of micromolar hydrogen peroxide equivalent per litre (μmol H_2O_2 equiv/L). The assay has excellent precision values of <2%.

Measurement of total antioxidant status

Total antioxidant status in serum was determined using an automated measurement method (21). In this method, hydroxyl radicals, which are among the most potent of the biological radicals, are produced. In the assay, ferrous ion solution, which is present in Reagent 1, is mixed with hydrogen peroxide, which is present in Reagent 2. The sequentially produced radicals such as brown-coloured dianisidinyl radical cations, produced by the hydroxyl radical, are also potent radicals. The oxidation reactions progress among dianisidyl radicals, and further oxidation reactions develop, increasing colour formation. Antioxidants in the sample suppress the oxidation reactions and colour formation. Using this assay, the anti-oxidative effect of the sample against the potent free-radical reactions, which are initiated by the produced hydroxyl radicals, was measured. Results are expressed as milimole (mmol) Trolox equiv/L. The precision of the assay was <3%.

Calculation of the oxidative stress index

The OSI was calculated according to the following formula: OSI (arbitrary units) = TOS (μmol H_2O_2 equiv/L)/TAS (mmol Trolox equiv/L) $\times 10^{-1}$

Determination of plasma copper, zinc, iron and magnesium contents

Plasma samples were diluted with deionized for copper and zinc measurements. Copper and zinc were determined by atomic absorption spectrometer (Varian SpectrAA 250 Plus, Australia) with a

deuterium background correction. Plasma copper and zinc values were expressed in µg/dL.

Iron and magnesium concentration were determined by colorimetric method with a commercial kit (Roche Diagnostics GmbH, Germany) using an automatic analyzer (Roche Cobas İntegra 800, USA). Plasma ıron and magnesium values were expressed in µg/dL, mg/dL, respectively.

Statistical analysis

Data analyses were conducted using SPSS v.15.0 software (SPSS, Inc., Chicago, IL, USA). Inter-group comparisons (controls *vs.* patients) were performed using the chi-square and Student's *t*-tests. When comparing numerical data (intra-group comparisons) that were not normally distributed, identified with the Kolmogorov-Smirnov Z test, the Mann–Whitney *U-test* was used if there were two groups (BPPV *vs.* Control). A *p*-value ≤ 0.05 was considered significant.

Results

The mean ± SD age of the patients was 45.75 ± 13.02 years (range, 23–74 years). Of the 38 controls included, 12 (31.6 %) were males and twenty-six (68.4 %) were females. The mean ± SD age of the controls was 44.74 ± 13.56 years (range, 21–73 years). No significant differences were observed between patients with BPPV and the controls with respect to age or gender ($P = 0.744$ and $P = 0.685$, respectively). We observed right-sided BPPV in 23 patients (63.9%) and left-sided BPPV in 13 patients (36.1%), regardless of gender.

Plasma TAS levels in BPPV group were 0.95 ± 0.15 and 1.09± 0.20 in controls. Plasma TAS levels were significantly lower in BPPV groups than in controls. ($p= 0.001$). Plasma TAS levels among the BPPV patients and the controls are shown in Figure 1.

No significant differences were observed between patients with BPPV and the controls with respect to plasma TOS level. Plasma TOS levels in BPPV group were 25.57 ± 5.42 and 26.03± 8.70 in controls. (p=0.791) No significant differences were observed between patients with BPPV and the controls with respect to plasma OSI values. Plasma OSI values in BPPV group were 2.77 ± 0.85 and 2.49± 1.07 in controls. (p=0.209)
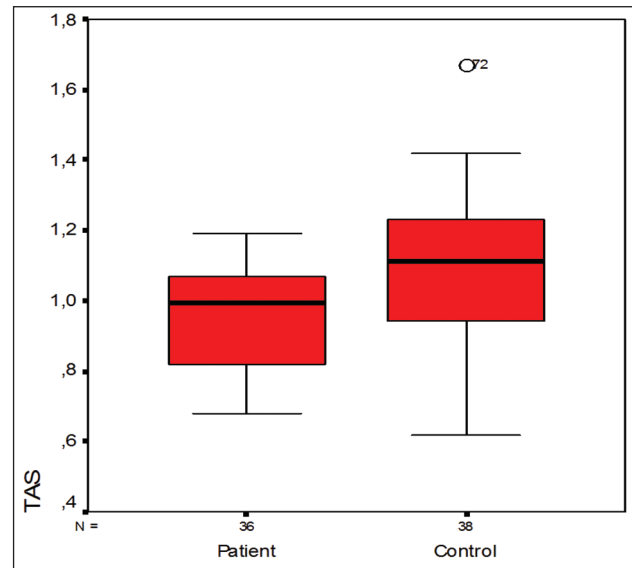
Figure 1. TAS levels between BPPV and control groups
Patient: patient group; Control: control group.
Plasma TAS levels were significantly lower in BPPV groups than in controls.

The demographic characteristics and oxidative stress parameters among the 36 patients with BPPV and the 38 controls are shown in Table 1. Plasma trace elements levels among the 36 patients with BPPV and the 38 controls are shown in Table 2.

Plasma iron concentrations in BPPV group were 81.75 ± 23.06 and 99.21± 31.89 in controls. Plasma iron concentrations was significantly lower in BPPV groups than in controls. ($p=0.009$). Plasma iron concentrations among the BPPV patients and the controls are shown in Figure 2.
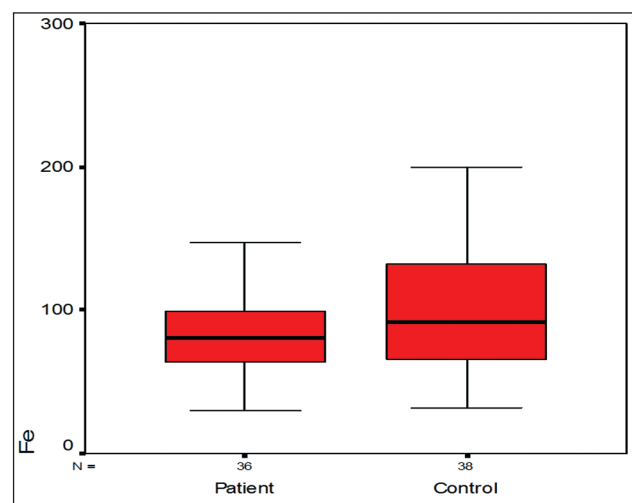
Figure 2. Fe levels in BPPV and control groups
Patient: patient group; Control: control group.
Plasma iron concentration was significantly lower in BPPV groups than in controls.

Table 1. Demographic characteristics and oxidative stress parameters among 36 adult patients with BPPV and 38 controls

Characteristic	BPPV n = 36	Control n = 38	Statistical significance[a, b]
Age (years)	45.75 ± 13.02	44.74 ± 13.56	P = 0.744
Gender (male/female)	13/23	12/26	P = 0.685
TOS (**µmol H**$_2$O$_2$ equiv/L)	25.57 ± 5.42	26.03 ± 8.70	P = 0.791
TAS (mmol Trolox equiv/L)	0.95 ± 0.15	1.09 ± 0.20	P = 0.001
OSI (arbitrary units)	2.77 ± 0.85	2.49 ± 1.07	P = 0.209

P < 0.05-change statistically significant; p > 0.05-change statistically not significant.

Table 2. Trace elements among 36 adult patients with BPPV and 38 controls

Characteristic	BPPV n = 36	Control n = 38	Statistical significance[a,b]
Fe	81.75 ± 23.06	99.21 ± 31.89	P = 0.009
Cu	101.2 ± 25.63	102.83± 33.82	P = 0.817
Zn	94.57 ± 29.95	92.81 ± 24.59	P = 0.783
Mg	1.89 ± 0.23	1.80 ± 0.27	P = 0.090

Fe: iron; Cu: copper; Zn: zinc; Mg: magnesium
P < 0.05-change statistically significant; p > 0.05-change statistically not significant.

No significant differences were observed between patients with BPPV and the controls with respect to plasma copper concentrations. Plasma copper concentrations in BPPV group were 101.2 ± 25.63 and 102.83± 33.82 in controls. (p=0.817)

No significant differences were observed between patients with BPPV and the controls with respect to plasma zinc concentrations. Plasma zinc concentrations in BPPV group were 94.57 ± 29.95 and 92.81± 24.59 in controls. (p=0.783)

No significant differences were observed between patients with BPPV and the controls with respect to plasma magnesium concentrations. Plasma magnesium concentrations in BPPV group were 1.89 ± 0.23 and 1.80± 0.27 in controls. (p=0.09)

Discussion

BPPV may be affected by oxidative stress and trace elements. We investigated plasma levels of the TAS, TOS and OSI values and iron, copper, zinc and magnesium concentrations.

Goto F et al. presented that free oxygen radicals, as measured in peripheral blood samples by the d-ROM (diacron reactive oxygen metabolites) test, were relatively enhanced in BPPV patients (10). In their study, although there were no statistically significant differences among the groups, the diacron reactive oxygen metabolites value of BPPV and Ménière's disease were higher with respect to control (10). They postulated that ischemia of the vestibular organ followed by blood recirculation may provoke oxidative stress. They evaluated vascular cell adhesion molecules (VCAM-1) as an ischemia marker. The elevated oxidative stress can provoke damage in vestibular organ (especially otolith dysfunction) (10).

In the present study, we measured free oxygen radicals. Principle of this assay is the color intensity, which can be measured spectrophotometrically, is related to the total amount of oxidant molecules present in the sample. The assay is calibrated with hydrogen peroxide and the results are expressed in terms of micromolar hydrogen peroxide equivalent per liter (µmol H2O2 Equiv./L) (20). We found enhanced free oxygen radicals in BPPV patients, but was not significantly. OSI is a parameter obtained by the calculation of both TOS and TAS levels. Statistically, the mean values and standart deviation of this parameter varies. Despite the standart deviation of TOS is high, it is low for TAS. (See table 1) Because of the calculated standart deviation is high for OSI and for the small number of cases, in the present study, the value of the OSI did not show significant changes.

The effects of various antioxidants in serum are additive, and the cooperation of antioxidants in human serum protects the organism against attacks by

free radicals (23). Thus, measurement of individual antioxidants may not accurately reflect the true antioxidant status of the organism. In this regard, measurement of TAS should be essential in evaluating the true antioxidant status (21,24,25).

Goto F et al. reported it is reasonable to assume that the angiitis may contribute to the onset of BPPV. It may be useful to control dizziness or vertigo by reducing free radicals as a product of oxidative stress. In their report, Goto F et al. presented that free oxygen radicals, were relatively enhanced in BPPV patients. Patients had increase mean value in contrast to healthy adults (26).

Cesarone et al. have found that in normal subjects the levels of free radicals were significantly decreased after antioxidant treatment (27). For these reasons, it may be useful to control dizziness or vertigo by reducing free radicals as a product of oxidative stress.

To treat patients with dizziness due to BPPV to control oxidative stress may be valuable (10). Similarly we found increased oxidative stress, but was not significantly. This situation may be valuable for the BPPV treatment protochol.

The relation between both the values of d-ROMs and of VCAM-1 and the duration of BPPV was found in patients with BPPV by Goto F et al (10). They evaluated VCAM-1 as an ischemia marker and d-ROM as a marker for oxidative stress. The diagnostic value could be such that enhanced values of oxidative stress would be a marker for BPPV and provide additional information for a diagnosis of BPPV (10). Present study we haven't investigated relationship between levels of oxidative stress, iron concentrations and duration and severity of BPPV. In the present study, we observed that the patients with BPPV are exposed to decreased TAS and iron levels. The increase in oxidative stress that was observed in BPPV subjects in the present study resulted from decrease in TAS. In present study the decrease in levels of TAS might result from dietary antioxidative deficiency.

It is well known that elements are co-factors of enzymes. Numerous studies have indicated that supplementations of antioxidants and trace element affected brain trace element and antioxidant levels (28,29,30). We found that plasma Fe concentrations were lower in BPPV patients. However, there is no report available on both Fe and oxidative values in

the same study in BPPV. In present study, the reduction in level of TAS might be due to depletion of iron levels since CAT (catalase) requires Fe for its catalytic activity. Fe is an essential element for maintaining the normal structure and functioning of the CNS (central nervous systems). The relationship of Fe status to brain function, cognition, and behavior, including affective behavior, has been the subject of considerable interest (31). The dangerous effects of decreases in the bioavailability of Fe in the brain have been shown to affect brain biochemistry, neurotransmitter production and cognitive function such as learning and memory (32). In present study the decrease in concentrations of Fe might result from dietary Fe deficiency. In the literature, we did not find the publication showing the relationship between Fe deficiency and BPPV in adults. But in their study, Erbek SH et al. found iron deficiency anemia in one pediatric patient and thalassemia minor in one patient. They observed in pediatric patient treatment of the anemia improved vertigo (33).

Cu deficiency decreases SOD (superoxide dismutase) activity (28). In our study, Cu levels were found unchanged in BPPV and control groups.

Zn is implicated in the functioning of more than 200 enzymes. Zn also plays an important role in axonal and synaptic transmission and is necessary for nucleic acid metabolism and brain tubulin growth and phosphorylation (34). We observed in the current study that Zn levels were higher and copper levels were lower in patients with BPPV than in control group but these were not significantly.

Ferreira et al. found significant difference between zinc and magnesium serum levels in the experimental group and the mean normal reference range for these elements, which reinforces the idea of malabsorption syndrome or disabsortive disease in the experimental group (35).

The role of Mg in dementia and other degenerative disorders has been the focus of increased attention in recent years, and its insufficiency and disturbances of concentrations in the brain and its effect in elderly patient have also been investigated. In our study plasma Mg levels were found to be increased in BPPV when compared to healthy controls. It has various effects at different concentrations on intellectual and neuronal functions via many biochemical mechanisms, which are regu-

lated by N-methyl-D-aspartate (NMDA) receptor response to excitatory amino acids, stability and viscosity of the cell membrane and toxic effects of calcium (36,37).

To our knowledge, this is the first study in which oxidative status of BPPV subjects was

determined using measurement of level trace elements and TAS along with measurement of TOS level and calculation of OSI.

Conclusions

Patients with BPPV are exposed to oxidative stress and decreased iron levels. The weakness of the antioxidant defence system combined with iron deficiency might be implicated in the pathogenesis of BPPV. Therefore, supplementation with iron involved in the antioxidative prosses may increase antioxidative activities, and consequently, a further improvement of symptoms in patients with BPPV might be expected. Large-scale clinical trials are needed to address the role of antioxidant status and trace elements in the etiopathogenesis of BPPV.

Limitations

This study is limited by small sample size and single-center design.

References

1. Hotson JR, Baloh RW. Acute vestibular syndrome. N Engl J Med. 1998; 339: 680-85.

2. Froehling DA, Silverstein MD, Mohr DN, Beatty CW, Offord KP, Ballard DJ. Benign positional vertigo: incidence and prognosis in a population-based study in Olmsted County, Minnesota. Mayo Clin Proc. 1991; 66: 596-601.

3. Mizukoshi K, Watanabe Y, Shojaku H, Okubo J, Watanabe I. Epidemiological studies on benign paroxysmal positional vertigo in Japan. Acta Otolaryngol Suppl. 1988; 447: 67-72.

4. Baloh RW, Honrubia V, Jacobson K. Benign positional vertigo: clinical and oculographic features in 240 cases. Neurology. 1987; 37: 371-78.

5. Clerici WJ, Yang L. Direct effects of intraperilymphatic reactive oxygen species generation on cochlear function. Hear Res. 1996; 101: 14-22.

6. Takumida M, Anniko M, Popa R. Possible involvement of free radicals in lipopolysaccharide-induced labyrinthitis in the guinea pig: a morphological and functional investigation. ORL J Otorhinolaryngol Relat Spec. 1998; 60: 246-53.

7. Seidman MD, Ahmad N, Bai U. Molecular mechanisms of age-related hearing loss. Ageing Res Rev. 2002; 1: 331–343.

8. Lautermann J, Crann SA, McLaren J, Schacht J. Glutathione-dependent antioxidant systems in the mammalian inner ear: effects of aging, ototoxic drugs and noise. Hear Res. 1997; 114: 75-82.

9. Bolzan AD, Bianchi MS, Bianchi NO. Superoxide dismutase, catalase and glutathione peroxidase activities in human blood: influence of sex, age and cigarette smoking. Clin Biochem. 1997; 30: 449-54.

10. Goto F, Hayashi K, Kunihiro T, Ogawa K. The possible contribution of angiitis to the onset of benign paroxysmal positional vertigo (BPPV). International Tinnitus Journal. 2010; 16: 25-28.

11. Halliwell B. Free radicals, antioxidants, and human disease: curiosity, cause, or consequence? Lancet 1994; 344: 721-24.

12. Christou K, Markoulis N, Moulas AN, Pastaka C, Gourgoulianis KI. Reactive oxygen metabolites (ROMs) as an index of oxidative stress in obstructive sleep apnea patients. Sleep Breath 2003; 7: 105-10.

13. Aoki M, Asai M, Nishihori T, Mizuta K, Ito Y, Ando K. The relevance of an elevation in the plasma vasopressin levels to the pathogenesis of Ménière's attack. J Neuroendocrinol. 2007; 19: 901-16.

14. Monzani D, Genovese E, Rovatti V, Malagoli ML, Rigatelli M, Guidetti G. Life events and benign paroxysmal positional vertigo: a case-controlled study. Acta Otolaryngol. 2006; 126: 987-92.

15. Morimoto K, Morikawa M, Kimura H, Ishii N, Takamata A, Hara Y, et al. Mental stress induces sustained elevation of blood pressure and lipid peroxidation in postmenopausal women. Life Sci. 2008; 82: 99-107.

16. Ohta Y, Chiba S, Tada M, Imai Y, Kitagawa A. Development of oxidative stress and cell damage in the liver of rats with water-immersion restraint stress. Redox Rep. 2007; 12: 139-47.

17. Rockey DC, Cello JP. Evaluation of the gastrointestinal tract in patients with iron deficiency anemia. N Engl J Med. 1993; 329: 1691-95.

18. Kocyigit A, Erel O¨ , Gur S. Effects of tobacco smoking on plasma selenium, zinc, copper and iron concentrations and related antioxidative enzyme activities. Clin Biochem. 2001; 34: 629-33.

19. Celik HA, Aydin HH, Ozsaran A, Kilincsoy N, Batur Y, Ersoz B. Trace elements analysis of ascitic fluid in benign and malignant diseases. Clin Biochem. 2002; 35: 477-81.

20. Erel O. A new automated colorimetric method for measuring total oxidant status. Clin Biochem. 2005; 38: 1103-11.

21. Erel O. A novel automated method to measure total anti- oxidant response against potent free radical reactions. Clin Biochem. 2004; 37: 112-19.

22. Epley JM Caveats in particle repositioning for treatment of canalithiasis (BPPV). Otolaryngol Head Neck Surg 1997; 8: 68-76

23. Wayner DD, Burton GW, Ingold KU, Barclay LR, Locke SJ. The relative contributions of vitamin E, urate, ascorbate and proteins to the total peroxyl radical-trapping antioxidant activity of human blood plasma. Biochim Biophys Acta. 1987; 924: 408-19.

24. Kurtoglu E, Ugur A, Baltaci AK, Undar L. Effect of iron supplementation on oxidative stress and anti-oxidant status in iron deficiency anemia. Biol Trace Elem Res. 2003; 96: 117-23.

25. Miller NJ, Rice-Evans C, Davies MJ, Gopinathan V, Milner A. A novel method for measuring antioxidant capacity and its application to monitoring the antioxidant status in premature neonates. Clin Sci (Lond.)1993; 84: 407-12.

26. Goto F, Yabe H, Kunihiro T, Ogawa K. Oxidative stress and Ménière's disease and benign paroxysmal positional vertigo (in Japanese). Equibrium Res. 2008; 106: 484-85.

27. Cesarone MR, Belcaro G, Carratelli M, Cornelli U, De Sanctis MT, Incandela L, et al. A simple test to monitor oxidative stress. Int Angiol. 1999; 18: 127-30.

28. Klevay LM. Alzheimer's disease as copper deficiency. Med Hypotheses. 2008; 70: 802-807.

29. Bayer TA, Schafer S, Simons A, Kemmling A, Kamer T, Twpest R, et al. Dietary Cu stabilizes brain superoxide dismutase1 activity and reduces amyloid A beta production in APP23 transgenic mice. Proc Natl Acad Sci USA. 2003; 100: 14187-192.

30. Naziroglu M, Gumral N. Modulator effects of L-carnitine and selenium on wireless devices (2.45GHz)-induced oxidative stress and electro encephalography records in brain of rat. Int J Radiat Biol. 2009; 85: 680-89.

31. Beard JL, Connor JR, Jones BC. Iron in the brain. Nutr Rev. 1993; 51: 157-70.

32. Youdim MB, Yehuda S. The neurochemical basis of cognitive deficits induced by brain iron deficiency: involvement of doamine–opiate system. Cell Mol Biol. 2000; 46: 491–500.

33. Erbek SH, Erbek SS, Yilmaz I, Topal O, Ozgirgin N, Ozluoglu LN, et al. Vertigo in Childhood: a clinical experience. Int J Pediatr Otorhinolaryngol. 2006; 70: 1547-54.

34. Pfeiffer CC, Ilier UA. A study of zinc deficiency and copper excess in schizophrenias. Int Rev Neurobiol. 1972; 1: 141-65.

35. Ferreira GD, Cury MC, Oliveira JA, Manfredi AK,Vannucchi H. Vestibular evaluation using videonystagmography of chronic zinc deficient patients due to short bowell syndrome. Braz J Otorhinolaryngol.2009; 75: 290-94.

36. Cilliler AE, Ozturk S, Ozbakir S. Serum magnesium level and clinical deterioration in Alzheimer's disease. Gerontology. 2007; 53: 419–22.

37. Nowak L, Bregestovski P, Ascher P, Herbet A, Prochiantz A. Magnesium gates glutamate-activated channels in mouse central neurones. Nature. 1984; 307: 462-65.

Corresponding Author
Halil Kaya,
Harran University,
Faculty of Medicine,
Department of Emergency Medicine,
Sanliurfa,
Turkey,
E-mail: drhalilkaya@gmail.com

Bcl-2 expression correlates inversely to the number of apoptotic cells in the samples of goiter thyroid gland

Ljiljana Markovic[1], Ruzica Nedeljkov-Jancic[2], Jelena Aritonovic[3], Gordana Basta-Jovanovic[4]

[1] Institute of Pathophysiology, Faculty of Medicine, University of Belgrade, Belgrade, Serbia,
[2] Clinical Centre of Serbia, and Faculty of Medicine, University of Belgrade, Belgrade, Serbia,
[3] Clinical Centre Kosovska Mitrovica, University of Pristina, Kosovska Mitrovica, Serbia,
[4] Institute of Pathology, Faculty of Medicine, University of Belgrade, Belgrade, Serbia.

Abstract

Background: It is unclear whether thyroid hormone levels and the levels of the expression of Bcl-2, a proapoptotic proteins regulator, can be used as an indirect indicators of apoptosis in thyroid tissue. AIM: The aim of our study was to determine whether thyroid hormone levels, as well as Bcl-2 expression, determined by immunohistochemical staining, and percentages of apoptotic cells, could be used in the future as possible indicators of thyrocyte changes in goiter patients with hypothyroid and euthyroid goiter.

Subjects and methods: Total of 30 goiter patients were included in the study. TSH, T3, and T4 levels were measured before the surgery; 15 subjects had low levels of thyroid hormones (hypothyroid goiter), and 15 subjects had normal thyroid hormone levels (euthyroid goiter). Thyroid tissue specimens were obtained from each patient. Percentages of apoptotic cells in tissue specimens were determined by TUNEL method.

Results: Average percentage of apoptotic cells was 7.81 ± 6.72 and average Bcl-2 expression score was 2.2 ± 1.42 (%, mean, $\pm$ SD). The percentage of apoptotic cells was higher, while the Bcl-2 expression scores were lower in the patients with hypothyroid goiter, as compared to the patients with euthyroid goiter (both $P < 0.01$). CONCLUSIONS: These results suggest that thyroid hormone levels are related to the increased apoptosis rate in hypothyroid goiter. The Bcl-2 expression is an important factor determining the rate of thyrocyte survival and proliferation in goiter tissue.

Key words: Thyroid, Bcl-2, Apoptosis, Goiter, TUNEL, Immunohistochemistry.

Introduction

Goiter is a swelling in the thyroid gland, which can lead to enlargement in the neck tissue and a compression of the trachea and surrounding tissues (1). The most common cause of goiter are iodine deficiency and Hashimoto's thyroiditis; however, regardless of the type and the mechanisms of development, apoptosis of thyrocytes is one of the main factors of cell loss during goiter formation and involution (2, 3, 4, 5). In spite of the increasing knowledge about molecular mechanisms of apoptosis in various tissues and about the roles of thyroid hormones in apoptosis (6, 7), it still remains unclear whether thyroid hormone levels and the levels of Bcl-2 expression can be used as indirect indicators of apoptosis in thyroid tissue.

Apoptosis is the process of programmed cell death that takes place in many tissues both in physiological and pathological conditions. It is regulated by various factors and signaling pathways. In the thyroid gland, most authors agree that the balance between the activities of pro-apoptotic and anti-apoptotic proteins regulate thyrocyte survival, and that the best-characterized thyrocyte apoptosis-related genes are those for death receptors, caspases, and Bcl-2 family members (8). Bcl-2 is a family of proteins which regulates proapoptotic proteases and regulate mitochondrial outer membrane permeabilization (MOMP), and therefore may determine the cellular commitment to apoptosis (9). It was shown that the ratio of the expression of death antagonists (Bcl-2, Bcl-XL, and Mcl-1) to death agonists (Bax, Bak, Bcl-Xs, and Bad) determines the survival or death of cells in physiological and pathological conditions (10, 11, 12). Nevertheless, many questions about the exact role of these factors in thyroid pathology still remain unanswered. It is known that thyroid hormones regulate cellular

metabolic activity and are involved in cell proliferation, apoptosis, and differentiation (6,7), probably by induction of Fas/FasL system and other signaling pathways associated with Bcl-2 family of proteins. Recently, it was suggested that thyroid hormone nuclear receptors are able to modify the fate of cells through their ability to form complexes with transcription factors, such as p53 - a key regulator of apoptosis and proliferation (6). In some experimental models, it has been shown that T3 acts as a universal trigger for both, cell death and subsequent proliferation (13).

Various modern techniques are used to determine the rates of apoptosis. One of the commonly used methods is detection by terminal deoxynucleotidyl transferase deoxyuridine 5-triphosphate nick end labeling (TUNEL) permitting visualization of apoptotic nuclei, thereby allowing measuring the fraction of apoptotic cells in tissue. This technique is, unfortunately, sometimes expensive, time consuming, and requires specially trained laboratory personnel.

Unlike healthy thyroid tissue, goiter thyroid tissue is a useful medium for detection of apoptotic cells, as well as of certain markers of cell death and proliferation. Having in mind the role of Bcl-2 family member proteins and thyroid hormones in thyrocyte death and survival, it is important to know the potential relationship between these factors and the percentages of apoptotic cells in the goiter thyroid tissue. The primary objective of our study was, therefore, to investigate whether there is a difference in Bcl-2 expression scores (determined by immunohistochemical staining) and thyrocyte apoptosis rates (determined by the TUNEL method), between euthyroid and hypothyroid goiter patients. The secondary objective of the study was to verify whether thyroid hormone levels and the levels of Bcl-2 expression can be used as indirect indicators of apoptosis in thyroid tissue

Materials and methods

Thyroid tissue

We obtained the thyroid specimens from 30 randomly selected goiter patients surgically treated at a University Clinical Centre, Kosovska Mitrovica, Serbia. 15 patients were clinically diagnosed with hypothyroid goiter (later histopatologically verified as Hashimoto's Thyroiditis), and 15 patients,

were clinically diagnosed and histopatologically verified as euthyroid goiter (struma diffusa et struma polynodosa). The exclusion criteria for the study were chronic diseases such as neurological diseases, diabetes mellitus, as well as alcohol and drugs abuse. The tissue samples were taken during thyreoidectomy operation. Informed consent was obtained from all subjects. The study protocol was in accordance with the guidelines of the Helsinki Declaration 1975, revised in 1983, and the guidelines of Ethical Committee of The School of Medicine, University of Belgrade. A permission was obtained from the local ethical committee and the informed consent from the patients.

Blood samples

Total T3, T4, levels in serum were determined in all patients before the operation using the radioimmunoassay test. The TSH serum levels were determined using hTSH-IRMA test. All hormonal tests were done following established protocols previously described (12, 14, 15).

Detection of apoptosis by terminal deoxynucleotidyl transferase deoxyuridine 5-triphosphate nick end labeling (TUNEL)

The in situ cell death detection kit with POD (Roche Diagnostics GmbH, Germany) was used according to the manufacturer's instructions. Apoptosis was evaluated subjectively by 2 independent observers using a 103 lens in 10 randomly selected fields(Microscope Leica 1000B, Bio Optic) Institute of Pathophysiology, Faculty of Medicine, University of Belgrade, of each specimen and expressed as the percentage of positive nuclei per total number of thyrocyte nuclei in every field. An average of the percentages from the 10 fields was estimated for every specimen. The agreement of the two observers for the evaluation of the results of TUNEL was almost complete. The numbers used for the evaluation of this method represent the mean of the two scores given by each independent observer.

BCL-2 Determination by Immunohistochemistry

Immunohistochemical staining was performed sing mouse monoclonal antibodies against human Bcl-2 (IgG1k; DAKO Corp. A/S, Glostrup, Denmark), as previously reported (16). Positive reac-

tivity was identified using a streptavidin-biotin-peroxidase detection system (DAKO Corp. catalyzed signal amplification system, DAKO Corp.). The paraffin-embedded tissue sections were deparaffinized, then put in Target Retrieval Solution (DAKO Corp.) to amplify the signal, placed in a water bath (95–97 ^{0}C) for 20–40 min, and then cooled for 20 min. at room temperature. After blocking endogenous peroxidase activity with a 3% hydrogen peroxidase solution for 10 min, intrinsic biotin with an endogenous avidin/ biotin blocking kit (Nichirei Corp., Tokyo Japan), and nonspecific binding by serum-free protein, the tissue was incubated with pre-diluted mouse monoclonal antibodies (10 mg/mL) (Roche Diagnostics GmbH,Nannheim,Germany) followed by 15-min incubation with streptavidin-biotin-peroxidase complex. Staining was completed with diaminobenzidine for 5 min, and the specimens were counterstained with Mayer's hematoxylin for 2–5 min. The Bcl-2 positive thireocits were counted on 10 fields and averaged to express number of thyreocytes per one field. Intensity and distribution of positive staining was evaluated on a scale of 0–5 (0 = 0%; 1 = 1–20%; 2 = 21–40%; 3 = 41–60%; 4 = 61–80% and 5 = 81–100% of thyrocytes), respectively, by two independent observers, whose agreement was almost complete. The numbers used for the evaluation of this method represent the mean of the two scores given by each independent observer (17).

Statistical analysis

Statistical data analysis was done using SPSS v 10.1 statistical package (SPSS Inc., Chicago, IL). Simple descriptive statistics was calculated and reported as percentages (%), means, and standard deviations (SD). Analysis was done using Mann–Whitney U test (for detection of differences between the two groups of patients), Chi-square test, and Spearman's rank correlation coefficient (for correlation analysis). The obtained values for P < 0.05 were considered statistically significant.

Results

Average serum levels of T3 was 1.834 nmol/L, ± 0.502 nmol/L, Table 1; T4 100.06 nmol/L, ± 23.8 nmol/L, Table 2; and TSH 5.99 mU/L, ± 5.15

mU/L, Table 3 (means, ± SD; Table 4 and 5). There were no sex and age differences between the groups. Average Bcl2 expression score was 2.2, ± 1.42, Table 6. The percentage of apoptotic cells was higher in patients with hypothyroid goiter than in the patients with euthyroid goiter (11.9% versus 2.4%, P<0.01, Figure 1).

Table 1. T3 values in the two types of goiter

Goiter	N	mean	SD
Hypothyroid	15	1.527	0.339
Euthyroid	15	2.141	0.453

(t = 4.207, P<0.001).

Table 2. T4 values in the two types of goiter

Goiter	N	mean	SD
Hypothyroid	15	86.513	19.657
Euthyroid	15	113.613	19.908

(t = 7.042, P<0.001).

Table 3. TSH values in the two types of goiter

Goiter	N	mean	SD
Hypothyroid	15	10.035	4.287
Euthyroid	15	1.945	1.193

(t = 3.752, P = 0.001)

Table 4. Distribution of goiter patients according to sex

Sex	Hypothyroid		Euthyroid		Σ	
	N	%	N	%	N	%
Women	14	93.3	14	93.3	28	93.3
Men	1	6.7	1	6.7	2	6.7
Σ	15	100	15	100	30	100

Differences not significant.

Table 5. Age of the patients

Goiter	N	mean	SD	95% confidence interval	
				Upper limit	Lower limit
Hypothyroid	15	54.73	7.421	50.623	58.843
Euthyroid	15	57.53	6.30	54.044	61.022
Total	30	56.133	6.91	53.552	58.714

(t = 1.114, P = 0.275).

Expression of the BCL-2 proteins on thyrocytes, labeled as 0, 1 and 2 is higher in hypotiroid goiter than in euthyroid goiter (P< 0.001); expression of BCL-2, labeled as 3, 4 and 5 is higher in euthyroid goiter as compared to hypothyroid goiter (P< 0.001).

Table 6. Distribution of BCL-2 protein in the cells

Goiter	Expression BCL-2 proteins on thyrocytes													
	0		1		2		3		4		5		total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Hypothyroid	3	100	8	100	4	57.1	0	0	0	0	0	0	15	50.0
Euthyroid	0	0	0	0	3	42.9	6	100	4	100	2	100	15	50.0
Total	3	100	8	100	7	100	6	100	4	100	2	100	30	100
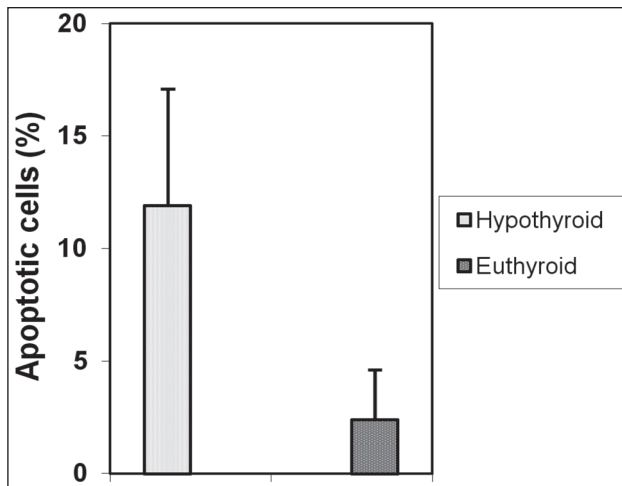
Figure 1. The percentages of apoptotic cells in goiter patients was higher (t=6.578, P<0.01) in patients with hypothyroid goiter than in the patients with euthyroid goiter (11.9% versus 2.4%) The apoptotic cells in patients with hypothyroid goiter A) (t=6.578, P<0.01) and in the patients with euthyroid goiter (11.9% versus 2.4%) B) stained with Tunel
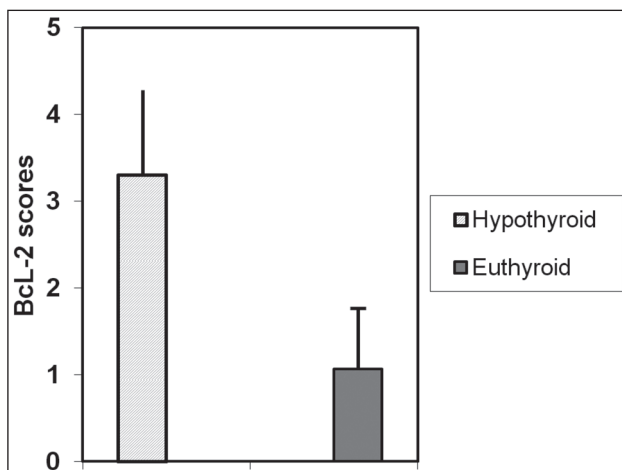
Figure 2. Expression scores of Bcl-2 family proteins in goiter patients. The level of Bcl-2 was much higher in areas where apoptosis was less pronounced, and vice versa, Bcl-2 showed low expression or it was not present when the apoptosis was more pronounced

There was also a difference in Bcl-2 expression scores in patients with hypothyroid goiter as compared to the patients with euthyroid goiter (P< 0.01, Z=4.417, Figure 2). The correlation between percents of apoptotic cells and thyreocyts that express BCl-2 was negative in both, hipothiroid (r = -0.722, P < 0.01, Figure 3) and euthiroid patients (r = -0.720, P < 0.01, Figure 4; and Table 7).
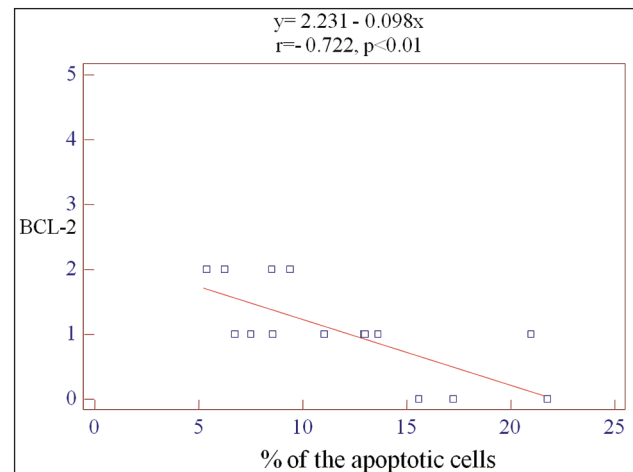
Figure 3. Correlation between % of the apoptocic cells and BCL-2 valued in the patients with hypothyroid goiter (r = -0.722, P< 0.01)
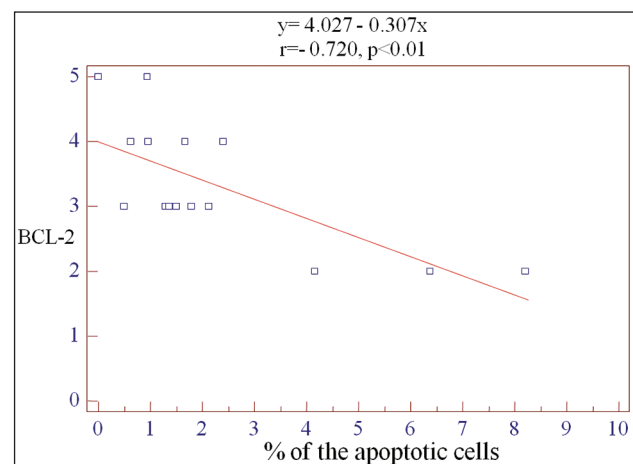
Figure 4. Correlation between % of the apoptotic cells and BCL-2 valued in the patients with euthyroid goiter (r = -0.720, P< 0.01)

Table 7. Correlations between hormonal serum levels, Bcl-2 scores and apoptotic cells

Positive correlations
T3 vs. Bcl-2 (r = 0.4925, P<0.01):
T4 vs. Bcl-2 (r = 0.5615, P<0.01)
TSH vs. percentages of apoptotic cells (r = 0.55, P<0.01)
Negative correlations
TSH vs. Bcl-2 (r = -0.7598, P<0.01)
T3 vs. percentages of apoptotic cells (r = -0.4076, P<0.05)
T4 vs. percentages of apoptotic cells (r = -0.5505, P<0.01)
Bcl-2 vs. percentages of apoptotic cells (r = -0.7504, P<0.01)

Discussion

In the present study it was shown that in goiter patients, Bcl-2 expression is higher in patients with euthyroid goiter than in patients with hypothyroid goiter with Hashimoto's thyroiditis. Our results also indicate that the percentage of apoptotic cells is higher in patients with hypothyroid goiter with Hashimoto's thyroiditis, than in patients with euthyroid goiter. Destruction of thyrocytes in Hashimoto's thyroiditis seems to be a consequence of inappropriate expression of Fas or TRAIL molecules (TNF-related apoptosis-inducing ligand), which can be induced by cytokines released by infiltrated lymphocytes, as well as the reduction of antiapoptotic Bcl-2 protein (18). Several studies (4, 19) indicate that the main regulatory proteins of mitochondrial signaling pathway are proteins of Bcl-2 family, of which the Bcl-2 and Bcl-xl are anti-apoptotic (preventing apoptosis) and Bax and Bak are proapoptotic (cause mitochondrial apoptosis), we investigated the expression of Bcl-2 proteins and their correlation with apoptotic cells.

Weetman (16) believes that the thyroid cell destruction in autoimmune hypothyroidism might be related to the T cell-mediated cytotoxicity and death receptor-mediated apoptosis. Although the existence of apoptosis was confirmed both in euthyroid and hypothyroid goiter, the percentage of apoptotic cells (2.3%) was much lower in the euthyroid goiter. The cause of these results may be found in different environmental conditions, different treatment, or different phases of activity in which the disease was studied. Numerous studies indicate that thyrocytes are linked to several apoptosis-inducing proteins, which are, however, inactive in the absence of favorable environmental conditions. Hyperplasia may be associated with thyrocyte apoptosis, although iodine and antithyroid medications can also affect the results (20, 21).

The results of Chen S et al. showed that the level of Bcl-2 is almost identical in Graves disease and thyroid follicular adenoma but much smaller in Hashimoto's thyroiditis, while Fas, Fas-L and Bcl-2 in Hashimoto's thyroiditis and goiter are almost the same (22). We have also shown that in patients with hypothyreoid goiter and patients with euthyroid goiter there is a highly negative correlation between the percentage of apoptotic cells and the presence of Bcl-2. The negative correlation between the number of apoptotic cells and the presence of Bcl-2 is also in accordance with the results of Patel VA et al. who investigated the level of Bcl-2 and the number of apoptotic cells in goiter development and involution in rats. Their study has shown high levels of Bcl-2 in normal thyroid gland and in goiter. They also observed increase in the numbers of apoptotic cells during goiter development. After two days of goiter involution, Bcl-2 levels dropped and there was a four-fold increase in apoptotic cells. In the following days the level of Bcl-2 increased again while the number of apoptotic cells returned to low levels (23). The results of the present study confirm that the expression of Bcl-2 protein affects apoptosis of thyrocytes in goiter, given that the level of Bcl-2 was much higher in areas where apoptosis was less pronounced; and vice versa, Bcl-2 expression showed low in areas where apoptosis was more pronounced.

Although we found statistically significant correlation between the percentage of apoptotic cells and the values of thyroid hormones (T3, T4), when all goiter patients are considered as one sample, no such corelation exists when the patient with Hashimoto's thyroiditis and those with euthyroid goiter, are analysed separately (as 2 samples). The same lack of correlation was noticed between the percentage of apoptotic cells and the TSH values. Indeed, Bossowski et al. also in their work suggested no significant correlation between thyroid hormones and percentage thyrocytes expressing of Fas and FasL in patients with Graves disease and Hashimoto's thyroiditis (18).

Contrary to our results, *in vitro* studies show that TSH can prevent Fas-mediated apoptosis in a dose dependent manner (24), which results in thyroid hypertrophy. The difference in the reports may be due to differences in disease activity and the stage of goiter development at the time the testing was done. In the early stage of goiter, hyperplasia depends on the TSH level, but at a later stage TSH-independent autonomous nodules begin to develop. As the disease progresses, non-toxic, diffuse TSH-dependent hyperplasia can turn into toxic or non-toxic TSH-independent multinodular goiter. Also, differences in reports may be the result of therapy used to treat goiter, since many studies indicate the possible effect of iodine and other medication on the occurrence of apoptosis (21, 25, 26).

Iiodine-rich diet in rats leads to a reduction of the thyroid gland. Low concentrations of iodine are capable of preventing apoptosis, whereas high concentrations result in increased Fas-induced apoptosis. Cytotoxic effect caused by the iodine on rat thyrocytes has the characteristics of necrosis and apoptosis (25). Recent studies have shown that excess iodine in molecular form causes thyrocyte apoptosis, leading to free radical formation, and mitochondrial damage (27). Studies conducted on patients with endemic multinodular goiter indicated that after six months of iodine load, apoptotic thyrocyte number was increased up to ten times, Bcl-2 in thyrocytes disappeared, whereas Bax appeared in the thyroid follicular epithelial cells (20).

The present study shows that expression of Bcl-2 protein prevents thyrocite apoptosis in goiter, and that the level of Bcl-2 was much higher in the areas where apoptosis was less pronounced; and vice versa, Bcl-2 showed low expression or it was not present in the parts where the apoptosis was more pronounced. Some authors state that in addition to Bcl-2 protein, Fas and FasL proteins are also responsible for thyrocyte apoptosis (22, 28). Numerous studies have shown that iodine and antithyroid drugs affect thyroid apoptosis in goiter (21, 25). The cause of contradictory results might be found primarily in different environmental conditions, different treatment in different phases of disease activity. Studies suggest that all aspects of apoptotic process are present in thyrocytes, but some of them may be inactive in the absence of favorable environmental conditions. Whether the impairment of death antagonist Bcl-2 is a direct consequence of environmental stimuli (iodine) or is the result of an intrinsing thyrocite alteration, is as yet not known. The present study confirms that thyroid hormone levels and the levels of Bcl-2 expression could be used as indirect indicators of apoptosis in thyroid tissue. Further investigations are certainly needed to confirm this findings.

Acknowledgments

References

1. Kumar V, Abbas A, Fausto N, Mitchell R. Robbins Basic Pathology. 8th ed. Philadelphia: Saunders. 2007; 758-771.

2. Tamura M, Kimura H, Koji T, et al. Role of apoptosis of thyrocytes in a rat model goiter. A possible involvement of Fas system. Endocrinology 1998;139: 3646-53.

3. Lin JD. The role of apoptosis in autoimmune thyroid disorders and thyroid cancer. BMJ 2001; 322: 1525-7.

4. Labat-Moleur F, Chabre O, Guillermet C, et al. Graves-Basedow disease goiter: a model of Bax-Bcl-2 regulated apoptosis. Thyroid 1999; 9: 483-92.

5. Preedy VR, Burrow GN, Watson RR. Comprehensive Handbook of Iodine: Nutritional, Biochemical, Pathological and Therapeutic Aspects. Elsevier Inc. 2009; 47-54.

6. Puzianowska-Kuznicka M, Pietrzak M, Turowska O, Nauman A. Thyroid hormones and their receptors in the regulation of cell proliferation. Acta Biochim Pol 2006; 53: 641-50.

7. López-Fontal R, Zeini M, Través PG, et al. Mice lacking thyroid hormone receptor Beta show enhanced apoptosis and delayed liver commitment for proliferation after partial hepatectomy. PLoS One 2010; 5: e8710.

8. Stassi G, De Maria R. Autoimmune thyroid disease: new models of cell death in autoimmunity. Nature Reviews Immunology 2002; 2: 195-204.

9. Danial NN. BCL-2 family proteins: critical checkpoints of apoptotic cell death. Clin Cancer Res 2007; 13: 7254-63.

10. Krajewska M, Krajewski S, Epstein JI, et al. Immuno-histochemical analysis of Bcl-2, Bax, Bcl-X, and mcl-1 expression in prostate cancers. Am J Pathol 1996; 148: 1567–76.

11. Branet F, Brousset P, Krajewski S, et al. Expression of the cell deathinducing gene bax in carcinoma developed from the follicular cells of the thyroid gland. Journal of Clinical Endocrinology and Metabolism 1996; 81: 2726 –30.

12. Koga A, Hiromatsu Y, Jimi A, Toda S, Koike N, Nonaka K. Immunohistochemical analysis of Bcl-2, Bax and Bak expression in thyroid glands from patients with subacute thyroiditis. Journal of Clinical Endocrinology and Metabolism 1999; 84: 2221-5.

13. Kucharova S, Farkas R. Hormone nuclear receptors and their ligands: role in programmed cell death (review). Endocr Regul 2002, 36: 37-60.

14. Petrik J, Rumora L, Juretić D, Cepelak I. Apoptozadetekcija i kvantifikacija. Biochemia medica 2003; 13: 109-17.

15. Negoescu A, Guillermet C, Lorimier P, Brambilla E, Labat-Moleur F. Importance of DNA fragmentation in apoptosis with regard to TUNEL specificity. Biomed Pharmacother 1998; 52: 252-8.

16. Weetman AP. Cellular immune response in autoimmune thyroid disease. Clinical Endocrinology 2004; 61: 405-13.

17. Hiromatsu Y, Kaku H, Mukai T, et al. Immunohistochemical analysis of Bcl-2, Bax, and Bak expression in thyroid glands from patients with Graves' disease. Endocrine Journal 2004; 51: 399-405.

18. Bossowski A, Czarnocka B, Bardadin K, et al. Identification of apoptotic proteins in thyroid gland from patients with Graves' disease and Hashimoto's thyroiditis. Autoimmuniti 2008; 41: 163-73.

19. Mitsiades N, Poulaki V, Kotoula V, et al. Fas/FasL ligand up-regulation and Bcl-2 down-regulation may be significant in the pathogenesis of Hashimoto's thyroiditis. Journal of Clinical Endocrinology and Metabolism 1998; 83: 2199-203.

20. El May MV, Zekri S, Boubaker S, Ladgham A, El May A. Chronic iodine overload and apoptosis in cold nodules from endemic multinodular goiters. Arch Inst Pasteur Tunis. 2005; 82: 69-74.

21. Cooper SD. Antithyroid Drugs. N Engl J Med 2005, 352: 905-17.

22. Chen S, Fazle Akbar SM, Zhen Z, et al. Analysis of the expression of Fas, FasL and Bcl-2 in the pathogenesis of autoimmune thyroid disorders. Cell Mol Immunol 2004; 1: 224-8.

23. Patel VA, Hill DJ, Sheppard MC, Wang J-F, Logan A, Eggo MC. Apoptosis during goiter involution-the role of Bcl-2. J Endocrinol 2000; 164: 323-30.

24. Andriokula M, Tsatsoulis A. The role of Fas-mediated apoptosis in thyroid disease. European Journal of Endocrinology 2001; 144: 561-8.

25. Markovic Lj, Nenadovic M, Atanackovic M, Sopta J, Stefanovic D, Govedarovic V. Bcl-2 proteins on thyrocytes in lymphocytic thyroiditis as a consequence of administration of iodine in potassium iodide. II itercontinental congress of pathology, Iguassu Falls(Brazil), Editors: Soares F, Vassallo J, Bleggi Torres LF. Medimond International Proceedings 2004; 39-42.

26. Wartofsky L. Disease of thyroide. In: Harrison's principles of internal medicine. Isselbacher K. McGraw-hill inc, New York, 1994; 1930-53.

27. Tsatsoulis A. The role of apoptosis in thyroid disease. Minerva Medica 2002; 93: 169-80.

28. Chen S, Fazle Akbar SM, Zhen Z, et al. Analysis of the expression of Fas, FasL and Bcl-2 in the pathogenesis of autoimmune thyroid disorders. Cell Mol Immunol 2004; 1: 224-8.

Corresponding Author
Ljiljana Markovic,
Institute of Pathophysiology, Faculty of Medicine,
University of Belgrade, Belgrade,
Serbia,
E-mail: ljmarkovich@med.bg.ac.rs

Domestic violence and the experience of health services

Maria de Fatima Bezerra de Alencar[1], Modesto Leite Rolim-Neto[1,2], Henrique Cesar Nascimento Ramalho-Filho[1], Nádia Nara Rolim Lima[1], Uilna Natercia Soares Feitosa[1], Alberto Olavo Advincula Reis[3]

[1] Suicidology Research Group, Barbalha, Brazil,
[2] Universidade Federal Ceara, Fortaleza, Brazil,
[3] Universidade de Sao Paulo, Sao Paulo, Brazil.

Abstract

Background: Domestic violence against women refers to all acts of gender-based violence perpetrated against women, including physical, sexual and psychological violence occurring within the family. The high rates of domestic violence and disproportionately high rates of maternal mortality in developing countries are recognized as global public health problems.

Methods: This study is based on data extracted from the SciELO database and secondary data extracted from the WHO website about domestic violence, health services and health narratives.

Results and discussion: Violence also occurs among the wealthier population, who can hide domestic violence. when considered assaults committed within the residence, 63% of victims were women. Studies have found higher prevalence among poorest women, who consult health services three times more than the others and that the number of queries.

Conclusion: Violence against women deserves to be approached as a health problem, in addition to violation of human rights and citizenship. The narrative construction can be an instrument to make possible the emergence of a new authorship and the possibility of choice.

Key words: Domestic violence, women**,** health services.

Background

Formally, even before the onset of the economic surplus in the early community, which made different the activities of men and women, the sexual division is the first form of division of labor[1]. In fact, with the advent of Christianity equality between men was wanted, but the woman remained anonymous, the female was still despised. There was no equality between men and women. In this historical context, the violence was not recognized as such, but realizes that it existed, was practiced implicitly by the authority that the man had on the woman, treating her as his property[2].

Therefore, their visibility can be correlated both to the forms through which manifests itself as the society's capacity to effectively perceive it[3]. The high rates of domestic violence and disproportionately high rates of maternal mortality in developing countries are recognized as global public health problems. However, it is unclear what proportion of maternal mortality, and due to domestic violence, if there are differences between countries and to what extent, and which factors could explain these differences.

Espinoza and Camacho[4] argue that domestic violence against women refers to all acts of gender-based violence perpetrated against women, including physical, sexual and psychological violence occurring within the family. To the authors to more comprehensive definition of violence against women and given by the United Nations Declaration on the Elimination of Violence against Women[5]: "any act of gender-based violence that results or may result in, physical, sexual or psychological harm or suffering to women, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or private life".

Roughly speaking, domestic violence as a problem of health or a health condition does not correspond to a definition of the disease pathophysiology. Consequently, domestic violence is not specified in the ICD-10. Domestic violence is essentially a behavioral problem, as well as alcoholism and drug abuse[4].

Methods

This study included an analysis based on primary data extracted from original publications and review articles contained in the databases of the Scientific Electronic Library Online (SciELO), and secondary data extracted from the WHO website. There were restrictions on language or type of article. We performed a manual selection of texts, through descriptors: domestic violence, health services and health narratives. Of these articles, we excluded those that addressed the different thematic purpose of this study. A total of 40 articles dating from the period 2002 to 2011 were selected.

Results and discussion

In capitalism the economic necessity of division of labor in the production units led to a deterioration of workers' wages forcing women to look for supplement family income. Note that women's work became part of the production process because it represented cheap labor and easy exploitation by capital. As the woman began to have access to knowledge and have more freedom of expression, they realized that in addition to the duties they were entitled.

These events and changes represented a failure for the husband who felt powerless in the face of such facts. Violence on the form of aggression began to be used by men, physical and moral coercion was common practice, and even many crimes of passion occurred at this time[5].It is understood domestic violence as various forms of interpersonal violence (physical assault, sexual abuse, psychological abuse and neglect)[6,7].

The curious thing is that violence also occurs in the wealthier classes. Indeed, as they have many resources, political and economic, can hide domestic violence, hence their under-representation in the data reported violence[8]. As to the time of aggression, the correlation found with the indirect schooling shows that the clarification of the women leads to lower degree of tolerance for violence[9].Thus, the scene of violence against women, domestic violence or family assumes a prominent role.

Saffioti[21], based on data from the 1990 National Household Sample Survey, performed by IBGE (Brazilian Institute of Geography and Statistics),

notes that of all assaults committed within the residence, 63% of victims were women .Investigations in health services show annual prevalence of violence against women perpetrated by intimate partners ranging from 4-23% and increasing to 33-39% when considering the total period of violence in the lives of these women[10,11,12,13]. These studies have found higher prevalence among the poorest women, who consult health services three times more than the others and that the number of queries, grows proportionally to the severity of the attacks. However, it has been observed that health professionals do not identify these women are victims of violence, even when the lesions presented are virtually pathognomonic of the phenomenon[14,15].

It is considered that these professionals create barriers to meet women due to factors such as lack of time and resources, fear of offending women, lack of training, fear of opening "Pandora's box" and frustration when dealing with non-response many users in relation to advice[16]. Research conducted by Amaral, Letelier, Gois and Aquinas[17] shows that 48% of battered women work outside the home. The National Health Conference[17], considers paid work one of the best ways to reduce domestic violence, since the main victims are women who only work at home.

To the extent that use disorders psychoactive substances are associated with domestic violence, it is assumed generally that the reduction of substance use automatically eliminates the physical and sexual abuse. Although recent research shows that treatment of alcoholism is associated with reduced partner violence[18], this does not always occur. Alcoholism partner was appointed as one of the main triggers of aggression, corroborating the fact that the attacks usually occur on weekends, between 8 P.M. and midnight, hours and days in which he is allegedly drunk and the victim has little possibilities of escape, because the offender is at home[19], although not considered directly responsible for violence, is an aggravating factor because it is observed that the occurrences often occur from Friday evening and step into the weekend and the victim often reports that the fellow was making use of alcoholic beverages [28].Another important aspect found in the search Giffin[20] was the fact that 38% of women thought the possibility of suicide, which reports that the United States,

the abuse is risk factor of 35% of suicide attempts of American women.

The important thing about these studies is that from them we can develop strategies to reduce the violence that exists in our society. As Freedmann and Combs[21], narrative therapy is an approach that considers those who seek therapy for people dealing with such issues, problems or never identified with a label that bear on the problem. His emphasis is on the person's skill set to expand its existential possibilities, through the review of his ideas about himself and his dealing with everyday issues. One of their assumptions is that we live and how to build people through stories and they are always open to be re-written or updated.

Narrative therapy works to separate people from problem-saturated narratives, including the identity as a project always open, built relationships with networks that include other people, family and institutions[22].Understood violence as a multifactorial construct and personal narratives as constructed by means of beliefs and values, one can assume a vast work to be addressed in narrative construction of the broad context for understanding the phenomenon and real and from there the possibilities open to of deconstruction and other open spaces for liberating narratives[23].

Aldrighi[26], in a study on violence in the couple discusses the need to address the couple to understand domestic violence, points to the risk that focus on only the results of domestic violence, but not the process. Pitman[24] states that it is possible to understand the constitution, organization and process of domestic violence (in the case focusing on the couple) through the sequence in which events are narrated. Since health, I mean full health, including biopsychosocial approach in this type of violence. In the construction of intervention strategies, it is important to consider the use of elements of popular domain known population, highlighting the role of narratives[25].

There are situations where, from this assumption, the women began claiming their rights, with the formation of various movements. Remember that the women's movement initiates partnerships with the state towards the implementation of public policies for working with this problem. In 1983 he created the State Council on the Status of Women in Sao Paulo, in 1985 it created the National Council of Women's Rights and the first Women's Police Stations (DDM), also in São Paulo[26]. The DDMs were the first and great resource to the public in combating violence against women and especially domestic violence in the country. His character is basically police: detect transgressions of the law, determine its origin and criminalize domestic violence[27]. It remains silent recognition of basic health services for the detection of violence due to its proximity and wide coverage.

The prenatal care can serve as an important space for their identification[28] representing the doorway to approach violence, establishing links with women and encouraging service[29].Address, therefore, violence against women and their interface with health as well as provide visibility to the issue of sexuality and forced sex within a marital imply, among other tasks: the recognition of violence as "object" of the health sector, considering both the expanded concept of health as the impact that the quality of life[30], the integration of issues such as sexuality, gender and human rights in the practice of multidisciplinary teams for humanization of care and questioning of the situations addressed, to welcome and to interact demands male and female, seeking both to facilitate greater assertiveness of the female sexual subject (in addition to the "subjects of") as rescue reciprocity between genders in times of instability of labor relations and renegotiation of "marital debts". In the operationalization of the interdisciplinary health care, and intersectional services (Police, Medical-Legal Institute, Health Units, etc.) which upholds the right to comprehensive care for "victims", "authors" of violence and their families, avoiding the "victimization" through a "linked network of medical, psychological, legal, police and social"[31]. However, for the visibility of domestic violence occurs in the primary health care are necessary organizational changes in service and in the approaches taken by professionals in order to prioritize not only the fulfillment of goals and execution of the techniques proposed by the programs. This means that dialogue should be established and more symmetrical relations between professionals and users[31]. But is particularly in situations of group work, when they feel welcomed, women spoke spontaneously about the violence. The speech of one of them led to the emergence of

other reports of violence, working like a snowball. This shows that women are willing to talk about their situation; they feel the possibility of an attentive listening and acceptance of their problems, even without the guarantee of solving them[32,33].

Most programs and health services also has no care protocols for cases of domestic and sexual violence against women, despite a note concerning the availability of women, when interviewed, reported a living situation[34].

Conclusion

Thus, according to the violation of human rights and citizenship, violence against women also deserves to be approached as a health problem. From the welcoming attitude, was the encouragement of narrative construction, as an instrument to facilitate the emergence of new authorship, or some other paths and the possibility of choice, as opposed to the narrative disorientation immobilizing victims. The speech of women and the delineation of the visits progressed in order to generate power and the possibility of new stories from new narratives. Reflect gender violence as any act that results or may result in harm or suffering raises biopsychosocial (re) think health practices, particularly in the use of different definitions of the phenomenon of the available statistics, as well as the diversity of information sources. Roughly speaking, the lack of population surveys more accurate estimates difficult.

Authors' contributions

MLRN and HCNRF contributed in the design and development of the study, acquisition, analysis and interpretation of data, and wrote the manuscript. NNRL and UNSF and MFBA advised on the study design, development of the research and revised the manuscript. All authors read and approved the final manuscript.

References

1. Netto, JP. Economia Política: uma introdução crítica. São Paulo: Cortez, 2006.

2. Gonçalves HS, Ferreira AL, Marques MJV. Avaliação de serviço de atenção a crianças vítimas de violência doméstica. Rev Saúde Pública. 1999; 33(6): 547-553.

3. Espinoza H, Camacho AV. Maternal death due to domestic violence: an unrecognized critical component of maternal mortality. Rev Panam Salud Publica. 2005; 17(2): 123-129.

4. Monica L, Zilberman ML, Blume SB. Violência doméstica, abuso de álcool e substâncias psicoativas. Rev Bras Psiquiatr. 2005; 27(Supl II): S51-5.

5. Wilt S, Olson S. Prevalence of domestic violence in the United States. J Am Med Womens Assoc. 1996; 51(3): 77-82.

6. Amaral C, Letelier C, Góis I, Aquino S. Dores Visíveis: violência em delegacias da mulher no Nordeste. Fortaleza: Edições UFC, 2001.

7. BRASIL, 10ª Conferência Nacional de Saúde. A violência doméstica é também uma questão de saúde pública. Brasília: Editora MS, 1997.

8. Adeodato VG, Carvalho RR, Siqueira VR, Souza FGM. Qualidade de vida e depressão em mulheres vítimas de seus parceiros. Rev Saúde Pública. 2005; 39(1): 108-113.

9. Angulo-Tuesta AJ. Gênero e violência no âmbito doméstico: a perspectiva dos profissionais de saúde. Rio de Janeiro: Escola Nacional de Saúde Pública, 1997.

10. Giffin K. Violência de gênero, sexualidade e saúde. Cad Saúde Pública. 1994; 10: 146-55.

11. Gomes R. A violência enquanto agravo à saúde de meninas que vivem nas ruas. Cad Saúde Pública. 1994; 10: 156-67.

12. Augengraun M, Wilson TE, Allister L. Domestic violence reported by women attending a sexually transmitted desease clinic. J Am Sex Transm Dis Assoc. 2001; 28: 143-6.

13. Deslandes S, Gomes R, Silva CMP. Caracterização dos casos de violência doméstica contra a mulher atendidos em dois hospitais públicos do Rio de Janeiro. Cad Saúde Pública. 2000; 16: 129-37.

14. Hartigan P. La OPS enfoca el problema de la violencia contra la mujer. Rev Panam Salud. 1997; 2: 290-4.

15. Meneghel S, Barbiani R, Steffen H, Wunder AP, Rosa MD, Rotermund J, et al. Impacto de grupos de mulheres em situação de vulnerabilidade de gênero. Cad Saúde Pública. 2003; 19: 109-18.

16. Paltiel F. La salud mental de la mujer de las Americas. In: Genero, mujer y salud en las Americas. Washington: Organizacion Panamericana de la Salud; 1993.

17. Krug EG, Dalhberg LL, Mercy JA, Zwi AB, Lozano R, editors. Informe mundial sobre la violencia y la salud. Geneva: OMS, 2003.

18. BRASIL, Ministério da Saúde. Violência intrafamiliar: orientações para a prática em serviço. Brasília: Editora MS, 2002.

19. Schraiber LB, Oliveira AFPL, França-Junior I, Pinho AA. Violência contra a mulher: estudo em uma unidade de atenção primária à saúde. Rev Saúde Pública. 2002; 36: 470-7.

20. Kronbauer JFD, Meneghel SN. Perfil da violência de gênero perpetrada por companheiro. Rev Saúde Pública. 2005; 39(5): 695-701.

21. Saffioti HIB, Cançado MER, Almeida SS. A Rotinização da violência contra a mulher: o lugar da praxis na construção da subjetividade. Congresso Internacional América 92. Raízes e Trajetórias. São Paulo: USP, 1992.

22. Campbell JC. Health consequences of intimate partner violence. Lancet. 2002; 359: 1331-6.

23. Garcia-Moreno C. Dilemmas and opportunities for an appropriate health-service response to violence against women. Lancet. 2002; 359: 1509-14.

24. O'Farrell TJ, Fas-Stewart W, Murphy M, Murphy CM. Partner violence before and after individually based alcoholism treatment for male alcoholic patients. J Consult Clin Psychol. 2003; 71(1): 92-102.

25. Machado MRC. Narrativa de mulheres vítimas de violência: passos do processo. Psicol Teor Pratica. 2004; 6(1): 97-104.

26. Aldrighi T. Violencia conjugal: o caminho percorrido do silencio e revelação. Sao Paulo: Pontificia Universidade Catolica, 2001.

27. Pittman FK. Turning points. New York: Norton, 1987.

28. Ramão SR, Meneghel SN, Olivier C. Nos caminhos de Iansã: cartografando a subjetividade de mulheres em situação de violência de gênero. Psicol Sociedade. 2005; 17(2): 79-87.

29. Schraiber LB, Oliveira AFLP. Violence against women: interfaces with health care, Interface Comunicação Saúde Educação. 1999; 3(5): 21-26.

30. Cavalcanti LF, Gomes R, Minayo MCS. Representações sociais de profissionais de saúde sobre violência sexual contra a mulher: estudo em três maternidades públicas municipais do Rio de Janeiro, Brasil. Cad Saúde Pública. 2006; 22(1): 31-9.

31. Minayo MCS. A difícil e lenta entrada da violência na agenda do setor saúde. Cad Saúde Pública 2004; 20: 646-7

32. Andrade CJM, Fonseca RMGS. Considerações sobre violência doméstica, gênero e o trabalho das equipes de saúde da família. Rev Esc Enferm USP. 2008; 42(3): 591-595.

33. D'Oliveira AFPL, Schraiber LB. Violência de gênero, saúde reprodutiva e serviços. In: Giffin K, Costa SH, organizadoras. Questões da saúde reprodutiva. Rio de Janeiro: FIOCRUZ; 1999.

34. Dantas-Berger SM, Giffin K. A violência nas relações de conjugalidade: invisibilidade e banalização da violência sexual? Cad Saúde Pública. 2005; 21(2): 417-425.

Corresponding Author
Modesto Leite Rolim-Neto,
Universidade Federal do Ceará,
Faculty of Medicine,
Barbalha,
Ceará,
Brazil,
E-mail: modestorolim@yahoo.com.br

Comparative studies on the hypocholestrimic effect of branded and conventional yoghurt

Shabnam Javed[1], Rauf Ahmad[2], Shaista Nawaz[2], Salman Saeed[2]

[1] Institute of Agricultural Sciences, University of the Punjab, Lahore, Quaid-e-Azam Campus, Lahore – 54590, Pakistan,

[2] Food and Biotechnology Research Center, Pakistan Council of Scientific and Industrial Research Laboratories, Lahore-54600, Pakistan.

Abstract

Long term daily consumption of yoghurt has a definite and significant role in reducing the blood cholesterol, low density lipoproteins (LDL) and triglyceride and hence helps in the prevention of coronary heart diseases (CHD). This study was designed to determine the effects of branded and conventional yoghurt available in local market in Lahore (Pakistan) on serum cholesterol levels of 30 healthy volunteers of 25 to 40 years of age with initial cholesterol levels between 200 - 240 mg/dl for 60 days (8 weeks). The present investigation concluded that the long term daily consumption of both branded and conventional marketed yoghurts decreased total cholesterol, LDL and triglycerides along with an increase in high density lipoproteins (HDL). However the effect is more promising in branded yoghurt compared with the conventional one. Thus it was found that the daily consumption of yoghurt helps to prevent the high risk of CHD.

Key words: Yoghurt, LDL, HDL, hypercholesterimia, coronary heart disease.

Introduction

Yoghurt is one of the oldest fermented milk products and is well-known and more acceptable than others in the world (Coïsson *et al.*, 2005). It is more nutritive as compared to milk due to its vitamins contents, digestibility and source of calcium and phosphorous. It is consumed by large number of our population either as a part of diet or as a refreshing beverage. The popularity of yoghurt is due to its characteristics like pleasant aromatic flavor, thick creamy consistency and its reputation as food associated with good health (Kleyn *et al.*, 1979; Domagla, 2005).

Yoghurt has high nutritional value and healthful properties. It is believed that yoghurt has valuable therapeutic properties thereby helps in curing gastrointestinal disorders (Athar, 1986; Shahid *et al.*, 2002). Anti-carcinogenic effects of Yoghurt have been reported by Wollowski *et al.*, (1999). There are many reports about beneficial effects of yoghurt in large intestine disorders. Perdigón *et al.* (2000 and 2001) showed the inhibition of a chemically induced colon cancer in mice fed with yoghurt.

Cholesterol is an important and basic building block for body tissues like cell membrane and lipoproteins and plays key role in the synthesis of steroids, hormones, gluco-corticoids and bile acids. However, high serum cholesterol level has been commonly recognized as an important factor in disease development. There has been reported a high correlation between hypercholesterolemia especially of low-density lipoprotein, and incidence of atherosclerosis (Levy, 1981). Elevated blood cholesterol is a well known major risk factor for CHD (Aloglu and Oner, 2006). Hypercholesterolemia is one of the most important risk factor for cardiovascular diseases. Benoit *et al.* (2010) studies also showed that people with elevated total cholesterol and HDL-cholesterol were at increased CHD risk. The WHO has prediction that by 2030, cardiovascular diseases will remain as one of the leading causes of death, affecting approximately 23.6 million people around the World (WHO, 2009). The risk of heart attack is three times higher in people with hypercholesterolemia, compared to those who have normal blood lipid profiles.

Mann and Sporry were among the first investigators who demonstrated the reducing effects of fermented milk on cholesterol concentration (Gary *et al.*, 2000). Effect of yogurt on the metabolism of lipids and hypocholesolemic actions were studied by St-onge *et al.*, 2000, Brown and Valiere 2004, Shah 2006, Lourens-Hattingh *et al.*, 2001, Shakeri, 2003). Numerous in *vitro* and in

vivo studies have been conducted investigating the potential positive effects of yogurt in lowering cholesterol. James (1999) had reported that out of seven various clinical studies (Bazarre *et al.*, 1983, Hepner *et al.*, 1979, Jaspers *et al.*, 2006, Massey 1984, McNamara *et al.*, 1989, Payens *et al.*, 1995, Rossouw *et al.*, 1981), six obserrved a reduction in serum cholesterol concentration associated with Fermented Milk intake. Fermented dairy products and probiotic bacteria decrease the absorption of cholesterol (Ebringer *et al.*, 2008). Therefore, the present investigation was conducted to establish the hypocholestrimic effects of locally branded and conventional yoghurt by long-term daily consumption for 56 days to 30 normal healthy adults of 25 to 40 years of age with initial cholesterol levels between 200 - 240 mg/dl.

Materials and methods

One branded yogurt sample and one conventional yogurt *dahi* were purchased from local market of Lahore to evaluate their hypocholestrimic effect. Thirty healthy volunteers (both males and females), 25-40 years of age, were selected for participation in the trial on the basis of prior physical examination, medical history and serum cholesterol level. A pre-intake period was arranged for one week, during which participants were advised to maintain their ordinary living habits including their diets but should not take pickles and fermented milk. At the end of pre-intake period, serum lipids were determined from blood samples taken before breakfast (fasting). Serum total cholesterol levels were within the range of 200-240 mg/dl. The volunteers were divided into three groups, control group, group 1 and group 2. After one week of pre-intake, subjects were instructed to consume 300 grams of respective yogurt (group 1was fed branded yogurt and group 2 was fed conventional yogurt, *dahi*) except control group with no yoghurt for a period of 60 days daily as a part of their routine habitual meals (break fast, lunch and dinner).

Blood samples were collected after 60 days consumption of yogurt from each individual and serum was separated which was analysed for triglycerides, total cholesterol, HDL-cholesterol and LDL- cholesterol using diagnostic kits.

Triglycerides

Randox®GPO-PAP (UK) kit method was employed for triglycerides estimation. The triglycerides were determined after their enzymatic hydrolysis with lipases. The indicator was a quinoneimine.

Enzyme reagent were mixed with serum samples and incubated for 10 minutes at 20-25^{0}C. The absorbance was measured at 500 nm against blank.

Total Cholesterol

Human®CHOD-PAP (Germany) kit was used for total cholesterol determination. It employed enzymatic colorimetric estimation of cholesterol after its enzymatic hydrolysis and oxidation. The indicator quinoneimine was formed from hydrogen peroxide and 4-aminophenazone in the presence of phenol and peroxide.

Reagent was mixed with serum sample and incubated for 10 min at 20-25 ^{o}C. The absorbance was measured Spectro UV-VIS Dual Beam UVS-2800 LABOMED, INC. against blank at 500 nm.

HDL-Cholesterol

HDL fraction was assayed using AutoZyme Cholesterol (Richelsen *et al.*. 1996). The assay mixture was incubated for 10 min at 37 ^{0}C followed by absorbance at 500nm.

LDL-Cholesterol

LDL-Cholesterol was computed according to Friedewald's formula (Friedewald's *et al.*, 1972).

LDL cholesterol=Total cholesterol-HDL cholesterol-(serum triglycerides/5)

Results and discussion

In order to check hypocholestrimic effect of market branded yoghurt and conventional yoghurt, 30 subjects of different age groups (20-43) were divided in three groups, Control group, group 1 and group 2. Control group did not received any yoghurt while group 1 received 300 g/day branded yoghurt and group 2 consumed conventional yoghurt of the same amount for a period of 60 days. At the start of study, blood samples were collected to estimate triglycerides, total cholesterol, LDL *(*Low-density lipoprotein) and HDL (High density lipoprotein) levels and then after 60 days, blood

samples were again collected and analyzed for aforementioned parameters.

Results of total cholesterol levels in 3 different groups were shown in the Figure 1 which clearly indicated that yogurt consumption for 60 days significantly reduced total cholesterol in groups 1 and 2 in comparison with control group and this effect is more profound in branded yogurt as compared to conventional yogurt. There were significant differences ($P<0.05$) in cholesterol levels in subjects consuming the yogurt as compared with the control.
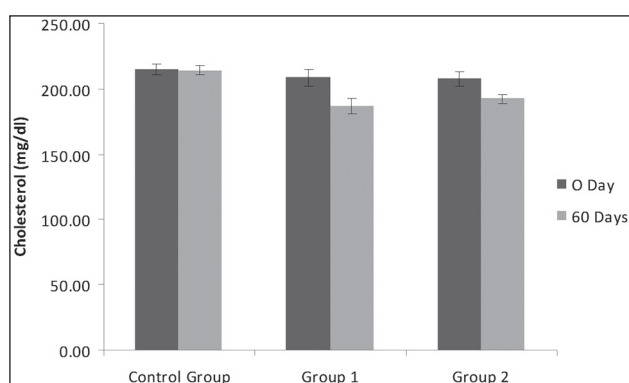
Figure 1. Mean Cholesterol levels in various groups at zero and sixty days

A same kind of observation was made by Jaspers *et al.* (2006) showing that daily yogurt consumption in the diet significantly reduced fasting total serum cholesterol 10-12% in human adult males. Jafari *et al.* (2009) reported that consumption of both probiotic and ordinary yogurt caused a significant decrease in serum total cholesterol. More over Marie-Pierre *et al.* (2000) studied the effect of fermented dairy products on cholesterol concentration and concluded that yoghurt has a moderate cholesterol lowering action. Proper intake of fresh yoghurt increased short chain fatty acids this in turn aids to decrease the circulating cholesterol concentration by inhibiting hepatic cholesterol synthesis. Agerbaek *et al.* (1995) and Schaafsma *et al.* (1998) also reported a significant reduction in serum cholesterol concentration after yogurt consumption.

Results of LDL-cholesterol in 3 different groups at zero day and sixty days were presented in Figure 2 which showed a significant decrease in LDL-cholesterol concentration in experimental groups, 1 & 2 as compared to control group. As LDL-cholesterol was calculated from the values for serum total cho-

lesterol, triglycerides and HDL- cholesterol using the equations of Friedewald *et al.* (1972), the reduction in serum LDL-cholesterol concentration would be expected. Our results are generally in agreement with some of other findings (Aklain *et al.* 1997, De Smet *et al.* 1998). Schafasma *et al.* (1998) studied the effects of yoghurt on blood lipids and showed that it has lowered serum LDL-cholesterol levels in normal healthy male adults. Similarly Richelsen *et al.* (1996) also studied long term effects of yoghurt on plasma lipoproteins and declared a rapid reduction of LDL cholesterol after a period of one month, thus clearly indicated its hypocholestrimic function.
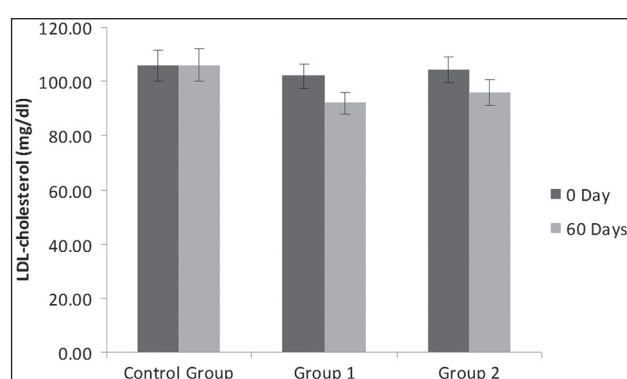
Figure 2. Mean LDL-Cholesterol in Various Groups at zero and sixty days

Figure 3 showed the results of HDL-Cholesterol levels in 3 different groups at zero and 60 days which indicated that yogurt consumption significantly elevated the HDL-cholesterol levels in both groups (1 & 2) consuming yoghurt compared with control group without yoghurt consumption and this effect was more profound in branded yogurt as compared to conventional yogurt.

A same kind of observation was being made by Kiebling *et al.* (2002) who concluded that long term daily consumption of 300g of yoghurt over a period of 21 wks increased serum concentration of HDL cholesterol in women thus leading to the desirable improvement of LDL/HDL cholesterol ratio.

Some research scientists indicated that the HDL to total cholesterol ratio is more important than total cholesterol level alone for the prediction of heart disease risk as cholesterol is unable to mix with water and therefore it needs some assistance to travel throughout the blood stream. HDL helps to remove cholesterol from the body by transporting it to the liver whereas LDL does not aid

in transportation of cholesterol instead it deposits cholesterol on the inner vessel walls. A decrease in total cholesterol with simultaneous increase of HDL-cholesterol was also observed by Hashimoto *et al.* (1999) and Taranto *et al.* (1998).
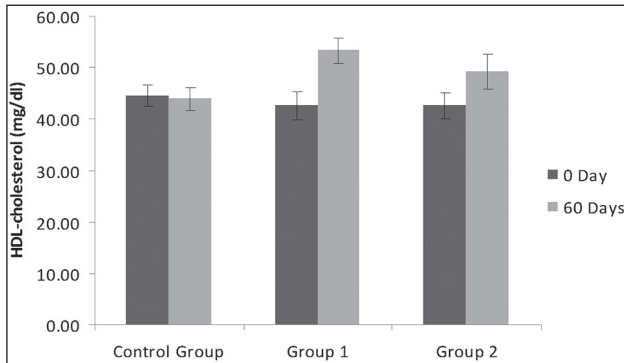
Figure 3. HDL-Cholesterol in Different groups at zero and sixty days
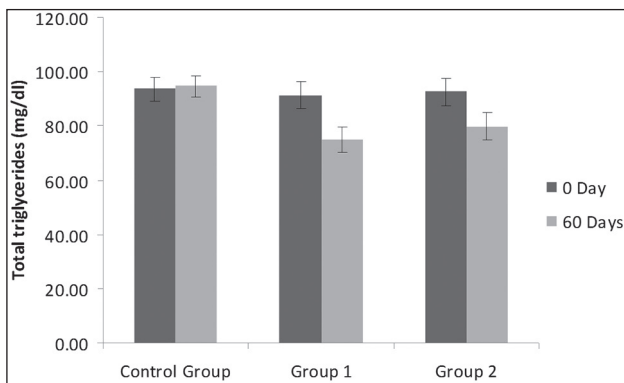
Figure 4. Triglycerides at zero and sixty days

The mechanisms of serum lipid improvement had been suggested from an in vitro experiment which demonstrated that intestinal lactic acid bacteria have capacity to assimilate and bind cholesterol as well as bile acids with bacterial cells (Bottazi *et al.*, 1986; Gilliland *et al.*, 1985; Hosono and Tono-oka, 1995). Results of triglycerides at zero and 60 days in 3 different groups were shown in the Figure 4 which indicated that yogurt consumption for 60 days reasonably reduced total triglycerides in group 1 and 2 in comparison with control group. However, this effect is more profound in branded yogurt as compared to conventional yogurt. There was significant difference (P) in triglycerides in subjects consuming yogurt as compared with the control.

Yadav *et al.* (2006) reported that plasma total cholesterol, triglycerides, LDL-cholesterol, very-low-density lipoprotein-cholesterol and blood free fatty acids were significantly reduced in skim milk and dahi fed animals as compared with control animals. In contrast, HDL -cholesterol in plasma was higher in skim milk (14%) and dahi (29%) fed animals as compared with control animals. Yeganeh *et al.* (2010) who studied the effects of probiotic and conventional yogurt on lipid profile in women had observed positive changes in lipid profile in both yogurt groups compared with the control group with a decrease in total cholesterol to HDL-cholesterol ratio and an increase in HDL-cholesterol.

Maity and Misra (2010) also concluded that increased consumption of market Dahi can be recommended for hypercholesterolemic individuals with a view to reducing the incidence of coronary heart disease in India.

Jafari *et al.* (2007) suggested the hypercholesterolemic individuals to consume more yogurt as the source of dairy products in their diet based on their study results that higher the baseline blood cholesterol level, the more beneficial effects of milk replacement with yogurt, especially probiotic yogurt.

Conclusion

The results of this study clearly demonstrated that branded yogurt was more effective in improving serum lipids in humans as compared to traditional conventional yogurt. This study clearly projects the usefulness of the yogurt containing diet as safe alternative immunotherapeutic agent and functional food for the persons suffering from hypercholesterolemia.

The result of this study demonstrated that yogurt has the potential to significantly reduce serum cholesterol concentrations and regular yogurt consumption generally exerts positive effects on the lowering of fat metabolites in particular cholesterol. Reductions of serum cholesterol concentrations of 3 to 4% are clinically meaningful since every 1% reduction in serum cholesterol concentrations leads to a 2 to 3%reduction in estimated risk for coronary heart disease (Manson 1992). Thus, regular intake of yogurt may decrease estimated risk for coronary heart disease by 6 to 10%. However, in order to enhance the results obtained in this project; further studies are required to better understand the mechanism of action and the magnitude of the effect from FM/yogurt intake in hypercholesterolemic subjects.

References

1. Agerbaek, M., L. U. Gerdes, and B. Richelsen 1995. Hypocholesterolaemic effect of a new fermented milk product in healthy middle-aged men. European Journal of Clinical Nutrition 49: 346–352.

2. Aklain A.S., S. Gonc, and S. Duzel 1997. Influence of yogurt on serum cholesterol levels in mice. Journal of Dairy Science 80: 2721-2725.

3. Aloglu, Z., and H. Oner. 2006. Assimilation of cholesterol in broth, cream and butter by probiotic bacteria.European. Journal of Lipid Science and Technology 108(9):709-713.

4. Athar, I. H. 1986. Preparation of Cheese and Yoghurt (Dahi) at Household Level. Pakistan Agriculture Research Council, Islamabad.

5. Bazarre, T.L., S.L. Wu, and J.A. Yuhas 1983.Total and HDL cholesterol concentrations following yogurt and calcium supplementation. Nutrition Reports International 28:1225–1232.

6. Benoit, J. A., J. S. Rana, S. G. Erik, G. Stroes, J. P. Després, P. K. Shah et al. 2010. Beyond Low-Density Lipoprotein Cholesterol: Respective Contributions of Non–High-Density Lipoprotein Cholesterol Levels, Triglycerides, and the Total Cholesterol/High-Density Lipoprotein Cholesterol Ratio to Coronary Heart Disease Risk in Apparently Healthy Men and Women. Journal of American College of Cardiology 55:35-41.

7. Botazzi, V., C. Zacconi, E. Gonzaga, and M. Paladino 1986.Absorption of cholesterol by intestinal lactic acid bacteria. Annuals of Microbiology 36:1-5.

8. Brown, A.C. and A. Valiere 2004. Probiotics and medical nutrition therapy. Nutrition and Clinical Care 7(2), 56–68.

9. Coïsson, J.D., F. Travaglia, G. Piana, M. Capasso, and M. Arlorio.2005. Euterpe oleracea juice as a functional pigment for yogurt. Food Research Intetnational 38: 893-897.

10. De Smet I., P. De Boever, and W. Versteaete. 1998. Cholesterol lowering in pigs through enhanced bacterial bile salt hydrolase activity. British Journal Nutrition 79:185-194.

11. Domagla J. 2005. Texture of yoghurt and bioyoghurts from goat's milk depending on starter culture type. Milchwissenschaft. 60(3): 289-292.

12. Ebringer, L., M. Ferenčík, and J. Krajčovič. 2008. Beneficial health effects of milk and fermented dairy products. Review Folia Microbiologica. 53(5): 378-394.

13. Friedewald, W. R., R. V. Levy, and D. S. Fredrickson. 1972. Estimation of concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. Clinical Chemistry 18: 499-502.

14. Gary L, M. M. Myers, P. P. Kimberly, S. Waymack, S. Jay, R. Gerald, E. Cooper, and J. Sampson 2000. A Reference Method Laboratory Network for Cholesterol: A Model for Standardization and Improvement of Clinical Laboratory Measurements. Clinical Chemistry Journal 46: 1762-1772.

15. Gilliand, S. E., C. R. Nelson, and C. Maxwell. 1985. Assimilation of cholesterol by Lactobacillus acidophilus. Applied Environmental Microbiology 49: 377-381.

16. Hashimoto H., K. Yamazaki F. H., M. Kawase, M. Hosoda, and A. Hosono. 1999. Hypocholesterolemic effect of Lactobacillus casei subsp. Casei TMC 0409 strain observed in the rats fed cholesterol contained diets. Animal Science Journal 72: 90-97.

17. Hepner, G., R. Fried, S. Jeor, St. L. Fusetti, and R. Morin. 1979. Hypocholesterolemic effect of yogurt and milk. American Journal of Clinical Nutrition 32:19–24.

18. Hosono, A. and T. Tono-oka. 1995. Binding of cholesterol with lactic acid bacterial cells. Milchwissenschaft. 50: 556-560.

19. Jafari, A. A., S. Hosseini, H. A. Majd, and F. Tahbaz . 2007. Effect of milk replacement with yogurt and probiotic yogurt on blood profiles of hypercholesteolemic individuals. Iranian Journal Diabetes Lipid & Lipid Disorders 7:13.

20. Jafari, A. A., B. Larijani, H. A. Majd, and F. Tahbaz. 2009. Cholesterol-lowering effect of probiotic yogurt in comparison with ordinary yogurt in mildly to moderately hypercholesterolemic subjects. Annual of. Nutrition Metabolism 54: 22-27.

21. James, W., M. D. Anderson, and S. E. Gilliand. 1999. Effect of Fermented Milk (Yogurt) Containing Lactobacillus Acidophilus L1 on Serum Cholesterol in hypercholesterolemic Humans. Journal of the American College of Nutrition 18 (1): 43–50.

22. Jaspers, D. A., L. K. Massey, and L. O. Luedecke. 2006. Effect of Consuming Yogurts Prepared with Three Culture Strains on Human Serum lipoproteins. Journal of Food Science 49(4): 1178-1181.

23. Kiebling, G., J. Schneider, and G. Jahreis. 2002. Long-term consumption of fermented dairy product on HDL cholesterol. Journal of Clinical Nutrition 56: 843-849.

24. Kleyn, D. H., J. M. O. Neil, and L. B. Hare. 1979. Consistency and compositional characteristics of commercial yoghurts. Journal of Dairy Science 62(4): 1032-1034.

25. Levy, R. I. 1981. Cholesterol, lipoproteins and heart disease present status and future prospects. Clinical Chemistry 27: 653–662.

26. Lourens-Hattingh, A. and B. C. Viljoen. 2001. Yogurt as probiotic carrier food. International Dairy journal 11: 1-17.

27. Maity, T. K. and A. K. Misra 2010. Hypocholesterolemic effect of Lactobacillus casei isolated from Dahi (Indian yoghurt) in albino rats. Milchwissenschaft. 65(2): 140-143.

28. Marie, P. S., R. F. Edward, and J. H. J. Peter. 2000. Consumption of fermented dairy product on cholesterol concentration. American Journal of Clinical Nutrition 71(3):674-681.

29. Manson, J. E., H. Tosteson, P. M. Ridker, S. Satterfield, P. Hebert, and G. T. O'Connor 1992. The primary prevention of myocardial infarction. North England Journal of Medicine 326: 1406–1416.

30. Massey, L.K. 1984. Effect of changing milk and yogurt consumption on human nutrient intake and serum lipoproteins. Journal of Dairy Science 55:255– 262.

31. McNamara, D.J., A.E. Lowell and J.E. Sabb. 1989. Effect of yogurt intake on plasma lipid and lipoprotein levels in normolipidemic males. Atherosclerosis 79:167-171.

32. Payens, V. W., E. J. M. Rethans, and H. de Waard. 1995.The influence of consumption of a large quantity of yoghurt or milk on the serum cholesterol concentration. Milchwissenschaft. 30:525–530.

33. Perdigón, G., M. Medina, E. Vintiñi, and J. C. Valdéz. 2000. Intestinal pathway of internalization of lactic acid bacteria and gut mucosal immune stimulation. International Journal of Immunopathology and Pharmacology 13: 141-150.

34. Perdigon, G., R. Fuller, and R. Raya. 2001. Lactic acid bacteria and their effect on the immune system. Current Issues in Intestinal Microbiology 2:27-42.

35. Richelsen, B., K. Krisyensen, and S. B. Pedersen. 1996. Long term effect of fermented milk product on plasma lipoproteins. European Journal of Clinical Nutrition 50: 811-813.

36. Rossouw, J. E., E. Burger, and P. Van Der Vyver. 1981. The effect of skim milk, yoghurt, and full cream milk on human serum lipids. American Journal of Clinical Nutrition 34:351–356.

37. Schaafsma G., W. J. A. Meuling, W. van Dokkum, and C. Bouley. 1998. Effect of fermented milk product on blood lipids in male volunteers. European Journal of Clinical Nutrition 52:436.

38. Shah, N.P. 2006. Health benefits of yogurt and fermented milks. Probiotics and fermented milks in Manufacturing Yogurt and Fermented Milks (R.C. Chandan, ed.) Blackwell Publishing, Ames, IA .pp. 327–339.

39. Shahid Y., T. Masud, and T. Aziz. 2002. Quality Evaluation of Market Yoghurt/Dahi. Pak. Journal of Nutrition 1(5): 226-230.

40. Shakeri, M. 2003. Effect of Butter Waste on Physicochemical, Microbial and Organoleptical Properties of Probiotic Yogurt. M.Sc. thesis. Agriculture College of Ferdowsi University. Mashhad. Iran. 21-28 and 32-45.

41. St-Onge, M.P., E. R. Farnworth, and P. J. H. Jones. 2000. Consumption of fermented and nonfermented dairy products: Effects on cholesterol concentrations and metabolism. American Journal of Clinical Nutrition 71(3): 674–681.

42. Taranto M.P., M. Medici, G. perdigon, A. P. Ruiz Holgado, and G. F. Valdez. 1998. Evidence for hypocholesterolemic effect of Lactobacillus reuteri in hypercholesterolemic mice. Journal of Dairy Science 81:2336-2340.

43. WHO 2010. Cardiovascular Disease; Fact sheet N°317, Geneva, Switzerland, September, 2009. Available at: http://www.who.int/mediacentre/factsheets/fs317/en/print.html (accessed on 19 May 2010).

44. Wollowski, I., A. T. Bakalinsky, C. Neudecker, and B. L. Pool-Zobel. 1999. Bacteria used for the production of yogurt inactivate carcinogens and prevent DNA damage in the colon of rats. Journal of Nutrition 129: 77.

45. Yadav, H., J. Shalini, P. R. Sinha. 2006. Effect of Skim Milk and Dahi (Yogurt) on Blood Glucose, Insulin, and Lipid Profile in Rats Fed with High Fructose Diet. Journal of Medicine and Food. 9(3): 328-335.

46. Yeganeh, H.S., I. Elmadfa, A. Djazayery, M. Jalali, R. Heshmat, and M. Chamary. 2010. The effects of probiotic and conventional yoghurt on lipid profile in women. British Journal of Nutrition. Cambridge University Press. England.

Corresponding Author
Shabnam Javed,
Institute of Agricultural Sciences,
University of the Punjab,
Lahore,
Pakistan,
E-mail: shabnamjaved@yahoo.com

Clinical application of continuous antegrade perfusion by paracalculous ureteral catheter in ureteroscopic holmium laser lithotripsy

You-qiang Fang, Dejuan Wang, Jian-guang Qiu, Jieying Wu, Hailun Zhan

Department of Urology, The Third Affiliated Hospital, SUN Yet-sen University, Guangzhou, China.

Abstract

Objective: To explore the clinical value of continuous antegrade perfusion by paracalculous ureteral catheter in ureteroscopic holmium laser lithotripsy for mid-distal ureteral stone.

Methods: Sixty-two patients who had middle or inferior segment ureter calculi were enrolled in this study and randomized into two groups. 31 cases underwent modified ureteroscopic holmium laser lithotripsy with a F4 ureteral catheter inserted and crossed by the stone with certain depth under straight supervision of ureteroscopy. Normal saline was injected continuously through the catheter during lithotripsy procedure. 31 cases underwent directly ureteroscopic holmium laser lithotripsy. The total operation time, time of stone removal, stone clearance rate and surgery complications were compared between two groups.

Results: All procedures were successful with no case transferred to open surgery. No ureter perforation or breakage occurred in two groups. Total operation time in modified lithotripsy group and direct lithotripsy group were 33.90±7.61min VS 35.23±7.03min (t=-0.71, P=0.48>0.05). Time of stone removal were 8.93±3.29min VS 12.13±2.68min (t=-4.17, P=0.0001<0.05). Stone clearance rate were 100% VS 96.77% with stone in one case of direct lithotripsy group immigrated to renal pelvis, which was treated by extraorgan shock wave lithotripsy after surgery. All patients in two groups were followed for 3 months to 1 year.

Conclusions: Intraoperative paracalculous ureteral catheter and continuous antegrade perfusion does not increase total operation time in ureteroscopic holmium laser lithotripsy. It can maintain clear operation field and favorable stone removal, resulting in less time of stone clearance during laser lithotripsynes.

Key words: Urinary tract calculi, ureteroscopy ic lithotripsy, Holmium:YAG laser, ureteral catheter.

Introduction

In recent years, as endoscopic lithoclasts and ureteroscopy-assisted techniques advance, microinvasive ureteroscopic lithotripsy is extensively used in the urinary surgeries and has served as an important, microinvasive, safe and effective treatment modality for lower ureteral calculi [1]. This procedure is reported to associate with a higher middle and lower ureteral calculus clearance than extracorporeal shock wave lithotripsy (ESWL) [2,3]. Nevertheless, calculus upward migration remains unresolved during ureteroscopic holmium laser lithotripsy and how to safely, simply and effectively prevent this problem to reduce the calculus residue becomes the research hot spot in the urologic field [4-6]. Currently, various assisted lithotripsy instruments such as N-Trap basket have been developed to reduce the upward migration of calculi but all have limitations [7]. This study enrolled a total of 62 patients who had middle or lower ureter calculi and received either modified ureteroscopic holmium laser lithotripsy with continuous water injection via the paracalculous ureteral catheter or direct lithotripsy. Surgical outcomes and complications of the 2 procedures were compared to investigate the value of continuous antegrade perfusion by paracalculous ureteral catheter in ureteroscopic holmium laser lithotripsy.

Materials and methods

Clinical data

A total of 62 patients (29 males and 33 females) with lower and middle ureteral calculi were enrolled in the current study. They were scheduled

for ureteroscopic lithotripsy in the Department of Urinary Surgery from February 2009 to December 2010. Patients were eligible if they were adult, with the calculus having the diameter of > 0.6cm and ≤ 1.5cm and being present only in the urinary system and below the upper edge of pelvis of the sacroiliac joint (middle and lower ureteral calculi), as confirmed by KUB. Patients with acute urinary infection (fever and increasing leukocyte) prior to surgery, congenital ureteral stricture or the history of surgery in the homolateral ureteral surgery were excluded from the current study.

All patients were randomly divided in 2 groups of 31 patients to receive either modified ureteroscopic holmium laser lithotripsy with a F4 ureteral catheter inserted over calculi and injected the water continuously throughout the surgery or direct holmium laser lithotripsy. All surgeries were conducted by a single surgeon. Preoperative clinical data were shown in Table 1.

Surgical procedures

All patients were placed in the lithotomy position and received the combined spinal-epidural anesthesia. 60/100 W holmium laser generator (LUMENIS) and 8/9.8 or 7F hard ureteroscopy which was equipped with TV image monitoring system (OLYMPUS) were used for surgery. Sterilized saline perfusate was suspended 80cm above the operation table. The ureteroscopy was visibly inserted to the bladder. After conventionally examining neoplastic masses and calculi, the bilateral ureteral orifices were identified along the intrureteric ridge and then the ureteroscope was placed under the guidance of a 4F ureteral catheter reversely inserted into the diseased ureteral orifice. Following confirming that the ureteroscope was in the ureteral cavity, the operation table was elevated to place the patient in a 20-30° dorsal elevation position. The ureteroscope was carefully shifted upwards to search for calculi. The size, position

and presence of polyp encapsulation were observed. The laser lithotripsy energy/frequency was set 1.5-2.0J/5Hz.

Modified lithotripsy

A 4F catheter was inserted over the calculus and detained at the catheter end 8-10cm in the front of the calculus (Figure 1). Then, the ureteroscope was removed and the tail end of the catheter was connected with a 50ml injector via the extension tube (Figure 2a, b). The ureteroscopy was inserted again via the external urethral orifice (Figure 3) and entered into the ureter along the catheter. Holmium 400μm optical fibers were placed via the ureteral operation channel to the calculi (Figure 4). The calculus was fragmented less than 2mm using the nibbling method starting from the calculus edge, during which, the normal saline was continuously injected into the catheter to maintain the clear surgical field. Next, the water switch on the other side was closed. When the calculi shifted downwards, the ureteroscope was gradually withdrawn and concurrently conducted lithotripsy (Figure 5a, b).
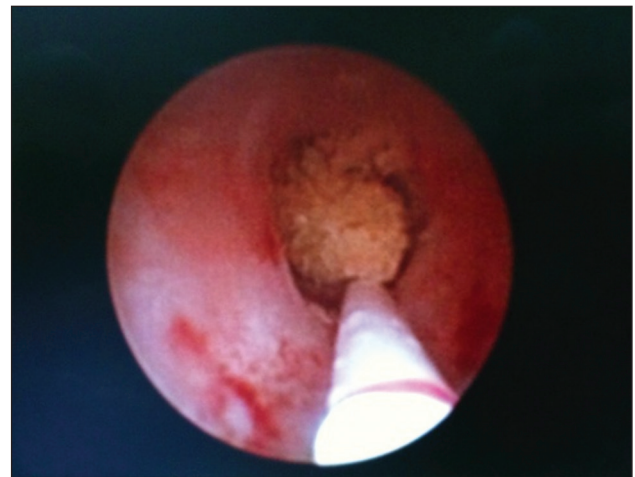
Figure 1. The 4F ureteral catheter was inserted and crossed by the calculus

Table 1. Preoperative clinical data of both groups (mean±SD)

Groups	Total number	Age/years*	Male/female*	Left/right*	Maximal diameter (cm)/range
Modified lithotripsy	31	39.39±11.74	15/16	17/14	1.16±0.27/0.7-1.5
Direct lithotripsy	31	38.23±11.62	14/17	18/13	1.18±0.28/0.7-1.5

*Note: * P>0.05*
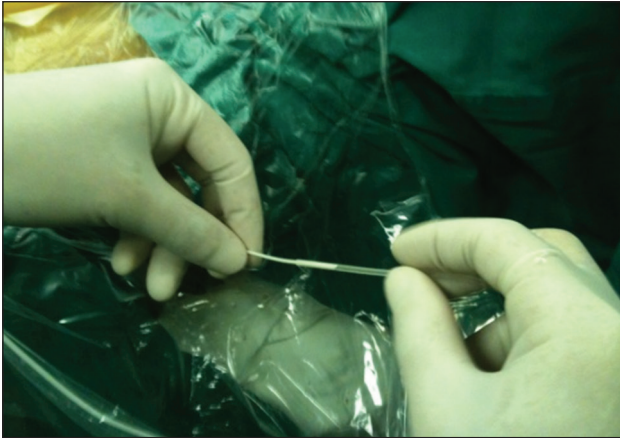
Figure 2a. The tail end of the ureter was connected with a scalp needle extension tube

Figure 2b. A 50ml injector was connected with the tail end of the ureter via the scalp needle extension tube
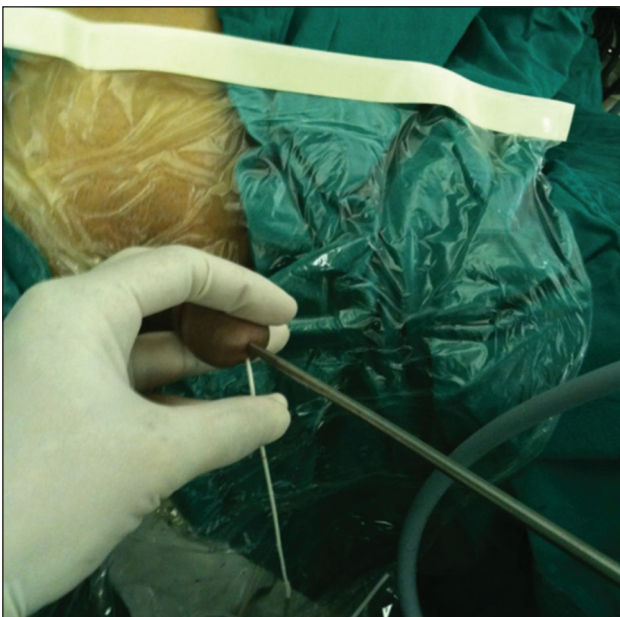
Figure 3. The ureteroscope was inserted again via the external urethral orifice
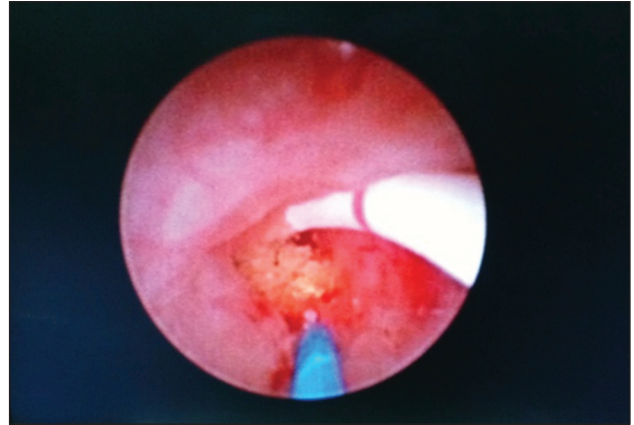
Figure 4. The holmium laser optic fibers were placed to the calculus via the ureteroscopic channel
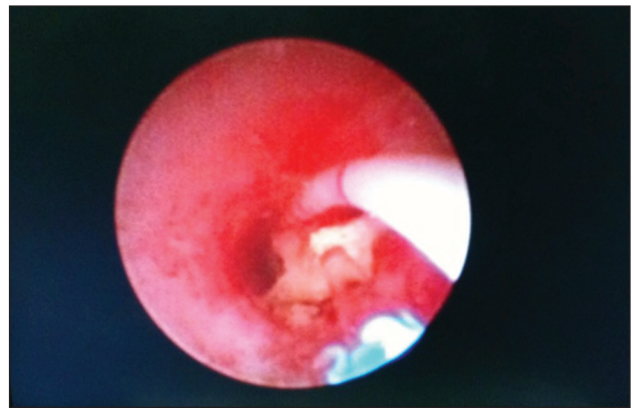
Figure 5a. The ureteroscopy was retragraded while lithotripsy was conducted
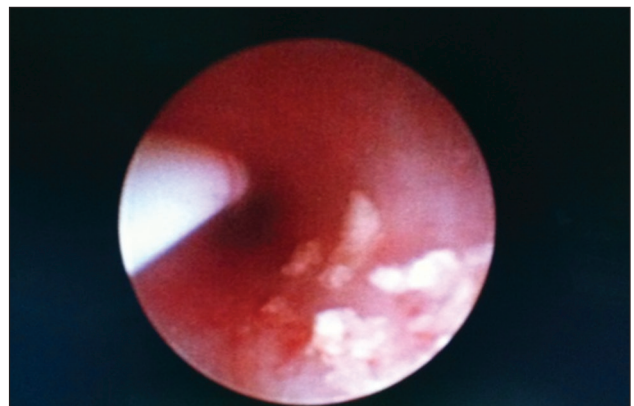
Figure 5b. The ureteroscopy was retragraded while lithotripsy was conducted

Conventional lithotripsy

After the 4F catheter was withdrawn via the operation channel, the holmium laser fibers were placed to fragment the calculi below 2mm.

A 4.7F intra-ureteral support tube (double J tube) and a double-channel ureteral catheter were indwelled conventionally in both groups.

Postoperative management

Within in 3 days post surgery, antibiotics were given to prevent infection. Within 8 hours following surgery, liquid diet was required. On day 1 following surgery, patients could take out-of-bed activities and KUB was conducted for calculus residue and position of double J tube. The urinary catheter was conventionally remained for 1-2 day and then patients were discharged. The double J tube was removed under the cystoscope in weeks 3 to 4 following surgery in Clinic.

Statistical analysis

SPSS11.0 was used for statistical analysis. Measurement data were analyzed using the t test. $P<0.05$ was considered statistically different.

Results

Surgical data

All surgeries were successful. In both groups, no case was transferred to open surgery and no ureter perforation or breakage was reported. One patient in the modified lithotripsy group was transferred to the direct lithotripsy due to the great calculus upward migration and excluded from the study. The total surgical period was 33.90±7.61min vs. 35.23±7.03min in the modified lithotripsy group (n=30) and direct lithotripsy group (n=31) (t=-0.71, P=0.48>0.05) and the lithotripsy period was 8.93±3.29min vs. 12.13±2.68min in both group (t=-4.17, P=0.0001<0.05). All patients discharged within 1-2 days following surgery. The calculus clearance was 100%(30/30) in the modified lithotripsy group and 96.77% (30/31) in the direct lithotripsy group. In the latter group, 1 patient was supplemented with ESWL post surgery due to the calculus upwards migrating to the renal pelvis. Surgical data are shown in Table 2.

Postoperative follow-up

The double J tube was removed within 3 to 4 weeks following surgery. The follow-up period ranged from 3 months to 1 year in both groups. Ultrasonography showed no calculus residue or urinary stricture and disappearing or alleviating dropsy.

Discussions

Since reported by Bagley for the first time in 1995, ureteroscopic holmium laser lithotripsy is extensively applied to treat the urinary calculi within a short time [8]. Holmium laser smashes calculi primarily via the heat effect. During lithotripsy, water on the surface of and within calculi gasificates into globules post absorbing light energies; then globules split and produce shock waves to crush calculi into pieces; and finally, these pieces were discharged from the body [9,10]. The traditional pneumatic lithotripsy crushes the calculi into pieces by the mechanical vibration, which generally starts from the calculus center. As a result, the entire calculus may be divided into severe big pieces, most of which require a secondary comminution, and relatively big pieces may be washed out of the visual field or to the renal pelvis, with a high possibility of piece residue. Current holmium laser lithotripsy used in clinical practice can achieve a 10KW pulsed peak powder, which is enough to comminute calculi with various components and density. In this study, calculi could be communited into pieces of less than 2mm by the edge nibbling method with the appropriate laser power and frequency. Therefore, ureteroscopic holmium laser lithotripsy is associated with a higher efficiency and less calculus residues as compared to the pneumatic lithotripsy and has been the standard surgical procedure for the middle and lower ureteral calculi [11].

In spite of the advantages aforementioned, the holmium laser lithotripsy has the following limitations: 1. Small and much calculus pieces often made unclear visual field. Thus, the surgeon had to stop operations relevant to lithotripsy and modulate the water switch of the ureteroscopy. Lit-

Table 2. Surgical data of both groups (mean±SD)

Groups	Case/n	Age/year	Left/right	Maximal diameter/cm	Total surgical time/min	Lithotripsy time/min**
Modified lithotripsy	30	39.63±11.86	16/14	1.16±0.27	33.90±7.61	8.93±3.29
Direct lithotripsy	31	38.23±11.62	18/13	1.18±0.28	35.23±7.03	12.13±2.68

*Note: **P>0.05*

hotripsy can be continued only after the calculus pieces precipitate or are washed away, which prolongs the surgical time. 2. Calculus upward migration during surgery is also a difficulty. In a study on combined laser and flexible ureteroscope to treat the upper ureteral calculi by Chow et al., there were still around 25% subjects with calculus upward migration [12]. Hence, the key of successful ureteroscopic holmium laser lithotripsy is to cooperate the laser lithotripsy with a safely, simply and effectively method to prevent the calculus upward migration [4-6].

In this study, artificial water was continuously injected via the 4F urinary catheter to generate the above-down flow to wash away the extensive calculus pieces, keeping a clear surgical field and shortening the lithotripsy time. Also, the ureter pressure above the calculus is increased by the catheter locking the calculus and continuous water injection, which prevents and reduces the calculus upward migration. In this study, the continuous water injection via the ureteral catheter had less surgical time than the conventional direct lithotripsy (P<0.05) without increasing the total surgical time. In the modified lithotripsy group, no patient experienced calculus upward migration with a calculus clearance of 100% while the calculus migrated upward to the renal pelvis in one patient of the direct group and ESWL was required post surgery. The modified method is superior to the conventional method in treatment of middle and lower ureteral calculus.

We draw several conclusions: 1). After confirming that the ureteroscope was in the ureteral cavity, the operation table was elevated rapidly to make the patient's head run up 20-30°, avoiding the calculus upward migration induced by water injection. 2). After identifying the calculus, the influent water is decelerated to avoid that the calculus is washed upwards after the ureteroscope approaches the calculus. At this time, the ureteroscope is swayed to observe the circumference of the calculus and a 4F ureteral catheter is reversely inserted over the calculus with a depth of around 8-10cm to guarantee the impulsive force and prevent the short-range upward migration of the calculus due to the upward force produced by laser lithotripsy. 3). After the ureteral catheter is placed, the water can be injected immediately via the extension tube. During this procedure, the ureteroscope is

turned down or even closed on the premise of clear surgical field, which is beneficial to ensure the above-down artificial water flow. 4). The approximate laser energy/frequency for lithotripsy is 1.5-2.0J/5Hz. On the basis of lithotripsy, the laser energy/frequency should be turned down as can as possible to achieve the small and accurate "fixed fire" lithotripsy, reducing the great quantity of stone fog and large broken stone and avoiding the huge upward force. 5). The calculus is brushed into pieces of less than 2mm using the edge nibbling method and the ureteroscope is withdrawal with lithotripsy continuing when the calculus shifts downwards on the action of the water flow and gravity. Thus, small broken stone power can be washed into the bladder via the curved space parallel to the ureteroscope and ureteral catheter to avoid increasing the calculus removed time induced by repeated usage of lithotomy forceps.

In this study, eligible patients were with the calculus of the diameter of not above 1.5cm, since the larger calculus adheres to the ureter, causing difficult insertion of the 4F ureteral catheter. In the modified lithotripsy group, only 1 patient had a larger calculus (1.5cm) and finally, the direct lithotripsy method was used due to the calculus upward migration during the process of the ureteral catheter placement. In the 31 patients of the modified method, KUB showed no calculus residue and no significant complications were reported with a favourable efficacy. Nevertheless, paracalculous ureteral catheter in ureteroscopic holmium laser lithotripsy is associated with some limitations: 1). Paracalculous ureteral catheter placement is time-consuming, especially in the early development of the surgery, and retrograde catheter placement has some resistance. Certain time is often spent to avoid false passage formation and calculus upward migration during displacement. 2). Paracalculous ureteral catheter and ureteroscope placements can narrow the operation space, causing difficult operations. Therefore, ureteroscope insertion and withdrawal should be very gentle to avoid ureter breakage. 3). Continuous water injection can increase the intrapelvic pressure, causing causative organisms in urinary infection to enter into the renal parenchyma against the current, resulting in the systemic infection or infection diffusion. Therefore, the surgery should be conducted in the absence of urinary infection. After paracalculous ureteral catheter placement, the upper ureteral fluid

drained from the catheter end should be observed and in the presence of purulent hydrops, the water injection pressure should not be too high to avoid the purulent hydrops diffusion. Drainage and intravenous anti-infection therapy should be given post surgery [13]. In this study, the modified procedure is associated with a significantly lower lithotripsy time but not the total surgical time than the conventional procedure, possibly because the ureteroscope placement is time-consuming. The total surgical time of the modified procedure is shortened by accumulating experiences on paracalculous ureteral catheter placement and lithotripsy operations.

In conclusion, intraoperative paracalculous ureteral catheter and continuous antegrade perfusion does not increase total operation time in ureteroscopic holmium laser lithotripsy. It can maintain clear operation field and favorable stone removal, resulting in less time of stone clearance during laser lithotripsynes. It has important clinical value to use paracalculous ureteral catheter in laser lithotripsy.

Acknowledgments

References

1. Elashry OM, Elgamasy AK, Sabaa MA, Abo-Elenien M, Omar MA, Eltatawy HH, El-Abd SA. Ureteroscopic management of lower ureteric calculi: a 15-year single-centre experience. BJU Int. 2008; 102(8): 1010-7.

2. Nabi G, Downey P, Keeley F, Watson G, McClinton S. Extra-corporeal shock wave lithotripsy (ESWL) versus ureteroscopic management for ureteric calculi. Cochrane Database Syst Rev. 2007; 24(1): CD006029.

3. Preminger GM, Tiselius HG, Assimos DG, Alken P, Buck AC, Gallucci M, Knoll T, Lingeman JE, Nakada SY, Pearle MS, Sarica K, Türk C, Wolf JS Jr. 2007 Guideline for the management of ureteral calculi. Eur Urol. 2007; 52(6): 1610-31.

4. Zehri AA, Ather MH, Siddiqui KM, Sulaiman MN. A randomized clinical trial of lidocaine jelly for prevention of inadvertent retrograde stone migration during pneumatic lithotripsy of ureteral stone. J Urol. 2008; 180: 966-968.

5. Kesler SS, Pierre SA, Brison DI, Preminger GM, Munver R. Use of the Escape™ nitinol stone retrieval basket facilitates fragmentation and extraction of ureteral and renal calculi: A Pilot Study. J Endourol. 2008; 22(6): 1213-1218.

6. Springhart WP, Tan YH, Albala DM, Perelman J, Teichman JM, Preminger GM. Use of stone cone minimizes stone migration during percutaneous nephrolithotomy. Urology. 2006; 67: 1066-1068.

7. Farahat YA, Elbahnasy AE, Elashry OM. A randomized prospective controlled study for assessment of different ureteral occlusion devices in prevention of stone migration during pneumatic lithotripsy. Urology. 2011; 77(1): 30-5.

8. Bagley D, Erhard M. Use of the holmium laser in the upper urinary tract. Tech Urol. 1995; 1(1): 25-30.

9. Teichman JMH, Vassar GJ, Bishoff JT, et al. Holmium YAG lithotripsy yelds smaller fragments than lithoclast, pulsed dye laser or electrohydraulic lithotripsy. J Urol 1998; 159: 17.

10. Nuttall MC, Abbaraju J, Dickinson IK, Sriprasad S. A review of studies reporting on complications of upper urinary tract stone ablation using the holmium:YAG laser. Brit J Med Surg Urol. 2010; 3(4): 151-159.

11. Kauer PC, Laguna MP, Alivizatos G, Joyce A, Muschter R, Swartz R, Tolley D, de la Rosette JJ; ESUT. Present practice and treatment strategies in endourological stone management: results of a survey of the European Society of Uro-technology (ESUT). Eur Urol 2005; 48: 182-188

12. Chow GK, Blute ML, Patterson DE, et al. Ureteroscopy: update on current practice and long term complications. J Urol. 2001; 165(2): 71.

13. Leijte JA, Oddens JR, Lock TM. Holmium laser lithotripsy for ureteral calculi: predictive factors for complications and success. J Endourol. 2008; 22(2): 257-60.

Corresponding Author
Jian-guang Qiu,
Department of Urology,
The Third Affiliated Hospital,
SUN Yet-sen University,
Guangzhou,
China,
E-mail: qiu190019@163.com

Quantitative characteristics of digito-palmar dermatogliphic complex among men with schizophrenia in Serbia

Miodrag Stosljevic[1], Milosav Adamovic[2], Fadilj Eminovic[2], Aleksandar Damjanovic[3], Gerin Ahmo[4]

[1] Institute for Psychophysiological Disorders and Speech Pathology,"Prof.dr Cvetko Brajovic", Belgrade, Serbia,
[2] Faculty for Special Education and Rehabilitation, University in Belgarde, Serbia,
[3] Clinical Centar of Serbia, Institute of Psychiatry, Belgrade, Serbia,
[4] Department of Forensic Psychiatry Orebro, Sweden.

Abstract

Introduction: Dermatogliphics is a science that studies dermal prints (dermatogliphs) on volar side of palms and soles. Dematogliphs are specific for every person thus by studying them we can determine a series of parameters which can help us diagnose and treat the examined persons.

Objective: Research's objective was to determine possible differences in dermatogliphic characteristics of digito-palmar complex (DPC) among schizophrenic patient and healthy population.

Method: The research was conducted on 32 persons with schizophrenia aged from 22 to 34 (average: years old) while control group consisted of 32 healthy men age from 25 to 35 (average: years old). In the scope of digital DPC part we examined a number of dermal ridges on each finger separately (FRC - finger ridge count) and total dermal ridge count on all ten fingers (TRC - total ridge count). With palmar DPC part we measured angles between tri-aradius (atd, dat, adt, atb, btc, ctd) as well as dermal ridges count between triradius a-b, b-c i c-d.

Results: Our research results show that when compared with healthy population, schizophrenic patients have higher RC on second and fifth finger of both hands, higher TRC, higher ab-RC and atd-angle higher also.

Conclusion: Dermatogliphic analysis can be useful in the process of diagnosing schizophrenia but only as an additional method, and never as a dominant diagnostic procedure.

Key words: Schizophrenia, dermatogliphs, a-b count, atd angle.

Introduction

Dermatogliphics is a science which examines dermal prints (dermatogliphs) on volar side of palms and soles. American scientists Cummins H. and Middle C. used the term dematogliphs to describe dermal lines for the first time in 1926, and that same year on the National Congress of American Anatoms and Morphologists (NCAAM) dermatogliphics was officially verified as a branch of medical science [1].

Schiciphrenic patients' dermatogliph markers are well studied in expert literature, therefore the signicicant number of reserchers delt relatively with this problem even during the 50-ies of XX centuy [2.3]. It is well known that skin and brain are develop from the same ectoderm, so dermatogliph markers can provide certain information on early development brain demage among schicophrenic patients [4].

"When we talk about etiological factors of schicofrenia, than as the mostly importnat we should mention early brain demages. Contemporary theories consider that schicophrenia appears as the late consequence of early brain demage, thus abnormal neurodevelopment occures. The damage can appear as a result of reduced nerve fibers 'activity, abnormal migration of neurons, disorder in the process of myelination. All these abnormalities come as a consequence of genetic disorders, but they can also appear during intrauterine and perinatal period…" [5]

Dermatogliphs of fingers and volar side of palms are formed from 11-24 weeks of the intrauterine period [6], so it is assumed that this is the period during which it might come to the disorder in brain development [7], in other words it is a critical period in etiology of schizophrenia [8].

In any way, evident origin of cerebral abnormalities among psychotic patients remains unknown, so studying the connection between dermatogliphic characteristics and etiology of schizophrenia might be of crucial significance in daily practice with these examinees, and also with patients who suffer from neurotic disorders, such as panic disorder [9]. Truth be told, in expert literature we can also find researches that completely negate the connection between the dermatogliph findings and schizophrenia [10,11].

Therefore, the significant number of works, with often contradictory results, and the inexistence of similar studies in this area in Serbia, were the reasons for which we decided to conduct this research with the aim to determine possible differences in dermatogliphic characteristics of Digito Palmar Complex (DPC) between schizophrenic men and healthy population.

Objective

Research's objective was to determine possible differences in dermatogliphic characteristics of digito-palmar complex (DPC) among schizophrenic patient and healthy population.

Method

The research was conducted on 32 persons with diagnosed schiyophrenia aged from 22 to 34 (average 28 years old), while control group consisted of 32 healthy men aged from 25 to 35 (average 30 years old). The examinees with schiyophrenia mainly belonged to the simplex form, and less to the hebephrenic form, while olny two examinees belonged to the paranoid form.

Examinees were processed dermatoglyphicaly in the Institute for Psychophysiological Disorders and Speech Patology „prof dr. Cvetko Brajovic" (Serbia) and in the "Stosljevic" Ordination (Serbia), to where the examinees were reffered by the recomendation of the attending psychiatrist who did diagnose schizophrenia. The research was conducted during the period 2000-2010.

To collect DPC prints, in order to identify and classify dermatogliphs, we decided to use the digital scanning method following the protocols of Kuminsa and Midloa[12] and Penrosea[13].

We defined the dermatogliphs of palmar areas using the common scanner "Canon" (CanoScan 9000F) combined with the software for digital image editing "VectorMagic" (Picture 1.).
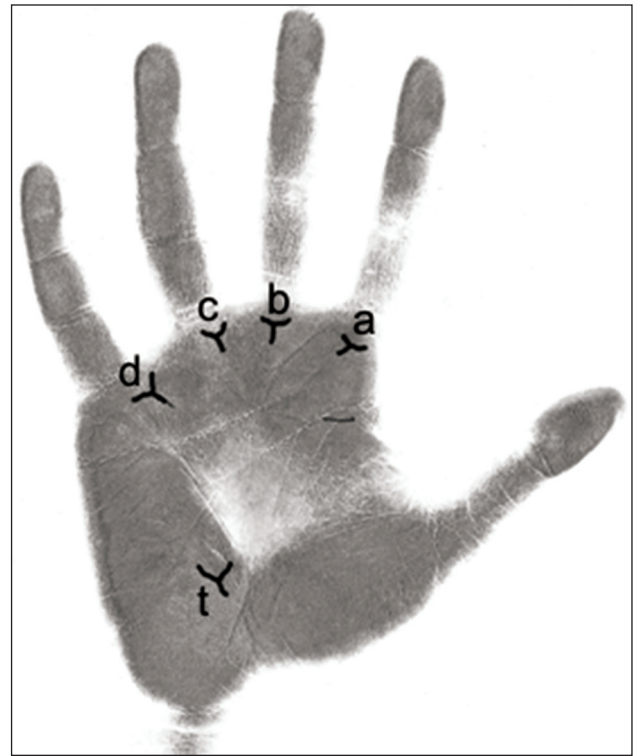
Picture 1. Digital hand print edited by "VectorMagic"software

We defined the dermatogliphic patterns on fingertips using the specialized scanner (AET62 NFC, producer: Advanced Card Systems Ltd.) combined with the "VeriFinger" software which semi-automatically transforms the data from natural to graphically readable form (Picture 2).

Naturalni otisak/ Natural print

Obrađeni otisak/ Edited print
Picture 2. Digital fingertip print edited by "Veri-Finger" software

While selecting variables we decided to use the quantitative DPC analysis. This implies that in digital DPC area we examined the number of dermal ridges on each finger separately (FRC - finger ridge count), as well as the total number of dermal ridges on all ten fingers (TRC - total ridge count). At DPC palmar area we measured angles between triradius (atd, dat, adt, atb, btc, ctd) as well as dermal ridge count (RC – ridge count) between triradius a-b, b-c i c-d.

Triradius is the point in which all tree nearly parallel lines meet. These fields form angles of 120° and separate the tree regions. To be able to even

talk about triradius in general, it is important that the mutual angle of the lines, which the triradius are formed from, have at least 90°. Picture 1. shows triradius *a, b ,c, d* and *t* and by connecting them we get the above mentioned dermatogliphic markers.

Gained results of quantitative analysis were compared by Student t-test in SPSS program (version 17.0.) where we considered the p-value ≤ 0.05 to be significant.

Results

During the collection of dermatogliphic findings, patients were under the therapy, therefore they showed lower number of positive symptoms, such are acoustic hallucinations, thought withdrawal phenomenon, mind control, relation ideas; and higher number of negative symptoms, such as emotional emptiness, indifference which led to complete disinterest, various speech disorders (neologisms, uniformity, abilia).

The DPC quantitative analysis means statistical comparison of numeric values which were gained by counting dermal ridges and by measuring angles between triradius. Results of quantitative DPC analysis of digital area among schizophrenic patients and control group are shown in Table 1. In these results we noticed statistical significance for FRC variable of second and fifth finger of both hands (p<0,05) as well as for dermal ridge count variable

Table 1. Results of quantitative digital DPC area analysis of schizophrenic patients and control group

Localization of dermal ridges		Experimental group	Control group	P
		Mean±SD AS+SD	Mean±SD AS+SD	
Right hand	First finger	18.98±3.16	18.54±2.84	>0.05
	Second finger	13.85±2.35	11.35±2.89	**<0,05**
	Third finger	11,87±2,41	12,36±2,64	>0,05
	Fourth finger	14,15±2,87	14,43±2,93	>0.05
	Fifth finger	13,27±2,83	11,82±2,98	**<0,05**
	Total	72,12±3,99	68,50±4,01	**<0,001**
Left hand	First finger	19,45±3,18	18,94±3,76	>0,05
	Second finger	12,38±2,96	10,80±2,94	**<0,05**
	Third finger	13,02±2,74	2,89±3,12	>0,05
	Fourth finger	12,31±2,24	12,02±2,83	>0,05
	Fifth finger	15,32±3,12	13,04±2,32	**<0,05**
	Total	70,38±3,94	67,69±4,06	**<0,01**
Total count on ten fingers (TRC)		142,50±6,88	136,19±6,03	**<0,001**

on five fingers of right hand (p<0,001) and for the five fingers of left hand p<0,001). We defined the significant difference for the TRC variable (p<0,001) also. Results of DPC quantitative analysis of palmar area among schizophrenic patients and control group are shown in Table 2. From these results we can conclude the statistical significance for the atd-angle (p<0,05) and ab-number (p<0,05) on both hands.

For the rest of the examined variables we could not determine the existence of statistical significance.

Discussion

Avila M.T. et al. in their work, have proposed the hypothesis that the schizophrenia is a result of the interaction between certain genetic factors and non-specific insults during embryonic development, and that dermatogliphic abnormalities are the signs of these alleged insults, thus these insults can provide information about the time schedule of formation of aberration at this level of early development. In any way, the number of researches provides evidence that dermatogliphic deviations exist in at least some of the patients with schyzophrenia [7].

Table 2. Results of quantitative palmar DPC area analysis of schizophrenic patients and control group

Type and localization of dermatoglyphic markers		Experimental group Mean±SD AS+SD	Control group Mean±SD AS+SD	P
Right hand	Atd Angle	46,20±1,24	42,17±1,25	**<0,05**
	Dat Angle	58,79±0,78	58,15±0,72	>0,05
	Adt Angle	82,25±1,25	81,63±1,23	>0,05
	Atb Angle	15,97±1,12	15,33±0,95	>0,05
	Btc Angle	12,83±0,45	12,01±1,13	>0,05
	Ctd Angle	14,00±0,66	13,28±0,71	>0,05
	a-b number	4,61±0,92	31,61±0,98	**<0,05**
	b-c number	24,13±0,84	5,75±0,56	>0,05
	c-d number	33,22±0,89	4,88±1,15	>0,05
Left hand	Atd Angle	48,31±1,65	43,06±1,37	**<0,05**
	Dat Angle	58,04±0,83	58,87±0,88	>0,05
	Adt Angle	83,34±1,15	82,21±1,65	>0,05
	Atb Angle	16,28±1,12	15,72±1,45	>0,05
	Btc Angle	11,86±0,85	11,27±0,97	>0,05
	Ctd Angle	14,18±0,83	14,89±1,01	>0,05
	a-b number	36,93±0,72	32,45±0,88	**<0,05**
	b-c number	25,88±0,69	25,59±0,95	>0,05
	c-d number	34,78±1,73	33,34±1,28	>0,05

Therefore research of Sivkov S.T et al. showed that TRC was significantly higher among schizophrenic examinees rather than among the control group, and statistically significant difference appeared on second and fifth finger of the right hand, and also on the first, second and fifth finger of the left hand, which was very similar to the findings that we have got from our research [14]. Kelly B.D. et al. proved that TRC is a sensitive market in diagnosing schizophrenia, in the same research they determined that there was a possibility that some unidentified event during period from 6 to 15 week of gestation might cause the appearance of schizophrenia among monozygotic twins and this can be in relation with higher TRC[15].

In our research we have found evidence of presence of statistical significance in ABRC among schizophrenic examinees and control group, which is in complete accordance with a number of researches that can be found in available literature, such as Feraona P. et al., Fatjo-Vilasa M. et al, Bramona E. et al. [16, 17, 18]. What is more, with careful analysis of these results, we can determine that the most of the mentioned authors are in accordance with the idea that this dermatogliphic marker is one of the most sensitive parameters in the process of diagnosing schizophrenia.

In addition to the above, in our research, we have determined that the ATD angle was increased among schizophrenic patients, which was also proved by Balgir R.S. et al., therefore we can ascert that while diagnosing schizophrenia we must pay attention to this dermatogliphic marker [19].

Conclusion

Results of our researches show that schizophrenic patients have higher RC on second and fifth finger of hands, higher TRC and higher ab-RC, as well as higher atd-angle, compared with healthy population. Based on that we can assume that dermatogliphic analysis might be helpful in the process of diagnosing schizophrenia but only as the supplement method, and never as the dominant diagnostic procedure.

References

1. Stošljević LM, Adamović M. Clinical dermatoglyphic as preventive branch of special education, Disabilities and Disorders: Phenomenoloy, Prevention and Treatment, Faculty of special education and rehabilitation, 2010: 303-314.

2. Wendt G.G, Zell W. Schizophrenia and the fingerprints, Arch Psychiatr Nervenkr Z Gesamte Neurol Psychiatr. 1951; 186(5): 456-63.

3. Raphael T, Raphael IG. Fingerprints in schizophrenia, JAMA. 1962 Apr 21; 180: 215-9.

4. Van Oel CJ, Baaré WF, Hulshoff Pol HE, Haag J, Balazs J, Dingemans A et all. Differentiating between low and high susceptibility to schizophrenia in twins: the significance of dermatoglyphic indices in relation to other determinants of brain development, Schizophr Res. 2001 Dec 1; 52(3): 181-93.

5. Jašović Gašić, M. Marić N. Shizofrenija, u: Jašović Gašić, M. Toševski-Lečić, D. (urd), Psihijatrija, Medicinski fakultet, Beograd 2007.

6. Sabancıoğulları V1, Koşar Mİ1, Sönmez M1, Sarıönder Gencer E2, Tetiker H1, Bolayır E2, Çimen M1. Dermatoglyphic features in patients with Idiopathic Epilepsy. HealtMED. 2011, Vol. 5, No. 1: 78-84.

7. Avila MT, Sherr J, Valentine LE, Blaxton TA, Thaker GK. Neurodevelopmental interactions conferring risk for schizophrenia: a study of dermatoglyphic markers in patients and relatives. Schizophr Bull. 2003; 29(3): 595-605.

8. Chok JT, Kwapil TR, Scheuermann A. Dermatoglyphic anomalies in psychometrically identified schizotypic young adults. Schizophr Res. 2005 Jan 1; 72(2-3): 205-14.

9. Vedat Sabanciogullari, E. Erdal Ersan, Orhan Dogan, Selma Dogan and Selma Sabanciogullari. Dermatoglyphic characteristics in panic disorder. HealtMED. 2010, Vol 4, No. 2: 366-372.

10. Rosa A, Marcelis M, Suckling J, Hofman P, Bullmore E, Delespaul P, et all. Nonreplication of the association between ab-ridge count and cerebral structural measures in schizophrenia. Compr Psychiatry. 2003 Nov-Dec; 44(6): 459-61.

11. Rosa A, Cuesta MJ, Peralta V, Zarzuela A, Serrano F, Martínez-Larrea A, et all. Dermato-glyphic anomalies and neurocognitive deficits in sibling pairs discordant for schizophrenia spectrum disorders. Psychiatry Res. 2005 Dec 15; 137(3): 215-21

12. Cummins H, Middle C. Fingerprint, Palms and Soles, Dover, New York; 1961.

13. Penrose LS. Memorandum of dermatoglyphic nomenclature, Birth Defect. 1968; 4: 1-12

14. Sivkov ST, Akabaliev VH, Kaleva NN Comparative dermatoglyphic study of schizophrenic patients: evidence of the neurodevelopmental model of schizophrenia.Folia Med (Plovdiv). 2009 Jul-Sep; 51(3): 25-30.

15. Kelly BD, Cotter D, Denihan C, Larkin D, Murphy P, Kinsella A, Neurological soft signs and dermatoglyphic anomalies in twins with schizophrenia.

16. Eur Psychiatry. 2004 May; 19(3): 159-63.

17. Fearon P, Lane A, Airie M, Scannell J, McGowan A, Byrne M Is reduced dermatoglyphic a-b ridge count a reliable marker of developmental impairment in schizophrenia? Schizophr Res. 2001 Jul 1; 50(3): 151-7.

18. Fatjó-Vilas M, Gourion D, Campanera S, Mouaffak F, Levy-Rueff M, Navarro ME New evidences of gene and environment interactions affecting prenatal neurodevelopment in schizophrenia-spectrum disorders: a family dermatoglyphic study. Schizophr Res. 2008 Aug; 103(1-3): 209-17. Epub 2008 Jun 26.

19. Bramon E, Walshe M, McDonald C, Martín B, Toulopoulou T, Wickham H, Dermatoglyphics and Schizophrenia: a meta-analysis and investigation of the impact of obstetric complications upon a-b ridge count. Schizophr Res. 2005 Jun 15; 75(2-3): 399-404.

20. Balgir RS, Murthy RS, Wig NN. Genetic loadings in schizophrenia: a dermatoglyphic study. Isr J Med Sci. 1993 May; 29(5): 265-8.

Corresponding Author
Fadilj Eminovic,
Faculty for Special Education and Rehabilitation,
University in Belgarde,
Serbia,
E-mail: eminovic73@gmail.com

Nucleoside reverse transcriptase inhibitors alter preadipocyte and adipocyte in vitro

Meimei Tao[1,2,3], Jiqiu Kuang[2], Ming Li[3], Taisheng Li[2]

[1] Department of Respiration, Meitan general hospital, Beijing, China,
[2] Department of Infectious Diseases, Peking Union Medical College Hospital and AIDS Research Center, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, China,
[3] Department of Endocrinology, Peking Union Medical College Hospital, Chinese Academy of Medical Science; Key Laboratory of Endocrinology, Ministry of Health, Beijing China.

Abstract

Background: *Nucleoside Reverse Transcriptase Inhibitors* (*NRTI*s) are suspected of participating in peripheral fat loss in patients during long-term treatment with antiretroviral drugs.

Method: We compared the effects of stavudine (D4T), zidovudine (AZT) and didanosine (ddI) with different concentrations on the proliferation, differentiation and secretion in 3T3-L1 preadipocytes and adipocytes.

Results: Zidovudine and stavudine could decrease the proliferation index (PI) of preadipocytes. Zidovudine, stavudine and didanosine could lead to the decline of preadipocytes viability in MTT assay. Stavudine and zidovudine (10 µg/ml) could markedly reduce the number of oil red-positive cells and result in the less secretion of adiponectin of differentiated adipocytes. Only stavudine (10 µg/ml) resulted in the less secretion of insulin-like growth factor-1 (IGF-1) in proliferation and differentiation medium. In contrast, didanosine could increase the secretion of adiponectin in the differentiation medium and IGF-1 in the proliferation medium.

Conclusion: Stavudine and zidovudine (10 µg/ml) may lead to lipodystrophy syndrome by impairing the proliferation, differentiation and secretion of preadipocytes. Didanosine appeared to be less harmful compared with zidovudine and stavudine in lipodystrophy syndrome.

Key words: Lipodystrophy, stavudine, zidovudine, didanosine, proliferation.

Introduction

Combination antiretroviral therapy for HIV infection is frequently associated with HIV-related lipodystrophy syndrome (HIV-LD), the prevalence of which varies from 28% to 55% [1,2]. *Nucleoside Reverse Transcriptase Inhibitors* (*NRTI*s) are important drugs in HIV treatment, which block reverse transcriptase and disrupt the replication of HIV by preventing the transformation from RNA to DNA. However, increasing evidence indicate that *NRTI*s are an independent risk factor for HIV-LD. The loss of peripheral subcutaneous fat is the prominent signs of HIV-LD. Several pathophysiological mechanisms have been proposed to explain the NRTIs-associated lipoatrophy, including the impairment of mitochondrial DNA (mtDNA) replication [3], the induced mitochondrial dysfunction [4], changes of cytokines [5]. Moreover, it was recently found that *NRTI*s could lead to loss of fat tissue by affecting proliferation of preadipocytes [6].

In China, highly active antiretroviral therapy (HAART) was widely used since 2002. NRTIs were major drugs in the treatment programs. Although stavudine, zidovudine and didanosine were not preferred in western countries, they were still applied broadly in China. There have been reports about lipodystrophy when HIV-positive patients were given an antiretroviral therapeutic regimen containing zidovudine, didanosine, stavudine [7,8,9]. Based on the hypothesis that lipodystrophy is a consequence of region-specific disturbances in adipocyte number due to the imbalance between apoptosis and differentiation, several studies have focused on a possible direct effect of antiviral drugs on preadipocytes or murine preadipocyte cell lines in vitro culture experiments [10,11]. However, most studies paid more attention to the effects of NRTI on differentiation and adipocytokine secretion. To our knowledge, few researches have involved the effect of NRTIs on proliferation and cell viability.

The 3T3-L1 murine cell line is one of the most widely used and well-characterized models for the study of adipocyte differentiation and func-

tion [12,13]. We therefore compared the effects of three NRTI: stavudine (D4T), zidovudine(AZT) and didanosine(ddI) on preadipocytes and differentiated 3T3-L1 adipocytes in terms of proliferation, differentiation and adipocytokine secretion.

Materials and methods

Cell culture

Murine 3T3-L1 preadipocytes were obtained from institute of basic medical sciences, Chinese Academy of Medical Sciences, Peking Union Medical College. 3T3-L1 preadipocytes were maintained in Dulbecco's Modified Eagle's Medium/ F12 (DMEM/F12, Invitrogen USA) containing 10% fetal calf serum (FCS) and 2 mM L-glutamine and incubated at 37°C in a humidified atmosphere of 5% CO2. Culture medium was changed every 2 days until the cells were used for proliferation or differentiation assays.

Antiretroviral drugs

Stavudine, zidovudine and didanosine were purchased from Desano Co, Ltd. Drugs stock in dimethyl sulfoxide (DMSO) were stored at -20℃ and diluted into culture media. Control medium also have the same final DMSO concentrations as that in the medium with drugs.

Preadipocyte proliferation and viability assays

Firstly, proliferation was evaluated by flow cytometry. 5- (and 6-) carboxy fluorescein diacetate succinimidyl ester (CFSE) was dissolved in dimethyl sulfoxide at a concentration of 5 mM (stock solution). 3T3-L1 preadipocytes were trypsinized from $25cm^3$ culture bottle, then adjusted to $1 \times 10^7 \sim 5 \times 10^7$ cells/ml in phosphate buffered saline (PBS). The final concentration of CFSE in cell suspension was 0.2 μM. Cells were vortexed and incubated at 37°C for 5 min in the dark. At the end of the staining period, the cells were washed at least two times with PBS and plated on 24 well plates at 10^4 cells per well. After 24 hours, the medium was replaced with fresh medium containing stavudine, zidovudine and didanosine at different concentrations (0.1,1,10 μg/ml).

Preadipocytes were digested and washed, then measured by flow cytometry every two days until day 6. Fluorescence was expressed as mean fluorescent intensity (MFI). MFI declined when cell proliferated. All experiments were repeated three times. The data obtained were analyzed with Modfit software and expressed as proliferation index (PI).

Secondly, cell viability of preadipocytes was assessed by the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay [14]. Preadipocytes were incubated on 96 well plates at 10^4 cells per well until 24 hours, then continued to grow in the absence or presence of stavudine, zidovudine and didanosine at different concentrations. The absorbance values were measured everyday up to day 6.

Lipid metabolism

3T3-L1 preadipocytes were plated on 24-well plates at 10^5 cells per well. After complete confluence reached (day 0), differentiation was induced as previously described [15]. Lipid accumulation was visually assessed by Oil Red O staining and microscope on day 8. For Oil red O staining, cells were washed twice with PBS, fixed in 3.7% formaldehyde for 1 h, and stained for 30 min with 0.2% (w/v) oil red O solution in 60% (v/v) isopropanol. Cells were then washed several times with water, and excess water was evaporated by placing the stained cultures at approximately 32°C.

Determination of adipokine levels by ELISA

Adiponectin and insulin-like growth factor-1 (IGF-1) concentrations were determined on day 8 of differentiation in 48-h supernatants of 3T3-L1 cells, and IGF-1 was also determined on day 6 of proliferation in 48-h supernatants of 3T3-L1 cells, using the Mouse Adiponectin/Acrp30 and IGF-1 sandwich ELISA kits (R&D systems, Minneapolis, USA).

Statistical analysis

At least three separate experiments were performed for each study. Data are shown as mean ± standard deviation (SD). Statistical differences among different groups were evaluated using one-way analysis of variance (ANOVA) and post hoc Tukey test to compare with the control group.

Results

Effects of zidovudine, stavudine and didanosine on 3T3-L1 preadipocytes proliferation and viability

Based on proliferation index (PI) by flow cytometry, zidovudine (10 µg/ml) and stavudine (10 µg/ml) reduced proliferation on day 6 in 3T3-L1 preadipocytes (by 29% and 42%, respectively) and didanosine-treated cells had approximately normal proliferation levels, as indicated in Figure 1. Figure 2. as a representative histogram of flow cytometry assays. In zidovudine and stavudine groups, the mean fluorescence intensity was higher than control. In didanosine groups, the mean fluorescence intensity had a similar extent compared with control. Above changes showed concentration-dependent trend.
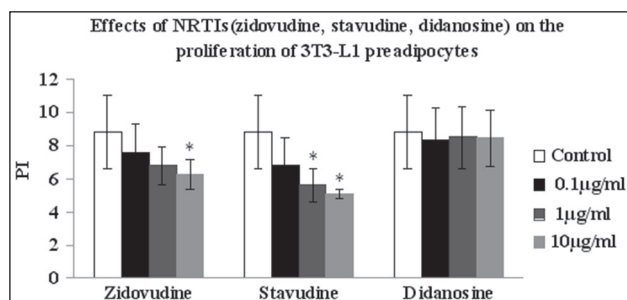
*Figure 1. Effect of NRTIs (AZT, D4T, ddI) on the proliferation of preadipocytes cell line 3T3-L1. Cells were placed in culture dishes and cultured in DMEM supplemented with AZT, D4T and ddI at various concentrations. At 6 day the cells were harvested by trypsinization, and the proliferation was determined using flow cytometry. Bars indicate mean ± SD of 3 independent experiments performed in at least triplicate dishes. *P<0.05*

Based on MTT results in Figure 3, stavudine, zidovudine and didanosine all significantly decreased preadipocytes viability, expressed as decline of cell number. Increasing drug concentrations caused further decline of cell viability.
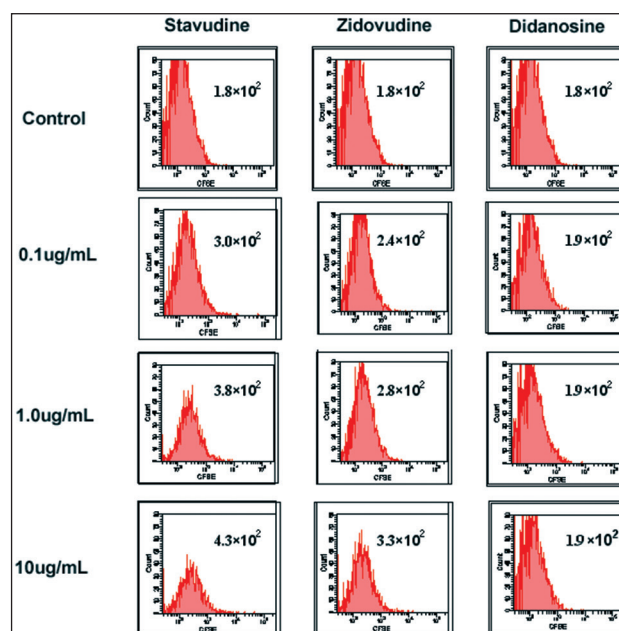
Figure 2. Effect of NRTIs (AZT, D4T, ddI) on the proliferation of preadipocytes cell line 3T3-L1(Histogram of flow cytometry).
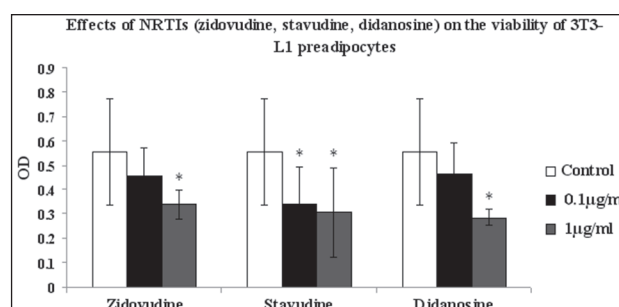
*Figure 3. Effect of NRTIs (AZT, D4T, ddI) on the number of living preadipocytes cell. Cells were placed in culture dishes and cultured in DMEM supplemented with AZT, D4T and ddI at different concentrations. At 6 day the living cells were determined by the MTT assay. *P<0.05*

Effects of stavudine, zidovudine and didanosine on lipid metabolism

3T3-L1 preadipocytes were induced to differentiate in the absence or presence of stavudine, zidovudine and didanosine. Figure 4 showed oil red O staining on 8 days after adipogenic induction. 3T3-L1 cells treated with stavudine (10 µg/ml), zidovudine (10 µg/ml) showed a markedly decrease in oil red-positive cells compared with control group. 3T3-L1 cells treated with didanosine (10 µg/ml) also showed a decrease in oil red-positive cells.
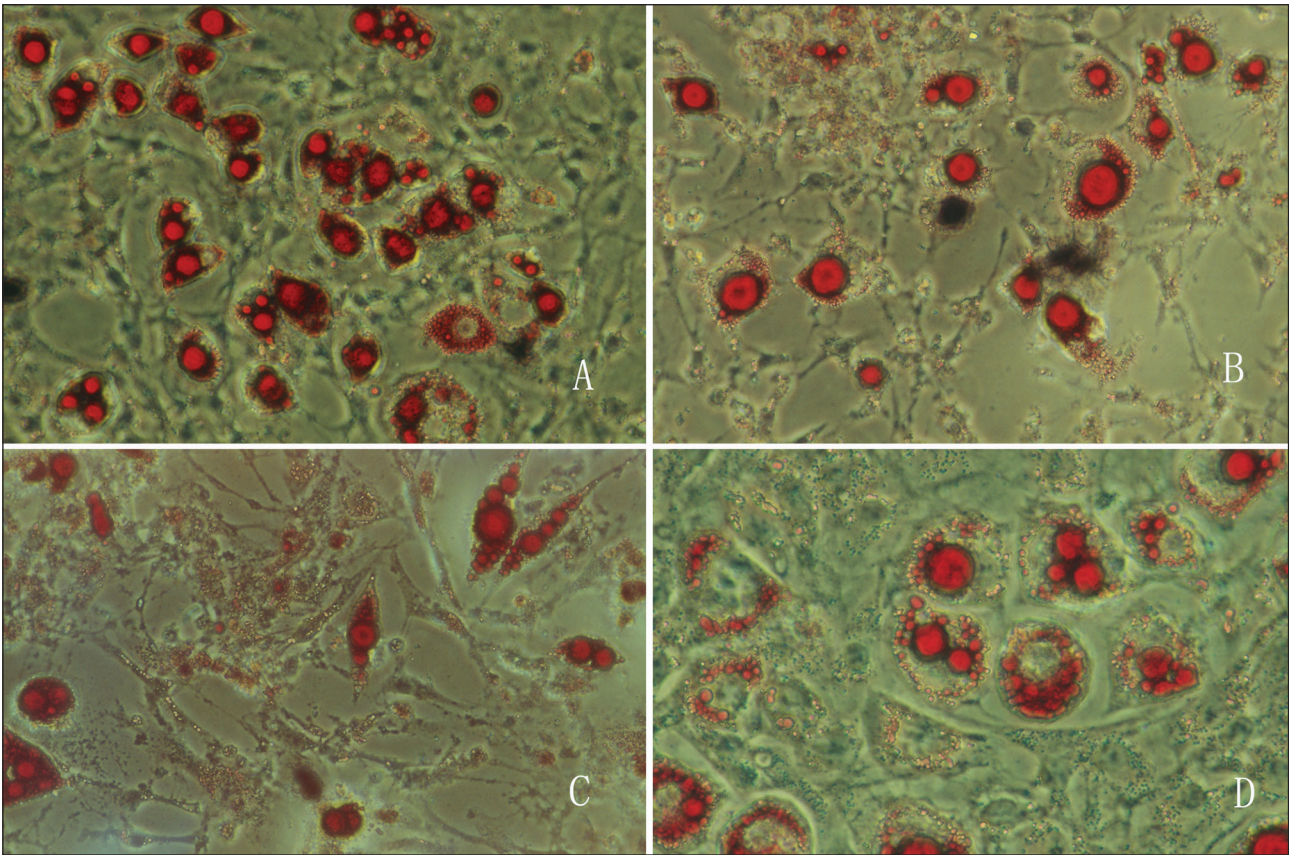
Figure 4. Impaired adipocyte differentiation after exposure to AZT, D4T and ddI. The 3T3-L1 adipocyte phenotype (determined by Oil red O staining of the cells) was examined by conventional fluorescence microscopy at day 8 after the initiation of differentiation in the absence of drug (A) or in the presence of AZT (10 µg/ml) (B), d4T (10 µg/ml) (C), or ddI (10 µg/ml) (D). 3T3-L1 cells treated with AZT, D4T and ddI showed a decrease in oil red-positive cells compared with control group, especially with AZT and D4T

Effects of stavudine, zidovudine and didanosine on adiponectin and IGF-1 secretion in differentiating adipocytes

On the day 8 after differentiation, 10µg/ml zidovudine reduced the adiponectin production by more than 50% compared with the control, and 10µg/ml stavudine was more pronounced, while didanose could increase the secretion of adiponectin in dose-dependent way, as shown in Figure 5. Only 10µg/ml stavudine could result in the less secretion of IGF-1 compared with control group, as shown in Figure 6.
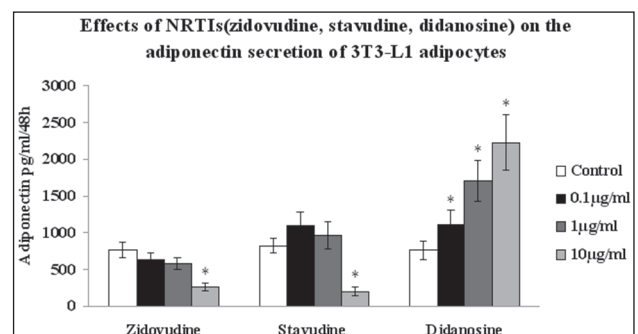
*Figure 5. Effect of NRTIs(AZT, D4T, ddI) on the adiponectin secreted by adipocytes line 3T3-L1. The level of adiponectin was determined by ELISA 8 days after adipogenic induction. Bars indicate mean ± SD of 3 independent experiments performed in at least triplicate dishes. *P<0.05.3T3-L1 cells treated with 10 µg/ml AZT and D4T showed a remarkable decrease in adiponectin compared with the controls. 3T3-L1 cells treated with ddI showed an increase in adiponectin compared with the controls.*
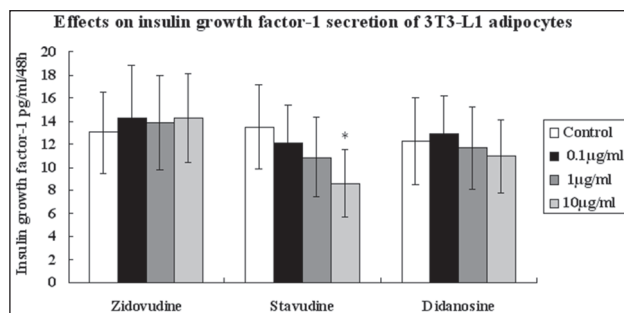
*Figure 6. Effect of NRTIs(AZT, D4T, ddI) on the IGF-1 secreted by adipocytes line 3T3-L1. The level of IGF-1 was determined by ELISA 8 days after adipogenic induction. Bars indicate mean ± SD of 3 independent experiments performed in at least triplicate dishes. *P<0.05. 3T3-L1 cells treated with 10 μg/ml D4T showed a remarkable decrease in IGF-1 compared with the controls.*

Effects of stavudine,zidovudine and didanosine on IGF-1 secretion in proliferating preadipocytes

Only 10μg/ml stavudine resulted in the less secretion of IGF-1 compared with control group in the medium of proliferating preadipocytes, while 1μg/ml and 10μg/ml didanosine could lead to the more secretion of IGF-1 in the medium of proliferating preadipocytes, as shown in Figure 7.
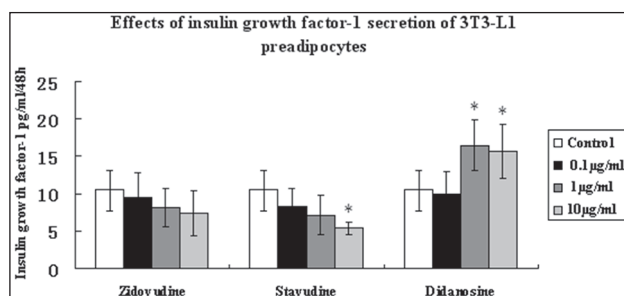
*Figure 7. Effect of NRTIs (AZT, D4T, ddI) on the IGF-1 secreted by preadipocytes line 3T3-L1. The level of IGF-1 was determined by ELISA at 6 day in the proliferating medium. Bars indicate mean ± SD of 3 independent experiments performed in at least triplicate dishes. *P<0.05. 3T3-L1 cells treated with 10 μg/ml D4T showed a remarkable decrease in IGF-1 compared with the controls. 3T3-L1 cells treated with 10 μg/ml ddI showed an increase in IGF-1.*

Discussion

It has been confirmed that subcutaneous lipoatrophy is associated with NRTIs. Adipose tissue mass is determined by both the number and volume of adipose cells. Adipose cell number reflects the balance between cell acquisition and cell loss. Cell acquisition is determined by proliferation and differentiation of preadipocytes, and cell loss occurred via apoptosis of preadipocytes and adipocytes. Adipose cell volume represents the lipid accumulation [16,17]. Vitro studies have discovered mitochondrial toxicity [11,18], apoptosis of adipocytes and change of adipokines induced by NRTIs [19,15]. Previous studies have aimed to proliferation and cell activity [10,11,12]. In different experiments, unequal drug concentrations, test methods and cultured periods lead to inconsistent results. So, we compared the effects of stavudine, zidovudine and didanosine on proliferation, differentiation and adipocytokine secretion in 3T3-L1 cell line.

NRTIs concentration was chosen based on mean plasma concentration in treated patients, in which Stavudine was 0.5-3.4μg/ml, zidovudine 0.1-1.8μg/ml, didanosine 1.0-2.6μg/ml [20].But adipose tissue concentration in treated patients was unclear. So the concentrations of drugs were lower than minimum concentration, above maximum concentration and between the two.

Proliferation of preadipocytes was evaluated by flow cytometry, which had been used to test proliferation of lymphocytes, mesenchymal stem cells and smooth muscular cells and adipocytes [21]. It has been shown that CFSE did not affect activity of preadipocytes, and almost all cells were dyed [22]. Based on the results of CFSE dying method, it was found that stavudine and zidovudine declined the proliferation of preadipocytes in a dose dependent way. Didanosine-treated cells had approximately normal growth. The decline of cell number in all drugs-treated groups was observed in MTT results. This phenomenon might be associated with apoptosis, mitochondria dysfunction [11,18]. MTT could reflect the number of living cells, which is associated with proliferation and death [14], so this assay partly reflects apoptosis of cells, including mitochondrial dysfunction. The advantage of MTT is sensitivity, so this assay is used to test cell proliferation in many cases. Flow

cytometry reflects cell proliferation. In our experiments, there are some differences between MTT results and flow cytometry results based on above reasons. A reduction in the preadipocyte cell number may lead to an overall reduction in adipocyte tissue mass through adipocyte hypoplasia. Preadipocytes were undifferentiated into mature adipocytes and it was an important way to affect overall lipid acquisition through reducing preadipocyte cell number [23,24]. Preadipocytes treated with stavudine or zidovudine could not proliferate effectively, numbers of preadipocytes and mature adipocytes declined significantly in parallel, all of which may lead to lipoatrophy. Caron et al reported that stavudine and zidovudine did not alter cell proliferation or adipogenesis in vitro 3T3-F442A preadipocytes culture [25]. This may be due to the different concentration of stavudine, zidovudine and the methods of evaluating cell proliferation.

Adiponectin is an adipocyte-secreted protein that acts through an endocrine mechanism on its target tissues and plays a positive role in insulin sensitivity. In lipodystrophic and insulin-resistant patients on HAART, adiponectin circulating levels and mRNA expression are reduced in adipose tissue [26,27]. It was reported that stavudine and zidovudine at therapeutic serum maximum concentrations could impair adiponectin production in vitro adipocytes experiments [15,18]. In this study, it was found that stavudine and zidovudine at the highest tested level (10μg/ml) could result in the significantly less secretion of adiponectin in differentiated adipocytes, while didanosine increase the secretion of adiponectin. Adiponectin plays an important role in the process of lipoatrophy. It was found that adiponectin was significantly and inversely associated with central obesity [28]. Another study found that the adiponectin concentration of the HIV-LD patients rose by month 6 and began to decrease substantially by 18th month in a case-control research [9]. Therefore, less secretion of adiponectin may account for HIV-LD through stavudine and zidovudine. However, it was difficult to make it clear whether more secretion of adiponectin through didanosine was protective or compensatory effect in short-term in vitro experiment.

It was reported that IGF-1 stimulated the proliferation of 3T3-L1 preadipocytes in vitro, but it also stimulates differentiation when cells reach confluence [29,30]. Another research found that IGF-1 protect preadipocytes and adipocytes from apoptosis through autocrine circuit [31]. In this study, both stavudine and zidovudine reduced the secretion of IGF-1 in the proliferating preadipocytes medium, while didanosine increased the IGF-1 release. This may partly account for the unchanged proliferation index of 3T3-L1 preadipocytes even when treated with 10 μg/ml didanosine. There has been not paper about the associate between didanosine and IGF-1 in 3T3-L1 cells based on our knowledge.

In summary, it was found that stavudine and zidovudine impaired the proliferation, differentiation and living cell number of 3T3-L1 preadipocytes. In addition, it was also discovered that stavudine and zidovudine reduced the lipid accumulation and adiponectin secretion in differentiated 3T3-L1 cells. This may account for the lipodystrophy syndrome induced by zidovudine and stavudine. Although it was also found that didanosine impaired the differentiation and viability of 3T3-L1 preadipocytes, didanosine increased the adiponectin secretion in differentiated 3T3-L1 cells and IGF-1 in proliferating 3T3-L1 cells. This may account for the fact that ddI combined with either nevirapine or ritonavir-boosted saquinavir over 96 weeks of antiretroviral therapy was possibly not associated with limb fat atrophy, in contrast to when treatment contained ddI, D4T and nelfinavir [32]. This study was based on murine 3T3-L1 preadipocytes culture in vitro. Further studies will be needed to explore drugs effects in vivo.

Acknowledgments

References

1. *Miller J, Carr A, Emery S, Law M, Mallal S, Baker D, Smith D, Kaldor J, Cooper DA: HIV lipodystrophy: prevalence, severity and correlates of risk in Australia. HIV Med. 2003; 4: 293-301.*

2. *Bacchetti P, Gripshover B, Grunfeld C, Heymsfield S, McCreath H, Osmond D, Saag M, Scherzer R, Shlipak M, Tien P; Study of Fat Redistribution and Metabolic Change in HIV Infection (FRAM): Fat Distribution in Men with HIV Infection. J Acquir Immune Defic Syndr. 2005; 40: 121-31.*

3. *Brinkman K, ter Hofstede HJ, Burger DM, Smeitink JA, Koopmans PP: Adverse effects of reverse transcriptase inhibitors: mitochondrial toxicity as common pathway. AIDS. 1998; 12: 1735-44.*

4. *Elimadi A, Morin D, Albengres E, Chauvet-Monges AM, Allain V, Crevat A , Tillement JP: Differential effects of zidovudine and zidovudine triphosphate on mitochondrial permeability transition and oxidative phosphorylation. Br J Pharmacol. 1997; 121: 1295-300.*

5. *Sweeney LL, Brennan AM, Mantzoros CS: The role of adipokines in relation to HIV lipedystrophy. AIDS. 2007; 21: 895-904.*

6. *Stankov MV, Schmidt RE, Behrens GM; German Competence Network HIV/AIDS: Zidovudine impairs adipogenic differentiation through inhibition of clonal expansion. Antimicrob Agents Chemother. 2008; 52: 2882-9.*

7. *Boothby M, McGee KC, Tomlinson JW, Gathercole LL, McTernan PG, Shojaee-Moradie F, Umpleby AM, Nightingale P, Shahmanesh M: Adipocyte differentiation, mitochondrial gene expression and fat distribution: differences between zidovudine and tenofovir after 6 months. Antivir Ther. 2009; 14: 1089-100.*

8. *George JA, Venter WD, Van Deventer HE, Crowther NJ: A longitudinal study of the changes in body fat and metabolic parameters in a South African population of HIV-positive patients receiving an antiretroviral therapeutic regimen containing stavudine. AIDS Res Hum Retroviruses. 2009; 25: 771-81.*

9. *Adler-Wailes DC, Guiney EL, Wolins NE, Yanovski JA: Long-term ritonavir exposure increases fatty acid and glycerol recycling in 3T3-L1 adipocytes as compensatory mechanisms for increased triacylglycerol hydrolysis. Endocrinology. 2010; 151: 2097-105.*

10. *Stankov MV, Lücke T, Das AM, Schmidt RE, Behrens GM: Mitochondrial DNA depletion and respiratory chain activity in primary human subcutaneous adipocytes treated with nucleoside analogue reverse transcriptase inhibitors. Antimicrob Agents Chemother. 2010; 54: 280-7.*

11. *Janneh O, Hoggard PG, Tjia JF, Jones SP, Khoo SH, Maher B, Back DJ, Pirmohamed M: Intracellular disposition and metabolic effects of zidovudine, stavudine and four protease inhibitors in cultured adipocytes. Antivir Ther. 2003; 8: 417-26.*

12. *Nobusue H, Kondo D, Yamamoto M, Kano K: Effects of lysophosphatidic acid on the in vitro proliferation and differentiation of a novel porcine preadipocyte cell line. Comp Biochem Physiol B Biochem Mol Biol. 2010; 157: 401-17.*

13. *Hansen MB, Nielsen SE, Berg K: Re-examination and further development of a precise and rapid dye method for measuring cell growth/cell kill. J Immunol Methods. 1989; 119: 203-10.*

14. *Stankov MV, Lucke T, Das AM, Schmidt RE, Behrens GM: German Competence Network HIV/AIDS. Relationship of mitochondrial DNA depletion and respiratory chain activity in preadipocytes treated with nucleoside reverse transcriptase inhibitors. Antiviral Therapy. 2007; 12: 205-16.*

15. *Ailhaud G, Grimaldi P, Negrel R: Cellular and molecular aspects of adipose tissue development. Annu Rev Nutr. 1992; 12: 207-33.*

16. *Prins JB, O'Rahilly S: Regulation of adipose cell number in man. Clin Sci. 1997; 92: 3-11.*

17. *Jones SP, Qazi N, Morelese J, Lebrecht D, Sutinen J, Yki-Järvinen H, Back DJ, Pirmohamed M, Gazzard BG, Walker UA, Moyle GJ: Assessment of adipokine expression and mitochondrial toxicity in HIV patients with lipoatrophy on stavudine- and zidovudine-containing regimens. J Acquir Immune Defic Syndr. 2005; 40: 565-72.*

18. *Nolan D, Hammond E, Martin A, Taylor L, Herrmann S, McKinnon E, Metcalf C, Latham B, Mallal S: Mitochondrial DNA depletion and morphologic changes in adipocytes associated with nucleoside reverse transcriptase inhibitor therapy. AIDS. 2003; 17: 1329-38.*

19. *Roche R, Poizot-Martin I, Yazidi CM, Compe E, Gastaut JA, Torresani J, Planells R: Effects of antiretroviral drug combinations on the diferentiation of adipocytes. AIDS. 2002; 16: 13-20.*

20. *Raposio E, Guida C, Coradeghini R, Scanarotti C, Parodi A, Baldelli I, Fiocca R, Santi PL : In vitro polydeoxyribonucleotide effects on human pre-adipocytes. Cell Prolif. 2008; 41: 739-54.*

21. *Hemmrich K, Meersch M, von Heimburg D, Pallua N: Applicability of the dyes CFSE, CM-DiI and PKH26 for tracking of human preadipocytes to evaluate adipose tissue engineering. Cells Tissues Organs. 2006; 184: 117–27.*

22. Yeo CR, Lee SM, Popovich DG: Ginseng (Panax quinquefolius) reduces cell growth, lipid acquisition and increases adiponectin expression in 3T3-L1 cells. Evid Based Complement Alternat Med. 2011; 2011: 610625.

23. Camp HS, Ren D, Leff T: Adipogenesis and fat-cell function in obesity and diabetes. Trends Mol Med. 2002; 8: 442-7.

24. Caron M, Auclair M, Lagathu C, Lombès A, Walker UA, Kornprobst M, Capeau J: The HIV-1 nucleoside reverse transcriptase inhibitors stavudine and

25. zidovudine alter adipocyte functions in vitro. AIDS. 2004; 18: 2127-36.

26. Lihn AS, Richelsen B, Pedersen SB, Haugaard SB, Rathje GS, Madsbad S, Andersen O: Increased expression of TNF-alpha, IL-6, and IL-8 in HALS: implications for reduced adiponectin expression and plasma levels. Am J Physiol Endocrinol Metab. 2003; 285: 1072-80.

27. Lagathu C, Bastard JP, Auclair M, Maachi M, Kornprobst M, Capeau J, Caron M: Antiretroviral drugs with adverse effects on adipocyte lipid metabolism and survival alter the expression and secretion of proinflammatory cytokines and adiponectin in vitro. Antivir Ther. 2004; 9: 911-20.

28. Verkauskiene R, Dollfus C, Levine M, Faye A, Deghmoun S, Houang M, Chevenne D, Bresson JL, Blanche S, Lévy-Marchal C: Serum adiponectin and leptin concentrations in HIV-infected children with fat redistribution syndrome. Pediatr Res. 2006; 60: 225-30.

29. Luo L, Zhang L, Tao M, Qiu Z, Xie J, Han Y, Li M, Li T: Adiponectin and leptin levels in chinese patients with HIV-related lipodystrophy: a 30-month prospective study. AIDS Research and Human Retroviruses. 2009; 25: 1265-72.

30. Jones JI, Clemmons DR: Insulin-like growth factors and their binding proteins: biological actions. Endocr Rev. 1995; 16: 3-34.

31. Scavo LM, Karas M, Murray M, Leroith D: Insulin-Like Growth Factor-I stimulates both cell growth and lipogenesis during differentiation of human mesenchymal stem cells into adipocytes. J Clin Endocrinol Metab. 2004; 89: 3543–53.

32. Fischer-Posovszky P, Tornqvist H, Debatin KM, Wabitsch M: Inhibition of death-receptor mediated apoptosis in human adipocytes by the insulin-like growth factor I (IGF-I)/IGF-I receptor autocrine circuit. Endocrinology. 2004; 145: 1449-59.

33. Lowe SH, Hassink EA, van Eck-Smit BL, Borleffs JC, Lange JM, Reiss P. Stavudine but not didanosine as part of HAART contributes to peripheral lipoatrophy: a substudy from the Antiretroviral Regimen Evaluation Study (ARES). HIV Clin Trials. 2007; 8: 337-44.

Corresponding Authors
Taisheng Li,
Department of Infectious Diseases,
Peking Union Medical College Hospital,
Chinese Academy of Medical Science,
Peking Union Medical College,
Beijing,
China,
E-mail: litsh@263.net

Ming Li,
Department of Endocrinology,
Peking Union Medical College Hospital,
Chinese Academy of Medical Science,
Beijing,
China,
E-mail: lmpeking@yahoo.com.cn

P wave dispersion can help to identify infarct related artery in Acute inferior myocardial infarction

Mustafa Yilmaz[1], Muhammed Karadeniz[2], F. Ozlem Arican Ozluk[1], Kemal Karaagac[1], Mustafa Kuzeytemiz[1], Tezcan Peker[1]

[1] Cardiology Department, Bursa Yuksek Ihtisas Training and Research Hospital, Bursa, Turkey,
[2] Cardiology Department, Etlik Ihtisas Training and Research Hospital, Ankara, Turkey.

Abstract

Background: The aim of this study was to investigate the diagnostic value of P wave dispersion in prediction of infarct-related artery in patients with acute inferior myocardial infarction.

Methods: The study consisted of 62 patients (mean age 55 ± 12) presenting with acute inferior myocardial infarction undergoing successful primary percutaneous coronary intervention. Patients were classified into two groups according to infarct-related artery detected at angiography. Patients, in whom the infarct-related artery was the right coronary artery and circumflex artery, were defined as group I and group II, respectively. P max, P min, P Wave dispersion, ST elevation in D_3 greater than D_2 and ST depression in aVL greater than D_1 were assessed on admission and following intervention ECG.

Results: P wave dispersion on admission ECG predicted right coronary artery as the infarct-related artery with a sensitivity of 74% and a specificity of 71% (p < 0.001, p = 0.004, respectively). ST elevation in D3 greater than D2 predicted right coronary artery as the infarct-related artery with a sensitivity of 97% and a specificity of 37%. Using ROC curve analysis PWD yielded an area under the curve of 81% (p < 0.001) for separation to predict RCA as IRA in patients with acute inferior myocardial infarction. When the PWD (= 48 msn) was used as cutpoint to predict RCA as a IRA in patients with acute inferior myocardial infarction could be identified with a sensitivity of 74% and a specificity of 71% and a positive predictive value of 76%.

Conclusion: P wave dispersion can predict to identify RCA as infarct related artery in patients with acute inferior myocardial infarction.

Key words: Myocardial infarction, P wave duration, P wave dispersion.

Introduction

Acute ST elevated myocardial infarction (STEMI) is one of the main causes of death all over the world. The primary goal in the treatment of STEMI is to open infarct-related artery as soon as possible. The best way to achieve this goal is rapid determination and reperfusion of infarct related artery by means of percutaneous coronary intervention (PCI). There are many studies for the determination of infarct related artery in acute inferior myocardial infarction in the literature.[1,2] P wave dispersion reflects inhomogeneous conduction of sinus impulse.[3] P wave dispersion has been investigated in several cardiac diseases such as coronary ischemia, paroxysmal atrial fibrillation, hypertension, prehypertension, bicuspid aortic valve.[4-9] However, P wave dispersion has not been studied extensively in acute myocardial infarction.[10-12]

Aim

The aim of the present study is to explore the diagnostic value of p wave dispersion in predicting the infarct-related artery in patients with acute inferior myocardial infarction.

Materials and methods

Patients

Sixty-two patients (52 males, 10 females, mean age 55 ± 12) who presented within 12 hours of the onset of acute inferior myocardial infarction and underwent successful PCI were included in this study.

Acute inferior MI was identified by having ST elevation ≥ 1 mm in D_2-D_3-aVF, and reciprocal changes on the surface ECG and chest pain longer than 30 minutes. Serum CK-MB levels in patients were increased at least two-times. In all patients, the culprit lesion was shown by coronary angiog-

raphy for confirming the diagnosis of acute inferior myocardial infarction. The study was approved by our hospital's ethics committee, and informed consent was obtained from all patients.

Patient history, physical examination, 12-lead ECGs, echocardiography, coronary angiography findings, accompanying systemic diseases, and medications were recorded. The patients were assessed for the presence of cardiovascular risk factors. After the coronary care unit (CCU) admission, the blood samples were drawn to measure complete blood count and basic biochemical parameters. ECGs were obtained 90 minutes and 24 hours after successful primary PCI.

Hyperlipidemia was diagnosed as low-density cholesterol (LDL) was greater than 100 mg/dl or lipid-lowering medication was used. Blood pressure of all patients was measured. Systolic blood pressure (SBP) equal or greater than 140 mmHg and/or diastolic blood pressure equal or greater than 90 mmHg or under control by using blood pressure-lowering medications were defined as hypertension. Patients with a fasting glucose level equal or greater than 126 mg/dl on two separate occasions or using oral antidiabetic drugs or insulin were defined as diabetes mellitus.

Patients who had a history of a previous myocardial infarction, failed primary percutaneous coronary intervention, a left main coronary lesion of >50%, malignancy, previous cerebrovascular accident, impaired renal function (creatinine level> 2.5 mg/dl), subacute presentation, the presence of spontan recanalization on angiography, right ventricular infarction involvement, a rhythm other than sinus, bundle branch block, history of chronic obstructive lung disease or asthma, hypertrophic or dilated cardiomyopathy, previous beta blocker or other antiarrhythmic use, acid-base disorder, pericarditis and severe valvular disease were excluded from the study.

Electrocardiography

All patients had a 12-lead ECG in supine position soon after CCU admission. ECG recordings were obtained with a standardized paper speed of 25 mm/s and recording voltage amplitude of 10 mm/mV. Repeat ECGs were recorded at 90th min and 24th hour. The first ECGs were obtained before administration of beta-blocker. All ECGs were

stored in a digital system and all the measurements were done by computer based method. Analysis of ECG and P waves were performed by investigator independently without the knowledge of patient's clinical condition. The onset of p wave was defined as the point at which the onset of upward deflection of p wave intersects the isoelectric line while the p wave end was defined as the point at which the end of deflection of p wave intersects the isoelectric line. P wave dispersion was defined as the difference between the maximum and minimum p wave durations. ST elevation in D_3 greater than D_2 ($D_3 > D_2$) and ST depression in aVL greater than D1 (aVL> D_1) were defined as a minimum difference of 0.5 mm.

Echocardiography

All patients underwent a complete transthoracic echocardiography (TTE) and Doppler study using multiple views in left lateral decubitus position. Echocardiographic examination was performed within 24 hours of admission. TTE study was performed using a 3.5 MHz transducer on a Vivid 7 Pro device (GE Vingmed Ultrasound, Horten, Norway). Echocardiographic measurements were performed according to the recommendations by American Society of Echocardiography.

Angiography

All patients underwent a coronary angiography with an intention for determination of infarct related artery (IRA) and revascularization. Before catheterization, all patients were administered aspirin (300 mg, sublingually) and clopidogrel (600 mg, PO). Following insertion of the femoral sheath, a heparin bolus of 100 IU/kg was given. Primary angioplasty and stenting procedures were completed according to standard techniques. Determination of infarct-related artery was accomplished by observing a thrombosed critical stenosis or complete obstruction of RCA or Cx in certain locations. A narrowing of ≥ 70% in other vessels were defined as additional vessel disease. After primary percutaneous coronary intervention, recanalization of IRA was evaluated by angiography. Angiographic succes was defined as achieving a distal TIMI III flow and no more than 20% residual stenosis. Following transfer to CCU, surface ECGs were obtained at 90th minute and 24th hour. Glycoprotein IIb/IIIa

inhibitor use was left to operator's discretion. All patients were followed in coronary intensive care unit until stabilization was achieved.

Statistical Analysis

SPPS version 10.0 software package was used for statistical analysis (SPSS Inc, Chicago, Illinois, USA). Continuous variables were expressed as mean ± standard deviation. Categorical variables were expressed as percentage (%). Normally distributed variables were compared across groups by means of student t test whereas variables which did not normally distribute were compared by means of Mann Whitney U test. Categorical variables were compared via Chi-square test. For IRA determination, parameters were assessed by logistic regression analysis and significant parameters in univariate logistic regression were re-evaluated by multivariate logistic regression analysis. The sensitivity and specificity of significant parameters in multivariate logistic regression analysis for showing IRA were analyzed by means of ROC analysis. A P value of < 0.05 was considered significant.

Results

35 patients with right coronary artery disease (56%) were defined as group I while 27 patients with circumflex artery disease (44%) were defined as group II. There were no significant differences regarding demographic, echocardiographic, biochemical, and angiographic features. There were also no significant differences in major cardiovascular risk factors such as hyperlipidemia, smoking. (Tables 1, 2, 3)

Table 1. Demographic and echocardiographic characteristics of groups I and II

	Group I (n:35)	Group II (n:27)	P value
Mean age (years)	54 ±12	56 ± 12	0.47
Sex (male/female)	32 / 3	20 / 7	0.06
BMI (kg/m2)	28 ± 3	27 ± 3	0.31
Duration of angina (min)	145 ± 88	169 ± 118	0.36
Door to balloon time (min)	30 ± 12	30 ± 12	0.92
Systolic BP (mmHg)	124 ± 19	125 ± 23	0.79
Diastolic BP (mmHg)	81 ± 13	77 ± 15	0.33
Heart Rate (bpm)	72 ± 17	75 ± 17	0.53
Smoking (%)	22 (62%)	14 (51%)	0.38
Hypertension (%)	8 (22%)	11 (40%)	0.13
Diabetes mellitus (%)	4 (11%)	6 (22%)	0.25
Hyperlipidemia (%)	8 (22%)	5 (18%)	0.67
LVEF (%)	47 ± 4	48 ± 5	0.46
LA (mm)	38 ± 3	38 ± 3	0.92

BMI: Body mass index, BP: Blood pressure, LVEF: Left ventricle ejection fraction, LA: left atrium

Table 2. Laboratory values of groups

	Group I	Group II	P value
Glucose (mg/dl)	167 ± 88	155 ± 63	0.54
Urea (mg/dl)	30 ± 8	30 ± 8	0.98
Serum creatinine (mg/dl)	0.8 ± 0.1	0.8 ± 0.2	0.84
Total cholesterol (mg/dl)	193 ± 36	187 ± 43	0.55
LDL (mg/dl)	126 ± 31	129 ± 33	0.67
HDL (mg/dl)	33 ± 9	31 ± 7	0.37
Triglyceride (mg/dl)	164 ± 112	134 ± 86	0.24
Max CK (u/l)	1658 ± 1390	2289 ± 1731	0.11
Max CKMB (u/l)	168 ± 112	214 ± 159	0.19
MaxTnT (ng/ml)	37 ± 33	46 ± 39	0.31

LDL:Low density lipoprotein, HDL:High density lipoprotein, Max CK:maximum creatine kinase level , Max CKMB: maximum creatine kinase MB level, Max TnT:maximum troponin T level.

There were no significant differences in dominance of IRA, type of intervention, stent diameter, stent length, and glycoprotein II_b/III_a use between groups (Table 3).

In p wave duration and p wave dispersion (PWD) analyses, there were significant differences between groups in regard of pre-intervention P max and PWD (106 ± 10 ms vs 97 ± 8 ms p < 0.001 and 54 ± 8 ms vs 44 ± 7 ms p < 0.001, respectively), at 90th minute post-intervention P max and PWD (102 ± 6 ms vs 93 ± 7 ms and 46 ± 6 ms vs 39 ± 5 ms p < 0.001, respectively), at 24th hour post-intervention P max and PWD (98 ± 8 ms vs 91 ± 6 ms p = 0.001 and 42 ± 5 ms vs 35 ± 6 ms p < 0.001, respectively). However, P minimum values were not different between two groups (Table 4).

PWD and P maximum were significantly decreased in post-PCI period in two groups. But, there was a significant increased in post-intervention 90th P min than pre-intervention P min in group I (55 ± 5 ms vs 51 ± 5 ms p < 0. 01). (Table 5,6)

P max, P min, PWD, ST elevation in D_3 greater than D_2 ($D_3 > D_2$), and ST depression in aVL greater than D1 (aVL> D_1) were analyzed in univariate logistic regression analysis for prediction power of IRA. In multivariate logistic regression analysis remained significant two parameters (PWD and $D_3 > D_2$) (OR: 0.82 p = 0.01 and OR: 0.07 p = 0.02, respectively). (Table 7)

Using ROC curve analysis PWD yielded an area under the curve of 81% (p < 0.001) for prediction RCA as an IRA in patients with acute inferior

Table 3. Angiographic characteristics of patients

		Group I	Group II	P value
Procedure (%)	PCI+stent	20 (57%)	16 (59%)	NS
	Direct stent	15 (43%)	11 (41%)	NS
Coronary vessel involvement (%)	Single-vessel	15 (43%)	7 (26%)	NS
	Two-vessel	9 (24%)	15 (56%)	NS
	Three-vessel	11 (31%)	5 (18%)	NS
Lesion localization (%)	Proximal	18 (51%)	10 (37%)	NS
	Middle	11 (31%)	16 (59%)	NS
	Distal	6 (17%)	1(4%)	NS
Stent diameter (mm)		3.0 ± 0.4	2.9 ± 0.4	0.39
Stent lenght (mm)		22.9 ± 8.3	22.5 ±14.8	0.88
Gp IIb/IIIa use (%)		25 (71%)	16(59%)	0.31
Thrombus aspiration (%)		4 (11%)	-	0.06
Sinoatrial nod arter (%)	RCA/Cx	29 /6	23 /4	0.80
Infarct related artery (%)	Dominant	27 (77%)	18 (67%)	0.35
	Non-dominant	8 (23%)	9 (33%)	
Processing time (min)		49 ± 10	47 ± 9	0.39

PCI:percutan coronary intervention

Table 4. Comparison of P wave durations of groups

	Group I	Group II	P value
P max 1 (ms)	106 ± 10	97 ± 8	**<0.001**
P min 1 (ms)	51 ± 5	52 ± 5	0.55
PWD 1 (ms)	54 ± 8	44 ± 7	**<0.001**
P max 2 (ms)	102 ± 6	93 ± 7	**<0.001**
P min 2 (ms)	55 ± 5	54 ± 5	0.35
PWD 2 (ms)	46 ± 6	39 ± 5	**<0.001**
P max 3 (ms)	98 ± 8	91 ± 6	**0.001**
P min 3 (ms)	56 ± 6	55 ± 5	0.53
PWD 3 (ms)	42 ± 5	35 ± 6	**<0.001**

Pmax1:pre-intervention, Pmax2: post-intervention 90th min, Pmax3: post-intervention 24th hour

Table 5. Change in P wave in Group I

	Pre-intervention	Post-intervention 90th min	Post-intervention 24th hour	P1 value	P2 value	P3 value
P max (ms)	106 ± 10	102 ± 6	98 ± 8	**0.008**	**<0.001**	**0.005**
P min (ms)	51 ± 5	55 ± 5	56 ± 6	**<0.01**	**0.001**	0.62
PWD (ms)	54 ± 8	46 ± 6	42 ± 5	**<0.001**	**<0.001**	**<0.001**

P1:between pre intervention and 90th min, P2: between pre intervention and 24th hour, P3: between 90th min and 24th hour, PWD: p wave dispersion

Table 6. Change in P wave in Group II

	Pre-intervention	post-intervention 90th min	post-intervention 24th hour	P1 value	P2 value	P3 value
P max (ms)	97 ± 8	93 ± 7	91 ± 6	**0.003**	**0.003**	**0.01**
P min (ms)	52 ± 5	54 ± 5	55 ± 5	0.10	0.053	0.24
PWD (ms)	44 ± 7	39 ± 5	35 ± 6	**<0.001**	**<0.001**	**0.001**

P1:between pre intervention and 90th min, P2: between pre intervention and 24th hour, P3: between 90th min and 24th hour, PWD: P wave dispersion

Table 7. Analysis of parameters with univariate and multivariate logistic regression analysis in terms of prediction of infarct-related artery

	Univariate logistic regression		Multivariate logistic regression	
	OR(95% CI)	**P value**	**OR(95% CI)**	**P value**
P max	0.90 (0.85-0.96)	**0.002**	1.05(0.93-1.18)	0.42
P min	1.02 (0.93-1.12)	0.54		
PWD	0.85 (0.78-0.92)	**<0.001**	0.82 (0.70-0.96)	**0.01**
$D_3>D_2$	0.05 (0.006-0.42)	**0.006**	0.07 (0.008-0.71)	**0.02**
$aVL>D_1$	0.001(0.001-52.75)	0.78		

PWD: P wave dispersion, $D_3>D_2$: a greater ST elevation in D_3 compared to D_2, $aVL>D_1$: ST depression in aVL greater than D_1, OR:odds ratio, CI:confidence interval

Table 8. Sensitivity and specificity values for PWD and $D_3>D_2$

	Sensitivite	Spesifite	PPV	AUC (95% CI)	P value
PWD	0.74	0.71	0.76	0.817 (0.711-0.924)	<0.001
$D_3>D_2$	0.97	0.37	0.66	0.671 (0.530-0.812)	0.022

PWD: P wave dispersion, $D_3>D_2$: a greater ST elevation in D_3 compared to D_2, PPV:positive predictive value, AUC: The area under the curve, CI: Confidence interval

myocardial infarction. When the PWD (= 48 msn) was used as cutpoint to predict RCA as an IRA in patients with acute inferior myocardial infarction could be identified with a sensitivity of 74% and a specificity of 71%, and a positive predictive value of 76%. The sensitivity, specificity, and positive predictive value for D3>D2 to predict RCA as an infarct related artery were 97%, 37%, and 66%, respectively. The area under the curve was 67% (p = 0.02) (Tables 8).

Discussion

It has been studied that P wave dispersion changes may occur unstable angina pectoris, acute coronary syndromes and in exercise or angioplasty induced myocardial ischemia. However, P wave dispersion has not been studied extensively in acute myocardial infarction.[3,10,11,12] To the best of our knowledge, this is the first study to predict IRA by use of PWD in patients with acute inferior myocardial infarction. Our study showed that P maximum and P wave dispersion increased significantly in predicting RCA as an infarct related artery in patients with acute inferior myocardial infarction.

Previous studies showed changes in P wave duration in acute coronary syndromes, myocardial ischemia, and following elective coronary angioplasty.[4,5,10,11,12] Dilaveris et al. showed that P wave duration and PWD increase during anginal episodes.[5] Ozmen et al. reported that increased P wave duration and PWD via balloon angioplasty induced ischemia.[11] Nevertheless, another study demonstrated that reperfusion therapy in STEMI patients decreases PWD.[10] We found a significantly increased P wave duration and PWD in patients with acute inferior myocardial infarction.

Also, P max and PWD were significantly higher in RCA disease compared to circumflex (Cx) disease in patients with acute inferior MI. This may be due to the fact that atrial walls are supplied by branches of RCA in most cases and RCA supplies the AV node in about 90% of human hearts, and the sinus node in about 55%.[11,13,14] Another mechanism may be the increased RV filling pressure in acute inferior MI due to RCA occlusion, leading to an increase in RA size and pressure. As a result of, elevated right atrial pressures induced inhomogeneity in atrial conduction. Furthermore, we demonstrated that the values of P max and PWD significantly decreased after primary angioplasty in inferior acute myocardial infarction, the decrease was more pronounced in RCA artery disease than circumflex disease. This is concluded that rapid and complete reperfusion by primary angioplasty can result significant reduction in the electrical instability of atrium.

Limitations

This study has several limitations; the study groups are small sample size. The other limitation is absences of rhythm follow-up in both groups.

Conclusion

Results of this study demonstrated that PWD which is readily measured on surface ECG can predict RCA as an infarct-related artery in acute inferior myocardial infarction with a sensitivity of 74%, specificity of 71%, and a positive predictive value of 76%. In addition, a greater ST elevation in D_3 compared to D_2 can predict RCA as IRA with a sensitivity of 97%, specificity of 37%, and a positive predictive value of 66%. The prolongation of PWD and P maximum may be useful and simple marker to identify RCA as infarct related artery in patients with acute inferior myocardial infarction.

References

1. Andersen HR, Nielssen D, Falk E. Right ventricular infarction: diagnostic value of ST elevation in lead III exceeding that of lead II during inferior/posterior infarction and comparison with right-chest leads V_3R to V_7R. Am Heart J 1989; 117: 82-86

2. Zimetbaum PJ, Krishnan S, Gold A, et al. Usefulness of ST segment elevation in lead III exceeding that of lead II for identifying the location of the totally occluded coronary artery in inferior wall myocardial infarction. Am J Cardiol 1998; 8: 918-919

3. Dilaveris PE, Gialafos EJ, Sideris SK, et al. Simple electrocardiographic markers for the prediction of paroxysmal idiopathic atrial fibrillation. Am Heart J. 1998; 135: 733-738.

4. Karabag T, Dogan SM, Aydin M, et al. The value of P wave dispersion in predicting reperfusion and infarct related artery patency in acute anterior myocardial infarction. Clin. Invest Med 2012; 35: 12-19

5. Dilaveris PE, Andrikopoulos GK, Metaxas G, et al. Effects of ischemia on P wave dispersion and maximum P wave duration during spontaneous anginal episodes. Pacing Clin Electrophysiol. 1999; 22: 1640-1647

6. Cui QQ, Zhang W, Wang H, et al. Assesment of atrial electromechanical coupling and influential factors in nonrheumatic paroxysmal atrial fibrillation. Clin Cardiol. 2008; 31: 74-78.

7. Ermis N, Acikgoz N, Cuglan B, et al. Comparison of atrial electromechanical coupling interval and P-wave dispersion in non-dipper versus dipper hypertensive subjects. Blood Press. 2011; 20: 60-66

8. Ermiş N, Açıkgöz N, Yaşar E, et al. Evaluation of atrial conduction time by P wave dispersion and tissue Doppler echocardiography in prehypertensive patients. Turk Kardiyol Dern Ars. 2010; 38: 525-530.

9. Bilen E, Kurt M, Tanboğa IH,et al. Assessment of P-wave dispersion in patients with isolated bicuspid aortic valve and its relationship with aortic elasticity. Turk Kardiyol Dern Ars 2012; 40: 16-21

10. Akdemir R, Ozhan H, Gunduz H, et al. Effect of reperfusion on P-wave duration and P-wave dispersion in acute myocardial infarction: primary angioplasty versus thrombolytic therapy. Ann Noninvasive Electrocardiol 2005; 10: 35-40

11. Ozmen F, Atalar E, Aytemir K, et al. Effect of balloon-induced acute ischaemia on P wave dispersion during percutaneous transluminal coronary angioplasty. Europace 2001; 3: 299-303

12. Celik T, Iyisoy A, Kusaklioglu H,et al. Effects of primary percutaneous coronary intervention on P wave dispersion. Ann Noninvasive Electrocardiol 2005; 10: 342-327.

13. Lazar EJ, Goldberger J, Peled H, et al. Atrial infarction: diagnosis and management. Am Heart J. 1988; 116: 1058-1063

14. James TN, Burch GE. The atrial coronary arteries in man. Circulation 1958; 17: 90-98

Corresponding Author
Mustafa Yilmaz,
Bursa Ihtisas Training and Research Hospital,
Cardiology Department,
Yildirim Bursa,
Turkey,
E-mail: mustafayih@yahoo.com.tr

Serum Zn concentration, IgA and IgG Immunoglobulin levels and middle-aged Iranian females

Mehri Aliasgharpour, Mahnaz Mohammadlo

Reference Health Laboratory Research Center of Iran - World Health Organization (WHO) Collaboration Center-Biochemistry-Trace Elements Analysis Laboratory.

Abstract

Background: Zinc (Zn) is one of the minerals that is required for a wide applications in human health. Since there is no specialized Zn storage system in the body, therefore, one has to reach and maintain a steady state of zinc intake and excretion for normal cellular function. In the present work Zn concentration in a group of 50 middle aged (40-51 years) female patients was determined. Then a possible relationship between low serum Zn concentration, age, IgA and IgG immunoglobin (Ig) levels were investigated.

Methods: Zn concentration (n=50, Gender=F) was determined using F-AAS plus with deuterium background correction system and a Hamamatsu light source (Japan). The method for the determination of Ig levels was Immunodifusion.

Results: Out of n=50 female patients, only n=26 (52%) presented low serum Zn concentration (range 0.58-0.69 µg/ml). Obtained results of Pearson product moment correlation indicated a significant relationship only for the age and low serum Zn concentration (r = 0.43, p<0.05). Between other variables (Zn & Ig levels) no significant correlation was found.

Conclusion: Further clinical studies can provide valuable and significant correlation between defined variables among Iranian middle aged females.

Key words: Atomic absorption spectroscopy, immunoglobulin levels, humoral immunity, zinc.

Introduction

Zinc is an essential nutrient for all organisms. In humans it is required for the proper function of over 90 metalloenzymes, the growth and division of cells, the DNA synthesis, the normal development, and the immunity (1,2,3). The major problem in zinc biology is that there is no specialized zinc storage system in the body, therefore, one has to re-ach and maintain a steady state of zinc intake and excretion for normal cellular function. Further, the total body content of zinc in humans is 2-4 grams but zinc is called trace element because its plasma concentration is only 0.80 µg/ml (4,5). In addition, the bioavailability of zinc is influenced by a number of different factors and has been shown to depend on many factors such as age (6,7) of the consumers.

Zinc is necessary for the normal function of all kinds of immune cells and even mild nutritional Zn deficiency depresses humans immune system. However, B cells which represent the main cells of humoral immunity and after stimulation differentiate to antibody producing plasma cells, are less dependent on zinc for proliferation (4,8,9). Literatures have shown the effect of zinc for the integrity of the immune system in elderly population (7,10) and children (11), however, its effect on middle age population is limited (12).

The objectives of the present work were to determine the Zn concentration in a group of 50 middle aged female patients at Reference Health Laboratory Research Center of Iran and study the possible relationship between low serum zinc concentration, age and the immunoglobulin (Ig) levels particularly those of the IgA and IgG classes.

Material and methods

Study design

A total of 50 middle aged female patients were randomly selected for the study. They were healthy individuals and a questionnaire for each patient was completed with information on patient's age, any impaired immune responses, and weight loss. The age range among patients was 40- 51 (Table 1). To investigate whether there is a correlation between pairs of variables such as low Zn concentration, age, IgA and IgG (Ig), Pearson product moment correlation was performed.

Table 1. The Patients Information

Total number of patients	50
Gender	F
Age range	40-51
Weight loss	NO
Impaired immune responses	NO

Preparation of Zn blood samples and analysis

Fasting morning blood samples were obtained and sera were separated from the cells and transferred into acid washed polyethylene tubes within 45'. Serum samples were kept frozen (-70 ^{0}C) until the time of analysis. The method for the serum Zn determination was based on a procedure described by Smith (12). A Varian spectra FAA-20 plus with deuterium background correction system and a Hamamatsu light source (Japan) were used. The sample introduction was manual. Sera then were sent to serology laboratory for the determination of IgA Single Radial Immunodifusion (SRID)(lot # 8403 Bahar Afshan Co, Iran) and IgG; Single Radial Immunodifusion (SRID) (lot #8402 Bahar Afshan Co, Iran).

Results

Table 1 gives the patients information. Out of 50 female patients, 26 (52%) presented low serum Zn concentration, range (0.58-0.69 µg/ml) and 24 (48%) had normal serum Zn level, range (0.80-0.98 µg/ml). The reference interval for zinc in serum is 0.70-1.20 µg/ml (14). The IgA and IgG among patients were in the normal range. The reference intervals for IgA and IgG (15) are 70-400 mg/dl, (20-60 years) and 700-1600 mg/dl, (20-60 years) respectively (Table 2).

We carried out the Pearson product moment correlation between low Zn concentration of 26 patients, age, IgA and IgG levels. A Significant correlation was observed only for age (r = 0.43, p=0.03) (Table 3).

Table 3. Pearson Product Moment Correlation between Variables & Low Zn Concentration Of 26 Patients

Variable	r	p value
Zn & Age	0.43	0.03
Zn & IgG	0.08	0.69
Zn & IgA	0.12	0.57

Discussion

Zinc is known to be essential for all highly proliferating cells in the human body especially the immune cells. During Zn deficiency the number of granulocytes, and natural killer cells are shown to decrease (16). However, B cells of humoral immunity are less dependent on zinc for proliferation (4,8,9,17).

In the present work serum Zn concentration in a group of 50 middle aged female patients (40-51 years) was determined. Then the possible correlation between low serum zinc concentration, age, IgA and IgG (Ig) levels were studied.

Our results indicated 26 (52%) female patients out of 50 presented low serum Zn concentration that was correlated with their age as well (p<0.03). In this regard our finding is in agreement with Al-Timimi (18) who observed a high prevalence of mild to moderate zinc deficiency in Baghdad, Iraq. In addition, our results indicated low serum Zn concentration (0.63 ±0.052 µg/ml) had no impact

Table 2. Descriptive Zn Concentration & Immunoglobulin Levels Among Patients

	Number of patients with low serum Zn	Number of patients with normal serum Zn
Gender	F(26)	F(24)
Mean Zn concentration µg/ml	0.63±0.052	0.86 ± 0.053
Range Zn µg/ml	0.58-0.69	0.80-0.98
IgA level mg/dl	300.23± 81.78	310.90± 34.05
IgG level mg/dl	1387.81 ±160.0	1458.75± 149.80
Mean age	43.65 ± 2.84	45.0 ± 1.99

on the serum IgA and IgG(Ig) levels and no correlation among them was obtained (p>0.05). Kukral (19) has reported that marginal zinc deficiency did not alter the IgM and IgG serum concentrations at all. In addition, this finding is in accordance with previous observations that mature B cells were more resistant to apoptosis caused by low serum Zn levels due to high Bcl-2 level (4,8,9,17,20,21)

In summary low zinc concentration had no impact on IgA and IgG levels in our group investigated, however, it was correlated with their age significantly. Further clinical studies will provide valuable information and may present significant relationships among variables in middle aged female population.

References

1. Sandstead HH. Requirements and toxicity of essential trace elements, illustrated by zinc and copper. Am J Clin Nutr. 1995; 61: 621S-624S.

2. Wood RJ. Assessment of Marginal Zinc Status in Humans. J Nutr. 2000; 130: 1350S-1354S.

3. Sanderson P, Elsom RL, Kirkpatrick V, Calder PC, Woodside JV, Williams EA, Rink L, Fairweather-Tait S, Ivory K, Cantorna M, Watzl B, Stone EM. UK food standards agency workshop report: diet & immune function.Br J Nutr. Epub 2010 Mar 9; 103(11): 1684-7.

4. Rink L, Gabriel P. Zinc and the immune system. Proc Nutr Soc; 59:541-552,2000.

5. Valberg LS, Flanagan PR, Chamberlain MJ. Effects of iron, tin and copper on zinc absorption in humans. Am J clin Nutr. 1984; 40: 536-541.

6. Weiss G, Winder B, Zoller H, Fuchs D. The immuno-biology of zinc and the kidney. Immunol today. 1998; 19: 193.

7. Rink L, Cakman I, Kirchner H. Altered cytokine production in the elderly. Mech Ageing Dev. 1998; 102: 199-210.

8. Rink L, Gabriel P. Extracellular and immunological actions of zinc. Biometals. 2001; 14: 367-383.

9. Shanker AH, Prasad AS. Zn and immune function: the biological basis of altered resistance to infections. Am J Clin Nutr. 1998; 68 (suppl. 2): 447S-463S.

10. Sandstead HH. Is zinc deficiency a public health problem? Nutr. 1995; 11: 87-92.

11. Prasad AS.Zinc deficiency in women,infants and children. J Am Coll Nutr. 1996; 15(2): 113-20.

12. Andriollo-Sanchez M, Hininger-Favier I, Meunier N, Toti E, Zaccaria M, Brandolini-Bunlon M, Polito A, O'Connor JM, Ferry M, Coudray C, Roussel AM. Zinc intake and status in middle-aged and older European subjects: the ZENTTH study. Eur J clin Nutr. 2005; 59 Suppl 2: S37-41.

13. Smith JC, Jr. Butrimovitz GP, Purdy WC. Direct measurement of zinc by atomic absorption spectroscopy. Clin Chem. 1979; 25: 1487-1479.

14. Burtis CA, Ashwood ER. Tietz Textbook of Clinical Chemistry 3rd ed; chapter 30;Trace elements ed, Milne D B. pp1037-1041. Philadelphia, W.B. Sanders Co, 1999.

15. de Jong AL, Green DM, Trial JA, Birdsall HH. Focal effects of mononuclear leukocyte transendothelial migration: TNF- α production by migrating monocytes promotes subsequent migration of lymphocytes. J Leukoc Biolo. 1996; 60: 129-136.

16. Prasad AS. Effects of zinc deficiency on immune function. J Trace Elem.Exp.Med. 2000; 13: 1-20.

17. Zazonico R, Fernandes G, Good RA. The differential sensitivity of T cell and B cell mitogenesis to in vitro Zn deficiency. Cell. Immunol. 1981; 60: 203-211.

18. Al-Timimi DJ, Al-Sharbatti SS, Al-Najjar F. Zinc deficiency among a healthy population in Baghdad,Iraq. Saudi Med J. 2005; 26(11): 1777-81.

19. Kukral HW, Kirchgessner M, Roth HP. Effect of marginal zinc deficiency on humoral immunity in Rats. Ernahrungswiss. 1988; 27(2): 126-36.

20. Fraker PJ, King LE, Laakko T, Vollmer TL. The dynamic link between the integrity of the immune system and zinc status. J Nutr. 2000; 130 (suppl.5S): 1399S-1406S.

21. Haase H, Rink L. The immunity and the impact of zinc during aging . Immunity & Aging. 2009; 6: 9.

Corresponding Author
Mehri Aliasgharpour,
Reference Health Laboratory Research Center of Iran,
Tehran,
Iran,
E-mail: aliasgharpour@health.gov.ir
          mehri9@gmail.com

Huntintington's disease - gene anticipation

Sanja S. Plestic[1], Ana R. Markovic[1], Elena A. Suhanek[2]

[1] Institute of Psychiatry, Clinical Center of Vojvodina, Novi Sad, Serbia,
[2] Institute for Emergence Medicine Novi Sad, Novi Sad, Serbia.

Abstract

Huntington disease is neurodegenerative disease and is autosomal dominantly inherited. Here is presented a 42 year old female patient who has been treated from psychotic disorder with severe neurological symptoms in the form of horeiform movements. Diagnosis of Huntington disease was determined on the basis of positive family anamnesis and conducted genetic research using direct analysis of the CAG reapeat within the IT-15 gene that incodes the hungtintin protein. Gene anticipation is present due to the fact that her father and grandfather also had this disease, but starting later in life.

Key words: Huntington disease, anticipation, genetic.

Introduction

Huntington chorea is a serious neurodegenerative disease. This disease is caused by the mutation of CAG, a changeable, repetitive Citosin-Adenin-Guanin trinucleotide sequence [1]. It is predominantly autosomal inherited, and is characterized by progressive horeiform movements and intellectual deterioration [2]. Huntington's disease has a population frequency of about 7-10 per 100,000 population and usually starting in adult life-fourth or fifth decade. Hunt ington's disease manifesting in early adulthood is rare [3,4]. American neurologist George Huntington (1872.) was the first who presented classic description of the disease (''On Chorea''), and so this disease was named after him – Chorea Huntington [5]. The incidence of family cases is very often, although a few sporadic cases have been described [6]. Patients (both heterozygots and those who will get ill) have the risk of carrying over the mutant gene to 50% of their children.

Both male and female descendants get ill. It happens more often that the risk-carrier carry over the mutant gene before he becomes ill [6]. It is interesting that the most cases patience inherit the gene from their fathers before the age of 20. In favor of the gene anticipation which presents the appearance that the disease in further generations appear in earlier lifetime, in the literature was reviewed that in about 3% of cases the disease appear in the juvenile lifetime, and that those patients mostly inherited the disease from fathers who became ill later, after their children [7].

Case report

Patient B.M., 42 year old female, was hospitalized in the psychiatric clinic. The reason for this was dissociative clinical picture with paranoid – interpretative ideation. She is a hairdresser, divorced, has two daughters, both students at the university. According to hetero data received from the mother and daughters, her behavior has changed during last five years when she lost her working activities, divorced from her husband, accusing him for infidelity, with a striding of paranoid ideas, gradually breaking contacts also with her mother, withdraw from social life, rarely left her house and spent time only in bed. Before hospitalization her behavior was predominantly distopic and apragmatic, her behavior towards her daughters was unexplained, prohibiting them to eat, locked the daughters in the house enabling them to give exams at the university, so that her mother called first aid that brought her to the hospital. Neurological difficulties appeared approximately last two years with heavy walk with disorders of movement, spasm and choreatic movements, which in the beginning appeared only in the half of the body (hemichorea) and later on in the complete body. From the family anamnsesis the data were received that the father of the patient was cured with the diagnosis of schisophrenia, and the mother of the patient described that his walking and movements were the same as of the patient, and the same symptoms had the grandfather of the patient.

At the hospitalization in the mental status was registered a dissociative thought flow in a broader

context, verbal contact was reinstalled but hardly was going in wanted direction, in the content were non-systematized paranoid- interpretative ideations directed to her surrounding, towards her daughters with whom she lived, as well as towards her mother and her ex- husband. It was also reviewed a lot of blocks in the mind flow. In neurological status is registered choreatic movement in standing and walking, with distressed movement of fingers, known as „piano playing" and mimic convulsion (mask). Muscle tonus is lower and speech dysarthric. The patient has poor developed constitution, it resembeled undernourishment.

During the hospitalization in brain CT were found severe subcortical and cortical atrophies, basal cisterns and chamber system uniformly more voluminous, cortical sulcusis were also slightly emphasized (Figure 1). Ophalmologist has examined her duffernetly diagnostical because the Willson disease was suspected, with a negative result of Keyser-Fleischer ring, and the level of ceruloplasmine in blood was within the limits of referent values.
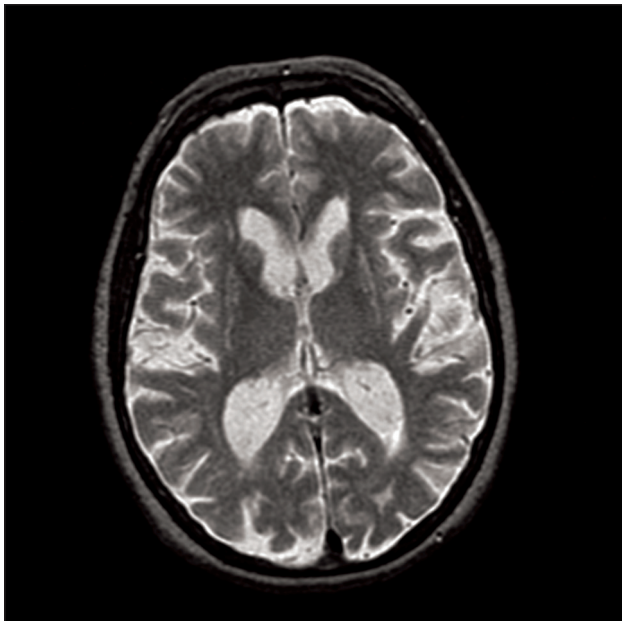
Figure 1. CT scan showing subcortical and cortical atrophy, basal cisterns and chamber system uniformly more voluminous, cortical sulcusis slightly emphasized

Psychological testing has shown organic damage of almost all measured functions as ethyologic factor of psychotic decompensation. Suspecting the Morbus Huntington a genetic research (PCR amplification of the region IT15 gene with appli-cation of capilar electrophoresis on the automatic secvenator using GeneMapper 4.0 softver) was conveyed and revealed that HD alleles have 17 and 46 CAD repeats, with what the diagnosis of the Huntington disease was confirmed.

Discussion

In the case primarily appear psychiatric symptoms which are in frame of the Huntington disease, and later on are registered also neurological symptoms as unwilling, choreatic movements of both legs and feet, and mimic muscle. A review of 11 studies of HD patients found psychosis to be present in 3 – 12% of patients, ranging from non-specific paranoia to presentations that are similar to schizophrenia [8]. Although diagnostically not confirmed, according to heterodata it is presumed that previous two generations had Huntington disease (father and grandfather), but the symptoms appeared in the later lifetime. Since 1993, genetic testing has been performed using direct analysis of the CAG reapeat within the IT-15 gene that incodes the hungtintin protein [9]. Using this method, the patient was confermed by genetic disease, which has not been possible in previous generations. With the patient the symptoms appeared in the fourthies what is in favour of the gene anticipation. After prescribing haloperidol in daily doses of 3 mg regresion of psychiatric as well as of neurological symptoms took place. Conventional antipsychotic drugs are still used to treat chorea in clinical practice [10]. But this is only symptomatic therapy. At this moment, researches, related to pharmacological treatment aimed at modification of huntingtin protein synthesis, are taking place. These reaserches has reached the level of the late pre-clinical research [11].

References

1. *Borbas T, Hegyesi H. Huntington chorea: Genetics and biochemistry, diagnosis and therapy. Acta Pharm Hung. 2002; 72(2): 127-36.*

2. *Roos RA. Huntington's disease: a clinical review. Orphanet journal of rare diseases. 2010; 5 (1): 1-8.*

3. *Pani C, Rajadhyaksha SB, Varudkar BL, Shah KN. Juvenile Hutington's disease. Neurol India. 1993; 41: 224-6.*

4. *Aggarwal HK, Nand N, Bharti K, Makkar V, Sehgal R. Huntington's Chorea – A Case Report with Typical Family Tree. JIACM. 2004; 5(4): 359- 62.*

5. *Glavan I. Živčane bolesti. Medicinska knjiga Beograd- Zagreb; 1953. p. 411- 6.*

6. *Radojičić B. Bolesti nernvog sistema. Medicinska knjiga Beograd- Zagreb; 1986. p. 595- 97.*

7. *Rubinsztein DC, Carmichael J. Huntington's disease: Molecular basis of neurodegeneration. Expert Rev Mol Med 5 (20): 1–21.*

8. *Bonelli RM, Hofmann P. A systematic review of the treatment studies in Huntington's disease since 1990. Expert Opinion on Pharmacotherapy. 2007; 8(2): 141-53.*

9. *The American Collage of Medical Genetics/American Society of Human Genetics Huntington Disease Genetic Testing Working Group. Laboratory Guidelines for Huntington Disease Genetic Testing. Am. J. Hum. Gent. 1998; 62: 000-000.*

10. *Tost H, Wendt CS, Schmitt A, Heinz A, Braus DF. Huntington's Disease: Phenomenological Diversity of a Neuropsychiatric Condition That Challenges Traditional Concepts in Neurology and Psychiatry. Am J Psychiatry. 2004; 161: 28-34.*

11. *Munoz – Sanjuan I, Bates P. G. The importance of integrating basic and clinical research towards the development of new therapies for Huntington disease. The Journal of Clinical Investigation. 2011; 121(2): 476-83.*

Corresponding author
Sanja Plestic,
Institute of Psychiatry,
Clinical Center of Vojvodina,
Novi Sad,
Serbia,
E-mail: sanjapl@yahoo.com

Effects of the Ramadan fast on trauma

Cemil Kavalci[1], Tamer Durdu[1], Fevzi Yilmaz[1], Deniz Arslan Engin[1], Turan Turhan[2], Serkan Yilmaz Muhittin[1]

[1] Ankara Numune Training and Research Hospital, Emergency Department, Ankara, Turkey,
[2] Ankara Numune Training and Research Hospital, Biochemistry Department, Ankara, Turkey.

Abstract

Background: Trauma can occur due to many factors such as vehicle-related factors, road-related factors or self-related factors. During the Ramadan fast, Muslims eat two meals, one before sunrise and the other shortly after sunset. The purpose of this study is to investigate whether fasting in Ramadan has any effect on trauma.

Methods: Our study was prospective, and included trauma patients older than 18 years old, admitted to our ED. The student's t-test was used for two continuous group comparisons. The chi-squared test was used for categorical variables; $p < 0.05$ was considered statistically significant.

Results: The most frequent causes of trauma in the Ramadan was falling (29.4), but the most frequent causes of trauma in the control period was violence (39.8). There was significant difference between the group's at the trauma mechanism ($p < 0.001$).

Conclusion: This study concludes that the rate of trauma cases shows an increase during Ramadan between the hours of 04.00-08.00 p.m. The rate of violence-related trauma cases, on the other hand, decrases during the same time period.

Key words: Ramadan, emergency, trauma.

Introduction

Trauma is the most common cause of death that affects especially the young. (1) Trauma can occur due to many factors such as vehicle-related factors, road-related factors or self-related factors. Main components of the last group appears as the sleeping regime and diet, educational background and substance abuse.

Ramadan is the ninth month of the Islamic lunar calendar. In the month of Ramadan it is estimated that, worlwide, some 400 million Muslim fast (2). During the Ramadan fast, Muslims eat two meals, one before sunrise and the other shortly after sunset. It is a holy month for Muslim people and includes long fasting periods, which may affect Emergency Department (ED) admissions (3).

There is a general opnion that in Ramadan, especially during the breaking of the Ramadan fast at sunset, trauma cases admitted to the Emergency Department increase. The purpose of this study is to investigate whether fasting in Ramadan has any effect on trauma.

Methods

Our study was prospective, and included trauma patients older than 18 years old, admitted to our ED. The study group (Group 1) consisted of patients admitted to the ED during Ramadan (1-30 August 2011), and the control group (group 2) consisted of patients who were admitted during the 30-day period after Ramadan (1-30 October 2011). We were approved by the ethical committee. The diagnosis, and demografic and clinical characteristics of with trauma patients admitted to the ED were recorded. Stastical analysis was performed using the SPSS 15.0 for Windows package program (SPSS Inc., Chicago, IL). The patients demografic and clinical features are shown as mean ±standard deviation, median, range, and percentage (%). Normal distribution was tested with Kolmogorov-Smirnov test. The student's t-test was used for two continuous group comparisons. The chi-squared test was used for categorical variables; $p < 0.05$ was considered statistically significant.

Results

This study was included 607 patients. Of these, 355 (58.4%) were admitted during Ramadan, and the remaining 252 (41.6%) formed the control group. The two group's demographic and clinical characteristics were similar (Table 1).

The evaluation of admission time showed that during Ramadan, the most frequent time period for admission was from 04.01p.m-08.00p.m

Table 1. Clinical abd demographic characteristics of patient's

	Ramadan period	Control period	p value
Demografic future			
Sex (%, male)	75.2	73.8	0.711
Age (years; mean±SD)	35.37±16.6	34.44±13.5	0.45
Clinical future			
Sistolic pressure	124,25±20,7	123,73±16,8	0,76
Diastolic pressure	77,76±11,4	76,35±10,3	0,12
Respiratuar rate	14,84±3,1	15,14±2,7	0,21
Admision number (n)	1253	1267	0.15
Admission time (%)			
00.01a.m-04.00 a.m	7,9	17,5	
04.01a.m-08.00a.m	10,1	4,8	
08.01a.m-12.00a.m	23,7	21,4	0.000
12.01p.m-04.00p.m	10,1	13,5	
04.01p.m-08.00p.m	40.8	23,4	
08.01p.m-12.00p.m	7,3	19,4	
Final desicion			
Admitted to hospital (%)	17.5	11.1	0.029
Discharged from ED (%)	82.5	88.9	
RTS (mean±SD)	7.78±0.35	7,82±0.19	0,002
Ethanol (mg/dl)	23.75±66.5	43.43±82.2	0.006

RTS (Revised trauma score)

Table 2. Trauma mechanisms of the patient's

Trauma mechanism	Ramadan	Control period	P
motor vehicle accident	23,4	29,8	0.09
pedestrian	12,1	12,7	0.74
violence	18	32,1	0.000
falling	26,8	10,3	0.000
Other injury	19,7	15,1	0.47

(41%), and patients were less frequently admitted from 08.01p.m-12.00p.m. In the control group, the most frequent time period for admission was from 04.01p.m-08.00p.m (23.4%), and patients were less frequently admitted from 04.01a.m-08.00a.m. There was significant difference between the group's admission time to the ED (p=0.000).

Trauma mechanisms of the patient's showed on the Table 2.

The most frequent causes of trauma in the Ramadan was falling (29.4%), but the most frequent causes of trauma in the control period was violence (39.8%). There was significant difference between the group's at the trauma mechanism (p<0.001). Mean ethanol level was 23.75±66.5 mg/dl in the group 1 and 43.43±82.2 mg/dl in group 2. There was statistically significance difference in groups (p<0.05).

Discussion

It has been known that 92% of the population in Turkey is Muslim and 66% of them fast during Ramadan (4). Several series have evaluated Ramadan's effect on general health in Muslim populations. Fasting in Ramadan had been associated with variations in the incidence of some diseases (3,5,6). Some studies evaluated that the relationship between Ramadan and ED admission (3,4). The literature search yielded virtually no data regarding trauma mechanism and time of patients referred to ED in Ramadan. This study is focusing on mechanism and time of the trauma.

Suwaidi et al (7) reported that in the hospitalization rate during Ramadan no gender and age difference has been observed. Similar to Pekdemir

et al (3) maintained that the patient population admitted to the ED during Ramadan yields no difference in terms of age and gender. The results of our study too stand in parallel to the findings and results of both of these studies. When compared with the control period, the patient population admitted to our ED during Ramadan show no difference in terms of age and gender.

Perk et al (8) and Ural et al (9) reported that blood pressure of the patients admitted during Ramadan shows no statistically significant change. Our findings too are consistent with their findings.

Previous studies showed that during the Ramadan, the most frequent time period for admission to the ED was between 04.00 and 08.00 a.m hours (3,7). Our results are consistent with the findings of the existing literature on the subject. In comparison with the control period, during Ramadan, the number of admissions to the ED increases two times. During Ramadan overall admissions to the ED between 04.00 a.m and 08.00 a.m increase two and a half times. This time period corresponds with the pre-down meal time during Ramadan. The increase can be explained due to the fact that Muslims tend to carry out their daily activities between two meal times during Ramadan one being just after sunset (*iftar*) and the other before sunrise (*sahur*).

The literature on the subject of admissions to the ED during Ramadan reveals two different assertions. While Pekdemir (3) and Topaçoğlu (4) maintain that compared with the control group no difference in the study group has been recorded during Ramadan. Langford et al (10) reported an increase in the admission of the Muslim population during Ramadan in terms of accidents as well as other medical reasons whereas admission rate of non-Muslims remains stable throughout that period. Our findings support Pekdemir and Topaçoğlu.

Langord et al (10) report an increase in the admission of the Muslim population during Ramadan in terms of accidents whereas admission rate of non-Muslims remains stable throughout that period. Gocmen et al (11) report a decrease in violence-related penetran injuries during Ramadan. Bener et al (12) on the other hand report a slight increase in the cases of traumas caused by traffic accidents during Ramadan. Pekdemir et al (3) showed that no difference in the causes of trauma cases during Ramadan has been observed. Our findings show that in the study group, when compared with the control group, violence-related traumas decreased but injuries caused by falling over increased. It is our belief that owing to the spritual atmosphere as well as moral feelings that Ramadan invokes Muslim people tend to become more tolerant towards one another and hence violence-related cases decline during that time.

Suwaidi et al (7) report no change in the hospitalization rate for congestive heart failure during Ramadan. The results of the study by Pekdemir et al (3) too confirm this assertion. However our study identifies an increase in the hospitalization rate during Ramadan. An examination of our patients' Revised Trauma Scores (RTS) reveals that the RTS's of the traumas occurred during Ramadan appear higher. The increase in the intensity of trauma as well as the rate of hospitalization can be explained due to the decline in patients' attention induced by decrease in blood sugar and fatigue.

When the alcohol levels of the patients in two groups are compared both exhibit lower alcohol levels in Ramadan group. There is no data in the existing literature regarding this issue. We assert that the fact that alcohol consumption decreases in Muslim societies during Ramadan has an impact on this condition.

Conclusion

This study concludes that the rate of trauma cases shows an increase during Ramadan between the hours of 04.00-08.00 p.m. This increase appears exclusively significant in trauma cases caused by falling. The rate of violence-related trauma cases, on the other hand, decrases during the same time period.

Limitation

A major limitation of the study is failure of documantation of fasting and non-fasting patients admitted in the ED.

References

1. *Brunett PH, Cameron PA. Trauma in Adults. In Tintinalli's Emergency Medicine: A Comprehensive Study Guide. Tintinalli JE, Stapczynski JS, Ma OJ, Cline DM, Cydulka RK and Meckler GD (Eds).7th Edition. China: Mc Graw Hill; 2011: p.1671-1675.*

2. *Rashed AH. The fast of Ramadan. BMJ 1992; 304: 521-522.*

3. *Pekdemir M, Ersel M, Yılmaz S and Uygun M. No significant alteration in admission to emergency departments during Ramadan. J Emerg Med 2010; 38: 253-256.*

4. *Topacoglu H, Karcıoglu O, Yuruktumen A, Kıran S, Cımrın AH, Ozucelık DN, SarıkayaS et al. Impact of Ramadan on Ramadan on demographic and frequnciesof disease-relaated visits in the emergency deparment. J clin Prac 2005; 59: 900-905.*

5. *Akhan G, Kutluhan S, Koyuncuoglu HR. Is there ny change of stroke incidence during Ramadan? Acta Neurol Scand 2000; 101: 259-61*

6. *Dönderici O, Temizhan A, Küçükbas T, Eskioglu E. Effects of Ramadan on peptic ulcer complications. Scand J Gastroenterol 1994; 29: 2033-4*

7. *Suwaidi J, Bener A, Hajar HA, Numan MT. Does hospitalization for congestive heart failure ocur more frequently in Ramadan: a population-based study (1991-2001). Int J Cardiol 2004; 96: 217-21*

8. *Perk G,* Ghanem J, Aamar S, Ben-Ishay D, Bursztyn M. *The effect of the fast of Ramadan on ambulatory blood pressure in treated hypertensives.* J Hum Hypertens. *2001; 15: 723-5.*

9. *Ural E, Kozdag G, Kilic T, Ural D,* Şahin T, Çelebi O and Komsuoglu B. *The effect of Ramadan fasting on ambulatory blood pressure in hypertensive patients using combination drug therapy.* J Hum Hypertens. *2008 Mar; 22(3): 208-10. Epub 2007 Oct 11.*

10. *Langford EJ, Ishaque MA, Fothergill J, Touquet R. The effect of the fast Ramadan on accident and emergency attendances. J R Soc Med. 1994; 87: 517-518.*

11. *Gocmen E, Koc M, Tez M, Yoldas O, Bilgin A, Keskek M. Effect of Ramadan on surgical emergencies. Ann Emerg Med 2004; 44: 283-5.*

12. *Bener A, Absood GH, Achan NV, Sankaran-Kutty M. Road traffic injuries in Al-Ain City, United Arab Emirates. J R Soc. Health 1992; 112: 273-6.*

Corresponding Author
Kavalci Cemil,
Ankara Numune Training and Research Hospital,
Emergency Department,
Ankara,
Turkey,
E-mail: cemkavalci@yahoo.com

Pulmonary manifestation of the lymphoma CT characteristic

Obrad Jovic[1], Sasa Vujnovic[2], Mirjana Cadjo[3], Dragana Roganovic[4], Tatjana Sladojevic[5]

[1] General Hospital „ St. Apostol Luka" Doboj, Bosnia and Herzegovina,
[2] Department of Radiology, Clinical Centar of Banja Luka, Bosnia and Herzegovina,
[3] Clinic for Lung Diseases, Clinical Centar of Banja Luka, Bosnia and Herzegovina,
[4] Department of Hematolgy, Clinical Centar of Banja Luka, Bosnia and Herzegovina,
[5] Health Centar, Banja Luka, Bosnia and Herzegovina.

Abstract

Limphoproliferative disorders of lung have a broad clinical and morphologic spectrum. The radiographic features are non specific. Invasion of the lungs can occur in 15-40% of patients and is nearly always associated with hilar adenopathy. Pulmonary manifestation of disease involved mass consolidation, multiple nodules, mases of pleural origin and pleural effusion. Computed tomography (CT) is used routinely in patients with lymphoma to stage disease. The radiologic differantation of pulmonary lymphoma from other disease can be difficult. We retrospectvely reviewed the radiological findings of 34 patients with Hodgkin disease and Nonhodgkin lymphoma. Pulmonary manifestation of disease was present in the 15 patients. (44%). The most common CT findings is mass consolidation, this finding was present in 8 of the 34 patients (23,5%).

Key words: Limphoproliferative disorders, Lung, Computed tomography.

Introduction

Lymphoma is a descriptive term for malignoma lymphoreticular specific cell lines (T-cells, B cells, ...), which make up about 57% of all hematological cancers (10). Lymphomas are divided into two large clusters of Hodgkin's disease (HD) and Non-Hodgkin's lymphoma (NHL). There is the incidence of 2.5 cases per 100,000 population in the age group 20-25 years, and incidence at the age of 60 years is about 43.7 cases per 100,000 population (10). The disease is usually manifested by enlarged lymph nodes, hepatomegaly, splenomegaly, and changes in the pulmonary parenchyma and pleura. Mediastinal lymphadenopathy and pulmonary pa-

renchyma abstraction is the most common manifestation of NHL, and some of the incidence of HD (3). Pulmonary manifestations of the disease occurs as a consequence of the spread of disease from the mediastinum and is indicated as a secondary pulmonary lymphoma, while the incidence of primary pulmonary lymphoma (2). Pulmonary form of the disease may be present in several forms depending on the hystological type of lymphoma. Pulmonary manifestations of the disease usually occurs as a pneumonic, and single or multiple soft tissue nodules, thickening of the pleura and/or pleural effusison (1). Abstraction of pleura is rare and can be seen as nodular plaques that are actually deposits of lymphoid tissue. If the lymphoma is limited to the lungs without extrathoracic spread at least three months is classified as primary lymphoma, and all the other cases with mediastinal and extrathoracic localization represent the secondary pulmonary lymphoma (5). According to the literature, primary pulmonary lymphoma is seen in about 0.4% of cases, while the abstraction of a secondary lung more dependt of hystological type of lymphoma (3).

Distribution (anatomic localization) disease in lymphoma is very important for the therapeutic treatment and prognosis of the disease. Computed tomography (CT) with the application of contrast in routine work in all patients with lymphoma (10,11,12). In addition to using the CT and other imaging methods in diagnosis of lymphoma, such MRI, PET, and others. Bronchoscopy as a diagnostic method is of little importance for the diagnosis, because endoluminal lesions are quite rare . Analysis of sputum in tumor cells may help in diagnosis (10). Lymph node biopsy, Fine needle biopsy and pathohistological processing the resulting products provide a definitive diagnosis (10).

Purpose: Show the frequency and characteristics of pulmonary manifestations in patients with the diagnosis of Hodgkin's disease and NonHodgkin's lymphoma.

Materials and Methods

The study retrospectively, which included 34 patients who were referred for review KT chest, regardless of gender, aged 16-81 years. In all patients diagnosed with histopathological malignant lymphoma and all patients in this study were divided into two groups and patients with HD and NHL.

In all patients chest examination was done at the Department of Radiology, Clinical Center Banja Luka on 16 CT layer device, the Somatom Sensation 16 - Siemens. Scanning parameters: Scan Thorax routines contrast, 120 kV, 100 mAs, a total scan time of 10 sec, cranio-caudal, pitch 1.15, acquisitions 16x1, 5 mm. Review carried out in non contrast enhanced and contrast enhanced series with thickness of 6 mm.Applied the iodic contrast agents, Ultravist 370, at a dose of 1 ml/kg , with the speed of injection of 2,5 ml/sec, pressure 150 psi. Scan range covers an area of the upper thoracic aperture to the back pleural recesus. All images were viewed in the "windows" W / L (windowlength) 1500 / 650, standard lung, and mediastinal windows 400/40-70.

Results

The study included 34 patients who were treated with the diagnosis of malignant lymphoma at the Clinic of Hematology in the period from January 2008 to March 2009, and by whom made CT review of the chest in the diagnosis or grading of the disease. The patients were age of 16-81 years of age, male 18 (53%) and female 16 (47%). Diagnosed with Hodgkin's disease were 11 patients (32.4%), and diagnosed with NHL were 23 patients (67.6%). In all patients a diagnosis was confirmed pathohistological, and in patients with pulmonary manifestation of lymphoma (a form of consolidation of lung parenchyma) diagnoses was confirmed after transthoracic biopsy. In patients with nodular form of lymphoma and lung manifestations with signs of thickened pleura, the conclusion that these are manifestations of pulmonary disease was pa-

ssed on the basis of monitoring the patient. (Manifestations are emerging after several months of detection of primary disease, or have pulmonary and pleural changes retiring after treatment).

In 34 patients was performed a total of 66 CT views of the chest.

The most common manifestation of lymphoma seen in surveys of the thorax is mediastinal lymphadenopathy in 26 patients (76.5%) usually with the abstraction parataracheal, subcarinal and hylar lymph nodes. Mediastinal lymphadenopathy was registered in 8 patients with HD (72.7%) and in 18 patients with NHL (78.3%).

For study purpose, the CT findings were divided intu three categories: a) consolidation of lung parenchyma, b) nodular lesions, c) thickening of pleura. Changes in the lungs had a total of 15 patients (44%), in 5 patients with HL (45.45%) and in 10 patients with NHL (43.50%).

The most common pulmonary manifestation of lymphoma patients in the studied sample was a consolidation of lung parenchyma, in 8 patients (53.33%) and 3 patients with HD and in 5 patients with NHL. In two patients have been found massive pulmonary consolidation in both lungs, with one from the NL and the one from the NHL.

Nodular lesions were registered in 3 patients (20%), in two patients with HD and in one patient with NHL. Single nodular lesions have been from one patient, and multiple in two patients. In all patients with nodular lymphoma manifestations noted the withdrawal of the changes implemented after therapy.

Thickening of the pleura is recorded in 2 patients (13,33%), both the NHL, one patient with an isolated thickening of the pleura, the latter associated with the consolidation of the pulmonary parenchyma.

Pleural effusion was noted in 2 patients (13,33%) of both the NHL.

Consolidation of lung parenchyma, and nodular lesions pleural outburst are recorded together in one patient with NHL. In 9 patients (26.5%) respiratory events were registered at the first examination of the chest, with 6 patients (17.6%) lung changes were registered 4-9 months after the first examination.
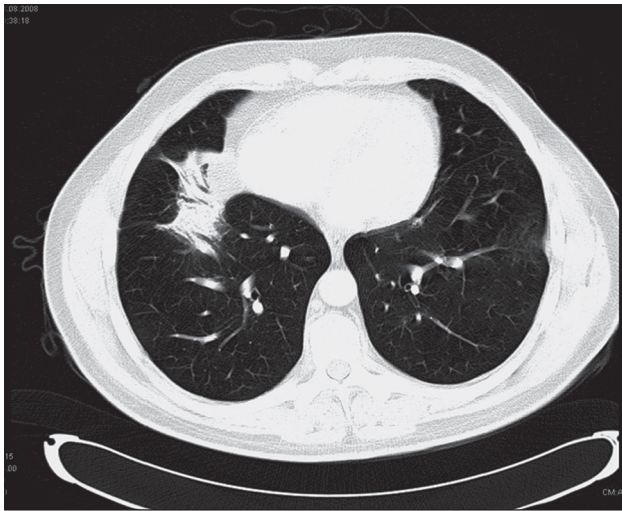
Figure 1. CT scan of lungs. Consolidation of lung parenchyma with bronchogram

Figure 2. CT scan of lungs. Nodular form of pulmonary manifestations of lymphoma

Figure 3. CT scan of lungs. Thickening of the pleura

Table 1. Table view pulmonary disease manifestation investigated sample.

Finding	No. of Patients (%)		
	Hodgkin's disease	NonHodgkin's Lymphoma	Total
	5	10	15
Consolidation	3	5	8(53,33%)
Nodules	2	1	3 (20%)
Pleural thickening	0	2	2 (13,33%)
Pleural effusion	0	2	2 (13,33%)

Discussion

In 15 patients (44%), diagnosed with lymphoma were registered in some form of pulmonary manifestations of the disease, which is also known as secondary pulmonary lymphoma. Mediastinal lymphadenopathy is the most common diseases intratoracic manifestation, no matter what type of lymphoma it is, but is somewhat more common in NHL. Consolidation of lung parenchyma has a wide range of events at the CT and the most frequent form, consolidation similar pneumonic consolidation with or without air bronchogram. Nodular lesions are manifested as single or multiple rounded lesions, soft tissue density discrete amplification density in contrast enhanced study, often iregular contour (visible changes in the larger sizes). Thickened pleura is generally manifested as a nodular thickening of the same and caused by the accumulation of lymphoid tissue.Pleural effusion was diagnosed in only two patients, although the literature mentions that occurs in a much higher percentage. Pleural effusion occurs as a result of obstruction lymphatic drainage and according to some authors is a bad prognostic sign (10). Pulmonary manifestations of lymphoma are usually in close contact with structures, mediastinum, and occasionally surrounded by smaller or larger atelectasis and signs of pneumonitis. The study included patients with CT examination of the chest where the immediate diagnosis of disease, and patients who have on several occasions examined to follow the course of the disease. CT is used in grading the disease because display changes are not visible on the plain chest radiography (4, 11, 12,).

In patients with pulmonary find the disease before they set a definite diagnosis of lymphoma, usually described as pneumonia or secondary deposits,

due to the characteristics described nonspecific CT changes. CT characteristics of pulmonary manifestations of lymphoma also show no significant morphological differences on which it can be said about any form of lymphoma it is. Data from the autopsy said that the pulmonary manifestations of the disease present in 62% of patients with lymphoma (7). For accurate interpretation of events thoracic lymphoma need a good knowledge of the lymphatic system of the lung, because lymphatic way is primary of spreading disease, and the dissemination hematological is rare (10). Mediastinal lymphadenopathy in the studied sample of luck in 76.5% cases, which is slightly higher than those of Colby and research staff that are lucky mediastinal lymphadenopathy in 61% of cases. Pulmonary manifestations are found in 44% of investigated, which is correlated with data from literature. The study recorded a slightly higher percentage of pulmonary manifestations in patients with NHL about 43.50%, which is more care in other surveys which ranges from 50-20% (12).

Conclusion

Computed tomography (CT) is the method of choice for diagnosis, mediastinal, lung and pleural manifestation of lymphoma. The protocol for lymphoma grading review includes CT regions neck, chest, abdomen and pelvic (3,4,7,8,10). Changes localized in the mediastinum, lungs and the chest wall to accurately diagnose with CT than conventional radiography, especially in defining the location and size changes. CT can help in defining the nature of change and with high precision when it comes to distinguishing liquids, grease, and calcification. It is also sensitive method when it comes to detecting and pulmonalnl mediastinal mass, but low specificity in differentiation benign from malignant changes. Pulmonary manifestations of lymphoma have nonspecific finding the CT and the grave for the differential diagnosis. When the issue of pulmonary manifestations of lymphoma differential diagnosis should be borne in mind pulmonary oedema, allergic reactions, opportunistic infections, pulmonary embolism, sarcoidosis, Kaposi's sarcoma, bronchoalveolar cancer et al. In a certain number of patients with lymphoma, the lung parenchyma are registered fibrous changes and most often performed in patients after hormonal therapy. CT is sensitive than other modalities in de-tecting lymphadenopathy and extralymphatic expansion lymphoma and is required in all patients prior to initiation of therapy (4). Computed tomography (CT) with the application of contrast in routine work in all patients with lymphoma and is important not only in grading the disease but also in the planning and tracing course of the disease and therapeutic response, the planning transplantation and diagnosis of complications of the disease (10).

References

1. Puri MM, Gupta K, Arora VK. A case oof Hodgkin's Disease presenting as Lymphocitic Interstitian Pneumonitis, Indian J Chest Dis Allied Sci 2003; 45: 139-142

2. Manoharn A, Piney WR, Schonell ME, Bader LV. Intrathoracic manifestations in non-Hodgkins lymphoma, Thorax, 1979; 34: 29-32

3. Kara M, Özkan M, Sak SD, Kuzu I, Kavacku S. Primary Pulmonary Non-Hodgkins limphoma, Journal of Ankara Medical School, 2002; Vol 24, No 4,

4. Sutton D. Textbook of Radiology and Imaging, Volume 1, Churchill Livingstone 2003; Vol 1, 3: 118-121

5. Semnic R. CT toraksa i abdomena, Institut za onkologiju Sremska kamenica, 2005; 78-79

6. Lazić J, Šobić V. Radiologija, Medicinska knjiga Meidicinske komunikacije 2002, 20; 443-444

7. Toma P, Granata C, Rossi A, Garaventa A. Multimodality imaging of Hodgkin disease and non-Hodgkin lymphomas in children. Radiographics. Sep-Oct 2007; 27(5): 1335-54. [Medline].

8. American Cancer Society. What Are the Key Statistics About Hodgkin Disease?. Cancer http://www.cancer.org/docroot/CRI/content/CRI_2_4_1x_What_Are_the_Key_Statistics_About_Hodgkin_Disease.asp?sitearea. (15.02.2009)

9. Langley CR, Garrett SJ, Urand J, Kohler J, Clarke NM. Primary multifocal osseous Hodgkin's lymphoma. World J Surg Oncol. Mar 17 2008;6:34.

10. Ajeet G, Vajpayee N. Lymphoma, B-Cell, http://emedicine.medscape.com/article/202677-overview (02.04.2009)

11. Narainder G, Bomanji JB. Hodgkin Disease, Thoracic http://emedicine.medscape.com/article/356522-overview (02.04.2009)

12. Nawaz KA, Prabhakar R. Non-Hodgkin Lymphoma, Thoracic http://emedicine.medscape.com/article/359607-overview (15.03.2009)

Corresponding author
Obrad Jovic,
General Hospital „St. Apostol Luka",
Doboj,
Bosnia and Herzegovina,
E-mail: jovico@teol.net

Therapy resistant depression or inadequately treated delusional depression: Case report and literature overview

Mina Cvjetkovic-Bosnjak, Aleksandra Nedic, Gordana Misic-Pavkov, Zoran Gajic

Psychiatric Clinic, Novi Sad, Serbia.

Introduction

Delusional depression represents a subcategory of Mood disorders (F32.3 or F 33.3), according to ICD X. In addition to depressive symptomatology such as mood disturbance, loss of appetite , insomnia, loss of will and interests and other criteria of a depressive disorder, delusional symptoms such hallucinations or delusional ideas appear, more often congruent, but incongruent to affective disturbance as well. (1,2)

Since the time of Hippocrates, physicians have recognized that some patients become delusional when they are depressed (3,4,5). Currently, delusional depressive patients make up approximately 20 % to 30% of all depressive patients who are hospitalized. In different countries (4,6) the data are similar. They have double the hospitalization rate of non-delusional depressed patients (3,5), while their average duration of hospitalization is approximately 50 to 60 days (4,5). The fact is that delusional depressive patients have been unable to perform usual activities for much longer than non-delusional patients, and that they may have a higher risk of suicide than non-delusional depressed patients (3,7).Therefore, this mood disorder subgroup carries major social and economic costs for these patients, their families and society in general, especially when treated improperly. (2,4).

Still, in mid XX century, Glassmann et al (7,8,9) reported that delusionally depressed patients do not respond well to antidepressants alone, while similar results occurred in a few other investigations, although in the XXI century. Many reports have commented on the efficacy of a combination of antidepressants and antipsychotics in the treatment of delusional depression (6,7,8,9,10)). The general conclusion suggests that the combination of antidepressants with antipsychotic drugs is superior to treatment with either one alone. Around 65 % of delusional depressive patients do not respond well to antidepressants alone. According to literature, a part of the non-responding depressive patients are delusional depressive patients, when treated without antipsychotic drugs.

In this article, we present a patient who was diagnosed with therapy-resistant depression, but this patient more likely suffered from a delusional depressive disorder and was treated for a few months with antidepressant alone. Consequently, this patient did not show remission prior to hospitalization.

Key words: Delusional depression, adequate pharmacotherapy, therapuresistence.

Case report

The patient, aged 50, unemployed, was admitted to part/day/hospitalization with a diagnosis of a moderate depressive episode, after three years of ambulance treatment without remission. The patient was divorced, but still living in the same flat with her ex-husband and son. Her daughter lives separately with her family.

For 25 years the patient worked as a lawyer, but was unemployed for the last two years. After being dismissed, the patient became sad, without interest, she felt worthless, complained about suicidal ideas, and her sisters took her to a psychiatrist. She slept well and her appetite was adequate. The psychiatrist noted that the patient suffered from moderate depression and began treating her with antidepressants in a combination with benzodiazepines (maprotiline, (50 mg per day, lorazepame 3 mg per day). After one month, a psychiatric check-up was conducted, and the antidepressant was changed as patient did not show any improvement. The patient's complaints were almost the same as during her first visit. Now, the therapy remained without an antipsychotic (sertraline 100 mg /day, but the initial doses were lower). After 6 weeks,

the patient came in for a regular psychiatric check-up, still with the same complaints. Her psychiatrist changed sertraline to mianserine, and noticed that her suicidal ideas were becoming progressive. For three months the patient took mianserine in daily doses of 60 mg, while the doses of benzodiazepines remained. Then, another anti-depressive drug was prescribed to the patient, fluoksetine, in daily doses of 40 mg, now in a combination with mood stabilization medicaments (carbamazepine in daily doses of 600 mg). The clinical feature still was the same, and there were no evident signs of remission. After two years, the diagnosis was changed to dysthumia and the psychiatrist recommended hospitalization, but the patient refused to go to hospital. During the next year the patient regularly attended psychiatric check-ups, and took a different kind of antidepressives, (amitriptiline 75 mg/day during two months, in a combination with benzodiazepines, imipramine (50 mg/day in combination with maprotiline (75 mg/die)), but still without improvement. Finally, she agreed to go to the Psychiatric Clinic, as she felt very bad, without interest, will, and with very intensive suicidal ideation.

The patient was admitted to part day hospitalization, although the team of psychiatrists and psychologists at the hospital suggested that full time hospitalization would be the best option, as it was necessary to try other medicaments. At the time of admittance, the patient was anxious, tense, fearful, and she looked confused. The ideas of worthlessness and lack of perspective were present, she was sad all day, and unpragmatic.

When she was admitted, an antipsychotic drug was prescribed, in a combination with an antidepressant.

During the next week the patient reported less intensive suicidal ideation, her mood changed, and she was less worried. The doses of antipsychotic drugs were slowly graduating, during next two weeks, and in that period the patient's mood became better, she had no hallucinations, and her suicidal ideas had disappeared. The entire time she slept well, and her appetite was satisfactory. Her sister reported that the patient is very motivated for different activities, and that she was functioning well at home. After 4 weeks of hospitalization, the patient was dismissed in solid remission. At the time of her dismissal, her therapy was:

- Clozapine a 25 mg 1|2, 1|2,1
- Maprotiline a 25 mg 3x1
- Clonazepam a 2 mg 3 x 1|4

Discussion

The diagnostic procedure in medicine, and especially in psychiatry, is of great importance, as the therapy guideline depends on the type of mental disorder. In mood disorders, antidepressant drugs must be prescribed, but if in a clinical environment the psychotic elements persist, it is necessary to combine antidepressive drugs with antipsychotic drugs, and this combination is the most effective. Because of these facts, the diagnosis of each patient with a mental disorder should be revised, especially if the treatment does not improve the clinical features. In this case, the patient was diagnosed with therapy-resistant depression, but the main reason for non-responsiveness was a misdiagnosis. After being prescribed with an adequate therapy, full remission was achieved.

Conclusion

The main purpose of this case report was to determine the best pharmacological treatment of patients with delusional depression, and to point out that if a patient failed to respond to antidepressants alone, a different treatment should be an option. In psychiatry, a diagnostic revision of therapy-resistant depression should be always made as such depression could be either bipolar, or delusional, and with adequate treatment, solid remission could be achieved.

References

1. Akiskal HS, Webb Wl Jr. (1983) Affective disorders. Recent advances in clinical conceptualization, Community psychiatry, 34: 695-02.

2. Berazzi F. (1999). Is atypical depression a moderate severity depression? A 536 case Study in J.Psychiatry Neurosci. May, 24 (3): 244-7

3. Lee TW, Tsai Sj, Yang CH, Hwang JP (2005). Clinical and phenomenological comparisons of delusional and non-delusional major depression in the Chinese elderly [Int.J. Geriatr. Psychiatry], Jun, vol 18 (6), pp 486-90

4. *Meyers BS, Klimstra SA, Gabielle M, Hamilton M, Kakuma T, Traumalasetti F, Alexopoulos GS (2001). Continuation treatment of delusional depression in older adultsThe American Journal of Geriatric Psychiatry,, vol 9 (4), pp.415_22*

5. *K. Boskovic, T. Cigic, M. Grajic, S. Todorovic/Tomasevic, A.Knezevic (2010). The quality of life of patients after a lumbar microdisectomy:n a four year monitoring study, Clinical Neurology et Neurosurgery, 112, 557_62*

6. *Leinonen E, Santala M, Hiotyla T, Santala M, Salkoganas RK. (2004). Elderly patients with major depressive disorder and delusional disorder are at increased risk of subseqvent dementia,Nordic Journal of Psychiatry, vol 58 (2), pp.161_4*

7. *Zanardi R, Franchini L, Seretti A, Perez J, Smeraldi E. (2000). Venlafaxine versus fluvoxamine in in the treatment of delusional depresion;a pilot double blined controlled study.,The Journal of Clinical Psychiatry,Jan,vol 61 (1), pp 26_9.*

8. *Sands JR, Harrow M. (1994), Psychotic unipolar depression at "follow up":factors related to psychosis in the affective disorders, American Journale of Psychiatry, July, 151 (7):995_000*

9. *Soldatovic-Stajic,B.(1999)Diferencijalno dijagnostički značaj neuroendokrinoloških testova u afektivnim poremećajima i njihova vrednost u predikciji antidepresivne farmakoterapije, Doktorska teza, Medicinski fakultet Novi Sad, Serbia*

10. *M.Cvjetkovic-Bosnjak (2001) Dijagnoza, suicidalni rizik, tok I prognoza psihoticnih depresija, doktorska disertacija, Medicinskji fakultet, Univeryitet u Novom Sadu,UDC 616,89-008.441.4407,616.895.4*

Corresponding Author
Mina Cvjetkovic-Bosnjak,
Psychiatric Clinic,
KCV,
Novi Sad,
Serbia,
E-mail: minacvjet@gmail.com

Determination of nursing students' moral judgment: A city in west region of Turkey

Fatma Basalan Iz[1], Suheyla Altug Ozsoy[2]

[1] Suleyman Demirel University, Faculty of Health Sciences, Public Health Nursing Department, Isparta, Turkey,
[2] Ege University School of Nursing, Public Health Nursing Department, Izmir, Turkey.

Abstract

Purpose: The aim of this research is to define nursing students' moral judgment ability.

Method: The sample included 304 student 2007-2008 spring semester 1., 2., 3., and 4., classes whose selected according to stratified sampling method. Power analysis was used in order to decide on sample size. In the research Defining Issues Test, Self Moral Evaluation Scale and Social Moral Evaluation Scale were used.

Results: Student's age mean were 21.19±1.68. According to Defining Issues Test, students' moral judgment ability scores mean were in 33.9±12.8 Students had 8.2 above 10 point from Self Moral Evaluation Scale and 4.8 above 10 point from Social Moral Evaluation Scale. Student's moral judgments supported traditional term features which pointed out in Kohlberg's theory.

Key words: Defining issues test, self moral evaluation, social moral evaluation, nursing student, cognitive moral development, moral judgment.

Introduction

Prolonging life by artificial means has brought about various ethical problems in addition to the severe squeals suffered by infants and children undergoing pediatric intensive care, apart from the high costs incurred (13, 14). Recognition of the limits of good medicine requires effective monitoring when continuing treatment is no longer in the patient's best interest. At this point, it would not be possible to determine futile treatment without consideration of both medical and ethical issues (13, 14, 30). As health care settings, financing, decision-making responsibility, and values shift, the nursing role will become more complex and independent. Regardless of the clinical practice setting, professional nurses will be increasingly confronted with the need to make or facilitate ethical decisions. (23, 30).

Many nurses consider ethical judgment as synonymous with clinical judgment and behavior. Nursing educators describe clinical judgment as a result of moral agency which is the effective influence a nurse exerts on the outcomes of a practice situation. In other words, in order to manifest sound clinical judgment, one must be able both employ proficient moral judgment and implement clinical decisions. (3, 23). Moral judgment provides for a course of action in a moral dilemma, refers to the cognitive aspects of reasoning about ethical problems. Moral judgment is influenced by external referent points such as ethical codes and principles. (29). Theoretically rooted in the work of Lawrence Kohlberg and James Rest, moral judgment is likely to be influenced by education and one's life experiences. A person's moral judgment has qualitative differences at different stages in one's life (10). Moral reasoning is the cognitive and developmental process of reasoning about moral issues. The process develops through sequential transformations and is the evidence of the organization of an individual's thinking about social cooperation. Moral reasoning is a person's perception of how the rights and responsibilities of individuals should be determined concerning distribution of the costs and benefits of social interaction. (13).

Moral judgment, as Rest (1994) and Kohlberg (1984) suggest, is more than justifications people provide for actions. It emphasizes strategies people provide for cooperation. Moral judgment is a personal approach managing the elements of a dilemma and a method to demonstrate a response to socialization and thereby influence the structure of society. The moral judgment reflects some aspects of nurses' socialization to their practice environment and their understanding of moral dilemmas (10).

The test most frequently used is Rest's Defining Issues Test. Kohlberg's Moral Judgement Interview, and Gibbs' Sociomoral Reflection Measure, and Crisham's Nursing Dilemma are used less often (5, 10). In European countries, Lind's Moral Judgement Test is most frequently employed (8). By means of these tests, many transverse and longitudinal studies of medical and other university students have been carried out in other countries in order to determine their level of moral judgement competence (4, 7, 10).

The aim of this research is to define nursing students' moral judgment ability according to "Kohlberg's Cognitive Moral Development Theory".

Method

Population and sample

The study was conducted descriptive in two major nursing colleges in the west of Turkey in 2007-2008 academic year. 920 students studying in this school constitutes this research (Table 1). Power analysis was used in order to decide on sample size. Power analysis is a method that provides a well designed research having levels of validity and reliability. Furthermore, this method also provides the reliability and consistency of the research results. It is recommended that in a research statistical power should be higher than 80% (25). Data were collected from 20 students for a power analysis. As a result of the analysis, considering the statistical power as 99%, implication of 304 students was decided.

The level load was set according to the number of students in each classroom. According to level based sample selection technique, data were collected from freshman (72 sts), sophomore (78 sts), junior (79 sts), and senior (75 sts) students 8 (Table 1). The survey sheets were filled in after school.

Instruments

Four instruments were used in this study.

Socio-demographic Questionnaire: The survey sheet that questions socio-demographic features was designed by the researcher. This survey consists of 32 questions in which age, grade, sex, the high school graduation, the place where s/he spent most of her/his life e.g., The application time of this socio-demographic data form is approximately 5 to 10 minutes.

Defining Issues Test: Defining Issues Test (DIT) was developed by James Rest in 1979 based on Kohlberg's cognitive moral development theory. The studies on adaptation, reliability and validity of DIT were done by Akkoyun in 1987. Akkoyun has stated that these four stories are suitable for Turkish culture (2, 24). For this reason, four moral dilemma stories stated as suitable to Turkish culture were used. These stories were; "Heinz and Drug", "Escaped Prisoner", The Doctor's Dilemma", and "Webster". It takes approximately forty minutes to complete DIT. Self Moral Evaluation Scale: Self Moral Evaluation Scale was developed by Güngör (15). It is based on individual's grading himself/herself by giving a self moral evaluation score from 1 to 10 (16). It takes approximately 3 to 5 minutes to complete the survey.

Table 1. Dispersal of sample incoming students in research

Schools	Number of students	Number of students calculation	Number of students in research
First School			
1.class	155	(155 / 920) X 304	51
2. class	152	(152 / 920) X 304	50
3. class	166	(166 / 920) X 304	55
4. class	169	(169 / 920) X 304	56
Total	**642**		**212**
Second School			
1. class	67	(67 / 920) X 304	21
2. class	83	(83 / 920) X 304	28
3. class	71	(71/ 920) X 304	24
4. class	57	(57 / 920) X 304	19
Total	**278**		**92**

Social Moral Evaluation Scale: The Social Moral Evaluation Scale was used by Hatunoğlu (2003) in order to reveal how subjects evaluate the social moral level in addition to the viewpoint of their own moral levels. It depends on individual's grading the society by giving moral evaluation scores from 1 to 10 (18). It takes approximately 3 to 5 minutes to administer the test.

Evaluations of Defining Issues Test Data: First of all, in order to evaluate DIT's survey sheets, consistency should be checked. The survey sheets regarded as valid as a result of the consistency check are included into the research and the others are not put into evaluation. A consistency check was done for P score in the research. Firstly, the survey sheets that had an M score greater than 50 were excluded from the evaluation. Secondly, 142 survey sheets that had inconsistency between gradation and ranking were excluded from the evaluation. Thirdly, it was made sure that individuals have chosen 9 or more items at the same degree of importance.

If the individual marked more than 9 items at the same degree of importance (e.g. 10 items marked as important in an obvious way) and if this is same for 2 or more situations, the survey sheet was not taken into evaluation. Likewise, 37 survey sheets were excluded from the evaluation. The survey sheets that did not match with DIT's consistency criteria were replaced by substitute students. Random selection table and class lists were used at the selection of substitute students. The consistent 304 student data were included in the research and all data were transferred to SPSS database.

In data analysis SPSS (The Statistical Packe for Social Sciences) program was used. The tests and analysis that are used follows as; A number and percentage distribution was used in order to evaluate the date gathered from the socio-demographic features forms filled by nursing college students. The relationship between socio-demographic variables, Defining Issues tests, Social moral Evaluation Scale, and Self Moral Evaluation Scale was analyzed by one way variance analysis and t test. For further analysis Bonferroni test was used. The correlation between Defining Issues tests, Social moral Evaluation Scale, and Self Moral Evaluation Scale was observed.

Results

Socio-demographic Variables: The 66 % of the students who attended to the research are 21-24 years old. The average age is 21.19 ± 1.68. 23.7 % of the students are freshmen, 25.7 % of the students are sophomores, 26.0 % of the students are juniors, and 24.7 % of the students are seniors. The place where students spend their most of their lives are provinces and districts. The 59.2 % of the students consider themselves as successful according to the university entrance exam. Most of the students consider their knowledge in the average or good. The efficiency of the education on deciding what to do against moral dilemmas are evaluated as 49.7 % adequate, 32.2 % average, 7.9 % inadequate and 0.3 % really inadequate. The most important personal moral is family and the most important occupational moral is being professional. The students stated that family plays the most important role in one's moral development. It was found out that there is an average relationship between the frequency of religious topics discussed among family members and the student's involvement to religion (r=+0.4, p<0.001). 45.7 % of the students attended to the survey evaluate themselves as sensible towards the incidents happening around them. 66.1 % of the students think they are good at interpret those incidents. 4.6 % of the students work in a non-governmental organization. Most of the students think that their parents' attitudes towards themselves are democratic. Most of the parents are primary school graduates. The type of the families is nuclear family, and they have middle income. Most of the students are the first child of their families and on an average they have 2 siblings.

Results Regarding DIT: The students attending to the survey have 20.1 ± 9.4 points of 5A stage, 3.6 ± 4.3 points of 5B stage, and 10.3 ± 7.4 points of 6th stage. DIT P point is 33.9 ± 12.8 (Table 2). The relationship between all of the independent variables concerning students attending to the survey and DIT was analyzed by variance analysis or t test according to the characteristic of the variable. Among all independent variables examined, there is a statistically meaningful relationship among the student's grade, the father's educational background and DIT score. At the end of the analysis, the meaningful relations are analyzed with Bon-

Table 2. Moral judgment stage distribution of defining issues test score

Stage	Defining Issues Test Score			
	5A stage	5B stage	6 stage	A
Mean Score	20.1±9.4	3.6±4.3	10.3±7.4	4.3±5.4
P Score	33.9±12.8			

ferroni advanced analysis. It was found out that the relationship between the student's grade and DIT score is the result of the higher DIT scores of junior students (F= 3.534, P<0.05, Figure 1). The relationship between the educational background of the father and DIT score is the result of higher DIT scores of the students whose fathers are not literate (F=2.181, p≤0.05, Figure 2).
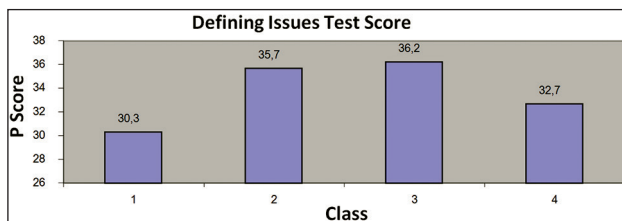
Figure 1. The Change of Scores Among Grades According to Defining Issues Test Score
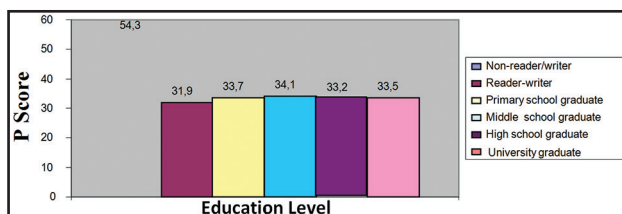
Figure 2. The Change in Fathers' Educational Backgrounds According to Defining Issues Test Score

Results Regarding Self Moral Evaluation Scale: Self Moral Evaluation Scale is based on individual's grading himself/herself by giving a self moral evaluation score from 1 to 10. The students in this study gave 8.2±1.1 (min-max; 4-10) Self Moral Evaluation Scale points to themselves (Table 3). The relationship between all of the independent variables concerning students and Self Moral Evaluation Scale was analyzed by variance analysis or t test according to the characteristic of the variable. It was found out that there is a statistically meaningful relationship among the students' achievement level at university, their knowledge, the level of interpretation of the incidents occurring around them, the efficiency of

their education on giving right decisions towards moral dilemmas, how they evaluate their involvement to religion, the mother's attitude towards the student, the father's educational background with self moral evaluation score. The results found meaningful at the end of variance analysis were analyzed with Bonferroni advanced analysis. The relationship found statistically meaningful among self moral evaluation and the students achievement level at university (F=5.58, p<0.05), knowledge (F=3.35, p<0.05), and the level of interpretation of the incidents occurring around themselves was found out that it is the result of higher Self Moral Evaluation Scores of students who consider themselves in a good condition. It was found out that the efficiency of the education the students receive during their school life on moral dilemmas (F=5.53, p<0.05) was because of the students high self moral evaluation scores, who consider their education as very efficient.

Table 3. Self morality evaluation and social morality evaluation assessment of students

Assessment of students	Mean score
Self Morality Evaluation Score	8.2±1.1 (min-max: 4-10)
Social Morality Evaluation Score	4.8±1.6 (min-max: 1-10)

The relation in the involvement to religion (F=4.01, p<0.05) is the result of the lower scores of the students who consider themselves as a little religious. It was designated that there is a relation between students who perceive their mothers' attitudes as democratic and higher self moral evaluation scores (F=4.01, p<0.05). It was also designated that there is a relation between the students' fathers' being primary school graduate and lower self moral evaluation scores (F=2.62, p<0.05).

Results Regarding Social Moral Evaluation Scale: Social Moral Evaluation Scale depends on individuals grading the society by giving moral

evaluation scores from 1 to 10.the students gave 4.8±1.6 (min-max; 1-10) social moral evaluation score to the society (Table 3). The relationship between all of the date gathered from students attending to the survey and Social Moral Evaluation Scale was analyzed by variance analysis and t test. It was designated after the analysis that there is a statistically meaningful relation between Social moral evaluation score and student's perception of his/her achievement at university. The relation that is found meaningful after the variance analysis was analyzed by Bonferroni advanced analysis. It was found out that the statistical relation (F=2.751, p<0.05) between Social moral evaluation score and the student's perception of his/her achievement at university was the result of the student who perceived his/her achievement as low. It was designated as a source of difference that the student who perceive his/her achievement as low has a lower social moral evaluation score. A correlation between dependent variables was found in this study which analysis the ability of moral judgment (p>0.05).

Discussion

This study is the first study in which Turkish nursing school students' moral judgment abilities are analyzed. According to the study results; the students attending to the study are in their traditional period, and DIT score was calculated as 33.9±12.8 (Table 2). According to DIT, in terms of interpreting moral judgment ability, 0-27 points are low, 28-41 points are average, and over 41 points are high. Latif and Dunn (2004) touched on Rest and Narvaez's (1994) results of their study on moral judgment development in professionals in their article. According to this study, DIT score is designated as 47.3 in medical doctors, 47.1 in physiotherapists, 46.8 in dentists, 45.7 in vets, 44.6 in nurses, 35.5 in pharmacists, 53.3 in university graduate students, 42.3 in university students, 40.0 in adults. (27). Kim *et al.* (2004) examined 37 nursing students' moral judgment development in a longitudinal study. They found out that the students' scores that they got in their first year (46.1) and the last year (47.4) at university were high. (20). The results of Casterlé, Grypdonck, Vuyl-steke-Wauters and Janssen's study in which they aimed to designate nursing school students' moral

judgments revealed that most of the students are at fourth period, in other words they are in traditional level. This result showed that the students are still motivated in terms of rules, norms, and duties. It also revealed that nurses still cannot give their own ethic decisions (4).

The studies conducted in our country stated that guidance counselors are 34.4, social studies teachers are 30.0, and science teachers are 34.1 (22). Lawyers are 18.44, attorney generals are 15.38, judges are 14.22, law school freshmen students are 19.71, and law school senior students are 19.34 (12). Psychology students are 36.9, and engineering students are 27.1 (6). In a study among teenagers aged from 14-18, girls are 22.4, and boys are 23.1 (1). The study conducted among 1027 high school students the number was stated as 23.3 (17).

The students' DIT score was calculated as 33.9±12.8 in this study which examines students' moral judgment abilities. According to DIT, having a moral judgment ability score from 28- 41 shows that the individual or the group has an average moral judgment ability. According to the study results, it can be said that the nursing school students have an average moral judgment abilities. When looked at the literature, it was found out that foreign nurses have higher scores from DIT. (20, 27). According to Kohlberg moral development can change from one society to another, which is stated in Çileli's work. (9). Furthermore, De May and Schulze also stated in their studies that moral development can vary (11). The factors like socio-cultural differences, educational system, economy, values, the application of legal sanctions, etc. play a great role in students' having average scores concerning their moral judgment abilities when moral judgment abilities are analyzed in nursing school students. The similarity between the results gathered from both the nursing students and other professions can be considered a finding that supports this idea (22).

Kohlberg states in his theory that moral development continues throughout puberty, only a few adults can reach high moral judgments, and this can be achieved around the age of 20 (21). It can be thought that since the experimental group is in their late adolescence, they largely completed their moral judgment developments. Furthermore, students can be considered as having the effects of secondary school and the characteristics of the

society they live in, since in the development of an individual's moral judgments are primarily effected by the family and then shaped by his/her school, the society s/he live in, and his/her personal features (28). The individual completes his/her identity at the university (26). When a student starts university, the duty of academic environment should be teaching professional ethics in addition to professional knowledge and abilities (3). The schools in which the study was conducted there was a shift from classical education system to integrated and problem based system. In an integrated and problem based education system, the student is a researcher, investigator, and tries to find relations. It was found out in this study which analyzes nursing students' moral judgment abilities that the new system affects positively the moral judgment ability according to the grades. The factors like graduation, finding a job, preparation for a new life affects negatively the senior students' moral development abilities.

When the students' Self Moral Evaluations are considered, it was found that students gave 8.2±1.1 (min-max; 4-10) self moral points to themselves. Güngör mentions about hierarchy of values, the stages of moral development, understanding of crime, and moral advice in his work "Psychology of Values". He used one of Kohlberg's stories in his study after making some adjustments. At the same time, he developed "Self Moral Evaluation Scale" based on individual's giving a score to himself/herself. Self Moral Evaluation Scale is based on individual's grading himself/herself by giving a self moral evaluation score from 1 to 10. Güngör designated that all of the participants evaluated themselves between 7th and 10th levels; the aggregation is especially on 8th and 9th levels; and self moral evaluation score is approximately (16). At the interpretation of the results Güngör stated that all of the normal adults see themselves as a level above their levels, and this level is over the average but not being able to reach the perfect point. He pointed out that when the level descends at least the individual would lose his/her self confidence; when the level is on its peak the necessary flexibility for learning and change would be lost; and moral supremacy would be mixed with thought rigidity (15). Ilgar (1996) in his study in which he analyzed students' self moral evalua-

tion designated that the sample group freshmen students have a score of 8.06±1.39 and senior students have a score of 8.11±1.46 in self moral evaluation (19). In his research Hatunoğlu (2003) designated the sample groups self moral evaluation score as 7.36±1.83. (18). It can be said that the results of the study which analyzed the nursing students' moral judgment abilities are similar to Güngör's and Ilgar's research findings. Whatever their moral judgment abilities are the students see themselves above the average. This situation can be evaluated as students have high level of self confidence and can attend to the activities in order to improve themselves.

When the findings of students' Social Moral Evaluations are analyzed, it was found out that students gave 4.8±1.6 (min-max; 1-10) social moral points to the society (Table 2). Social Moral Evaluation Scale was used by Hatunoğlu in order to figure out how individuals evaluate society's moral judgment level apart from how they see their own moral levels. Social Moral Evaluation depends on individual's grading the society by giving moral evaluation scores from 1 to 10. With this instrument a new view was contributed to self moral evaluation. In his study, in which he also analyzed self moral evaluation, Hatunoğlu designated sample group's social moral evaluation score as 3.77±1.89 and found the relationship between moral development level and social moral evaluation score meaningless (18). Although the students' social moral evaluation points that they give to society in a study which analyzes students' moral judgment abilities are higher than Hatunoğlu's study, he thinks that society's moral evaluation is under the average. While giving a decision on social moral evaluation students do not consider themselves as a part of the society and do not think that the other students may make negative judgments about themselves. This can be the result of the student's considering himself/herself apart from the society. While students think that their judgments are high, s/he may think that society's judgments are bad. The students' thought of society's judgments are below the average can be interpreted as the change in social structure was perceived in a wrong way by the students and the students' sense of trust towards society decreased.

Recommendations

The recommendations are presented according to the results of this study.
* Because of the positive effects of education on the development of moral judgment ability, using problem solving methods in order to enhance students' critical thinking abilities throughout the university education lasting 5 years, and conducting case studies,
* During clinical applications which are the most important parts of nursing education, including topics that may lead to moral dilemmas and educator's being a role model in solving moral dilemmas,
* Family plays a great role in the development of moral values, and for this reason planning projects supported by the government which can help family functions applied much more effectively,
* Conducting studies with large samples analyzing the effect of parent's educational level on the moral judgment ability,
* Conducting research on factors like gradu-ation and preparation for a new life which prevent the expected increase in senior students' moral judgment abilities,

References

1. Acuner HY. (2004). The development of moral judgment and moral education of 14-18 year old youth.) [Thesis] Samsun: Ondokuz Mayıs University, Institute of Social Sciences.

2. Akkoyun F. (1987). Empathy tendency and moral judgment. Psikoloji Dergisi, 6 (21): 91-8.

3. Burkemper JE, Dubois JM, Lavin MA. et al. (2007). Ethics education in msn programs: a study of national trends. Nursing Education Perspectives, 28(1): 10-7.

4. Casterlé BD, Grypdonck M, Vuylsteke WM. et al. (1997). Nursing students' responses to ethical dilemmas in nursing practice. Nursing Ethics, 4(1): 12-28.

5. Casterlé BD, Roelens A. & Gastmans C. (1998). An adjusted version of Kohlberg's moral theory discussion of its validity for research in nursing ethics. Journal of Advanced Nursing, 27: 829-835.

6. Cesur S.(1981). The relationship between cognitive and moral development. [Thesis] İstanbul: Boğaziçi University, Institute of Social Sciences, 1997.

7. Crisham P. Measuring moral judgement in nursing dilemmas. Nursing Research, 30(2): 104-10.

8. Çiftçi N. (2001). To be compare moral judgment abiliyt of highschool students in Germany and Turkey. [Thesis] Marmara University, Institute of Social Sciences.

9. Çileli M. (1981). Investigate related to intelligence development psychological approach of moral judgmend in 14-18 age among students. [Thesis] Ankara: Ankara University, Institute of Social Sciences.

10. Çileli M. (1986). Moral psychology and education. Ankara: V Yayıncılık.12-48

11. De May L, Schulze HJ. (1996). Indoctrination and moral reasoning: a comparison between dutch and east german students. Journal of Moral Education, 25(3): 309-24.

12. Ersoy NM. (1997). Investigate of moral development stages of employed justice field and taked education in this are. Unpublished doctoral dissertation, Ankara: Ankara University, Institute of Social Sciences.

13. Gander MJ & Gardiner HW. (2007). Children and adolescent development. Dönmez A, Çelen HN, Onur B trans. 6. pres. Ankara: İmge Kitabevi.45-87

14. Gilbert ES & Harmon JS. (2002). High risk pregnancy and born hand book. Taşkın L. trans eds. Ankara: Palme Yayıncılık, sf: 328-57.

15. Güngör E. (2000). Ahlak Psikolojisi, Ahlaki Değerler ve Ahlaki Gelişme, Research on values psychology, moral values, moral development. İstanbul: Ötüken Yayıncılık A.Ş.

16. Güngör E. (1993). Values psychology. Amsterdam: Hollanda Akademisyenler Birliği Vakfı Yayınları.

17. Harlak H, Dereboy Ç, Okyay P. et al. (Retrieved 5 January 2009). Determination of studys II stade of mind of adolescens. Aydın: Adnan Menderes University Scientific Research Project Unit 2007.. (http://www.akademik.adu.edu.tr)

18. Hatunoğlu HKAG. (2003). A comparation between self and public evalution of moral levels, and psychological symptom levels among college students who were at different moral development levels. Unpublished doctoral dissertation, Atatürk University, Institute of Social Sciences.

19. Ilgar MZ. (1996). Effects upon value systems, moral development stage and self-moral assesment of supervision focus. [Thesis] Erzurum Atatürk University, Institute of Social Sciences.

20. Kim YS, Park JW, Son YJ. et al. (2004). A longitudinal study on the development of moral judgement in korean nursing students. Nursing Ethics, 11(3), 254-65.

21. Kulaksızoğlu A. (2006). Adolescent psychology. 8. press. İstanbul: Remzi Kitapevi.

22. Kurt. Y. (1996). Guidance teachers, moral development stages of these teachers and perceptions of govermance focal. [Thesis] Ankara University, Institute of Social Sciences.

23. Mustapha SL & Seybert JA. (1989). Moral reasoning in college students: implications for nursing education. Journal of Nursing Education, 28(3): 107-11

24. Öner N. (1997). Psychological tests used in Turkey, one application source. İstanbul: Boğaziçi University Yayınları.

25. Özdamar K. (2003). Modern scientific research methods. Eskişehir: Kaan Kitabevi.

26. Özgüven İE. (2001). Psychological information and guiding in modern education. Ankara: PDREM.

27. Rest JR. & Narvaez D. (1994). Moral development in the professions: psychology and applied ethics. Hillsdale NJ: Lawrance Erbaum Associates, 3-225. Latif AD, Dunn BJ. ind. An assesment of the ethical reasoning of united states pharmacy students: a national study, American Journal of Pharmaceutical Education 2004; 68(2):1-10.

28. Şengün M. (2006). Moral thinks and judgments of last highschool students- Samsun county example. Dinbilimleri Akademik Araştırma Dergisi, 6(3): 297-316.

29. Viens DC. (1995). The moral reasoning of nurse practitioners. Journal of Academic Nurse Practice, 7(6): 277-85.

30. Winland BJE. (1983). A compararison of student nurses, nurses and non-nurses with regard to their moral judgements on nursing dilemmas. Unpublished Digital Dissertation, Florida Atlantic University, Retrieved 15 September 2006.

Corresponding Author
Fatma Basalan Iz,
Suleyman Demirel University,
Faculty of Health Sciences,
Public Health Nursing Department,
Isparta,
Turkey,
E-mail: fbasalan@gmail.com

The relationship between mental health and self-esteem in students of medical sciences

Abdullah Mahdavi[1], Maryam Ahmadi[1], Mehrdad Nadermohamadi[2], Davoud Adham[3]

[1] School of Health Management and Information Sciences, Tehran University of Medical Sciences, Tehran, Iran,
[2] Institute of Tehran Psichology, Tehran University of Medical Sciences, Tehran, Iran,
[3] Public Health Department, School of Health, Ardabil University of Medical Sciences, Ardabil, Iran.

Abstract

Background objective: Being informed about the mental health and self-esteem of university students is a matter of significance for this information is the base of holding training and interventional courses in order to improve their mental health and self-esteem which improves other aspects of their lives such as educational condition as well. In this research, the quality of mental health and its relationship with the rate of self-esteem have been investigated on the students who have entered Ardabil University of Medical Science in 2009-2010 educational years.

Methods: A total of 383 individuals including all of the students who have been accepted in this university to participate the first semester of 2009-2010 educational years in different fields. Students answered general health (GHQ28), and Rosenberg self-esteem questionnaire, afterward the data was statistically analyzed by SPSS software after being entered to the computer.

Results: The obtained information indicates that the average score of GHQ28 for the university students is $\bar{x}$=16.08 and the distribution of these scores has a positive skew, and the majority of the students got low scores which generally shows a rather good mental condition among them. Among the subscales of GHQ28, social dysfunction with an average of $\bar{x}$=6.98 was close to cut-off line. In this scale, more scores crossed the cut-off line. The total average score of students in self-esteem questionnaire was $\bar{x}$=32.25. The relationship between scores of GHQ and Rosenberg self-esteem test was r=-0.547 and its significance level was □=0.01. There was a significant difference between the scores of male and female students in GHQ.

Conclusion: The condition of Mental Health of the university students is in a medium rate and the evaluated prevalence rate of mental disorder among the investigated students was in coordination with the rate in the whole society. The general rate of self-esteem between the university students is almost good bun not ideal. This prevalence rate clears the necessity of top level preventing plans for all of the university students aiming to improve their self-confidence and mental health, planning programs aiming to improve their motivation and interest in various fields, preparation of second-level preventing therapeutic services, and informing the exposed individuals all in order to improve the mental health of these students.

Key words: Mental health, general health questionnaire (GHQ28), self-esteem, Rosenberg self-esteem questionnaire.

Introduction

Freshmen students do not usually convey to university any sort of information and profile on their health in terms of both physical and psychological wellbeing in their high school and thus different universities investigate freshmen students from different aspects. Studies on character and its relationship with health and psychological problems have attracted the attention of many researchers. Numerous empirical evidences can be found on whether personality traits can play a significant role in treatment of psychological problems (1). The vulnerability of university students with regard to different situations and problems such as exams, class activities, lack of leisure time, prolonged hours of studies, and concern about exam scores will lead to development of different kinds of psychological problems and will thus threat psychological wellbeing (2). Different studies have been conducted on psychological wellbeing of university students in a number of Iranian universities (3). Unfamiliarity of many students with university environment when they enter the university, being away from family,

lack of interest in field of study, incompatibility with people in their new environment, insufficiency of economic and welfare facilities and the like are among the factors that can create psychological problems and eventually may result in students' academic failure(4). Tobes and Cohen demonstrated in their studies that most students and particularly the freshmen experience difficulties in their relationships with others and have differences with different people including their peers, teachers and university staff (5). The results of the study by Leps Lee et al. (cited by Hosseini) indicate that emotional and psychological problems are more common in the first years of universities and the freshmen students expose more problems in their emotional compatibility. Among freshman university students being away from family and insufficiency of financial resources as well as the problems associated with their accommodation and living in dormitories are parts the factors that will disrupt students' spirits and will lead to anxiety and a number of psychological problems. Leps Lee et al. are strongly of the conviction that such problems as shortage of welfare and economic facilities can lead to psychological problems and thus academic failure (6).

Based on different studies conducted on this issue, psychological problems and particularly depression are common among Iranian students (7),(8). Yaghoobi (cited by Izadi) demonstrates that more than 18% of medical students at Gilan University were susceptible to psychological problems (9). Kafi et al. examined the students at Tehran University and concluded that approximately 10% of students have a history of family problems, 9% have a history of academic problems, and 3% have a history of psychological problems (10). Mohammadi Aria (cited by Izadi) used SCL-90-R and concluded that the tendency to develop psychological problems among students is 12.1% (9). Saki and Keikhavani (cited by Izadi) reported that the occurrence of psychological problems among medical students at Ilam University was 53 and 37% (9).

Contrary to expectations, studies do not confirm a significant correlation between demographic data and self-esteem and psychological wellbeing (11). In the study conducted by Arasteh, the prevalence of psychological problems was significantly higher in girls (12). The results of the study by Esfandiari did not show any significant relationship between

GHQ28 scores and general health in girls and boys (13). The study by Joodaki revealed that there is a difference between female and male students with regard to psychological wellbeing variable, however there is no difference with regard to self-esteem (7). Izadi and Yaghoobi examined the psychological wellbeing of students at Faculty of Humanities of Mazandaran University and found out that with regard to somatic problems, obsession, anxiety, depression, and total rate of symptoms of paranoid thoughts girls indicate higher means. With regard to psychological problems there was not a significant difference between girls and boys (9).

The correlation between being local student and psychological wellbeing has been different in different studies. Some studies indicate that there is no difference between local and non-local students with regard to their psychological wellbeing. Meanwhile, the findings of Keni and Donaldson (cited by Kafi) propose the existence of problems in students from other cities due to being away from family, financial difficulties, and concerns about accommodation (10). The study by Naeemi on 182 Paramedics students in Sari, including 116 girls and 66 boys, revealed a significant correlation between self-esteem and motivation and responsibility. He used the self-esteem questionnaire by Cooper Smith and Hermans achievement motivation in his study (14). Based on Ericson theory (cited by Zare), academic achievement is significant for younger ages, but loses its significance for adults (4).

The study by Soofiani at Tabriz University on 370 students revealed a positive and significant correlation between neurosis and general health. In addition, this study indicated negative and significant relationship between personality traits (extroversion and conscientiousness) and general health. Amongst the results of this study is that 69% of changes in general health can be explained by personality traits and perfectionism (1).

The results of the study by Sadeghi confirm the previous studies with regard to the correlation between psychological wellbeing and religious attitudes. Numerous studies have been conducted on psychological wellbeing and religious beliefs as well as spirituality and all have reported positive significant correlations (15).

A study on the correlation between self-esteem and psychological wellbeing in teenagers indica-

ted that the most important psychological need in 87.4% of case studies is the need of self-esteem (16). A study at Shiraz Medical University indicated that there is no significant correlation between academic status and general health and self-esteem. However, general health is correlated with self-esteem. In this study Cooper's self-esteem questionnaire and Goldberg general health questionnaire were used (4).

This study is in line with initial evaluation of students and determination and correlation of their psychological wellbeing and self-esteem in Medicine students of Ardebil University in 2009-2010 academic calendars. It is axiomatic that awareness of general health or vulnerability and at risk status of students, particularly from psychological aspects and provision of data on their psychological wellbeing and self-esteem are the first steps to pathological studies. In other words, if the results of this study indicate the existence of problems with regard to psychological wellbeing and self-esteem, it can be the beginning of further studies on the causes and factors of such problems and will be the prerequisite of other pathological studies.

Materials and Methodology

This study is a descriptive-correlation research. It describes the characteristics of case studies with regard to self-esteem and psychological wellbeing and will then investigate their correlation. The statistical population of this study includes the freshmen students in the 2009-2010 academic years. Since there are 400 students, all these students were questioned using the census method, which is a proper method for small populations (17).

Different materials have been designed to measure people's psychological wellbeing. GHQ28 general health questionnaire is one of the proper tools designed by Goldberg and Hiller in 1972 (18). This study makes use of GHQ28 and self-esteem Questionnaire by Rosenberg. GHQ28 includes 28 questions. It was designed by Goldberg to assess four domains of physical wellbeing, depression, anxiety, and social performance. Each domain consists of seven questions. In order to score the questions, Linkert method is used. The maximum score of the questionnaire is 84. Studies in Iran have usually calculated the validity of the questionnaire as 84% to 91%. The cutting point

score for distinguishing the problematic students is 23. Noorbala et al. demonstrated that the best cutting score using Linkert scoring method is 23. The validity and validity of the questionnaire were also confirmed in epidemiologic studies using screening tools(19). Ibrahimi et al. investigated the validity of GHQ and obtained the cutting point of 24 and validity of 97 (20).

Rosenberg's self-esteem Questionnaire includes 10 questions and each question is scored on the scale of four from totally agree to totally disagree. The minimum and maximum scores are 10 and 40. High scores are indicative of high self-esteem and low scores show low self-esteem. Greenburger et al. studied 197 students and concluded the internal reliability of the score at 0.84 and reported the validity coefficient of retest in Rosenberg self-esteem score at 0.84 on 78 students (with a two-week interval), 0.67 on 82 students (with a five month interval) and 0.62 on 81 students (with one year interval), which were all significant (21). Cronbach alpha has been calculated at 74% for Rosenberg Self-Esteem Questionnaire (22).

Rosenberg Self-esteem Questionnaire (1965) and Cooper Smith Self-Esteem Questionnaire are two common scales for measuring self-esteem(23). The data in the questionnaires were analyzed in SPSS-16 and descriptive and inferential statistics in order to find answers to research questions. The mean and standard deviation, skewness, kurtosis, normality of scores distribution, and ratio of variables were also calculated. Coefficient and coefficient significance test, t-test were used to show that the differences of means are significant.

Results

Among 383 people who participated in the study, 126 (32.9%) were men and 257 people (67.1%) were women. 366 were single and 17 were married. 138 people were local and 245 were non-local. The average age of students who took part in this study was 21.23, with standard deviation of 2.84. The youngest participant was 18 and the oldest was 37. The high school grade point average (GDP) for participants was 17.34 with standard deviation of 1.88.

General Health

With regard to the results obtained from GHQ28, the main indices (mean and median), distribution indices (standard deviation, variance) and sub-scales of somatic problem A, insomnia anxiety B, social dysfunction C, depression D, total score GHQ28 have been presented in Table 1. Skewness and kurtosis of each of the sub-scales in GHQ28 indicated that none of the sub-scales have normal distribution. The sub-scale of social dysfunction, although not having a normal distribution, is close to normal.

In addition, for each of the subscales and total test, the Npor test (Kolmogorov–Smirnov) was used to evaluate the normality of distribution. The results obtained from Kolmogorov–Smirnov test and skewness and kurtosis analysis as well as the distribution of scores in GHQ28 with the probability of α=0.05, distribution of each of the subscales and total score of GHQ28 is not normal. Table 2 illustrates the number and percentage of people suffering from a problem in each of the subscales with a score of higher than 7. The number of people whose total score is higher than 23 was 76.

Self-Esteem

Based on Kolmogorov–Smirnov test, it can be stated that self-esteem in students taking part in the study does not have a normal distribution. Skewness (-0.544) and kurtosis (0.242) of self-esteem scores are indicative of lack of normal distribution in these scores. Based on the results obtained from Kolmogorov–Smirnov test and the study of skewness and kurtosis and distribution of the scores in Rosenberg questionnaire, it can be stated with α=0.05 confidence that self-esteem scores in the sample does not enjoy normal distribution.

Correlation between General Health and Self-Esteem

The relationship between general health and self-esteem was obtained using Pearson Correlation Coefficient at -0.547. The results are presented in Table 4. Based on the correlation obtained between the subscale scores of GHQ28 and the scores in Rosenberg Self-Esteem Questionnaire, it can be stated with α=0.01 confidence that there is a significant correlation between general health scores and self-esteem scores. The increase in the scores of GHQ28 imply being at risk, and if it goes above 23 the possibility of disorder will increase. The relationship between any of the GHQ28 subscales, i.e. somatic problems (a), anxiety and insomnia (b), social dysfunction (c), and depression (d) - with self-esteem score has been presented in Table 3. In addition, it can be seen that all the correlations are significant. The increase in the score of somatic problem, which is indicative of

Table 1. Main and distribution indices of sub-scales of GHQ28

Statistical Indicator \ Subscale	A somatic problem	B insomnia anxiety	C social dysfunction	D depression	Total score
Total	383	381	383	383	383
Average	3/8	3/6	6/98	1/7	16/08
Median	1	0	6	0	9
Standard deviation	3/34	3/69	2/99	2/93	10/61
Variance	11/20	13/63	8/9	8/6	112/58

Table 2. Number and percentage of people with problems in any of the subscales

Having Problem	A somatic problem	B insomnia anxiety	C social dysfunction	D depression	Total score
Yes	8 2/1٪	9 2/3٪	15 3/9٪	8 2/1٪	76 19/8٪
No	375	372	368	375	307
Total	383	383	383	383	383

Table 3. Correlation between subscales of GHQ28 and self-esteem

Subscales of GHQ28	A somatic problem	B insomnia anxiety	C social dysfunction	D depression	Total score
Correlation coefficient with self-esteem	-0/423	-0/458	-0/418	-0/485	-0/547

vulnerability in this area, decreases the score of self-esteem. The increase in the score of depression, anxiety and insomnia, and social dysfunction too decrease the score of self-esteem.

Discussion and Conclusion

General Health

As it can be observed in the Results section, the responses by participants of the study to GHQ28 do not have a normal distribution and have positive skewness. This indicates that most students obtained a low score in this questionnaire. GHQ28 shows the degree of damage, thus low scores indicate little damage and high scores indicate great damage. Therefore, the fact that most students obtained low scores in this questionnaire demonstrates that most of them enjoy good health and the status of general health does not have normal distribution to the benefit of the majority. The distribution of a variable such as the damage of (psychological or general health) is not similar to a variable such as age and is not a function of normal distribution. Most studies conducted on this issue ignore the shape of GHQ28's scores distribution, probably because assumption of lack of normal distribution is a rational hypothesis. The obtained mean for general health is not consistent with the results of the studies conducted by Meshki(11), Arasteh(12), Ahmadi (24), and Shariati(25) and is lower than them. However, it is consistent with the means obtained by Zare(4), Edhem(26), and Tavakollizadeh(27). Based on this conclusion, it can be stated that most students in this study enjoy a good general health. GHQ28 is usually used as a screening tool. It has been observed that the number of people who gain a score of higher than 23 in GHQ28 was 76 (19.84%). This is indeed not consistent with the results obtained by Arasteh (12), Ahmadvand (28), Ansari(29), and Dibaj(30) as it is lower. However, it is consistent with the results obtained by Kafi (10), and Bagheri(31).

Among the subscales of the GHQ28, the subscales of somatic problems, depression, and anxiety are in good condition, but the scores of the subscales of social dysfunction are generally high and the mean of scores is close to the cutting point. In other words, based on GHQ28, participants have a higher degree of social dysfunction,

but in other subscales, a fewer number of them have problems as most obtained low scores. High social dysfunction is consistent with the studies conducted by Arasteh (12), Ahmadvand (28), Jamilian(32), and Sadeghian(33).

The difference was meaningful and significant between girls and boys in GHQ28. This is not consistent with the results of the study by Soofiani(1), Esfandiari(13), Ahmad(24), Bagheri (31), Gatri(34), Saadati(35), Freedman(36), but it is consistent with the results gained by Joodaki (7), Sadeghi(15), and Abbaspoor(37). Girls showed a significant difference with boys in the somatic problems subscales, thus being more vulnerable in this regard. Higher score for girls in GHQ28 means that girls are exposed to greater risk or they are more vulnerable, and thus are in need of more attention. Educational and preventive programs should be provided for girls and their access to specialized services needs to be easier and wider. The difference in somatic scores between girls and boys is a good instance of multivariance nature of reasons of disease. In this case, it can be stated that different environmental, psychological, cultural and social factors play roles in the difference between scores of GHQ28 as obtained for girls and boys.

Self-Esteem

It has been observed that scores of self-esteem questionnaire do not have a normal distribution, although it is very close to normal. The mean scores 33.25 are almost the same, but the spread of changes (large variance and scope) have not allowed this variable to remain normal. Self-esteem of most students is high and this is consistent with the results obtained by Meshki(11) and Barkhordari (22). One reason can be the fact that all participants in the study are students and on the other hand the number of students in general physician major (N=55, 14.4%) is higher than students in other majors. Students in this major usually enjoy high self-esteem (highest mean (33.96) belongs to students studying their GP, and lowest mean (30.18) belongs to students studying professional hygiene). It should be noted that there is a significant correlation between self-esteem scores and general health scores of students and their major ($\alpha=0.01$, r=-0.547). With regard to the relationship between GHQ28 scores and self-esteem

scores and academic major, it is not possible to talk about causal relationships and to consider the reason behind high GHQ28 and self-esteem studying in a particular major of higher status. It is possible that those who feel satisfied with their academic major face fewer stress factors and feel better about their lives. Having proper plans that give students positive attitudes about their majors and show the significance and position of different majors seems necessary. In addition, the activities that can enhance individual's feeling about a particular major can be effective. This should be done by experts in each major. For instance, presentations about successful people, holding seminars and workshops, showing scientific documentaries about each academic major, honoring days named after particular majors, visiting work fields, interviewing with professionals, publishing a journal or newspaper about a particular area, launching scientific websites and societies can be beneficial.

Correlation between Self-Esteem and Mental Health

The correlation between self-esteem and general health was also significant in this study, thus confirming the results of the studies by Joodaki (7), Meshki(11), Zare(4), Abbaspoor(37), Sarabadani(38), Vaikeln(39), and Goldberg(40). However, this correlation cannot be interpreted as a causal relationship between self-esteem and general health, but as we know, characteristics traits are more related to general health than demographic factors and even a mutual relationship can be imagined between them. By and large, the findings of this study imply that most of the students enjoy a good mental health. The correlation between self-esteem and mental health is high and on the whole 76 people (19.84%) in the screening stage were vulnerable.

Acknowledgements

References

1. Soofiani, Hakimeh. *Investigation of the relationship between character and aspects of perfectionism and general health: Tabriz; 2007.*

2. Mionk EM, Mahmood Z. *Student mental health: a pilot study. Counselling psychology quarterly. 1999; 12(2): 199-210.*

3. Moshki M, Ghofranipoor F, Azad Fallah P, Hajizadeh E. *Effect of an educational program with self-esteem and health control beliefs on mental health promotion of university students. KAUMS Journal (FEYZ). 2009; 12(4): 38-45.*

4. Zare, Najaf, al e. *The relationship between academic achievement and general health and self-esteem in students of Shiraz Medical University. Iranian Journal of Eductaion in Medical Sciences 2007; 7.1: 59-67.*

5. Ross SE, Niebling BC, Heckert TM. *Sources of stress among college students. College Student Journal. 1999; 33: 312-7.*

6. Hosseini, Seyed Hamzeh, Moosavi, Ebrahim S. *Investigation of the status of mental health in the freshmen students in the 1999-2000 academic year at Mazandaran University of Medical Sciences. Research and Scientific Journal of Mazandaran University of Medical Sciences. 2000; 28(Autumn 2000): 23-32*

7. Joodaki, Marziye. *Investigation of the relationship of between shyness and mental health and self-esteem: AL Zahra 2007.*

8. Sedeghi, Movahed, Fariba, Narimani, Mohammad, Rajabi, et al. *investigation of the effect of teaching interaction skills on the mental health status of university students. Scientific and Research Journal of Ardebil University of Medical Sciences. 2008; 3(Autumn 2008): 261-9*

9. Izadi, Samad, Yaghoobi, Abdol, Ali. *A Study of the psychological status of students of humanities department at Mazandaran University when entering university and three years afterwards 2001-2005. the 4th national conference of students' mental health Mazandaran 2005.*

10. Kafi, Seyed, Moosa, Bolhari, Jafar, Peirovim, et al. *investigation of academic status and mental health status of research students at office of students consultancy. University of Tehran 1994.*

11. Meshki, Mehdi, al e. *Investigation of the effect of education and using self-esteem and health control beliefs on enhancing psychological health of students, . Research and Science Quarterly of Feiz. 2008; 4(Winter 2008).*

12. Arasteh, Modaber, al e. Investigation of the mental health status and its associated factors among medical and non-medical personnel of hospitals in Sanandaj City Scientific Journal of Kurdistan Medical University. 2006(Autumn 2008): 35-44.

13. Esfandiari, Gholamreza. Stressful factors and their relationship with general health of students at Kurdistan Medical University in 1999. Scientific Journal of Kurdistan Medical University. 2000; 18(Winter 2000).

14. Naeemi, Omolbanin. Investigation of the relationship between fear of success, self-esteem, and progress motivation in students of faculty of nursing in Sari: sari; 2004.

15. Sadeghi, Reza M, al e. Investigation of the religious attitude and mental health in students at Mazandaran University of Medical Sciences in 2008-2009 academic year. 2008.

16. Plancherel, b, Bologini, M. Self-esteem and mental health in early adolescence. J Adolese 1995; 18(1995): 450-74.

17. Kazemi, Shahla. Introductory methods of population analysis. Tehran: Payam-e-Noor University 1995.

18. Dadsetan, Parirokh. Anxiety or stress the new disease of the millennium. Teran: Roshd; 1998.

19. Noorbala, Ali A. Validation of 28-scale questionnaire of general health as a screening tool for psychological disorders in Tehran City,. Psychotherapy and clinical psychology. 2001; 4(2008): 47.

20. Ibrahimi, Amrollah, et al. Features of psychoanalysis, factor structure, clinical cutting point, sensitivity, and feature of general health questionnaire (GHQ28) in the Iranian patients suffering from psychological disorders. Research Journal of Behavioral Sciences. 2007; 1(2007).

21. Greenberger E, Chen C, Dmitrieva J, Farruggia SP. Item-wording and the dimensionality of the Rosenberg Self-Esteem Scale: do they matter? Personality and Individual Differences. 2003; 35(6): 1241-54.

22. Barkhordari, Masoomeh. Tendency to critical thinking and self-esteem in nursing students. Iranian Journal of Education in Medical Sciences. 2009; 1: 13-9.

23. Rosenberg M. Society and the adolescent self-image Princeton N J. Princeton university press. 1965.

24. Ahmadi, Jamshid. Depression in Medical Students. Andisheh and behavior Quarterly 1995; 4: 6-13

25. Shariati, Mohammad, al. E. Investigation of the mental health status and its associated factors in students of medical sciences in Iran. Payesh Quarterly. 2002; 3(Summer 2002): 29-37.

26. Edhem, Davood, al e. Investigation of mental health status of freshmen students in 2007-2008 academic year at Ardebil University of Medical Sciences. Research and Science Journal of Ardebil University of Medical Sciences. 2007; 3(Autumn 2008): 229-34

27. J. T, M M, L. H, P M. . Investigation of stressful incidents and their relationship with psychological disorders in the youth in Gonabad City. 2001.

28. Ahmadvand, al Ae. Investigation of the occurrence of psychological disorders among the population of Kashan city Iranian research journal of epidemiology. 2008; 2: 16-24

29. Ansari, hossein, al e. Investigation of general health among students at Zahedan University of Medical Sciences and factors associated Tabib Sharq. 2007; 4(winter 2007): 295-304

30. Dibajnia, Parvin, Bakhtiari, Maryam. Psychological status of students at rehabilitation faculty of Shahid Beheshti University. 2001.

31. Bagheri, Yazdi, Abbas, Bolhari, Jafar, Peyrovi, et al. Investigation of mental health status of newly admitted students in 1994-1995 academic year at University of Tehran. Thought and Behavior Quarterly. 1995; 4: 30-9.

32. Jamilian, Hamidreza, Fathabadi, Jalil, Khansari, Reza M. Spread of symptoms of psychological-behavioral disorders among the youth in Markazi province. Journal of Psychotherapy and clinical psychology of Iran. 2008; 14-4(Winter 2008): 454-8.

33. Sadeghian, Efat, Poor H. Stressful factors and their relationship with mental health of students of medical sciences in Hamedan. Journal of nursing and midwifery (HAYAT) TUMS. 2009; 1-1(2009): 71-81.

34. EA G, D. B, CM. S, J. H, FH C. Embarking upon a medical career. Psychological morbidity in first year medical student Med Educ. 1995; 29: 387-41.

35. Shamir S, Abootalib. Investigation of the relationship between personality styles of Yorzonski (informative, normal, confusion, preventive) and general health and responsibility in students of Tehran University. IRAN: Teacher Training Faculty of Tehran; 2004.

36. Friedman, S. H. Long-term relation of personality and health: Dynamisms, Mechanisms and Tropisms. Journal of Personality. 2000; 68: 1089-108.

37. *Abbaspoor, Parastoo. Investigation of the relationship between perfectionism and self-esteem and psychological health in students of medicine at governmental universities of Tehran in 2004-2005 academic calendar. IRAN: Teacher Training; 2006.*

38. *Tafreshi S, Leila. Investigation of the relationship between academic progress, self-esteem, and gender and computer anxiety in the students of master's at teacher training university. IRAN: Teacher Training 2005.*

39. *VB W. Ethnic differences in the self- esteem/academic achievement relationship: a Meta-analysis. 2006*

40. *Goldberg DP, Gater R, Sartorius N, Ustun T, Piccinelli M, Gureje O, et al. The validity of two versions of the GHQ in the WHO study of mental illness in general health care. Psychological medicine. 1997; 27(1): 191-7.*

Corresponding Author
Maryam Ahmadi,
Health Information Management Department,
School of Health Management and Information Sciences,
Tehran University of Medical Sciences,
Tehran,
Iran,
E-mail: m-ahmadi@tums.ac.ir

99mTc (V)-dimercaptosuccinic acid scintigraphy is useful imaging method for primary detection and follow-up of patients with medullary thyroid carcinoma

Milena P. Rajic[1], Marina Vlajkovic[1], Slobodan Ilic[1], Milos Stevic[1], Vladan Sekulic[1], Aleksandar Karanikolic[2]

[1] Department of Nuclear Medicine, University of Nis, Medical School and Clinical Centre, Nis, Serbia,
[2] Clinic for Surgery, University of Nis, Medical School and Clinical Centre, Nis, Serbia.

Abstract

Background and purpose: At the time of diagnosis of medullary thyroid carcinoma (MTC), many of patients already have regional or distant metastases. Persistently elevated or increasing serum calcitonin or carcinoembryonic antigen levels after thyroidectomy indicate tumor recurrence or metastases. Scintigraphy with tumor-avid radiopharmaceuticals enables visualisation of primary MTC and its metastases. Based on it, therapy approach may be selected. Whole-body scintigraphy with pentavalent 99mTc-dimercaptosuccinic acid [99mTc (V)-DMSA] is used in primary detection and follow-up of patients with MTC who have hypercalcitoninemia. Therefore, we reviewed our experience in detection of primary MTC and its metastases with this tumor-avid radiopharmaceutical.

Methods: Results of 99mTc (V)-DMSA scintigraphy of both patients with suspected primary MTC (G 1 group, n=17, calcitonin: mean value 461 pg/ml) and patients with histologically confirmed MTC after thyroidectomy and elevated calcitonin (G 2 group, n=11, calcitonin: mean value 2645 pg/ml) were compared with results of other imaging methods.

Results: Sensitivity and specificity of 99mTc (V)-DMSA scintigraphy for primary tumor visualization was 87.5% and 77.8%. False-positive findings were obtained in two patients with papillary thyroid carcinoma. In G 2 group, sensitivity and specificity for metastases detection on patient base was 50.0% and 100%. 99mTc (V)-DMSA showed 83.9% MTC lesions visible by all other imaging methods.

Conclusions: The findings showed that 99mTc (V)-DMSA scintigraphy has satisfactory overall sensitivity for both primary MTC and postoperative metastases detection. Despite newer imaging methods, 99mTc (V)-DMSA scintigraphy is particularly useful for primary diagnosis and follow-up of MTC patients with hypercalcitoninemia.

Key words: Medullary thyroid carcinoma, calcitonin, 99mTc (V)-DMSA scintigraphy.

Introduction

Medullary thyroid carcinoma (MTC) is a rare neuroendocrine tumor originating from the parafollicular C cells of the thyroid with the incidence of 5-10% in relation to thyroid carcinomas [1] and of 0.40-1.37% in relation to thyroid nodules [2, 3]. It occurs in a sporadic and a familial form [multiple endocrine neoplasia (MEN) 2a or 2b syndromes and familial non-MEN MTC]. Surgery is the only curative modality, while adjuvant therapy, including external beam radiotherapy and chemotherapy, is commonly used when the patient has a potential risk of either obstructive symptoms or persistent tumor growth. Therapy with radiopharmaceuticals, such as 131I-anti-_carcinoembryonic antigen (CEA) antibody or 90Y-dimercaptosuccinic acid (DMSA) is currently under investigation.

As its prognosis depends primarily on early detection [4] and completeness of the primary surgical treatment, effective diagnostic tools for cancer detection are essential in the MTC management. An elevated serum calcitonin level (Ct) is a highly sensitive tumor marker for MTC that can be used for screening, diagnosis, detection of recurrent or persistent disease and evaluation of treatment response [2, 3], while an abnormal CEA may indicate advanced disease [5]. Conventional radiological modalities, such as radiography, ultrasonography (US), computed tomography (CT) and magnetic resonance imaging (MRI) are mainly used for postoperative localization of metastases or recurrent lesions in patients with elevated serum levels of Ct or CEA; however, interpretation may be difficult as a result of distortion of normal anatomy after operation.

Scintigraphy with tumor-avid radiopharmaceuticals enables visualisation of primary MTC and its metastases. Based on it, therapy approach may be selected. Among the many radiopharmaceuticals, pentavalent (alkaline) ^{99m}Tc (V)-DMSA, ^{111}In/^{99m}Tc-somatostatin analogues, ^{18}F-fluorodeoxyglucose and ^{18}F-dihydroxyphenylalanine seem to be the most sensitive to identifying tumor sites [6-12].

The aim of this study was to evaluate our experience in detecting primary medullary thyroid carcinoma and its metastases using ^{99m}Tc (V)-DMSA whole-body scintigraphy.

Patients and Methods

Patients

The study included twenty-eight patients in whom ^{99m}Tc (V)-DMSA scintigraphy was performed in our Department, divided into two groups (Tables 1 and 2). The first group (G 1) comprised 17 patients (12 females; age range 26-83 yr, mean age 57.7 yr) with clinical (thyroid nodule, familiar history for MEN type 2) and biochemical findings (elevated serum Ct or CEA levels; Ct range 5.0-2630 pg/ml, mean value 461 pg/ml; CEA range 5.0-85.0 ng/ml, elevated in four of five patients) suggestive of primary MTC. Fifteen of them had elevated calcitonin. Two patients had elevated CEA only, and two patients had elevated both tumor markers. The second group (G 2) consisting of 11 patients (6 females; age range 27-65 yr, mean age 51.4 yr) underwent total thyroidectomy for MTC who had persistently elevated postoperative calcitonin levels (Ct range 21.0-20610 pg/ml, mean value 2645 pg/ml; CEA range 1.3-522 ng/ml, elevated in six of eight patients; 22 follow-up ^{99m}Tc (V)-DMSA scintigrams). One patient from G 1 group (no. 12) who had persistently elevated serum Ct levels after operation was included in G 2 group (no. 8). All patients gave informed consent for imaging.

In 16 out of 17 patients with suspected primary tumor, diagnosis was established after thyroidectomy, biopsy or fine needle aspiration cytology of the thyroid nodule (Table 1). However, in one patient (no. 1) diagnosis was made on the basis of repeated ^{99m}Tc (V)-DMSA scintigram, persistently high Ct levels and clinical signs of disease progression. The patients from the second group had undergone the total thyroidectomy with neck or neck associated with partial mediastinal lymph nodes dissection two months to 13 years before (mean 5.18 yr), and three of them had repeated cervical lymph node dissection. Three patients received adjuvant radiotherapy for the neck region following surgery, and two patients underwent local field radiotherapy for spine metastases. One patient has received chemotherapy. Deaths due to MTC occurred in three (no. 1, 6 and 7; 2.5-14 years after the operation) of eleven (27.3%) patients in group G 2, while one patient (no. 3) died due to complications after the operation of lung tumor. In addition, patient no. 1 from G 1 group died 2.5 years after detection of high level of calcitonin.

^{99m}Tc (V)-DMSA preparation and imaging

^{99m}Tc (V)-DMSA prepared by the addition of 1.5 ml of 1.0 % sodium bicarbonate (NaHCO3) solution to the DMSA kit (Laboratory for radioisotopes, Institute of Nuclear Sciences, Vinča, Serbia) to achieve alkaline pH of 7.80-8.40. One ml volume of 600 MBq technetium-99 pertechnetate added to the kit and incubated during 15-20 min at room temperature. Radiopharmaceutical injected intravenously in an activity of 440 to 555 within 4 h after labeling.

Whole-body (matrix size 256x1024, 12 cm/min) and spot images (matrix size 128x128 or 256x256, 600 s per frame) of the neck and regions with suspected foci of increased radiopharmaceutical uptake collected 2 h following the injection of ^{99m}Tc (V)-DMSA using computed "Siemens" dual-head gamma camera equipped with low-energy high-resolution collimators. Three experienced nuclear medicine physicians interpreted images. The foci of increased radiopharmaceutical uptake were considered as positive finding. ^{99m}Tc (V)-DMSA images were compared with contemporaneous imaging studies used to localize lesions including the thyroid (15 patients from G 1 group), bone, ^{131}I-metaiodobenzylguanidine (MIBG), ^{99m}Tc-Tektrotyd (somatostatin analogue) and liver scintigraphy as well as US, x-ray, CT or MRI.

Calcitonin and CEA measurements

Both calcitonin and CEA levels determined by immunoradiometric assay method (IBA-CIS, France and INEP, Serbia). Levels higher than 10 pg/ml for calcitonin and higher than 4 ng/ml for CEA considered as abnormal.

Statistical analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences software (version 12, SPSS Inc, Chicago IL, USA). Results are shown as the mean value, range or percentage.

Results

Among patients from G 1 group, 8 had MTC. As seen in Table 1, in seven of eight patients ^{99m}Tc (V)-DMSA scintigram was true-positive (TP) (Figures 1 and 2), in one false-negative (FN), in seven true-negative (TN) and in two patients false-positive (FP) for primary MTC. This resulted in sensitivity and specificity of 87.5% and 77.8% for primary tumor detection. Positive and negative predictive value was 77.8% and 87.5%. The smallest primary tumor focus identified by this radiotracer was 11x10 mm. Both patients with FP finding (no. 7 and 11) suffered from papillary thyroid carcinoma (PTC). In the patient no. 11, ^{99m}Tc (V)-DMSA scan showed a moderate increase accumulation in calcified supraclavicular lymph node metastasis, while in the patient no. 7 in the nodule of the left thyroid lobe with a few calcifications. A false-negative finding was recorded in patient no. 3 with thyroid nodule smaller than 1 cm in diameter. Four of eight patients with MTC had cervical, and one of them had also mediastinal lymph node metastases at operation. Two of them had cervical micrometastases that were not visualized on DMSA scan (Table 1). Distant metastases in bones had one patient (no. 1, Table 1).

a)
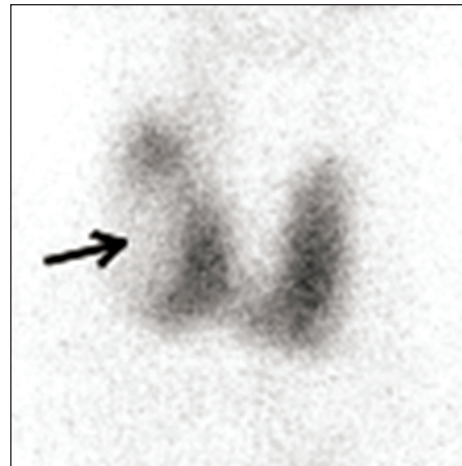
b)

Figure 1. True-positive ^{99m}Tc (V)-DMSA finding of patient no. 16 (G 1 group): focus of increased uptake in the right thyroid lobe due to MTC (a). Corresponding ^{99m}Tc-pertechnetate thyroid scintigram shows cold nodule in the right lobe (b).

Figure 2. True-positive ^{99m}Tc (V)-DMSA finding of patient no. 12 (G 1 group) shows foci of increased uptake in the left thyroid lobe (dashed arrow) and the left cervical compartment (solid arrow) matching with primary MTC and lymph node metastases.

In G 2 group, there were 10 TP, 10 FN and 2 TN ^{99m}Tc (V)-DMSA scintigrams (Table 2) resulting in sensitivity and specificity of 50.0% and 100% for metastatic diseases detection on patient base. Positive and negative predictive value was 100% and 16.7%. In two patients with FN finding

Table 1. Diagnosis, calcitonin levels and ^{99m}Tc (V)-DMSA findings of patients with suspected primary MTC (G 1 group)

Pt.	Treatment	Ct (pg/ml)	Definitive diagnosis	^{99m}Tc (V)-DMSA findings
1	none	160 214	DMSA: focus in RTL; DMSA: focus in RTL and foci in bones	TP (v: focus in RTL) TP (v: focus in RTL and foci in bones)
2	FNAC	27.0	benign colloid cyst	TN
3	thyroidect.	53.0	MTC, LTL (MEN 2a)	FN (nv: focus in LTL)
4	thyroid and ln biopsy	5.0	benign colloid cyst inflamatio granulomatosa	TN
5	FNAC ln biopsy	17.0	benign colloid cyst inflamatio granulomatosa	TN
6	FNAC	10.1	benign colloid cyst	TN
7	thyroidec.	27.0	PTC, both TLs, cervical ln mets.	FP (v: focus in LTL)
8	FNAC	8.0	benign colloid cyst	TN
9	thyroidec.	1800	MTC, both TL, cervical ln mmets.	TP (v: foci in both TL; nv: cervical ln mmets.)
10	thyroidec.	57.0	struma colloides cystica polynodosa	TN
11	thyroidec.	28.0	PTC, LTL, cervical ln mets.	FP (v: cervical ln mets.)
12*	thyroidec.	1320	MTC, LTL, cervical and mediastinal ln mets.	TP (v: focus in LTL, cervical and mediastinal ln mets.)
13	FNAC	28.0	benign colloid cyst	TN
14	thyroidec.	1231	MTC, LTL and isthmus, cervical ln mets.	TP (v: foci in thyroid and cervical ln mets.)
15	thyroidec.	306	MTC, LTL, cervical ln mets.	TP (v: focus in LTL; nv: cervical ln mmets.)
16	thyroidec.	2630	MTC, RTL	TP (v: focus in RTL)
17	thyroidec.	381	MTC, LTL	TP (v: focus in LTL)

MTC-medullary thyroid carcinoma, Ct-calcitonin, FNAC-fine needle aspiration cytology, thyroidect.-thyroidectomy, ln-lymph node, TL-thyroid lobe, R-right, L-left, PTC-papillary thyroid carcinoma, mets.-metastases, mmets-micrometastases, TP-true-positive, TN-true-negative, FP-false-positive, FN-false-negative, v-visualized, nv-not visualized
*patient underwent ^{99m}Tc (V)-DMSA scintigraphy after operation

(four scintigrams), (V)-DMSA failed to show the mediastinal and liver metastases (patient no. 1) and both adrenal gland (18 mm in diameter) and bone metastases (less than 10 mm in diameter; patient no. 6). However, follow-up scintigram of patient no. 6, performed 6.5 after initial operation, showed multiple metastatic disease (Figure 3). In remaining three patients (no. 4, 5 and 10; six scintigrams) with FN finding and persistently biochemically active disease over years, (V)-DMSA scintigrams showed a normal pattern. We assumed that they had micrometastases because none of the imaging methods could show any lesion. ^{99m}Tc (V)-DMSA showed 47 (83.9%) out of 56 MTC lesions visible by all other imaging methods together. The best results were obtained in patients with bone and lymph node metastases.
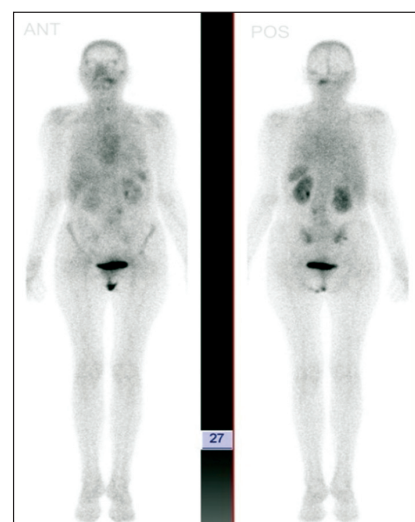
Figure 3. ^{99m}Tc (V)-DMSA whole-body scan of patient no. 6 (G 2 group) shows multiple MTC metastases in the skull, the spine, the pelvis and mediastinum.

Table 2. Time from initial operation, calcitonin levels and summary of ^{99m}Tc (V)-DMSA and other imaging methods findings of patients with MTC (G 2 group)

Pt.	Time from operation	Ct (pg/ml)	Other imaging methods findings	^{99m}Tc (V)-DMSA findings
1	6 mo	227	^{99m}Tc-Tekt.+LS: 2, 5	FN (nv: 2, 5)
2	2 mo	21	^{99m}Tc-Tekt.+ BS+MRI: 2, 3	TP (v: 3; nv: 2)
3	1st-10 yr 2nd-11.2 yr	1st-67 2nd-53	BS+US+CT: 0 ^{131}I-MIBG+CT: 4	TN† TN†
4	1st-3 mo 2nd-1.92 yr	1st-29.0 2nd-53	x-rays+US+MRI: 0 US+CT: 0	FN (mmets.) FN (mmets.)
5	1st-4 yr 2nd-5.91 yr	1st-51.6 2nd-106	^{131}I-MIBG+US: 0 ^{99m}Tc-Tekt.+US: 0	FN (mmets.) FN (mmets.)
6	1st-3 mo 2nd-7 mo 3rd-1 yr 4th -6.5 yr	1st-1053 2nd-1109 3rd-1144 4th-8910	US+CT+MRI: 3, 7 CT+MRI: 3, 7 CT+MRI: 3, 7 x-rays+CT+BS+US: 1, 2, 3, 5, 7	FN (nv: 3, 7) FN (nv: 3, 7) FN (nv: 3, 7) TP (v: 1, 2, 3, 5; nv: 7)
7	1st-9 yr 2nd-12 yr 3rd-12.5 yr 4th-13 yr	1st-97 2nd-270 3rd-283 4th-1671	BS+MRI: 3 CT: 2 CT: 2 CT+MRI: 2, 3, 4	TP (v: 3) TP (v: 2, 3) TP (v: 2, 3) TP (v: 2, 3, 4)
8*	1st-7 mo 2nd-1.50 yr	1st-19270 2nd-20610	BS+CT: 1, 2, 3, 4 BS+CT: 1, 2, 3, 4	TP (v: 1, 2, 3, 4) TP (v: 1, 2, 3, 4)
9	9.33 yr	650	CT: 2	TP (v: 2)
10	1st-6 yr 2nd-6.5 yr	232 148	^{99m}Tc-Tekt.^{131}I-MIBG+BS+CT+MRI: 0 ^{99m}Tc-Tekt.+BS+CT+MRI: 0	FN (mmets.) FN (mmets.)
11	1.5 yr	2134	^{99m}Tc-Tekt.: 1, 6	TP: (v: 1, 6)

Tekt.-Tektrotyd, LS-liver scintigraphy, BS-bone scintigraphy, MRI-magnetic resonance imaging, US-ultrasound, CT-computed tomography

Location of metastases: 0=not visualized, 1=cervical ln, 2=mediastinal ln, 3=bone, 4=lung, 5=liver, 6=brain, 7=adrenal gland

*patient underwent ^{99m}Tc (V)-DMSA scintigraphy before operation

†Ct production by small-cell lung cancer

Discussion

Patients with medullary carcinoma of the thyroid have a good life expectancy especially if it is diagnosed and treated when tumor is limited to the thyroid. Since at the time of initial diagnosis from 35% up to more than 50% (in this study 50.0% at operation in G1 group) of patients already have the lymph node metastases [4, 11], even if the primary tumor is smaller than 10 mm, it is necessary to use efficient diagnostic tools for early cancer detection. Persistently elevated or increasing serum calcitonin or CEA levels after initial surgical treatment indicate tumor recurrence or metastases [5, 13]. Even more, calcitonin may be elevated long before any imaging method can visualize metastases [14]. As regional or some distant metastases may be treated surgically or by external beam radiotherapy which may improve survival, many imaging methods are used in an attempt to localize tumor masses with considerable advantages in diagnosis and prognosis [7-12, 15]; however, none of them is sufficiently sensitive or specific for definitive diagnosis. In this context, scintigraphy with ^{99m}Tc (V)-DMSA is an eminent and established imaging procedure in primary detection and follow-up of patients with MTC [6-11], in spite of many newer radiopharmaceuticals and imaging methods.

Alkaline DMSA accumulates in calcified tissues as this agent is an orthophosphate-related ^{99m}Tc radiotracer [6], although this is not the only mechanism of its uptake. The uptake mechanism of ^{99m}Tc (V)-DMSA in tumor cells is believed to be associated with the volume of blood flow in the lesions and phosphate metabolism or pH of the tumors [16, 17]. Denoyer et al. [18] have demonstra-

ted that the radiotracer enters the cancer cell line specifically via type III NaPi cotransporters. Tumor cells overexpress type III NaPi cotransporters [19] and have a more acidic extracellular pH than normal cells that could explain the pH dependence of (V)-DMSA and its high affinity for tumors.

This study showed satisfactory sensitivity and specificity (87.5% and 77.8%) of [99mTc] (V)-DMSA scan for primary MTC detection. Only one patient with slightly elevated calcitonin and small nodule had FN result, which is in line with the previous observation of Clarke et al. [7]. False-positive results were obtained in patients with calcified PTC. There are a few case reports on [99mTc] (V)-DMSA uptake in thyroid carcinomas other than MTC [20, 21]. Vergara et al. [20] published that in a patient with metastatic Hürthle cell carcinoma [99mTc] (V)-DMSA showed a significant uptake in all tumor sites, while Yen et al. [21] found radiotracer uptake in skeletal and mediastinal metastases of poorly differentiated ("insular") carcinoma of the thyroid gland. At our knowledge, other authors reported a low [99mTc] (V)-DMSA uptake in PTC [22, 23] with the exception of Kobayaschi et al. [24] who found a marked uptake in one patent.

Some authors advocate precise preoperative localization of lymph node involvement in patients with primary MTC to minimize potential surgical complications and avoid reoperations, as well. In the current study, 4 patients with primary MTC had lymph node metastases at operation, and in two of them, micrometastases were not shown on [99mTc] (V)-DMSA scan. This finding is in line with observation of Kurtaran et al. [11].

In this study, overall sensitivity of [99mTc] (V)-DMSA for MTC lesions localization after thyroidectomy on patient base is similar to that evidenced by Arslan et al. [25]. False-positive findings with respect to regional or distant disease were not recorded. This corresponds with previous findings [8, 26], although some authors have reported false-positive [99mTc] (V)-DMSA foci in a decidedly limited number of patients [10, 27]. We noted false-negative results in five patients. Of those 5, three had undetectable lesions after several diagnostic imaging procedures which points to occult metastatic disease. In patient no. 1, dedifferentiation of tumor may be a possible explanation for the absence of radiopharmaceutical uptake in pro-

ven metastases. In patient no. 6, (V)-DMSA scans were negative at calcitonin levels of about 1100 pg/ml while scan became positive only when the calcitonin level rose to about 9000 pg/ml. Additionally, in one patient with MEN 2 a syndrome (no. 3) with slightly and persistently elevated calcitonin for years (V)-DMSA findings were judged as true-negative in view of the fact that elevated tumor marker originated from the coexisting calcitonin producing small-cell lung cancer [28] histologically verified after operation.

The overall sensitivity of [99mTc] (V)-DMSA scan for lesions detection after thyroidectomy of 83.9%, shown in the present study, agrees with previously reported sensitivity of 57% - 95% [10, 23, 26, 27]. It failed to reveal liver, adrenal gland and some mediastinal lymph node and skeletal metastases. Metastases to the adrenal glands, usually warning disseminated disease, are exceedingly rare in medullary thyroid carcinoma [29]. At our knowledge, there are no reports in literature on suprarenal gland metastases of MTC visualized on [99mTc] (V)-DMSA scan. However, [99mTc] (V)-DMSA uptake was seen in suprarenal gland metastasis of lung cancer [30].

Conclusions

Our findings underline that [99mTc] (V)-DMSA scintigraphy has satisfactory overall sensitivity for both primary medullary thyroid carcinoma and postoperative metastases detection. Absence of false-positive results after operation resulted in extremely high specificity for metastatic disease detection. Radiopharmaceutical uptake in papillary thyroid carcinoma should be considered, especially if serum calcitonin is not particularly high. Based on our results associated with advantages of radiopharmaceutical and imaging technique (a low cost, availability and easy radiopharmaceutical preparation, imaging 2 h after injection, no patient preparation), we believe that, despite newer imaging techniques, [99mTc] (V)-DMSA whole-body scintigraphy is an immensely valuable method for imaging patients with suspected or proven medullary thyroid carcinoma who have persistent hypercalcitoninemia.

References

1. Brunt LM, Wells SA Jr. Advances in the diagnosis and treatment of medullary thyroid carcinoma. Surg Clin North Am 1987; 67(2): 263-279.

2. Pacini F, Fontanelli M, Fugazzola L, Elisei R, Romei C, Di Coscio G, et al. Routine measurement of serum calcitonin in nodular thyroid diseases allows the preoperative diagnosis of unsuspected sporadic medullary thyroid carcinoma. J Clin Endocrinol Metab 1994; 78(4): 826-829.

3. Elisei R, Bottici V, Luchetti F, Di Coscio G, Romei C, Miccoli P, et al. Impact of routine measurement of serum calcitonin on the diagnosis and outcome of medullary thyroid cancer: experience in 10,864 patients with nodular thyroid disorders. J Clin Endocrinol Metab 2004; 89(1): 163-168.

4. Wells SA Jr, Baylin SB, Leight GS, Dale JK, Dilley WG, Farndonet JR. The importance of early diagnosis in patients with hereditary medullary thyroid carcinoma. Ann Surg 1982; 195(5): 595-599.

5. Machens A, Ukkat J, Hauptmann S, Dralle H. Abnormal carcinoembryonic antigen levels and medullary thyroid cancer progression. A multivariate analysis. Arch Surg 2007; 142(3): 289-293.

6. Ohta H, Yamamoto K, Endo K, Mori T, Hamanaka D, Shimazu A, et al. A new imaging agent for medullary carcinoma of the thyroid. J Nucl Med 1984; 25(3): 323-325.

7. Clarke S, Lazarus C, Maisey M. Experience in imaging medullary thyroid carcinoma using 99mTc (V) dimercaptosuccinic acid (DMSA). Henry Ford Hosp Med J 1989; 37(3-4): 167-168.

8. Uğur O, Kostakğlu L, Güler N, Caner B, Uysal U, Elahi N, et al. Comparison of ^{99m}Tc (V)-DMSA, ^{201}Tl and ^{99m}Tc-MIBI imaging in the follow-up of patients with medullary carcinoma of the thyroid. Eur J Nucl Med 1996; 23(10): 1367-1371.

9. Adalet I, Koçak M, Oğüz H, Alagöl F, Cantez S. Determination of medullary thyroid carcinoma metastases by 201Tl, 99Tcm-(V) DMSA, 99Tcm-MIBI and 99Tcm-tetrofosmin. Nucl Med Commun 1999; 20(4): 353-359.

10. Adams S, Baum RP, Hertel A, Schumm-Draeger PM, Usadel KH, Hör G. Comparison of metabolic and receptor imaging in recurrent medullary thyroid carcinoma with histopathological findings. Eur J Nucl Med 1998; 25(9): 1277-1283.

11. Kurtran A, Scheuba C, Kaserer K, Schima W. Indium-111-DTPA-D-Phe-1-octreotide and technetium-99m-(V)-dimercaptosuccinic acid scanning in the preoperative staging of medullary thyroid carcinoma. J Nucl Med 1998; 39(11): 1907-1909.

12. Beuthien-Baumann B, Strumpf A, Zessin J, Bredow J, Kotzerke J. Diagnostic impact of PET with 18F-FDG, 18F-DOPA and 3-O-methyl-6-[18F] fluoro-DOPA in recurrent or metastatic medullary thyroid carcinoma. Eur J Nucl Med Mol Imaging 2007; 34(10): 1604-1609.

13. Machens A, Gimm O, Ukkat J, Hinze R, Schneyer U, Dralle D. Improved prediction of calcitonin normalization in medullary thyroid carcinoma patients by quantitative lymph node analysis. Cancer 2000; 88(8): 1909-1915.

14. Raue F, Winter J, Frank-Raue K, Lorenz D, Herfarth C, Ziegler R. Diagnostic procedure before reoperation in patients with medullary thyroid carcinoma. Horm Metab Res Suppl 1989; 21: 31-34.

15. Giraudet AL, Vanel D, Leboulleux S, Aupérin A, Dromain C, Chami L, et al. Imaging medullary thyroid carcinoma with persistent elevated calcitonin levels. J Clin Endocrinol Metab 2007; 92(11): 4185-4190.

16. Yokoyoma A, Hata N, Horiuchi K, Masuda H, Saji H, Ohta H, et al. The design of a pentavalent ^{99m}Tc-dimercaptosuccinate complex as a tumor imaging agent. Int J Nucl Med Biol 1985; 12(4): 273-279.

17. Horiuchi K, Saji H, Yokoyama A. Tc (V)-DMS tumor localization mechanism: a pH-sensitive Tc (V)-DMS-enhanced target/non-target ratio by glucose-mediated acidosis. Nucl Med Biol 1998; 25(6): 549-555.

18. Denoyer D, Perek N, Le Jeune N, Frere D, Dubois F. Evidence that ^{99m}Tc-(V)-DMSA uptake is mediated by NaPi cotransporter type III in tumour cell lines. Eur J Nucl Med Mol Imaging 2004; 31(1): 77-84.

19. Uckert W, Willimsky G, Pedersen FS, Blankenstein T, Pedersen L. RNA levels of human retrovirus receptors Pit1 and Pit2 do not correlate with infectibility by three retroviral vector pseudotypes. Hum Gene Ther 1998; 9(17): 2619-2627.

20. Vergara E, Lastoria S, Varrella P, Lapenta L, Salvatore M. Technetium-99m-pentavalent dimercaptosuccinic acid uptake in Hürthle cell tumor of the thyroid. J Nucl Biol Med 1993; 37(2): 65-68.

21. Yen TC, King KL, Yang AH, Liu RS, Yeh SH. Comparative radionuclide imaging of metastatic insular carcinoma of the thyroid: value of technetium-99m-(V) DMSA. J Nucl Med 1996; 37(1): 78-80.

22. Miyauchi A, Endo K, Ohta H, Torizuka K, Matsuzuka F, Kobayashi A, et al. 99mTc (V)-dimercaptosuecinic acid scintigraphy for medullary thyroid carcinoma. World J Surg 1986; 10(4): 640-645.

23. Patel MC, Patel RB, Ramanathan P, Ramamoorthy N, Krishna BA, Sharma SM. Clinical evaluation of 99mTc (V)-dimercapto succinic acid (DMSA) for imaging medullary carcinoma of thyroid and its metastasis. Eur J Nucl Med 1988; 13(10): 507-510.

24. Kobayaschi H, Kotoura Y, Tsuboyama T, Hosono M, Sakahara H, Konnishi J. Incidental detection of papillary carcinoma of the thyroid by Tc-99m (V) DMSA tumor scintigraphy. Clin Nucl Med 1995; 20(7): 638.

25. Arslan N, Ilgan S, Yuksel D, Serdengecti M, Bulakbasi N, Ugŭr O, et al. Comparison of In-111 octreotide and Tc-99m (V) DMSA scintigraphy in the detection of medullary thyroid tumor foci in patients with elevated levels of tumor markers after surgery. Clin Nucl Med 2001; 26(8): 683-688.

26. Howe TC, Padhy AK, Loke K, Magsombol B, Ng D, Goh A. Role of Tc-99m DMSA (V) scanning and serum calcitonin monitoring in the management of medullary thyroid carcinoma. Singapore Med J 2008; 49(1): 19-22.

27. De Groot JWB, Links TP, Jager PL, Kahraman T, Plukker JThM. Impact of 18F-fluoro-2-deoxy-d-glucose positron emission tomography (FDG-PET) in patients with biochemical evidence of recurrent or residual medullary thyroid cancer. Ann Surg Oncol 2004; 11(8): 786-794.

28. Pu FR, Manning FCR, Brannigan AE, Crosby SR. Differential regulation of calcitonin secretion in normal and neoplastic pulmonary neuroendocrine cells in vitro. Exp Lung Res 2001; 27(8): 689-703.

29. Belldegrunn A, Hussain S, Seltzer SE, Louhlin KR, Gites RF, Richie JP. Incidentally discovered mass of the adrenal gland. Surg Gynecol Obstet 1986; 163(3): 203-208.

30. Ergün EL, Kara PÖ, Gedik GK, Kars A, Türker A, Caner B. The role of Tc-99m (V) DMSA scintigraphy in the diagnosis and follow-up of lung cancer lesions. Ann Nucl Med 2007; 21(5): 275-283.

Corresponding Author
Milena P. Rajic,
Department of Nuclear Medicine,
University of Nis,
Medical School and Clinical Centre,
Nis,
Serbia,
E-mail: milenarajic@ninet.rs

Investigation of the nursing students' opinions on the clinical practice of the psychiatry nursing lecture, the care plan and interaction process forms in Turkey

Gul Unsal Barlas, Nevin Onan, Semra Karaca

Marmara University, Health Science Faculty, Department of Psychiatric Nursing, Istanbul, Turkey.

Abstract

Purpose: This study was conducted in order to investigate the nursing students' abilities in the clinical practice and their opinions on the practice through the reports on the interaction process and nursing care plan prepared by them during the clinical practice of the psychiatry nursing lecture.

Methods: In this descriptive trial, data were collected by investigating the "Nursing Care Plan" and the "Interaction Process Form" forms submitted by the 4th grade students (n=72). The trial employed the "Document Review Method", and a coding schedule was established for review and categorization. Thus, multiple purposes of interview were determined. The forms prepared by the students were coded onto the schedule.

Results: During their interaction process, almost all of the students were observed to make an interview for the purpose of meeting and starting the communication while half of them had the purpose of giving information; the most commonly used methods included therapeutical methods such as asking open-end questions, listening, encouraging to speak and non-therapeutical methods such as asking questions involving personal interest. The care plan forms revealed that most common nursing diagnoses included impaired sleeping patterns, risk of self-directed violence and violence towards others, social isolation, deficient self-care, alterations in the thought process, ineffective individual coping.

Conclusions: The nursing students could be successful in implementing the nursing care plan but had difficulty in conducting the therapeutical interview process and that psychiatry practice made contributions to their own personal growth and ability to identify the patient.

Key words: Psychiatry nursing, nursing care plan, interaction process.

Introduction

Assessment of the students' practical skills is essential in all applied professions (Hunt, McGee, Gutteridge, & Malcolm, 2011). ANA (2000) classified the psychiatry nursing practice standards under 6 stages. These are assessment/data collection, diagnosing/determining the nursing diagnosis, identification of the outcomes (the outcomes expected to be experienced by the patients as a result of the nursing care), planning, application (planning and application of the nursing interventions) and assessment (Shives 2008). Both the institution, where the trial is conducted, and the clinical practice of the psychiatry nursing lecture employ the standards of ANA. The nursing students are required to use their therapeutical communication skills for the application of these standards (Shives, 2008). The extent to which the students are able to transfer the theoretical aspect of their education to the clinical practice can be evaluated by investigating their abilities of applying the care plan and their therapeutical communication skills (Chong, 2009).

Nursing theorists such as Travelbee and Peplau define nursing as an "interindividual interaction process" (Birol, 2004; Stockman, 2005). Peplau conceptualized the nurse-patient relationship as a relation going through stages that complement one another. At each stage, the nurse and the patient undertake certain roles and responsibilities. The patient can develop his/her interindividual relation and problem solving skills (Barker, 1998; Forchuk, 1991; Shives, 2008; Silverstein, 2006; Stockman, 2005). Orlando also indicated the interaction of the nurse with the patient as a requirement to ensure that the patient is understood correctly and his/her needs are fulfilled (Forchuk, 199; Öz 2010). Therapeutical relationship is essential in establishing a therapeutical cooperation and collaboration. In the psychiatric nursing care, the-

rapeutical communication and relationship lead to changes in the emotional, behavioral and cognitive processes of the patient and thus therapeutical relationship represents the core of the psychiatric care (Prıebe, & Mccabe 2008; Bernstein, 2006).

In Turkey, nursing training is given at the bachelor's level at the Nursing Faculties, Health Sciences Faculties or Health Colleges in 94 universities. In line with the European Union criteria, this training usually involves a 4600-hour theoretical and clinical education following a minimum primary training of 12 years with psychiatric nursing lecture given at the 3rd or 4th grade.

The objective of the psychiatry nursing is to ensure that the student effectively uses the information and skills gained in relation to human behaviors and behavioral disorders in protection of the mental health, patient care and rehabilitation based on the basic principles and concepts of nursing (Demir & Gökdoğan, 2002). The most significant tool to be used by the students for this purpose is their communication skills. Providing care for psychiatric patients requires specialized and advanced communication skills. Therefore, assessment of the students' skills during the therpaeutical interview process via interaction process and improving their skills based on the assessment is important (Shives, 2008).

During the clinical practice of the psychiatry nursing lecture, the students are required to make observations and interviews, establish the nursing diagnosis based on the data they've collected, implement the interventions as appropriate for the diagnosis and assess them (Cam, Özgür, Gürkan, Dülgerler, & Engin, 2004). Additionally, they also have to use the interaction process form, as distinct from the other clinical fields.

This trial was designed to evaluate the psychiatry nursing clinical skills and investigate the opinions of a group of nursing students. Accordingly, the reports on the interaction process and the nursing care plan submitted by the students were reviewed.

Method

Study setting

The study setting was the Faculty of the Health Sciences Nursing Department, University of Marmara. The Nursing Department offers a pre-

registration Diploma of Nursing program involving a student population of 480, with four year levels. The psychiatric nursing practice was integrated into the curriculum and the main concern was in the clinical area, as it focused on practice. The students received 7 weeks of theoretical training, 14 hours a week (98 hours in total). The training content consisted of the basic concepts in psychiatry nursing, abnormal behaviors and nursing approaches, nursing care and the interaction process. At the end of the theoretical training, the students were involved in clinical practice 8 hours daily, 5 days a week for 5 weeks (200 hours in total). The lecturers, who were also the authors of this trial guided the students during the clinical practice. For the patients, who were provided with care at the clinical practice, they used the patient identification form, the interaction process and the patient care plan forms. These forms were assessed in the trial.

Study Design

This descriptive trial was performed in the final-grade nursing students. The extent to which the students are able to transfer their theoretical information on psychiatry nursing to the clinical practice through a holistic approach was investigated by assessing the care plan and interaction process reports. The trial employed the "Document Review Method", and two separate coding schedules were established for categorization. In the first schedule, i.e. the care plan, the student's status on determining the diagnosis based on the nursing diagnoses of NANDA, whether or not they have implemented interventions as appropriate for the diagnosis and assessed them were coded. As for the second schedule, i.e. the interaction registry, it involved coding for the objective, the communication methods used and the assessment. The coding schedules were separately evaluated by three lecturers from the Psychiatry Nursing Department and those that were co-determined were coded.

Population and sampling

72 students at the 4th grade, who were included in the trial in the 2009-2010 educational year, represented the study sample; 120 forms of "Nursing Care Plan" and 216 forms of "Interaction Process Form" submitted by these students were assessed.

Ethical consideration

The Director of the Faculty of Health Sciences Nursing Department of the University of Marmara granted permission to conduct the study. Approval from an Ethics Committee was not required as there were no patients involved. A briefing on the information about the study, its objectives, the focus and the rationale was given to students. Informed consent was obtained directly from all students.

Data collection and assessments

"Data form", "Interaction Process Form" and the "Nursing Care Plan" forms were used as the data collection tools.

The Data Form included questions on the students' sociodemographic characteristics and the clinical practice of the psychiatry nursing.

Interaction Process Form consisted of the sections on the trial purpose, message of the nurse, message of the patient, the therapeutical methods used and the assessment. The students recorded their interviews on this form.

Nursing Care Plan consisted of the sections on the nursing diagnosis, nursing interventions and the assessment. In the nursing care plan, the students determined their nursing diagnosis by assessing the data they've obtained through the "patient identification form" (a form prepared by the investigators based on the functional health patterns, which standardizes the fields and the data to be assessed by the student), the "Interaction Process Form" and their observations, and planned interventions appropriate for these diagnoses. Making an assessment as a result of the interventions performed, they reported all these in the nursing care plan.

Data Analysis

The data were evaluated in the pc setting, using descriptive statistics.

Results and discussion

The results of the trial were presented under the following titles, each of them including the associated discussion.

Results on the students' sociodemographic characteristics

All the students, who participated in the trial were females; 38.9% were 22 years old with a mean age of 22.5±0.9. 61.1% of the students were high school graduates while 11.1% were vocational high-school graduates. 16.7% of the students had a family member diagnosed with psychiatric disorders; a vast majority, i.e. %65.3 of the students indicated that they didn't want to live in the same environment with a psychiatric patient (Table 1).

Table 1. Student Sociodemographics

Characteristics (N=72)	n	%
High school		
vocational school of health	8	11,1
Regular high school	44	61,1
Other high school	20	27,8
Familial psychiatric disorder		
Yes	12	16,7
No	60	83,3
Presence of psychiatric disorder in the person		
Yes	2	2,8
No	70	97,2
Whether or not he/she wants to stay in the same environment		
Yes	25	34,7
No	47	65,3

The results and the discussion related to the Interaction Process Form of the students

The interaction process was investigated based on the coding schedule prepared by the investigators. The students continued their interviews with a patient who provided care to multiple patients until the patient was discharged. Thus, multiple purposes of interview were determined. As a result of this investigation, 90.3% of the students determined a therapeutical purpose; 90.3% of the students had the purpose of meeting and starting the communication while 56.9% of them had the purpose of giving information (Table 2).

The first stage of the inter-individual relations theory is the initiation/orientation. This stage is the start of the one-to-one relation to the patient and an assessment period for the nurse. At this stage, both the patient and the nurse may have anxiety due to the difficulty of speaking to a stranger. Initiation and maintenance of the therapeutical communication, honest expression of the feelings by the patient and sincere acceptance of this by the nurse are required to succeed at this stage (Arnold & Boggs, 1999; Shives, 2008). Based on these results, we can

Table 2. Assessment of The Interaction Process

Interaction process		n	%
Objective	Determined	65	90,3
	Not determined	7	9,7
Objectives determined*	**Discussion**	**65**	**90,3**
	Bringing in insights	31	43,1
	Giving information	**41**	**56,9**
	Orienting towards activity	9	12,5
	Coping	25	34,7
	Ensuring emotional discharge	4	6.15
	Assessing family relations	6	9.23
	Increasing the self respect	9	12.5
	Assessing the suicidal thoughts	3	4.61
Therapeutic Methods**	Asking open-end questions	**67**	**93,1**
	Listening	**47**	**65,3**
	Encouraging to speak	**37**	**51,4**
	Establishing communication	6	8,3
	giving information	**39**	**54,2**
	transmitting the observations	33	45,8
	clarification	11	15,3
	repeating with one's own words	19	26,4
	summarizing	9	12,5
	focusing on the emotion	9	12,5
	using the silence	10	13,9
	feedback	1	1.4
	confrontation	1	1.4
Non-therapeutic methods**	Manipulation	50	30,6
	Judging	27	37,5
	Personal curiosity	41	56,9
	Asking closed-end questions	**52**	**72,2**
	Recommendations	10	13.9
	Approval	9	12.5
	giving uncertain assurance	4	6.15
	consolation	3	4.61
	changing the subject	6	8.3
Assessment	Yes	52	72,2
	no	20	27,8

multiple objectives were determined.
** multiple tools were used.

conclude that the students implemented the first stage, i.e. the initiation/orientation successfully.

Peplau and Travelbee indicated that in the functionality stage, the second stage of the therapeutical relation, a trust is established between the patient and the nurse followed by a care plan being developed as the process progresses. At this stage, therapeutical methods and techniques are used to determine the patient needs, help the patient identify his/her needs, ensure that he/she faces them realistically, assist him/her in determining the choices for solution, support him/her in trying new behavioral patterns and contribute to his/her communication and socializing skills (Arnold & Boggs, 1999; Marriner, 1986; Shives, 2008; Velioğlu, 1999). Crawford and Brown (2009) reported that communication skills such as asking open-end questions, using the silence, summarizing, clarification, repeating by using your own words and giving information were beneficial in several fields including explaining and making sense of the patient issues and facilitation of the patient care.

The investigation of the communication methods used by the students at the Interaction Process Form revealed that 93.1%, 65.3% , 51.4%, 45.8%, 26.4% and 15.3% of the students used the therapeutical methods of asking open-end questions, listening, encouraging to speak, transmitting the observations, repeating with one's own words and clarification, respectively. These results were obtained by the students using multiple methods in a single interview (Table 2). These results may mean that the students were successful in explaining and making sense of the patients' feelings.

Investigating the interaction registries with respect to non-therapeutic methods, 72.%, 69.4%, 56.9%, 37.5% of the students were observed to use nontherapeutic methods such as asking closed-end questions, manipulation, asking questions out of personal interest and judging, respectively. Methods known to prevent communication such as changing the subject, giving uncertain assurance, consolation, using stereotypes and talking irrelevantly were used less (Table 2). As the practice progressed, the use of the non-therapeutic methods was detected to gradually decrease. 87% of the students indicated that they frequently experienced a difficulty, which they defined as "not knowing what to say" during the therapeutic interview process. Kameg, Clochesy, Mitchel and Suresky (2010) reported similarly that their students also experienced this difficulty of not knowing what to say and had anxiety, particularly at the start of the interview and experienced a gradually decreasing communication difficulty. The use of non-therapeutic methods was attributed to the fact that the patients encountered psychiatric patients for the first time, the above mentioned difficulties and their feeling of anxiety.

In a trial by Sever, Işıl, Ünsal and Gonce (2000), 55.0% of the patients were detected to use therapeutic methods while 45.0% used both therapeutic and non-theraoeutic methods; this result was consistent with the result from this study.

Extensive use of the non-therapeutic methods makes it difficult for the patient to express his/her own emotions, thoughts and needs, leads to impairment and even termination of a trust-based relationship between the patient and nurse (Ozcan 2006). From this point of view, we may say that the student need a higher level of supervision in their clinical practice.

Peplau and Travelbee indicated that the final stage of the patient-nurse relation is the assessment stage. This stage involves the evaluation as to whether the objectives determined during the therapeutic process were achieved (Arnold & Boggs, 1999; Shives, 2008). In this trial, 27.8% of the students failed to make an assessment in line with the objectives they've determined. Reviewing the results from the interaction process as a whole, we can say that the students involved in the clinical practice of the psychiatry nursing lecture could start the therapeutic communication with a patient in line with a pre-specified objective and gradually develop their therapeutic communication skills. The results from the assessment revealed that the students had difficulties in assessing the objective they've determined for an interview. These issues may be related to the fact that, as distinct from the pre-specified objective, the interview progressed in line with a new objective that emerged during the process. In addition, the students' own emotional issues such as the anxiety had during the interview and the non-therapeutic methods may also cause these problems. In this respect, we may say that the students need to be involved more in clinical practice and supported by clinical supervision to gain experience in initiating, maintaining and terminating a therapeutic relation.

The results and discussion related to the care plan

In the psychiatry nursing practice, the students determined the nursing diagnoses based on their observations and patient interviews, the patient identification forms, the patient files and by analyzing the data they've obtained via communication with the team, and planned the care.

In their nursing care plan, the students determined a total of 318 nursing diagnoses from the FHP data collection fields. 12.9%, 10.4%, 9.7%, 9.7%, 8.5%, 8.5%, 7.5% and 6.0% of the determined diagnoses were impaired sleeping pattern, risk of self-directed violence/violence against others, social isolation, deficient self-care, impaired thought process, ineffective individual coping, anxiety and constipation respectively; these diagnoses were detected to be consistent with the patients selected as cases and their description (Table 3).

Table 3. The Nursing Diagnoses Established by The Students For Their Patients

FHP model data collection fields	NANDA diagnoses	Number	Percentage
Health perception and management function	Deficient insights	7	2,2
	Deficient information	14	4,4
nutritional-metabolic	Nutritional disorder	10	3,2
	Dry mouth	5	1.6
	Heart burn	2	0.6
	Impaired tissue integrity	2	0.6
elimination	constipation	19	6,0
Activity exercise	Deficient self care	31	9,7
Sleep-rest	Impaired sleeping pattern	41	12,9
Cognition and perception	Impaired thought process	27	8,5
	pain	1	0.3
Self perception	Low self respect	19	6,0
	Anxiety	24	7,5
	weakness	12	3,8
	desperateness	5	1.6
Role and relation	Social isolation	31	9,7
	Impaired verbal communication	2	0.6
	Change in role performance	5	1.6
Sexuality and reproduction	Impaired sexual pattern	2	0.6
Stress and coping	Ineffective individual coping	26	8,2
	Damaging the self and the others	33	10,4
Values and beliefs	Not diagnosed		
	Total	**318**	**100**

The trial revealed that the students were able to collect data in line with the functional health patterns, and determine the nursing diagnosis; the diagnoses determined reflected different reactional patterns and were consistent with the NANDA psychiatric disease nursing diagnoses (Carpenito-Moyet, 2005). Accordingly, we can say that the students evaluated the patients from a holistic perspective.

In the trial by Cam et al (2004), the most common nursing diagnoses established by the students during psychiatry nursing practice included impaired sleeping pattern, social isolation, deficient individual coping, impaired self-respect, altered thought process, potential for violence against the self or the others, anxiety, deficiency/alteration in maintaining health, modified nutrition/food intake less than necessary, deficient self-care/bathing, hygienic self-care; these results were in line with our results.

In the study they performed at a psychiatry clinic (2011), Sabancıoğulları, Ata, Kelleci and Doğan (2011) investigated the patient care plans conducted by the nurses by the functional health patterns model and the NANDA diagnoses and detected that the most common diagnoses were impairment in individual coping, reduced self respect, impaired role performance, impaired sleeping pattern, ineffective therapeutic regime management, potential of damaging others and altered thought process. These results support our trial results.

The students' opinions on the psychiatry nursing lecture practice and discussion

At the end of the clinical practice, 41.7% of the students indicated that they experienced a reduction in their prejudices relating to the psychiatric disorders and 65.3% observed a favorable contribution to their personal growth and professional relations (Table 4). Individuals, who break the social order, cause trouble for the society are stigmatized and excluded from the society. The unpredictable, abnormal behaviors of mentally ill persons and their potential for breaking the social order may evoke anxiety and cause them to be excluded from the society (Oban& Kucuk, 2011). We could say that a vast majority of the students, who are a part of the society, are prejudiced against and stigmatize the

mentally ill people before the psychiatry nursing clinic practice. These results could suggest that psychiatry nursing lecture clinical practice resulted in favorable changes in prejudice and stigmatization.

The literature reports show that psychiatry nursing clinical practice is beneficial in reducing the prejudices and developing therapeutical communication skills (Kameg, Clochesy, Mitchel, & Suresky, 2010). Many trials reported that psychiatry nursing lecture and practice made a favorable contribution to the communication skills of the students and developed their empathic skills (Işıl, Barlas, Onan, & Karaca, 2005; Karaarslan & Özgür, 2000; Pektekin, Buzlu, Sever, & Sönmez, 1990). Isıl and Barlas (1999) showed in their study that psychiatry clinical practice assisted students in changing their judgmental and nugatory attitudes against mentally ill people and getting to know themselves better and communicate more easily; this finding is consistent with our results.

Table 4. Contributions of The Psychiatry Practice

Contributions *	n	%
assisted me in getting to know myself	9	12,5
Reduced my prejudices against psychiatric disorders	30	41,7
Made favorable contributions to my personal and professional relations	47	65,3
Contribution to developing a holistic perspective	9	12,5

* multiple responses were given

Reviewing the difficulties they have in the psychiatry nursing lecture clinical practice, 54.8% of the students indicated they had difficulty in relation to the signs and the clinical statuses of the patients while 22.2% indicated difficulty in relation to the clinical setting (Table 5). Considering the stigmatization against the patients, the different clinical setting compared to the others and the fact that the students encounter such patients for the first time in the psychiatry practice, such a result is predictable.

Demir and Gökdoğan (2002) asked the students in their study whether they found the psychiatry nursing practice fields suitable in terms of physical and team work. Isıl and Barlas (1999) detected in their trial that the most common issues affecting the students in the psychiatry clinics were the " unfavorable approaches of the health team towards the patients" and the "communication breakdown

in the team"; in respect of the patients, the students indicated that "they were afraid of the patients and perceived them as very different persons". In line with our trial, these trials reveal the difficulties encountered in the psychiatry clinical practice.

Table 5. Difficulties in The Psychiatry Practice

Difficulties*	n	%
Difficulty about the personnel	14	19,4
Difficulty about the clinical setting	16	22,2
Difficulty about the symptoms and the clinical status of the patients	33	54,8
Perception of the inadequacy of the self	4	5,6
No difficulty	17	23,6

* multiple responses were given

Conclusion

In conclusion, despite experiencing several difficulties in relation to the therapeutic interview, and difficulties resulting from the nature of the disease and the clinical setting, the students were successful in implementing the nursing care plan. Based on the trial results, we may recommend increasing the hours of the theoretical communication training as from the 1st grade of the nursing training and ensuring an opportunity to practice in the lab setting. In addition, we may recommend conduct of the therapeutic communication under the supervision of a counselor in each clinical practice starting from the first.

References

1. Arnold E., & Boggs, K. Conceptual foundations of nurse-client relationships. In E. Arnold & K. Boggs (Eds.), Interpersonal relationships: Professional communication skills for nurses. Philadelphia: W.B. Saunders. 1999; 1–23.

2. Barker P. The future of the theory of interpersonal relations? A personal reflection on Peplau's legacy. Journal of Psychiatric and Mental Health Nursing. 1998; 5: 213-220.

3. Bernstein KS. Clinical assessment and management of depression. MEDSURG Nursing. 2006; 15: 333-342.

4. Birol L. Nursing process-systematic approach to nursing care. 6th Edition, İzmir: Etki Printing Publishing Ltd. Co. 2004.

5. Carpenito-Moyet L.J. Handbook of Nursing Diagnosis. (into: Erdemir F.)., 7th Edition,2005; 549-554, Istanbul/Turkey: Tayf Offset.

6. Chong M.C. Is Reflective Practice a Useful Task for Student Nurses? Asian Nursing Research. 2009; 3: 111-120.

7. Crawford P & Brown B. Mental health communication between service users and professionals: disseminating practice-congruent research. Mental Health Review Journal. 2009; 14: 31-39.

8. Cam O, Özgür G, Gürkan A, Dülgerler S & Engin E. the evaluation of students' nursing process reports in psychiatric nursing clinical practice. Journal of Ege University School of Nursing. 2004; 20: 23-34.

9. Demir Y, Gökdoğan F. Students' Evaluatıon of Psychiatry Nursing, Düzce Medical Journal. 2002; 3: 10-5.

10. Forchuk C. A comparison of the works of Peplau and Orlando. Archives of Psychiatric Nursing. 1991; 5: 38-45.

11. Hunt L A, McGee P, Gutteridge R & Malcolm H. Assessment of student nurses in practice: A comparison of theoretical and practical assessment results in England. Nurse Education Today. 2011; 1-5. doi: 10.1016/j.nedt.2011.05.010

12. Işıl Ö & Barlas G Ü. Nursing students' emotions and thoughts for the qualitative study of patients with psychiatric. 35th Turkish Congress of Psychiatry, Congress Book 1999; 181-84,Trabzon/Turkey.

13. Işıl Ö, Ünsal B G, Onan N & Karaca S. The effect of psychiatric nursing course proctice on emphatic skills of student. Journal of Psychiatry Psychology Psychopharmacology. 2005; 13: 103-105.

14. Kameg K, Clochesy J, Mitchel A M & Suresky J M. The impact of high fidelity human simulation on self-efficacy of communication skills. Issues in Mental Health Nursing. 2010; 31: 315–23.

15. Karaarslan A & Özgür GThe effect of clinical practice in psychiatric mental health nursing on the empathic tendency and skılls of nursing students. 1st International & 8th National Nursing Congress Book. 2000; 311-314, Antalya/Turkey.

16. Marriner A. Nursing Theorists and Their Work. Mosby Company, St.Louis, 1986.

17. Oban G & Küçük L. Stigma starts early: the rol of education among young people combating stigma about mental illnesses. Journal of Psychiatric Nursing. 2011; 2: 141-48.

18. Öz F. Basic concepts in the field of health. Revised 2nd Edition. 2010; 42-43, Ankara. Mattek Printing and Publishing Industry Trade Ltd. Co.

19. Özcan A. Nurse-patient relationship and communication. 2nd Edition. Ankara, System Offset Printing and Publishing Industry Trade Ltd. Co. 2006.

20. Pektekin Ç, Buzlu S, Sever A & Sönmez Y. Investigation of expectations of students taking the course in psychiatric nursing as a result of implementation of this course, and of these expectations are met or aren't met. II. National Nursing Congress Book. 1990; 86, İzmir/Turkey.

21. Prıebe S & Mccabe R. Therapeutic relationships in psychiatry: the basis of therap or therapy in itself? International Review of Psychiatry. 2008; 20: 521–26.

22. Sabancıoğulları S, Ata E E, Kelleci M & Doğan S. Evaluation According to the functional health pattern model and NANDA diagnoses of patient care plans made by nurses in a psychiatric department. Journal of Psychiatric Nursing. 2011; 2: 111-16.

23. Sever D A, Işıl Ö, Ünsal B G & Gonce N. The assesment of therapeutic communication skills at1st and 4th class of nursing collage students 1st International & 8th National Nursing Congress Book. 2000; 455-457, Antalya/Turkey.

24. Shives L R. Basic Concepts of Psychiatric-Mental Health Nursing. Seventh Edition, Lippincott Williams & Wilkins, Philedelphia, USA. 2008.

25. Silverstein C M. Therapeutic Interpersonal Interactions: The Sacrificial Lamb. Perspectives in Psychiatric Care. 2006; 42: 33-41.

26. Stockman C A. Literature revıew of the progress of the psychiatrıc nurse-paıent relationship as described by Peplau. Issues in Mental Health Nursing. 2005; 26: 911–19.

27. Velioğlu P. Concepts and Theories in Nursing. 1999; 53-118, Alaş Offset, İstanbul.

Corresponding Author
Gul Unsal Barlas,
Marmara University,
Health Science Faculty,
Department of Psychiatric Nursing,
Istanbul,
Turkey,
E-mail: gulunsal@gmail.com

Effective factors in prevention of self-medication based on Health Belief Model in women referring to the health homes in Tehran's 3rd district, 2012

Negin Niksadat[1], Mahnaz Solhi[2], Davood Shojae Zadeh[3], Mahmood Reza Gohari[4]

[1] School of Health, Tehran University of Medical Sciences. Tehran, Iran,
[2] Department of Health Education and Promotion, School of Health, Tehran University of Medical Sciences. Tehran, Iran,
[3] Department of Health Education and Promotion, School of Health, Tehran University of Medical Sciences. Tehran, Iran,
[4] Department of Statistics & Mathematics, Hospital Management Research Center, Tehran University of Medical Sciences. Tehran, Iran.

Abstract

Background and Aim: Self-medication is one of the significant health problems that its prevention especially among women is very important. The aim of this study was to determine the effective factors in preventing self medication behavior among women under the care of health homes in Tehran's 3rd district.

Materials and Methods: In This descriptive analytic study that was conducted on 88 women under the care of health homes in Tehran's 3rd district, sampling method was cluster and data were collected by a researcher-made questionnaire designed based on HBM model (perceived susceptibility, severity, benefits, barriers, and self efficacy) and a self-medication checklist which its reliability and validity were confirmed. Data analyzed on the SPSS16 software by using descriptive and analytical statistics tests.

Results: Mean score and standard deviation of perceived susceptibility, severity, benefits, barriers, self efficacy and practice were 15.71 ± 3.09, 20.68 ± 4.12, 20.46 ± 4.76, 25.30 ± 6.88, 23.98 ± 6.44 and 21.38 ± 5.49. Perceptions and practice were in the moderate levels among the most of women (50%-80%). The Findings showed that there was a significant relationship between practice with perceived barriers, self efficacy, susceptibility, benefits and marital status. The most common diseases for self-medication were: Headaches (60/2%), colds (47/7%) and the use of vitamins (46 %). Television and radio was the most cues to action among the women.

Conclusion: Considering the correlation between perceived susceptibility, benefits, barriers, and self efficacy with the prevention of self medication, Intervention designed based on Health Belief Model is useful in improving prevention of self-medication.

Key words: Self medication, Health Belief Model, women, prevention.

Introduction

Today, self-medication generally is one of the most socioeconomically and sanitary problem in different communities including Iran (1). Self-medication is a part of self- therapy process and includes supplying and administrating medications without practitioner's prescription and recommendation for diagnosis and treatment (2). The common medications in self-medication are antibiotics and injection vitamins (3). Self-medication is common in both developed and developing countries. In U.S., 42% of self-medication is for complementary treatment. One study has been demonstrated that 80% of people in Latin America use antibiotics for upper respiratory viral infection inappropriately (3). In Palestine, the prevalence of 98% self-medication has been reported among university students (5). According to world health organization' (WHO) estimations, up to 40% of health care expenditure are allocated to medicine purchasing (6). Self-medication has ascending trend in our country and this trend is continuing, so that the cost of medicine utilization was up to 350 milliard Rails in 2001. In 1997, Script Publication declared that amoxicillin has been the first bestselling medication in Iran at the cost of 13 milliard dollars and followed by ampicillin at the cost of 7 milliard dollars (7). It

is estimated that 83.3% of Iranian population use medications willfully (4). In Iran, 30.3% of patients with dermal diseases have self-medication (4). One study about chemical and botanic medications in Isfahan demonstrated that during the last six months, 86% of women had self-medication for at least for one disease (8). In one study in Yazd, more than 83% of students (6) and in Zarandieh 31% of aged people (1) had self-medication.

However, there is not any medicine without side effect, so self-medication increases medicines side effects (6). According to one study in Denmark, self-medication can considered as an element of high risk behaviors such as smoking and alcohol abuse in young people (9). Medicine utilization accounts for 30% of hepatic and renal diseases (6). Also, Rey Syndrome is fetal complication which occurred by aspirin usage in children (10). The drug and medicine abuse is the main cause of hospitalization in 3% of total patients in U.S. hospitals (6). Incorrect and arbitrary use of antibiotics helps to spreading the bacterial resistance. Bacterial resistance to infections that assumed curable fifteen years ago, allow they reappear as main threaten for public health (3).

There are several factors in regards of self-medication including: **a**. easy-accessibility of inexpensive medicines due to lack of rules and regulations, **b**. limited access to medical care due to geographical difficulties, social and economical inequities and cultural belief about health (11).In one study in Isfahan, the most important reasons for self-medication were previous experiments and easy-accessibility of medicines (8). In one study in China, previous experiments in use of medicines and low cost of medicines, like other developing country is the main cause of self-medication (12). One effective factor for self-medication which emphasized by most studies is over the counter drugs. Baghiyani Moghadam in one study in Yazd stated that about 70% of students have been declared that selling the medicines without prescription by pharmacy is the main reason for their self-medication (6).

Various studies demonstrated that women specially tend to do self-medication. On the other side, authors believed that women have not needed knowledge about complications of self-medication (13). So, it is important to focus on women population, because they have sensitive periods in their life such as pregnancy and breast feeding as well as they contact with other member of family, they have responsibilities and they are a model and template for other members in their family(7). The investigations and studies show that the recognition of effective factors in behavior variation can be changed easily, so it is necessary, educating the correct utilization of medicines and also resolving self- treatment by applying the effective factors that identified and reinforce these patterns. For this mean, the investigators of health education use the patterns for behavior changes. One of these patterns is Health Belief Model. According to this model, possibility of acquiring the preventive behavior in each person is effected by his perceptions about barriers, benefits, self –efficacy, sensitivity and severity (13). As women increased their attitude with respect to the limited of exposure to self-medication by elevating the perceived sensitivity and also by assistance of increasing the self- efficacy for prevention of self-medication, they can improve their beliefs and ability for implementing the preventive behavior. Therefore, the attitude of women for severity and complications of self-medication can be increased through educating of severity perception. The sum of two factors includes sensitivity and perceived severity result in perceived threat against self-medication. This perceived threat associated with the outcome of benefits and barriers perceptions such as analyses of benefits from lack of self-medication and analyses of potential barriers for lack of self-treatment along with cues to actions lead him or her to acquire the preventive behavior mean lack of self-medication. Cues to action are stimulations which affect the person internally or externally including friends and family, books, T.V. and media or fear to develop the side effect and etc.

The aim of this study is determination of predictors for preventative behavior about self- medication in women who are covered by municipal district no. 3 according to Health Belief Model. The results of this study can be applied for designing the educational interventions for prevention the behavior of self-medication.

Methods and Materials

This study is a descriptive- analytic research and it is as foreground for interventional study that has been done on 88 female who were covered by health

home in district no. 3 of Tehran in 2011. The aim of the study is determining the knowledge, perceptions and behaviors in the field of prevention from self-medication according to Health Belief Model.

The sample volume calculated 80 people according to not only the sample volume determination formula, but also mean of perceptions and the proportion of arbitrary usage behavior ($n = \frac{z^2 s^2}{d^2}$).

In present study, the method of sampling was multistage clustering. So first of all, municipal district no. 3 was selected among municipal urban districts and the several health home randomly selected among health homes of this district.

The data collecting tools in the study was questionnaire associated with interview and check list. First, after library studying and reviewing the article, we provide the questionnaire based on elements of health believe pattern. However its validity acquired by context test (teachers and expertise point of view) and also its reliability obtained by Test- retest and Chronbach's Alpha test.

Questionnaire's questions include following:

1. Demographic characteristics (5 questions)
2. Knowledge about self-medication (8 questions in the form of multiple-choice of two or four
3. Women sensitivity knowledge and perceptions (30 questions) in the form of 4 questions about sensitivity, 6 questions about severity, 5 questions about benefits, 8 questions about conceptual barriers and 7 questions in the field of self-medication as Lickert scale (with a range pentamerous)
4. Determining the practical guidance for preventing the self-medication (one question, multiple choices of 6)
5. Behavioral questions in the form of checklist for preventing the self-medication (2 questions-multiple choices of 2)

We scored questionnaire as follow: in knowledge section, scores were calculated from 23 score (one point for correct response and zero point for false response). The reliability of this part evaluated by the test retest (r= 0.92). In this section, according to mean ± standard deviation, the scores below 10 consider as weak knowledge, 11to17 as moderate knowledge and above 18 as good knowledge. The perceptual questions designed in form of 30 questions according to Lickert (with a range pentamerous) and 1 to 5 score, so the highest score considered for completely agreement tendency and the lowest for quietly opponent. For prevention of answers induction, some questions designed in reverse direction. Such cases also calculated by reverse questions scoring. The questions of people perceptions with emphasis on element of health belief pattern include: sensitivity (4 questions) with scores from 0 to 20 and Cronbach's alpha coefficient of 0.86, the comprehension severity (6 questions) with score from 0 to 30 and Cronbach's alpha coefficient of 0.82, comprehension benefit (5 questions) with score from 0 to 25 and Cronbach's alpha coefficient of 0.63, comprehension barriers (8 questions) with score between 0 to 40 and Cronbach's alpha coefficient of 0.83 and self-efficacy (7 questions) score from 0 to 35 and Cronbach's alpha coefficient of 0.88. Also internal adaptability of total questionnaire is confirmed by Cronbach's alpha coefficient of 0.86. In this section according to mean ± standard deviation, scores from 0 to 12, scores from 13 to 18 and scores more than 19 considered as weak, moderate and good sensitivity, respectively. Also, scores between 0 to16 considered as the weak severity, 17 to 24 considered as moderate and 25 to 30 considered as good severity. Similarly, Scores from 0 to 15, scores from 16 to 23 and from 15 to 25 considered as weak benefit, moderate benefit and good benefit, respectively. For barriers scoring, scores from 0 to 18 considered as weak barriers, 19 to 32 moderate barriers and 33 to 40 as good one. Finally, scores from 0 to 17, 18 to 30 and 31 to 35 considered as weak, moderate and good self- efficacy, respectively. In the section of practical guidance (one question, multiple-choice of 6) which people permitted select more than one choice, scores varied from 0 to 6. In the section of checklist, the function was according to whether that person had self-medication during the last month or not. One of each statement of two checklist questions obtained 0 or 1 score and the total scores of people in this section was varied from 0 to 31 and its consistency calculated by the method of 0.98 retest. In this section, score from 0 to 15 considered as weak function, 16 to 27 considered as moderate and 28 to 31 considered as good.

The information analyzed after data collecting by SPSS16 software and descriptive statistics (mean and standard deviation) and analytical tests (Chi-squared test and Spearman correlation coefficient) and p<0.05.

Also written consent obtained from participants and they could leave the study voluntarily. In questionnaire, we attempted to avoid designing the private and confidential questions. Before distribution the questionnaire, we explained the necessary explanation to participants and warranted the confidentiality of data.

Results

In this study, the mean of women age was 42/41± 11.07. In the terms of marital status, 81.1% were married and 18.2 were single. In the terms of educational degree, 64.8 % had diploma and lower and 31people, means 35.2 % had academic education. Also, 73.9% were homemaker and 26.1% were incumbent and employed. In Terms of average income of family, 28.7% of participant had 500.000T and lower per month, 52.9% between 600.000 - 1.000.000 T and 18.4% had 1.000.000 and upper per month. 79.5% of them covered by insurance service. Mean and standard deviation of function and elements of hygienic beliefs pattern has been shown in table 1.

Table 1. The mean and standard deviation of constructs of health belief model, knowledge and behavior scores

variable	Mean	standard deviation
knowledge	14.28	3.29
susceptibility	15.17	3/09
severity	20.68	4.12
benefits	20/46	4.76
barriers	25.30	6.88
self-efficacy	23.98	6.44
behavior	21.38	5.49

More participants were in the average level for knowledge (72.7%), perceptions [sensitivity (67%), severity (73.9), benefits (53.4%), barriers (73.9%), self-efficacy (77.3%)] and function (77.3%).

Media such as radio and T.V. (68.2%), practitioners (62.5%), publications and magazine (44.3%) according to frequency were the most important resource for obtaining the information in the field of prevention the self-medication.

In comparison functional and perceptual means (elements of Health Belief Model) with demographic variants of job, literacy, insurance coverage and marital status by using of independent t- test and evaluating the function and perception relationship to age and income variants by analyses variance showed that mean of function for prevention of self-medication has only meaningful correlation to marital status. Therefore, the mean of function score were higher in married people than singled people. But there was not any meaningful correlation between prevention of self-medication to demographic characteristics.

Using the Spearman rank correlation coefficient for evaluating the relationship between function and perception for prevention the self-medication demonstrated that there is meaningful correlation among function to barriers, self-efficacy, sensitivity and benefit for prevention of self-administration. So, the mean of behavior score has the most correlation (r=0.44) with barriers and has the least one with benefits (r=0.25), but there has not seen any meaningful relationship between function and knowledge (table 2).

Also this study demonstrated that there is meaningful relationship between all elements of Health Belief Model to each other (p<0.05), exception barriers and severity that had not any meaningful correlation (table 2).

In this study, according to frequency, the most situations that participants performed self- treatment were: headache (53 person, 60.2%), common cold (42 persons, 47.7%), taking the vitamin (0 person, 46%), anemia (20 persons, 22.7%), coughing (17 persons, 19.3%), throat pain (17 persons, 19.3%).

Discussion

This study show that the preventive behavior for self-medication is in middle level. In Shamsi study for prevention of self-medication, the mothers function score was 20.25± 6.47 that was resemble to our findings (14). In the other study by Shamsi for effectiveness of educational on prevention of self-medication in pregnant women in Arak, the rate of function in the field of self-treatment were lower than average before the educational intervention(13). Also in the simi-

Table 2. The relationships between health belief model elements and knowledge and behavior

		susceptibilty	severity	Benefits	barriers	self-efficacy	knowledge	performance
susceptibility	correlation	-						
	P							
Severity	correlation	0.311	-					
	P	0.003**						
Benefits	correlation	0.335	0.547	-				
	P	0.001**	0.001**					
Barriers	correlation	0.456	0.017-	0.253	-			
	P	0.001**	0.847	0.017*				
self-efficacy	correlation	0.365	0.388	0.396	0.555	-		
	P	0.001**	0.001**	0.001**	0.001**			
knowledge	correlation	0.081	0.327	0.232	0.051-	0.219	-	
	P	0.454	0.002**	0.030*	0.635	0.042*		
Behavior	correlation	0.278	0.066	0.252	0.441	0.408	0.033	-
	P	0.009**	0.538	0.018	0.001**	0/001**	0.763	

** p< 0.01, *p< 0.05

lar study for self-medication in Yazd, more than 83% of evaluated students had this problem that 18.8% of them used OTC higher than usual (6). In the present study, more participants have average knowledge that corresponds to Shamsi study for prevention of self-medication (14).But in the other equivalent study that has been done by Tajik et.al; the most participants had weak knowledge (7). It is require planning for improvement of the knowledge of these women in the field of prevention of self-medication by using of appropriate pattern. In this study, the perception and cognition of more people for prevention of self-medication is in the middle level that corresponds to Shamsi findings for measuring the structure of Health Belief Model for preventive behavior of self-medication among mothers in Arak who their attitude were in average level (14). In the other study that has been done by Shamsi et.al., the educational intervention, the perceived sensitivity in the field of self-treatment was lower than average and the rate of perceived severity, benefits and barriers were higher than average level(13). It is necessary to provide the effective educational intervention according to health Belief model that evaluating the perception and cognition. In this study, media such as radio and T.V., practitioners, publication and magazine identified as the most important resources for obtaining information for preventing the self-medication. Also, in several internal and external studies, radio and T.V. (15) and doctor (16) introduced as the most important resource for acquiring the pharmacology data and the external practical guidance was important in decreasing the rate of self-treatment (14). In the Shamsi study, midwifes of health care centers, practitioners of clinics, media, books and publications also were the most important resources for obtaining the information by evaluated mothers(17).With regard to findings in the improved programs in this field, radio and T.V., practitioners, books and publications can be used for enhancing the preventive behavior for self-medication .

The result of this study showed that there is meaningful correlation only between the mean of women function and marital status. So, the mean of function score in the married people were higher than singled people that correspond to some results of studies based on this model (18, 19). Maybe the reason is that the married people are more accurate and responsible than singled one. But in some studies, there was not any relationship between marital statuses to self-medication (20). Also in one study in Germany, there was not any relationship between demographic characteristics to self-medication (21). In the similar study in Yazd, it was not seen any meaningful correlation between age to attitude and function for self-medication (6). But in some other studies, demographic factors such as age, gender, literacy and income correlated to knowledge, attitude, and function for using of antibiotics (16).

In this research, there was seen meaningful relationship between function to barriers, self-efficacy, sensitivity and benefits for prevention of self-medication that according this model, the abovementioned correlations were confirmed in the Shamsi (14) and Karimi (1) studies for self-medication and Read study for condom application by women (22).

In the other studies that applied the health Belief model for vaccination and Pap smear, breast self examination and prevention of osteoporosis also there were meaningful relationship between function to sensitivity, benefits to barriers(23.24) , self-efficacy to benefits(25), and self-efficacy to barriers(26). Similarly, there were meaningful relationship between attitude and function in the study of Baghiyani et.al at Yazd for self-medication in students and also in the study of Chnag et.al at Taiwan for supplement medicines in diabetics (6, 27). Finally, with regard to results from the relationship between preventive behavior for self-medication to perceptions, increasing the people perception from barriers in the field of preventive behavior for self-medication and its benefits result in this opinion that person not only is vulnerable against to side effects of self-medication, but also he or she can perform preventive behavior against self-medication, so this behavior is improve in the society. The perceived barrier is the most important component in the health Belief model that predicts the performance of people (28). So it is necessary that the perceived barrier considered as a focused point for future intervention. In the Shamsi study, decreasing the barrier and increasing the perceived benefits in pregnant women resulted in reduction of self- treatment action score in research settings (13). It appears that attention to this issue by which correct usage of medicine reduces side effects and reinforces recovery may affect improving of the perceived benefits level. Also good perceived sensitivity effects prevention of self-medication and this issue should be included in the educational planning for prevention self-medication. In the present study, there was not any meaningful correlation between knowledge and behavior, but this correlation was seen in the other studies about self-medication (1, 29, and 30).

The most common cases for self – treatment in the present study has been headache, common cold, vitamin utilization, anemia, coughing, and sore throat respectively. This finding is correspond to results of studies that has been done in some Latin America (3), Jordan (2) and Nigeria (20) that demonstrated that common cold and throat pain (sore throat) form the most cases for self-treatment with antibiotics. In one study that performed in Tehran (17) and also one another in Isfahan (8), common cold was the most common disease for self- treatment. It appear that false beliefs about harmlessness of vitamin, OTC medicines and analgesics that have not need to prescription are the main cause of self-medication of this medications. So education in this field with emphasize on side effects could be very effective and important tool.

Conclusion

In this study, we identified the barriers, self-efficacy, sensitivity and perceived benefit as the effective factors in preventive behavior for self-medication. Knowledge, perceptions and function for prevention of self-medication were in the moderate level and radio, T.V., practitioner and publications were the most important guidance for performing this behavior. So it is recommended that the educational interventions are designed according to Health Belief Model for improving the prevention behavior of self-medication.

Acknowledgment

References

1. *Karimy M, Heidarnia A, Ghofranipour F. Factors influencing self-medication among elderly urban centers in Zarandieh based on Health Belief Model. Arak Medical University Journal (AMUJ). 2011; 14(58). [In Persian]*

2. *Yousef AMM, Al-Bakri AG, Bustanji Y, Wazaify M. Self-medication patterns in Amman, Jordan. Pharmacy World & Science. 2008; 30(1): 24-30.*

3. *Padilla LK. Self prescription of antibiotics by Latin Americans in Northern Nevada: University of Nevada, Reno; 2010.*

4. *Masoudi Alavi N, Izadi F, Ebadi A, Hajbagheri A. Self treatment experience in diabetes mellitus type 2. Iranian Journal of Endocrinology and Metabolism. 2009; 10(6): 581-8. [In Persian]*

5. *Sawalha AF. A descriptive study of self-medication practices among Palestinian medical and nonmedical university students. Research in Social and Administrative Pharmacy. 2008; 4(2): 164-72.*

6. *Baghiani Moghadam M, Ehrampoush M. Evaluation of attitude and practice of students of Yazd University of Medical Sciences to self-medication. TABIB-E-SHARGH. 2006. [In Persian]*

7. *Tajic R, Shamsi M, Mohammadbeygee A. knowledge, Attitude and Practice about self-medication among mothers in Arak city. Payesh. 2011; 10(2): 197-204. [In Persian]*

8. *Sharifirad G, Pirzad A, Azadbakht L. Knowledge and practice in association with self-medication of nutrient supplements, herbal and chemical pills among women based on Health Belief Model. Journal of Research in Medical Sciences. 2011; 16(6).*

9. *Westerlund M, Brånstad JO, Westerlund T. Medicine-taking behaviour and drug-related problems in adolescents of a Swedish high school. Pharmacy World & Science. 2008; 30(3): 243-50.*

10. *Du Y, Knopf H. Self-medication among children and adolescents in Germany: results of the National Health Survey for Children and Adolescents (KiGGS). British journal of clinical pharmacology. 2009; 68(4): 599-608.*

11. *Coffman MJ, Shobe MA, O'Connell B. Self-Prescription Practices in Recent Latino Immigrants. Public Health Nursing. 2008; 25(3): 203-11.*

12. *Togoobaatar G, Ikeda N, Ali M, Sonomjamts M, Dashdemberel S, Mori R, et al. Survey of non-prescribed use of antibiotics for children in an urban community in Mongolia. Bulletin of the World Health Organization. 2010; 88(12): 930-6.*

13. *Bayati A, Shamsi M, Mohammadbeygee A, Tajic R. The effect of education based on health belief Model (HBM) on situation self-medication in mother refer to health centers in Arak city. Shahid Beheshti University of Medical Sciences Journal. 2010; 14(6): 331-24. [In Persian]*

14. *Shamsi M, Karimi M, Gholamnia Z, Araban M, Kasmaie P. Measuring Health Belief Model constructs in preventive behavior about self-medication in pregnant women in Arak city. Qom University of Medical Sciences Journal. 2011; 5(3): 64-70. [In Persian]*

15. *Landers TF, Ferng YH, McLoughlin JW, Barrett AE, Larson E. Antibiotic identification, use, and self-medication for respiratory illnesses among urban Latinos. J Am Acad Nurse Pract. 2010 Sep; 22(9): 488-95.*

16. *Rousounidis A, Papaevangelou V, Hadjipanayis A, Panagakou S, Theodoridou M, Syrogiannopoulos G, et al. Descriptive study on parents' knowledge, attitudes and practices on antibiotic use and misuse in children with upper respiratory tract infections in Cyprus. Int J Environ Res Public Health. 2011 Aug; 8(8): 3246-62.*

17. *Shamsi M, Bayati A. A survey of the Prevalence of Self-medication and the Factors Affecting it in Pregnant Mothers Referring to Health Centers in Arak city, 2009. Jahrom Medical Journal. 2010;7(3). [In Persian]*

18. *Kabiru CW, Beguy D, Crichton J, Zulu EM. HIV/AIDS among youth in urban informal (slum) settlements in Kenya: what are the correlates of and motivations for HIV testing? BMC Public Health. 2011; 11: 685.*

19. *Gursoy AA, Mumcu HK, Calik KY, Bulut HK, Nural N, Kahriman IL, et al. Attitudes and health beliefs associated with breast cancer screening behaviors among Turkish women. J Transcult Nurs. 2011 Oct; 22(4): 368-75.*

20. *Sapkota AR, Coker ME, Rosenberg Goldstein RE, Atkinson NL, Sweet SJ, Sopeju PO, et al. Self-medication with antibiotics for the treatment of menstrual symptoms in Southwest Nigeria: a cross-sectional study. BMC Public Health. 2010; 10: 610.*

21. *Häußinger C, Ruhl UE, Hach I. Health Beliefs and Over-the-Counter Product Use. The Annals of pharmacotherapy. 2009; 43(6): 1122-7.*

22. *Reid AE, Aiken LS. Integration of five health behaviour models: Common strengths and unique contributions to understanding condom use. Psychol Health. 2011 Nov;26(11):1499-520.*

23. *Guvenc G, Akyuz A, Acikel CH. Health Belief Model Scale for Cervical Cancer and Pap Smear Test: psychometric testing. J Adv Nurs. 2011 Feb; 67(2): 428-37.*

24. *Chen MF, Wang RH, Schneider JK, Tsai CT, Jiang DD, Hung MN, et al. Using the Health Belief Model to understand caregiver factors influencing childhood influenza vaccinations. J Community Health Nurs. 2011 Jan; 28(1): 29-40.*

25. *Noroozi A, Jomand T, Tahmasebi R. Determinants of breast self-examination performance among Iranian women: an application of the health belief model. J Cancer Educ .2011 Jun; 26(2): 365-74.*

26. *Gammage KL, Klentrou P. Predicting osteoporosis prevention behaviors: health beliefs and knowledge. Am J Health Behav. 2011 May; 35(3): 371-82.*

27. *Chang HY, Wallis M, Tiralongo E. Predictors of complementary and alternative medicine use by people with type 2 diabetes. J Adv Nurs. 2011 Sep 13.*

28. *Glanz K, Rimer BK, Viswanath K. Health behavior and health education: theory, research, and practice: Jossey-Bass Inc Pub; 2008.*

29. *Sahebi L, Seydi A, Amini S, Mousa Khani M. Self-medication status among referring patients to tabriz pharmacies. Pharmaceutical Sciences. 2009; 14(4): 81-174. [In Persian]*

30. *Ziaie T, Ozgoli G, Yaghmaei F, Akbarzade A. Self-treatment with drugs during gestation. Journal of Nursing and Midwifery. 2009; 18(62): 35-9. [In Persian]*

Corresponding Author
Mahnaz Solhi,
Department of Health Education and Promotion,
School of Health,
Tehran University of Medical Sciences,
Tehran,
Iran,
E-mail: m-solhi@tums.ac.ir

The factors related to prevalence of urinary stress incontinence in women inhabiting in Primer Health Center, Turkey

Hatice Bektas[1], Ozgur Alparslan[2]

[1] Department of Midwifery, Kocaeli Health School, Kocaeli University, Kocaeli, Turkey,
[2] Department of Midwifery, Tokat School of Health Sciences, Gaziosmanpaşa University, Tokat, Turkey.

Abstract

Purpose: This study was designed to analyze the factors related to urinary stress incontinence prevalence in women who 15 aged or over, married, have giving birth and inhabiting in a primer health center region.

Method: The cross-sectional study covered 800 women, who inhabiting health care center region and was selected by the method of stratified sampling. Data was collected by questionnaire forms during home visits with the method face to face interview. The data were evaluated with the analyses of chi-square, fisher exact test, and multiple logistic regression analysis and with tables of percentages on computer.

Results: According to the results obtained, the prevalence of urinary stress incontinence in the population has been detected as 25.1 %. The existence of such cases as genetic factors Age, delivery number and incontinence history during pregnancy, UI problem in past, and being cystocele at present are determined as the risk factors related to urinary stress incontinence and to have direct effects on the development of urinary stress incontinence in accordance with the results of logistic regression analysis.

Conclusion: In our study, all participants have one or over risk factors for urinary stress incontinence.

Key words*: Woman, urinary stress incontinence, risk factors, prevalence, midwife, nurse.

Introduction

Urinary stress incontinence is defined by International Continence Society (ICS) as an involuntary act of incontinence in situations not requiring any effort like smiling, sneezing, etc. (1). Urinary stress incontinence is not a life-critical problem; however, it causes certain psychological problems in women including even depression depending on wetness and irritation. On account of these problems, individuals with urinary incontinence restrict their physical and social lives and avoid getting together other people in society. Daily work lives, domestic activities and sexual lives of these individuals are negatively affected, as well. They try to reduce incontinence number by limiting their fluid intake. However, very few of women consult a doctor on their own (2-4).

Determination of the frequency of urinary stress incontinence in women and involving factors is considered to be useful for the diagnosis and treatment of the group under risk, prevention of urinary stress incontinence, reduction of treatment costs of urinary stress incontinence and the trainings of midwives/nurses on this matter. From this regard, the present study is carried out to determine the frequency of urinary stress incontinence and involving factors in women who live in the region around Emek Health Care Center within the municipal boundaries of Sivas Province in Turkey, over 15 years of age, married and gave birth.

Material and methods

The study is designed as cross-sectional (01 July and 30 August 2006) and includes women who are over 15 years of age, married, gave birth and live in the area around Emek Primer Health Center within the municipal boundaries of Sivas Province, Turkey. Study sample size is determined as 800 by the formula of "sample selection from the population of undetermined size". Subsequently, the number of women in each quarter was determined by Household Determination Form (HDF). According to basic random sampling method, 800 women

were selected from the women who were over 15 years of age, married, gave birth and lived in the four quarters around Emek Health Care Center by stratified sampling.

Data was collected by questionnaire forms during home visits after obtaining the informed consent forms from women. No ethical committee decision was present because of the absence of local ethical committee; however, necessary approvals were obtained from local health authorities. The informed consents were obtained from the women willing to participate in the study, and the application phase started.

Urinary stress incontinence was set as dependent variable, while the demographic characteristics, fecundity histories, personal and family histories and characteristics of genitourinary way were accepted as independent variables.

For comparing to categorical data chi-square test or Fisher's exact chi-square test were used. Categorical data were expressed as count and percentages. A multivariate logistic regression model was implemented to determine the risk factors associated with urinary stress incontinence. *p* values below 0.05 were considered statistically significant. Statistical analysis was performed by using commercial software (SPSS inc, Chicago, IL)

Results

Considering the basic characteristics of 800 women included in the study who were over 15 years of age, married and gave birth; it was determined that the mean age was 39.83±12.99, 14.9% (n=119) were literate, 49.8% (n=398) had four or more pregnancies, 36.9% (n=295) had four or more deliveries, and 61% (n=488) had the first delivery experience in their adolescence period. 11.8% (n=94) of women gave birth at home and 87% (n=696) had vaginal. 99% (n=792) of women in the study had no knowledge on Kegel exercise.

According to the obtained study results, 25.1% of women suffered from urinary stress incontinence, and 62.2% (n=69) of 111 women who had urinary stress incontinence in the last 5 years did not consult to any doctor.

In the examination of factors effective in the development of urinary stress incontinence in women, it was determined that 20% (n=160) of women

smoked, 27.9% (n=223) had frequent constipation, 24.7% (n=198) were in menopause, 30.5% (n=244) had first degree family history of urinary stress incontinence, 34.3% (n=274) were obese, 35.13% (n=281) gave birth at home, and no health professional was present in 89% (n=183) of these deliveries, episiotomy was applied at least one time in 39% (n=311) of women and 19.6% (n=157) had incontinence problem in their pregnancies.

Considering the women in study, urinary stress incontinence was most frequently observed in the group of 39-49 years of age with 39% (Table 1). 49.75% of women included in the study had four or more pregnancies, and urinary stress incontinence was more frequent in this group by 39% (Table 1). 36.84% of women had four or more deliveries and urinary stress incontinence was most frequent in this group (Table 1).

Age (OR=1.023, p=0.012), delivery number of 3 (OR=2.430, p=0.026), delivery number of ≥4 (OR=2.647, p=0.015), incontinence history during pregnancy (OR=1.927, p=0.006), urinary incontinence problem in past (OR=8.144, p<0.001), and being cystocele at present (OR=9.755, p<0.001) were determined to have direct effects on the development of urinary stress incontinence in accordance with the results of logistic regression analysis (Table 2).

Discussion

Urinary incontinence is defined by ICS as an involuntary act of incontinence which could be objectively demonstrated and causes social and hygienic problems (1,5) .Urinary incontinence is commonly seen in society and has different types. The most frequent type is urinary stress incontinence, which is supported by the findings of many studies (6-9). Urinary stress incontinence can be defined as the situation which develops when the vesica pressure exceeds the urethral pressure in the event of stress without any detrusor contraction (10).

Prevalence of urinary incontinence in women was determined 35% in a study carried out in four different European countries (7), 27.5% in a study performed in France (7), and 20% in another study performed in Italy (11). Prevalence of urinary stress incontinence was higher than its other types in these studies. In the examination of other studies

Table 1. Range of Urinary Stress Incontinence According to Features of Women

Features of woman	Total	Urinary Stress Incontinence		X²	p
		Yes	No		
Age (year)					
17–27 age	132	13 (9,80)	119 (90,20)	62,607	**<0,001**
28–38 age	292	46 (15,80)	246 (84,20)		
39–49 age	200	78 (39,00)	122 (61,00)		
50–60 age	114	43 (37,70)	71 (62,30)		
≥61 age	62	21 (33,90)	41 (66,10)		
Number of Pregnancies					
1	96	7 (7,30)	89 (92,70)	57,310	**<0,001**
2	167	24 (14,40)	143 (85,60)		
3	139	25 (18,00)	114 (82,00)		
≥4	398	145 (36,40)	253 (63,60)		
Number of Birth					
1	125	12 (9,60)	113 (90,40)	41,150	**<0,001**
2	201	34 (16,90)	167 (83,10)		
3	179	50 (27,90)	129 (72,10)		
≥4	295	105 (35,60)	190 (64,40)		
Place of Birth					
Only Hospital	519	102 (19,70)	417 (80,30)	26,696	**<0,001**
Only Home	94	27 (28,70)	67 (71,30)		
Home and Hospital*	187	72 (38,50)	115 (61,50)		
Type of Birth					
Only Caesarean Section	57	4 (7,00)	53 (93,00)	10,982	**0,004**
Only Vaginal	696	183 (26,30)	513 (73,70)		
Sectio and vaginal**	47	14 (29,80)	33 (70,20)		
Urinary Incontinence in Pregnancy					
Yes	157	67 (42,70)	90 (57,30)	31,981	**<0,001**
No	643	134 (20,80)	509 (79,20)		
Total	800	201 (25,10)	599 (74,90)		

*: e.g., the expression used to define women who had their first delivery at hospital, and the second delivery at home
**:e.g., the expression used to define women who gave their first birth through vaginal delivery and the second birth by caesarean section

Table 2. Risk factors related Urinary Stress Incontinence

Risk Factors	Regression Coefficient (β)	Standard Error of β	p	Odds Ratio (OR)	95% Confident Intervals for OR
Age	0,023	0,009	**0,012**	1,023	1,005-1,042
Number of Birth =2	0,484	0,399	0,225	1,623	0,743-3,545
Number of Birth =3	0,888	0,400	**0,026**	2,430	1,109-5,325
Number of Birth ≥4	0,973	0,401	**0,015**	2,647	1,207-5,803
Incontinence in Pregnancy	0,656	0,240	**0,006**	1,927	1,205-3,081
History of Urinary Stress Incontinence	2,097	0,255	**<0,001**	8,144	4,937-13,434
History of cystocele (now)	2,278	0,369	**<0,001**	9,755	4,731-20,115
Constant	-3,506	0,453	**<0,001**	0,030	

carried out in Turkey, prevalence of urinary incontinence was determined as 18.8% in a study performed in provincial center of Kahramanmaraş on 4506 women over 15 years of age, and 73.6% of these women had urinary stress incontinence (12) . In the study performed by Kök et al. (9), urinary incontinence was determined in 37.11% of women included in the study, and 40% of them had urinary stress incontinence. According to the results of another study implemented in Sakarya Province on 650 women who consulted to six health care centers included in the study, urinary incontinence was determined in 16.4% of women (13). In a study performed in Malatya including 459 women over 20 years of age, urinary incontinence was determined in 49.7% of women, and 41.2% of them was diagnosed with urinary stress incontinence.[3] According to the results of the present study, prevalence of urinary stress incontinence was 25.1% ; in addition, it was observed in the group of 17-27 years of age with 9.8%, and in the group of 39-49 years of age with 39% . Although the study was carried out with different groups of age, prevalence of urinary incontinence was increased with age and decreased after 50 years of age in accordance with the results (3,4,6,8,11,12,14,15). Anatomic and physiological changes in urinary system with the increasing age, obstetric and gynecologic events, hormonal factors, drugs, decreasing physical activity could be reasons behind the declines in urinary stress incontinence frequency (2,7). According to the results of the present study, age has a direct effect on urinary stress incontinence (OR 1.023, p<.05) and frequency of urinary stress incontinence decreases after 50 years of age. From this regard, present study is in agreement with literature.

Urinary incontinence is a highly common problem; however, the rate of women who consult to doctor with this complaint is rather low. Some studies (2-4, 16) establish that 73.9-87.8% of women with urinary incontinence problem do not apply for any medical help. In the present study, 62.2% (n=69) of 111 women who had urinary stress incontinence problem in the last five years did not consult to doctor in any way. These findings were compatible with the literature. Women do not apply to doctor because they ignore the indications of urinary stress incontinence, they feel ashamed to consult doctor with incontinence complaints, they do not believe to benefit from treatments or they find it normal to have these indications with increased age (3, 9, 16, 17) .

In general, mechanisms of obstetric intervention and complications are not fully understood; however, they are supposed to induce urinary stress incontinence (8). Although the pregnancy is seen as a risk factor for urinary stress incontinence, it is not fully established that whether pregnancy or delivery is important (8,18). In the study carried out by Dolan et al. (20) by comparing women who had pregnancy or no pregnancy, it was found that pregnancy increased urinary incontinence prevalence by three times. In the study of Van Geelen et al. (Goldber et al. (19) as indicated) prenatal and postnatal urodynamic measurements of women were made and a significant decrease was noted in the urethral closing pressure and functional length in the postnatal period. These changes were higher in women who had vaginal delivery, while no change was detected in women who had delivery by cesarean section. In the present study, urinary stress incontinence was determined in 7.3% of women who had one pregnancy, and 36.4% of women who had four or more pregnancies. The relation between pregnancy number and urinary stress incontinence was found statistically significant (p<.05). However, it should not be ignored that the main effective factor could be the type of delivery.

According to the results of the studies (15, 19) giving birth is a huge risk factor for urinary stress incontinence and this risk increases with the number of birth. In the study of Siracusano et al. (11) it was reported that incontinence was more frequent in women of all age groups who gave birth than nullipar women, while it is even more frequent in women giving four or more births. On the other hand, they concluded that the relation between giving birth and incontinence was not clear (11). According to the results of the study performed by Dolan et al. (20) the parity increased incontinence prevalence. Prevalence of urinary stress incontinence was 9.6% in women who had one birth and 35.6% in women who had four or more births according to the results of the present study. From this regard, the prevalence of urinary stress incontinence increases in parallel with the number of birth. Therefore, the present study is compatible with the literature, and the number of delivery ≥4

has a direct effect on urinary stress incontinence according to the results of logistic regression (OR 2.647, p=0.015).

Type of delivery is another factor effective in emerging complaints of urinary stress incontinence (8). Vaginal delivery is known to be in relation with traumas of pelvic structure. Functional and anatomic changes in tissues, muscles and nerves caused by pelvic structure especially in the second phase of delivery are believed to play preparatory roles in the development of urinary stress incontinence (21). Vaginal delivery could damage pudendal nerves on pelvic tissue, which negatively affects the neural transmission speeds, vaginal contraction power and urethral closing pressure. This could be the reason of urinary stress incontinence seen in women following vaginal delivery. According to the results of the study performed by Rortveit et al. (14), there was a strong relation between vaginal delivery and urinary incontinence, though it could not be explained. In some studies investigating the relation between urinary stress incontinence and the type of delivery, urinary stress incontinence was more frequently determined in women who had vaginal delivery than those who had delivery by caesarean section (8,9). In another study, vaginal delivery was reported to be effective on urinary incontinence; however, age of the first delivery and the birth weight of baby were emphasized as decisive points (15). According to the results of the study carried out by Parazzini et al. (22) by comparing women who had no delivery or delivery by caesarean section in terms of urinary stress incontinence, the risk of urinary stress incontinence was found higher in women who had delivery by caesarean section. The results of the study performed by Mason et al. (23) indicated that vaginal delivery was effective on urinary stress incontinence and there was no difference between women who had delivery with interventions or vaginal delivery. In the same study, delivery by caesarean section was reported to have fewer effects on urinary stress incontinence compared to vaginal or intervention delivery. The results of another study supported the relation between the type of delivery and urinary incontinence (24) According to the results of the present study, urinary stress incontinence was determined 7% of women who had delivery only

by caesarean section (all deliveries were made by caesarean section), and 26.3% of women who had only vaginal delivery (all deliveries were vaginal). The present study is not compatible with the literature in this regard.

According to the results of Population and Health Research in Turkey (PHRT) (25), 9.7% of deliveries take place at home. In the present study, 64.9% (n=519) of women included in the study had delivery at hospitals while 35.1% (n=281) had delivery at home at least one time. Only 10.7% (30/281) of women who had delivery at home took assistance from health staff. The mean age of women who had delivery at home was determined as 49.81±12.24, and their mean number of pregnancy was 6.23±2.98. These results indicate that the rate of delivery at home increases with age and the number of pregnancy and delivery. According to the results of PHRT in 2008, the rate of women who were over 35 years of age or under 20 years of age was rather high. The number of delivery is seen as an important factor on the delivery at home. 3.9% of the first deliveries take place at home, while the 38.1% of the 6 or higher deliveries occurred at home. The rate increases with rank. From this regard, the results of the present study are compatible with the results of PHRT. The big difference between the present study and PHRT considering the rates of deliveries at home could be caused by the fact that PHRT included the last deliveries in the last 5 years. However, the present study included the histories of all the deliveries. Considering the delivery places of women and the distributions of urinary stress incontinence, delivery at home poses a bigger risk for urinary stress incontinence compared to the delivery at hospital. A statistically significant relation was detected between having delivery at home and urinary stress incontinence (p<0.05). Urinary stress incontinence was detected 19.8% of women who had delivery only at hospital and 28.7% of women who had delivery only at home. It could be stated that complications due to unhealthy conditions and interventions of unconscious people at home could increase the risk of urinary stress incontinence.

Familial inclination is known to take place in the transmission of many diseases. According to the results of a study performed in Israel, urinary stress incontinence was more frequent in those with

first degree family history of urinary stress incontinence. This result implies the genetic transmission of urinary stress incontinence (26) The results of the study carried out by Iosif et al. (27) demonstrate that hereditary factors were effective on incontinence. In the present study, 30.5% (n=244) of women with first degree family history of urinary stress incontinence were found to have incontinence. A statistically significant relation was detected between the first degree family history of urinary stress incontinence and urinary stress incontinence in the present study (p<0.05). This result indicated that women with first degree family history of urinary stress incontinence should be closely followed for the protection against incontinence and provided with educational and counseling services.

According to the results of the study performed by Mason et al. (23), 63% of women with incontinence included in the study stated to have urinary incontinence during their pregnancies for the first time and 31% of them continued to have these complaints in the postpartum period. In the same study, indications of urinary stress incontinence were first observed in 25% of participants at the end of pregnancy. The results of the study performed by Baloğlu et al. (27) demonstrated that complaints continued for two months in 9 out of 16 women who had vaginal delivery and urinary stress incontinence during pregnancy, while the complaints of urinary stress incontinence started in 7 women who had no urinary stress incontinence during pregnancy. In the present study, urinary stress incontinence was detected in 42.7% of women who had incontinence problem during pregnancy. According to the obtained results, there was a statistically significant relation between urinary stress incontinence and incontinence in pregnancy (OR 1.927, p<0.05). Urinary stress incontinence in pregnancy increases the risk of urinary stress incontinence in the subsequent periods, and the present study is compatible with the literature in this regard.

The most astonishing result obtained in the study was that only the 1% of women had known about Kegel exercises. In the foreign studies, it was emphasized that 29% of women used Kegel exercises to protect pelvic structures (28). In another study, 40% of women who gave birth applied these exercises. According to the results of the study performed by Alparslan et al. [29], 100% of women had no knowledge about Kegel exercises. In the present study, the reason why the Kegel exercises were not known at all was that the women did not consult to health staff for complaints about urinary stress incontinence, and therefore, they did not take any counseling and support. Despite the high prevalence of incontinence in women of all ages, another reason why they did not know about Kegel exercises could be that they did not attain the necessary information from health staff (29).

Conclusion

Urinary stress incontinence prevalence was determined as 25.1% in the present study carried out to determine the prevalence of urinary stress incontinence and the related factors in women who were over 15 years of age, married, gave birth and lived in the area of Emek Health Care Center. Age, the number of delivery, vaginal delivery, incontinence history in pregnancy, urinary stress incontinence in past and having cystocele at present were found to have direct effects on urinary stress incontinence.

Midwives and nurses who participate in the recent multidisciplinary studies on incontinence services are expected to have necessary knowledge and be equipped on urinary stress incontinence and make researches on this matter. Health education of midwives and nurses on this matter are considered to be useful for the determination of the urinary stress incontinence frequency in women and the determination of related factors the diagnosis and treatment of group under risk, prevention of urinary stress incontinence, and the reduction of treatment costs of urinary stress incontinence.

References

1. *Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, Kerebroeck P, Victor Al Wein A. The Standardization of Terminology of Lower Urinary Tract Function: Report from the Standardization Sub-committee of International Continence Society. Neurourology and Urodynamics. 2002; 21:167-178.*

2. *Ateşkan Ü, Mas M.R, Doruk H, Kutlu M. Yaşlı Türk Popülasyonunda Üriner İnkontinans: Görülme Sıklığı Muhtemel Klinik Tipleri ve Birey Açısından Öneminin Değerlendirilmesi. Geriatri. 2000; 345-349.*

3. *Güneş G, Güneş A, Pehlivan E. Malatya Yeşilyurt Sağlık Ocağı Bölgesindeki Erişkin Kadınlarda Üriner İnkontinans Prevalansı ve Etkili Faktörler. Turgut Özal Tıp Merkezi Dergisi 2000;754-757.*

4. *Ekin M, Karayalçın R, Özcan U, Erdemlioğlu E. The Prevalence of Urinary Incontinence and Its Influence on The Quality of Life In Women of Reproductive And Postmenopausal Age Groups. Journal of Ankara Medical School. 2004; 26:21-25.*

5. *Resnic NM. Urinary Incontinence. The Lancet. 1995; 346 (8967): 94-99.*

6. *Rortveit G, Daltveit AK, Hannestad YS, Hunskaar S. Vaginal Delivery Parameters and Urinary Incontinence: The Norwegian EPINCONT Study. Am J Obstet Gynecol. 2003; 189:1268-1273.*

7. *Hunskaar S, Lose G, Sykes D, Voss S. The Prevalence of Urinary Incontinence in Women in Four European Countries. BJU International. 2004; 93: 324-330.*

8. *Peyrat L, Haillot O, Bruyere F, Boutin J, M, Bertran P, Lanson Y. Prevalence and Risk Factors of Urinary Incontinence in Young and Middle-aged Women. BJU International. 2002; 89:61-66.*

9. *Kök G, Şenel N, Akyüz A. GATA Jinekoloji Polikliniğine Başvuran 20 Yaş üstü Kadınların Üriner İnkontinans Açısından Farkındalık Durumlarının Değerlendirilmesi. Gülhane Tıp Dergisi. 2006; 48:132-136.*

10. *Atasü T, Şahmay S. Üriner İnkontinans. Jinekoloji. Form Reklam Hizmeti 1996;580.*

11. *Siracusano S, Pregazzi R, d'Aloia G, Sartore A, Di Benedetto P, Pecorari V, et all. Prevalence of Urinary Incontinence in Young and Middle-aged Women in an Italian Urban Area. European Journal of Obstetrics & Gynecology and Reproductive Biology (EJOG). 2003;107:201-204,*

12. *Benlioğlu C. Kahramanmaraş İl Merkezli On Beş Yaş Üzeri Kadınlarda Üriner İnkontinans Prevalans Çalışması. Uzmanlık Tezi Kahramanmaraş Sütçü İmam Üniversitesi Sağlık Bilimleri Enstitüsü 2006; 35.*

13. *Filiz TM, Topsever P, Uludağ C, Görpelioğlu S, Çınar N. Türk Kadınlarında Üriner İnkontinans Şiddeti ve Yaşın Jenerik Yaşam Kalitesi SF-36 Üzerine Etkileri. Türkiye Klinikleri Tıp Bilimleri Dergisi 2007;189-194.*

14. *Rortveit G, Hunskaar S. Urinary Incontinence and Age at the First and Last Delivery: The Norwegian HUNT/EPINCONT Study. Am J Obstet Gynecol. 2006; 1-6.*

15. *Grodstein F, Fretts R, Lifford K, Curhan G. Association of age race and obstetric history with urinary symptoms among women in the Nurses' Health Study. Am J Obstet Gynecol. 2003; 189:428-434,*

16. *Tomoe H, Sekiguchi Y, Horiguchi M, Toma H. Questionnaire Survey on Female Frequency and Incontinence. International Journal of Urology. 2005;12:621-630,*

17. *Mason L, Glenn S, Walton I, Hughes C. Women's reluctance to seek help for stress incontinence during pregnancy and following childbirth. Midwifery. 2001; 17:212-21.*

18. *O'Boyle A, O'Boyle JD, Ricks RE, Patience TH, Calhoun B, Davis G. The Natural History of Pelvic Organ Support in Pregnancy. Int Urogynecol J Pelvic Floor Dysfunct. 2003; 14:46-49.*

19. *Goldberg R P, Kwon C, Gandhi S, Atkuru SV, Sorensen M, Sand PK. Urinary incontinence Among Mother of Multiples: The Protective Effect of Cesarean Delivery. Am J Obstet Gynecol. 2003; 188: 1447-1453.*

20. *Dolan L M, Casson K, Mcdonald P, Ashe RG. Urinary Incontinence in Northern Ireland: A Prevalence Study. BJU International. 1999; 83:760-766.*

21. *Meyer S, Hohlfeld P, Achtarg C, Pussolo A, De Grandi P. Birth Trauma: Short and Long Term Effects of Forceps Delivery Compared with Spontaneous Delivery on Various Pelvic Floor Parameters. Br J Obstet Gynaecol. 2000; 107: 1360-1365.*

22. *Parazzini F, Chiaffarino F, Lavezzari M, Giambanco V, Group OB. Risk Factors for Stress Urge or Mixed Urinary Incontinence. Br J Obstet Gynaecol. 2003; 110: 927-933.*

23. *Mason L, Glenn S, Walton I, Appleton C. The Prevalence of Stress Incontinence During Pregnancy and Following Delivery. Midwifery. 1999; 15: 120-128.*

24. *Koçak I, Okyay P, Dundar M, Erol H, Beser E. Female Urinary Incontinence in the West of Turkey: Prevalence Risk Factors and Impact on Quality of Life. European Urology. 2005; 48: 634-641.*

25. *Tezcan S. Türkiye Nüfus Sağlık Araştırması 2008 Ön Rapor Hacettepe Üniversitesi Nüfus Etütleri Enstitüsü 2009. [cited 2010 February 19]. Available from: http://www,hips,hacettepe,edu,tr/tnsa2008/data/TNSA-2008_On_Rapor-tr,pdf,*

26. *Mushkat Y, Bukovsky I, Langer R. Female Urinary Stress Incontinence-Does It Have Familial Prevalence?. Am J Obstet Gynecol. 1996; 174:617-619.*

27. *Baloğlu A, Malay U, Güven MC. Mesane Boynu Mobilitesine ve Üriner İnkontinans Gelişimine Etkileri Yönünden Vajinal Doğum ve Sezaryen Doğumun Karşılaştırılması. Türkiye Klinikleri Journal of Gynecology and Obstetric.2003; 13:41-47.*

28. *Huang AJ, MPhil MD, Thom DH, Kanaya A M, Wassel-Fyr CL, Van Den Eeden SK, et all. Urinary Incontinence and Pelvic Floor Dysfunction in Asian-American Women. Am. J Obstet. Gynecol. 2006;1-7.*

29. *Alparslan Ö, Doğaner G, Çiftçi M. Kadınların Üriner Enkontinans ve Kegel Egzersizi Hakkında Bilgi Düzeyleri. Sted. 2007; 16:129-133.*

Corresponding Author
Ozgur Alparslan,
Department of Midwifery,
Tokat School of Health Sciences,
Gaziosmanpasa University,
Tokat,
Turkey,
E-mail: ozgralp60@gmail.com
ozgur.alparslan@gop.edu.tr

Use of the first-trimester biochemical markers to predict intrauterine growth retardation

Slavica Vujovic[1], Alessandro Pala[2], Aleksandra Isakovic[3], Milan Terzic[4]

[1] Faculty of Science, University of Montenegro, Montenegro,
[2] Department of Perinatology, Obstetrics and Gynecology, University "La Sapienza" Roma, Italy,
[3] Department of Biochemistry, School of Medicine, University of Belgrade, Serbia,
[4] Department of Obstetrics and Gynecology, School of Medicine, University of Belgrade, Serbia.

Abstract

Objectives: To examine the clinical utility of the first-trimester maternal serum levels of pregnancy-associated plasma protein-A (PAPP-A) and free beta-human chorionic gonadotropoin (fβ-hCG) in their ability to predict intrauterine growth retardation (IUGR).

Methods: This was a prospective observational study of subjects attending the first-trimester combined screening program for Down syndrome in a university policlinic over a 1-year period. It included 700 pregnant women between ten and thirteen weeks of pregnancy. As part of screening for trisomy 21, all patients were tested for values of pregnancy-associated plasma protein-A (PAPP-A) and free beta- human chorionic gonadotropin (fβ-hC G), combined with the nuchal translucency (NT). The biochemical markers were converted to multiples of the expected normal median for a pregnancy of the same gestation (MoM). Pearson's correlation coefficient was used for association between variables. The study excluded examinees whose fetuses shown chromosomal or structural changes, as well as patients who suffered from chronic pathologies, i.e. chronic hypertension and insulin-related diabetes.

Results: During the study period, 700 women met the inclusion criteria. Analysis of crossing categoris of PAPP- AMoM findings of pregnant women in relation to the distribution by IUGR showed that there was no statistically significant difference ($\chi 2$ = 1.367, df = 1, p> 0.05), as in all categories PAPP-AMoM (i.e. in values up to and over 2.5) percentage of the IUGR incidence was nearly equal. Analysis of crossing categories of freehCGMoM findings in pregnant women in relation to the distribution by IUGR showed that there was no statistically significant difference ($\chi 2$ = 0.355, d f = 1, p> 0.05), as in all freehCGMoM categories (i.e., in values up to and over 2.5) the percentage of IUGR incidence was nearly equal. Analysis of IUGR, PIH and gestational diabetes association showed that the only statistically significant corre lation exists between IUGR and PIH. (p<0,01).

Conclusions: Therefore, neither hormone could be used individually as a clinical test for subsequent abnormal fetal growth; nevertheless, this is an important finding because it may enable the development of an algorithm to estimate an individualized risk of future development of fetal growth restriction based on multiple factors, including the first-trimester biochemical markers. The clinical value of using these hormonal levels to predict and manage fetal growth restriction requires further investigation.

Key words: Intrauterine growth retardation; pregnancy-associated plasma protein-A; free beta-human chorionic gonadotropoin; prediction; first-trimester biochemical markers

Introduction

Intrauterine growth retardation (IUGR) is multifactorial heterogeneous pathology (1) and therefore it is impossible to give unique recommendation for its detection. In clinical practice, early detection of fetuses at risk to develop growth restrictions or those that have already developed it is crucial for establishing an intensive program for fetal monitoring, aimed to define the most appropriate time for parturition (2).

Although ultrasound remains the standard technique for IUGR detection and fetal monitoring, examining biochemical indicators, such as IGF-I in umbilical cord blood, may result in more precise ultrasound estimates (3). In addition, biochemical parameters in maternal serum may have role in assessing the risk of IUGR. hCG levels of

2.0 MoM in maternal serum in the second trimester of pregnancy are associated with two or three times higher risk of IUGR. (4)

Although the connection between high levels of hCG in the second trimester and IUGR was widely investigated, it is still a controversial issue. Several authors have declared that there was a significant increase in the level of hCG in maternal serum in the second trimester of pregnancy in patients developing IUGR, ranged from 1: 21 to 2.5 MoM, and approximately 2-3 times higher increase in risk of IUGR-a was reported in patients with inexplicably high levels of hCG in the second quarter of pregnancy (4.5).

However, IUGR is closely associated with preeclampsia and it is very confusing factor, since the pathological features of preeclampsia include excessive placental secretion of hCG. The study aimed to resolve this issue has shown that hCG levels in the second trimester were not high in women who delivered growth retarded fetuses, and who did not develop later preeclampsia (6).

Measurements of PAPP-A in pregnancy resulted in optimistic conclusions especially regarding the prediction of occurrence of various obstetric abnormalities. PAPP-A in maternal serum are detected even in the 8th week of gestation and then they increase through the pregnancy (4). PAPP-A in maternal serum, measured between 8th and 13th weeks of gestation were significantly reduced in pregnancies with Down syndrome, on average, 2.5 times (7). Interestingly, the levels of PAPP-A in maternal serum achieve normal values between 17 and 19 weeks of gestation (8).

Intrauterine growth retardation (IUGR) continues to be an important determinant of perinatal mortality and morbidity in modern obstetrics (9). Physical evidence of abnormal fetal growth typically becomes apparent in the second half of pregnancy, although recent studies have suggested that indicators of aberrant fetal growth may be present as early as in the first trimester (10). In particular, two recent large prospective studies have shown that reduced pregnancy-associated plasma protein-A (PAPP-A) levels are associated with an increase in incidence of low birth weight (LBW) or delivery of small-for-gestational age (SGA) infants (11,12). Crown-rump length (CRL) measured in the first trimester is also strongly related to both PAPP-A

levels and birth weight but it was not taken into account in these studies (13). Therefore, it is unknown whether PAPP-A is an independent factor of fetal growth. Furthermore, PAPP-A is also known to be a protease of various insulin-like growth factor binding proteins (IGFBPs) (14). Since the expression and action of these binding proteins may be tissue specific (15), PAPP-A may, therefore, have differential effects on fetal growth of different tissues, as well as the overall fetal weight.

The ability to predict subsequent abnormal fetal growth in the first trimester could enable more appropriate fetal surveillance and management, which might potentially reduce prenatal complications due to fetal growth abnormalities. At present, there is no information concerning the effect of first-trimester biochemical markers on different fetal growth parameters in the mid-trimester of pregnancy. Therefore, the aim of the present study was to investigate the relationship between maternal levels of first-trimester biochemical markers and intrauterine growth retardation.

Materials and methods

This was a prospective observational study of subjects attending the first-trimester combined screening program for Down syndrome in a university policlinic over a 1-year period. It included 700 pregnant women between ten and thirteen weeks of pregnancy. As part of screening for trisomy 21, all patients were tested for values of pregnancy-associated plasma protein-A (PAPP-A) and beta- human chorionic gonadotropin (βHCG), combined with the nuchal translucency (NT).

The study excluded examinees whose fetuses shown chromosomal or structural changes, as well as patients who suffered from chronic pathologies, i.e. chronic hypertension and insulin-related diabetes.

The analysis included the processing of a database consisting of: medical history, demographic data, ultrasound findings and biochemical results.

We analyzed a database of coded variables in order to have better results readability and understanding. For the purpose of our study two aforementioned biochemical parameters, free hCGβ and PAPP-A, were analysed, and some of mentioned pregnancy complications, that is IUGR, with other data recorded in a specially designed database.

Table 1. Review of variables in database

Title	Value
Place	University policlinic
Age groups	<25 25-35 35+
Previous deliveries	Pd 0 pd 1 pd 2 pd>2 pd-previous deliveries
Previous abortions	No Yes
Complications in pregnancy	No Yes
Delivery terms	Preterm In term Prolonged
Infant body weight at birth	<2500 g. 2500-3000 g. 3000-4000 g. >4000 g.

Biochemical analysis of PAPP-A was performed using the immunofluorescence kit (Wallac DELFIA Xpress). Immunofluorescence kit (DELFIA Xpress Wellac) was used for free hCGβ. Doses were analyzed in the dual degree. Results are expressed as multiple median (MoM) of specific gestational periods (EG). Measurement of Crown-Rump Length (CRL) and nuchal translucency (NT) were performed by using endovaginal probe. The risk for Down syndrome was assessed using a LifeCycle software (version 2.2.4 PerkinElmer Life Sciences, Wallac Oy). Patients positive for screening, were grouped in the category of the real risk of Down syndrome, within extent over 1: 380, in accordance with indicative benchmarks, advising them to do chromosome analysis, both by villocentesis (CVS) and amniocentesis (A).

Pearson's correlation coefficient was used for association between variables (PAPP-A-free HCGβ) and each of the opposite outcomes. Statistical analysis was done by using Microsoft Excel ND Sigmastat version 3.1. Sensitivity and false positivity for all gynaecological complications were tested to identify any contradictory outcaste. Statistically, the p-value under 0.05 was taken into account.

Results

During the study period, 700 women were eligible, according to the inclusion criteria.

Table 2. Number of IUGR pregnancies in our study

Characteristic		F	%
IUGR	No	664	94,9
	Yes	36	5,1
	Total	700	100,0

The analysis showed that the distribution of numerical values in our work was around the normal (Kolmogorov Smirnov z was everywhere 1.96, p> 0.05), which allowed the use of parametric methods in the further analysis.

Table No. 4 shows descriptive values of parameters for the numerical elements of our work in relation to the distribution by IUGR attribute for the entire group of examinees.

Analysis showed that compared to the IUGR distribution there was no statistically significant differences in mean values of all analyzed parameters in Table No. 4, except for values relating to the delivery week (t = 2.033, p <0.05), and it is the result of higher average values of women in the group where IUGR was not reported. There was no statistically significant difference in other compared numerical features (p> 0.05) by IUGR distribution.
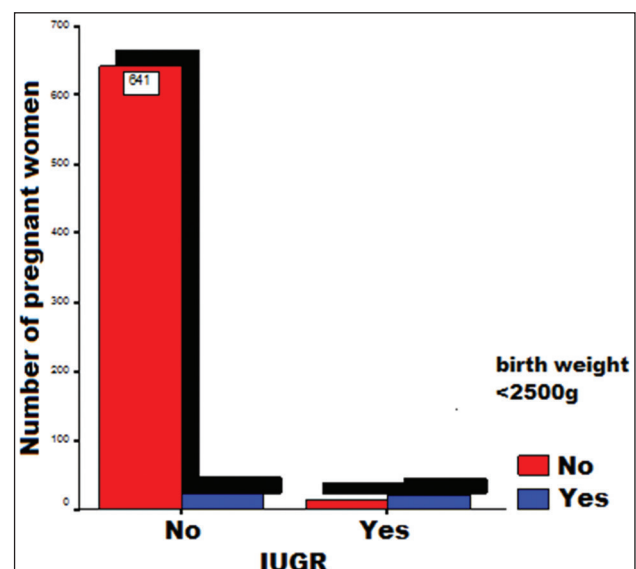
Graph 1. Incidence of pregnant women in relation to IUGR and birth weight up to 2500 g.

The analysis of crossing IUGR categories in pregnant women in relation to the distribution by birth weight under 2500 g showed that there

Table 3. Descriptive parameters for numerical characteristics in our study for target group of pregnant women

Characteristics	N	Minimum	Maximum	Average	SD
PAPP-A	700	,160	15,000	2,737	2,086
freehCG	700	6,000	941,000	70,726	62,227
Gestation week of biochemical analysis	700	10,000	13,430	11,902	,783
Age	700	18,000	45,000	31,160	3,739
Week of delivery	700	9,000	42,000	39,071	2,912
PAPP-A MoM	700	,110	5,350	1,170	,721
freehCG MoM	700	,130	79,600	1,393	3,144

Table 4. Descriptive parameters for numerical characteristics in our study for distribution by IUGR parameters (0-IUGR not found, 1- IUGR found).

Characteristics	IUGR	N	Average	SD	SE
PAPP-A	0	664	2,75	2,100	,081
	1	36	2,366	1,791	,298
freehCG	0	664	69,843	58,682	2,277
	1	36	87,003	108,698	18,115
Gestation week of biochemical analysis	0	664	11,898	,781	,030
	1	36	11,964	,823	,137
Age	0	664	31,150	3,743	,145
	1	36	31,440	3,699	,616
Week of delivery	0	664	39,120	2,913	,113
	1	36	38,110	2,755	,459
PAPP-A MoM	0	664	1,175	,710	,027
	1	36	1,094	,916	,152
freehCG MoM	0	664	1,386	3,201	,124
	1	36	1,516	1,815	,302

was a high statistically significant difference ($\chi2 = 174,531$; df = 1; p < 0,01), and it occurs because women with IUGR more frequently had infant birth weight under 2500 g., which was expected.
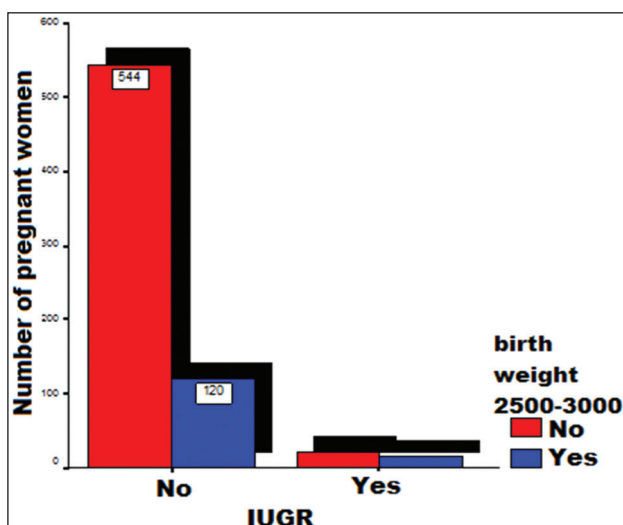
Graph 2. Incidence of pregnant women in relation to IUGR and birth weight of 2500-3000 g.

As in the previous table, the same situation was reported, that is, in women with detected IUGR, birth weight more often ranged between 2500-3000 g. than in examinees in whom IUGR was not detected.

The analysis of crossing IUGR categories in pregnant women in relation to the distribution by birth weight of 2500-3000 g. showed a high statistically significant difference ($\chi2 = 12.212$, df = 1, p <0.01).

Graph no. 2 and no. 3 clearly show that among our examinees there was no women with birth weight of their newborns over 3000 g.

Table 5. Incidence of pregnant women obtained by crossing their age categories and IUGR

		Age categories			Total
		< 25 years	25-35 years	Over 35 years	
IUGR	No	23	523	118	664
	Yes	1	26	9	36
Total		24	549	127	700
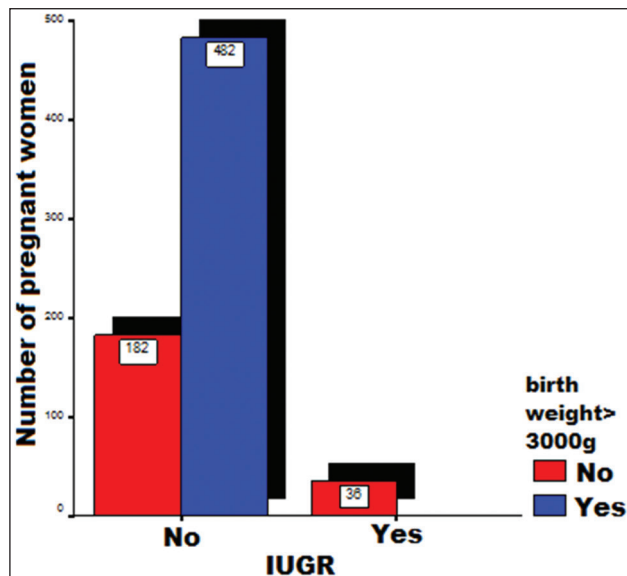
Graph 3. Incidence of pregnant women in relation to IUGR and birth weight of 3000-4000 g.

The analysis of crossing age categories of pregnant women in relation to the distribution by IUGR showed that there was no statistically significant difference ($\chi 2 = 1.217$, df = 2, p> 0.05), as in all age categories (i.e., in both younger and older) percentage of IUGR incidence were nearly equal.

Table 6. Incidence of pregnant women obtained by crossing categories of PAPP-AMoM and IUGR

Characteristics		IUGR		Total
		No	Yes	
PAPP-AMoM1	Up to 2,5	636	33	669
	over 2,5	28	3	31
Total		664	36	700

Analysis of crossing categoris of PAPP-AMOM findings of pregnant women in relation to the distribution by IUGR showed that there was no statistically significant difference ($\chi 2 = 1.367$, df = 1, p> 0.05), as in all categories PAPP-AMOM (i.e. in values up to and over 2.5) percentage of the IUGR incidence was nearly equal.

Table 7. Incidence of pregnant women obtained by crossing categories of freeHCGMoM and IUGR

Characteristics		IUGR		Total
		No	Yes	
freeHCGMoM1	Up to 2,5	625	33	658
	Over 2,5	39	3	42
Total		664	36	700

Analysis of crossing categories of freehCG-MoM findings in pregnant women in relation to the distribution by IUGR showed that there was no statistically significant difference ($\chi 2 = 0.355$, df = 1, p> 0.05), as in all freeHCGMoM categories (i.e., in values up to and over 2.5) the percentage of IUGR incidence was nearly equal.

Table 8. Incidence of pregnant women obtained by crossing categories of preterm delivery and IUGR

Characteristics		IUGR		Total
		No	Yes	
Preterm Delivery	No	596	24	620
	Yes	68	12	80
Total		664	36	700

Analysis of crossing findings related to preterm delivery in pregnant women compared to the distribution by category of intrauterine growth retardation (IUGR) showed a high statistically significant difference ($\chi 2 = 17.990$, df = 1, p <0.01), and it occurs because intrauterine growth retardation (IUGR) is more rarely found in women who have not experienced preterm deliveries (PRET) (96.2%), compared to those with preterm delivery (85.0%).

Table 9. Correlation between IUGR, PIH and gestation diabetes of pregnant women in our study

Characteristics	Statistical parameters	IUGR	PIH	Diabgest
IUGR	ρ		,126(**)	-,040
	p		,001	,291
	N		700	700
PIH	ρ			,034
	p			,372
	N			700
Diabgest	ρ			
	p			
	N			

** $p < 0,01$

Analysis of IUGR, PIH and gestational diabetes association showed that the only statistically significant correlation exists between IUGR and PIH. All other correlations analyzed in Table 9 were not statistically significant.

Discussion

Since the discovery of PAPP-A and-hCG fβ, there has been an increasing evidence that extreme levels of these hormones are associated with IUGR. However, many of studies in which they have been investigated have been retrospective with potential bias in the definition of gestational age, one of the most common confounding factors in the prediction of birth weight (10).

PAPP-A has been identified as a protease for IGFBPs, in particular IGFBP-4 16), and IGFBP-2 (17) and IGFBP-5 (18). As IGFBPs bind insulin-like growth factors (IGF-I and IGF-II), and hence inhibit their interaction with cell surface receptors (19), lower levels of PAPP-A would be expected to be associated with reduction in IGF activity and thus growth, and vice versa. Moreover, the location and action of these IGFBPs may be tissue specific (15). For example, IGFBP-4 is found abundantly in fibroblasts and osteoblasts (15,19), while the highest level of IGFBP-2 is found in hepatic tissue (15). In fact, in vitro and in vivo experiments have shown the positive effects of PAPP-A on bone growth by inhibiting IGFBP-4 (20).

Other possible causes of FGR include major structural abnormalities of the placenta (placental hemangioma, abnormal cord insertion, placenta bilobata) or abnormal localization of the placenta (e.g., placenta previa) (4). IUGR increases for two to three times, especially in pregnant women with hypersensitive disorders (4), and severity of hypertension is directly associated with IUGR, which was found in our work. Smoking (21), poor maternal nutrition (22), maternal malnutrition, and the presence of a chronic disease of mothers (23) or congenital infection, is associated with the development of IUGR-a.

Histopathological studies have shown that the placenta with IUGR have villi with limited angiogenesis due to less presence of endothelial vascular growth factor (24,25), which is related to the fact that the placenta cannot transfer oxygen and as a consequence the decrease in the mean of pO2 occurs. Preeclempsia, as one of the main factors contributing to IUGR, causes intravascular coagulation, fibrin deposition in the spiral arteries, and, consequently, placental hypoperfusion (26-29).

The results of previous studies that investigated the relationship between fβ-hCG and fetal growth were inconclusive. Morssink et al. (30) performed a small case-controlled study comparing 73 SGA pregnancies, 87 pregnancies with a preterm delivery and 292 matched normal controls. They found no association between either fβ-hCG or PAPP-A with subsequent fetal growth restriction or preterm delivery, which was the case in our study. Also our study found statistical differences in the correlation between IUGR and preterm delivery. Ong et al. studied more than 5000 cases and found no difference in fβ-hCG levels in SGA pregnancies compared to controls (31). Smith et al. showed that low fβ-hCG was associated with IUGR in a study population of over 8000. However, this relationship was lost after adjusting for PAPP-A (13). Krantz et al. (12), in another study of over 8000 subjects, found that an extremely low fβ-hCG level (<1st percentile) was associated with a relative risk of fetal growth restriction (4).

Both, maternal and fetal IGF-I affect the metabolism of the placenta, thus regulating the availability of substrates required for fetal growth (32). It seems that IGF in mothers and fetus are regulated independently, because there is no association between levels of IGF-I in maternal serum and cord serum. So, IGF-I of mothers may affect fetal growth only through its effect on placental function (33).

Conclusion of the study conducted in 2009, confirms that the low level of PAPP-A is significantly associated with increased risk of intrauterine growth retardation (34). The study observing PAPP-A and ADAM12 as markers for intrauterine growth retardation, through their role in the insulin-like growth factors, was carried out. In cases that have resulted in poor fetal growth, levels of PAPP-A and ADAM12 from 11 to 14 weeks of pregnancy were significantly lower than normal in this example (35). Fox et al. study also confirmed that PAPP-A is a useful marker for the identification of fetal growth retardation in the second trimester (36).

Previous studies have shown a relationship between a high second-trimester total hCG level with poor fetal growth (4). The mechanism for the negative correlation between fβ-hCG and growth requires further investigation.

Therefore, neither hormone could be used individually as a clinical test for subsequent abnormal fetal growth; nevertheless, this is an important finding because it may enable the development of an

algorithm to estimate an individualized risk of future development of fetal growth restriction based on multiple factors, including the first-trimester biochemical markers.

Reduction of PAPP-A in maternal serum is independent of changes in the synthesis of this protein in the placenta, because presence of PAPP-A mRNA is not significantly reduced in the placenta with Down syndrome. Moreover, the correlation between levels of PAPP-A in serum and tissue disappears in pregnancies with Down syndrome. These data lead to the conclusion that the decrease in PAPP-A in maternal serum is posttranslational and that it can be caused by changes in the mechanisms of placental secretion, or changes in the stability of secreted proteins (37).

Lower levels of PAPP-A in the first trimester may suggest that the fetus will be small but normal baby. On the other hand, it can be speculated that the small placenta is responsible for poorer fetal growth, so there is a subgroup of normal pregnancies in which the size or capacity of the placenta limits fetal growth (4).

Extreme carefulness is required in obstetric advice to realize that every test has limited power to predict the absolute risk for an individual.

The clinical value of using these hormonal levels to predict and manage fetal growth restriction requires further investigation.

References

1. Lin CC, Santolaya-Forgas J. Current concepts of fetal growth restriction. I. Causes, classification, and pathophysiology. Obstet Gynecol 1998; 92: 1044–1055

2. Lin CC, Santolaya-Forgas J. Current concepts of fetal growth restriction. II. Diagnosis and management. Obstet Gynecol 1999; 93: 140–146

3. Ostlund E, Bang P, Hagenas L, Fried G. Insulin-like growth factor I in fetal serum obtained by cordocentesis is correlated with intrauterine growth retardation. Hum Reprod 1997; 12: 840–844

4. Reis M. F, D'Antona D, Pertralgia F. 2002 Predictive value of hormones in maternal and fetal complications of pregnancy. Endocrine Reviews 2002; 23(2): 230-257

5. Muller F, Savey L, Le Fiblec B, Bussieres L, Ndayizamba G, Colau JC, Giraudet P. Maternal serum human chorionic gonadotropin level at fifteen weeks is a predictor for preeclampsia. Am J Obstet Gynecol 1996; 175: 37–40

6. Luckas MJ, Sandland R, Hawe J, Neilson JP, McFadyen IR, Meekins JW. Fetal growth retardation and second trimester maternal serum human chorionic gonadotrophin levels. Placenta 1998; 19: 143–147

7. Canick JA, Kellner LH. First trimester screening for aneuploidy: serum biochemical markers. Semin Perinatol 1999; 5: 359–368

8. Berry E, Aitken DA, Crossley JA, Macri JN, Connor JM. Screening for Down's syndrome: changes in marker levels and detection rates between first and second trimesters. Br J Obstet Gynaecol 1997; 104: 811–817

9. M Kady S, Gardosi J. Perinatal mortality and fetal growth restriction. Best Pract Res Clin Obstet Gynaecol 2004; 18: 397–410.

10. Smith GC. First trimester origins of fetal growth impairment. Semin Perinatol 2004; 28: 41–50.

11. Smith GC, Stenhouse EJ, Crossley JA, Aitken DA, Cameron AD, Connor JM. Early pregnancy levels of pregnancy-associated plasma protein A and the risk of intrauterine growth restriction, premature birth, preeclampsia, and stillbirth. J Clin Endocrinol Metab 2002; 87: 1762–1767.

12. Krantz D, Goetzl L, Simpson JL, Thom E, Zachary J, Hallahan TW, Silver R, Pergament E, Platt LD, Filkins K, Johnson A, Mahoney M, Hogge WA, Wilson RD, Mohide P, Hershey D, Wapner R. First Trimester Maternal Serum Biochemistry and Fetal Nuchal Translucency Screening (BUN) Study Group. Am J Obstet Gynecol 2004; 191: 1452–1458.

13. Smith GCS, Smith MFS, McNay MB, Fleming JEE. First-trimester growth and the risk of low birth weight. N Engl J Med 1998; 339: 1817–1822.

14. Mazerbourg S, Callebaut I, Zapf J, Mohan S, Overgaard M, Monget P. Update on IGFBP-4: regulation of IGFBP-4 levels and functions, in vitro and in vivo. Growth Horm IGF Res 2004; 14: 71–84.

15. Han VK, Matsell DG, Delhanty PJ, Hill DJ, Shimasaki S, Nygard K. IGF-binding protein mRNAs in the human fetus: tissue and cellular distribution of developmental expression. Horm Res 1996; 45: 160–166.

16. Lawrence JB, Oxvig C, Overgaard MT, Sottrup-Jensen L, Gleich GJ, Hays LG, Yates 3rd JR, Conover CA. The insulin-like growth factor (IGF)-dependent IGF binding protein-4 protease secreted by human fibroblasts is pregnancy-associated plasma protein-A. Proc Natl Acad Sci 1999; 96: 3149–3153.

17. Monget P, Mazerbourg S, Delpuech T, Maurel MC, Maniere S, Zapf J, Lalmanach G, Oxvig C, Overgaard MT. Pregnancy-associated plasma protein-A is involved in insulin-like growth factor binding protein-2 (IGFBP-2) proteolytic degradation in bovine and porcine preovulatory follicles: identification of cleavage site and characterization of IGFBP-2 degradation. Biol Reprod 2003; 68: 77–86.

18. Laursen LS, Overgaard MT, Soe R, Boldt HB, Sottrup-Jensen L, Giudice LC, Conover CA, Oxvig C. Pregnancy-associated plasma protein-A (PAPP-A) cleaves insulin-like growth factor binding protein (IGFBP)-5 independent of IGF: implications for the mechanism of IGFBP-4 proteolysis by PAPP-A. FEBS Lett 2001; 504: 36–40.

19. Clemmons DR. Role of insulin-like growth factor binding proteins in controlling IGF actions. Mol Cell Endocrinol 1998; 140: 19–24.

20. Ortiz CO, Chen BK, Bale LK, Overgaard MT, Oxvig C, Conover CA. Transforming growth factor-beta regulation of the insulin-like growth factor binding protein-4 protease system in cultured human osteoblasts. J Bone Miner Res 2003; 18: 1066–1072.

21. Zaren B, Lindmark G, Bakketeig L. Maternal smoking affects fetal growth more in the male fetus. Paediatr Perinat Epidemiol 2000; 14: 118–126

22. Henriksen T. Foetal nutrition, foetal growth restriction and health later in life. Acta Paediatr Suppl 1999; 88: 4–8

23. Isaksen CV, Laurini RN, Jacobsen G. Pre-pregnancy risk factors of small-for-gestational-age births and perinatal mortality. Acta Obstet Gynecol Scand 1997; Suppl 165: 44–49

24. Lyall F, Young A, Boswell F, Kingdom JC, Greer IA. Placental expression of vascular endothelial growth factor in placentae from pregnancies complicated by pre-eclampsia and intrauterine growth restriction does not support placental hypoxia at delivery. Placenta 1997; 18: 269–276

25. Ahmed A, Dunk C, Ahmad S, Khaliq A. Regulation of placental endothelial growth factor (VEGF) and placenta growth factor (PIGF) and soluble Flt-1 by oxygen—a review. Placenta 2000; 21(Suppl A): S16–S24

26. Long PA, Abell DA, Beischer NA. Fetal growth retardation and pre-eclampsia. Br J Obstet Gynaecol 1980; 87: 13–18

27. Lin CC, Lindheimer MD, River P, Moawad AH. Fetal outcome in hypertensive disorders of pregnancy. AmJ Obstet Gynecol 1982; 142: 255–260

28. Schjetlein R, Haugen G, Wisloff F. Markers of intravascular coagulation and fibrinolysis in preeclampsia: association with intrauterine growth retardation. Acta Obstet Gynecol Scand 1997; 76: 541–546

29. Schjetlein R, Abdelnoor M, Haugen G, Husby H, Sandset PM, Wisloff F. Hemostatic variables as independent predictors for fetal growth retardation in preeclampsia. Acta Obstet Gynecol Scand 1999; 78: 191–197

30. Morssink LP, Kornman LH, Hallahan TW, Kloosterman MD, Beekhuis JR, de Wolf BT, Mantingh A. Maternal serum levels of free beta-hCG and PAPP-A in the first trimester of pregnancy are not associated with subsequent fetal growth retardation or preterm delivery. Prenat Diagn 1998; 18: 147–152.

31. Ong CY, Liao AW, Spencer K, Munim S, Nicolaides KH. First trimester maternal serum free beta human chorionic gonadotrophin and pregnancy associated plasma protein A as predictors of pregnancy complications. BJOG 2000; 107: 1265–1270.

32. Owens JA. Endocrine and substrate control of fetal growth: and maternal influences and insulin-like growth factors. Reprod Fertil Dev 1991; 3: 501–517

33. Hills FA, English J, Chard T. Circulating levels of IGF-I and IGF-binding protein-1 throughout pregnancy: relation to birthweight maternal weight. J Endocrinol 1996; 148: 303–309

34. Montanari L, Alfei A, Albonico G, Moratti R, Arossa A, Beneventi F, Spinillo A. The impact of first-trimester serum free beta-human chorionic gonadotropin and pregnancy-associated plasma protein A on the diagnosis of fetal growth restriction and small for gestational age infant. Fetal Diagn Ther 2009; 25(1): 130-5

35. Cowans NJ, Spencer K. First-trimester ADAM12 and PAPP-A as markers for intrauterine fetal growth restriction through their roles in the insulin-like growth factor system Prenat Diagn 2007; 27(3): 264-71.

36. Fox NS, Chasen ST. First trimester pregnancy associated plasma protein-A as a marker for poor pregnancy outcome in patients with early-onset fetal growth restriction. Prenat Diagn. 2009; 29(13): 1244-8.

37. Brizot ML, Hyett JA, Mckie AT, Bersinger NA, Farzaneh F, Nicolaides KH. Gene expression of human pregnancy-associated plasma protein-A in placenta from trisomic pregnancies. Placenta 1996; 17: 33–36.

Corresponding Autor
Slavica Vujovic,
University of Montenegro,
Montenegro,
E-mail: slavica.vujovic@t-com.me

The effect of asthma education on the clinical condition of children with asthma

Gulcin Bozkurt[1], Suzan Yildiz[2], Sevim Ulupinar[3], Besey Gunes Oren[1]

[1] Istanbul University Faculty of Health Science, Bakirkoy, Istanbul, Turkey,
[2] Istanbul University Faculty of Nursing, Şişli, Istanbul, Turkey,
[3] Marmara University Faculty of Health Sciences, Haydarpasa, Istanbul, Turkey.

Abstract

Purpose: The purpose of this study was to determine the effect of asthma education on the clinical condition of children with asthma.

Methods: A descriptive, quasi-experimental, and single-group pre-post test study design was conceived. The study sample consisted of 46 mothers and their children with asthma being monitored at the Allergy-Immunology Polyclinic, an education and research hospital in Istanbul. Both the children and their mothers were given asthma education, which was followed up after 6 months.

Result: It was determined that the clinical condition of the children showed a significant difference ($P < .05$) at follow-up compared to baseline. The difference in clinical symptoms (shortness of breath, coughing, phlegm, and wheezing) between their status at baseline and their condition on the day of the interview following the education intervention was not significant ($P > .05$). Absence from school dropped significantly ($P < .05$) after the education intervention.

Conclusion: The findings suggest that if children are given asthma education and taught how to live with asthma, this can lead to an improvement in their clinical condition and a high standard of care to asthmatic children.

Key words: Asthma, patient education, child.

Introduction

The incidence of asthma is increasing across the world, especially in industrial countries [1,2]. It is predicted that one out of every ten children in Turkey has asthma [3]. Asthma causes a significant burden, not only by increasing the costs of health care, but also by reducing the ability of children to attend school and limiting their participation in social and family life [1].

Although preventive therapy is needed in the treatment of asthma, health professionals are more often likely to be involved in attack treatment and emergency care of asthma attacks. Management of asthma often focuses on 'crisis intervention', that is, the disease is addressed only when a problem occurs [4,5,6].

Asthma education is an effective intervention in the treatment of asthma [4]. Current guidelines for the management of asthma place great emphasis on the importance of appropriate training and education of those suffering from the disorder [1]. The National Heart, Lung, and Blood Institute (NHLBI) clinical practice guidelines strongly recommend that health professionals educate children with asthma and their caregivers about self-management [7,8].

An educational program designed to help patients cope with self-care in asthma should be focused on improving their knowledge of risk factors, treatment principles, and ways of avoiding the side-effects of the medication taken [1,3,9,10]

Asthma education aims to reduce exacerbations, because the patient or the caregiver will be able to recognize early warning signs and act accordingly. This will lead to shorter hospital stays, decrease the effects of hospitalization, and reduce exposure to side effects from repeated courses of oral corticosteroids. It may also result in decreased disruption of the family unit, decreased hospital and individual expenses, patient empowerment, and reduced absenteeism from school [4,7,10, 11].

In recent years, paediatric nurses have incorporated an important educational element into their role and have become indispensable members of multi-disciplinary teams with the ability to influence healthcare behavior [10]. Nurses can help improve the clinical condition of children by teaching patients and their parents how to live with asthma [1,6,12]. The National Asthma Education Program

proposes that an effective way to provide such a service is to train nurses in asthma education.

In Turkey, asthma education is generally not given to children with asthma or their families. Furthermore, there has been no research on the literature that evaluates the impact of asthma education provided to children with asthma and their families by nurse educators. The present study reveals the effects of asthma education provided by nurses on children with asthma and their mothers.

The purpose of this study was to determine the effect of asthma education on the clinical condition of children with asthma.

Method

Study design

We developed a descriptive, quasi-experimental and single-group pre-post test study design. As a descriptive study, the demographic characteristics and clinical status of children with asthma were determined. In the quasi-experimental aspect of the study, children and their mothers were offered asthma education. The children's clinical conditions before and after the intervention were compared.

The impact of the education on the condition of children with asthma were assessed (without any other intervention being undertaken) and on the basis of the clinical classification decided upon by national and international consensus.

Sample

This study was conducted on mothers and their asthmatic children being treated in the Allergy-Immunology Policlinic of an education and research hospital in Istanbul. The universe of the study was 500 children with asthma and their mothers who attended this polyclinic. The sample consisted of 50 children and their mothers who consented to participate in the study. Four children were excluded from the study because of their failure to attend the follow-up assessment after the education intervention. The final sample consisted of the remaining 46 children and mothers.

The criteria for sample included asthmatic children in the 7–17 age group and their mothers; neither group had any accompanying psychiatric problems.

Procedure

Data was gathered using the 'Information Sheet for Children with Asthma' and the 'Follow-up Sheet for Children with Asthma' developed by the researchers. Each sheet consisted of 28 questions. The 'Information Sheet for Children with Asthma' was based on the literature [3,8,9] and the recommendations of specialists.

The 'Information Sheet for Children with Asthma' was completed before the education sessions with the mothers began. The children in the study group received asthma management education together with their mothers. The education program made use of exposition, questions and answers, posters, group discussions, and other similar materials and techniques. The educational program was designed for groups of 8–10 participant mothers and children. A total of six groups attended the education program, and the duration of each session was approximately 50 minutes. The educational content was the same for each group. The program was delivered by a nurse-educator experienced in asthma management. The asthma education interventions were developed based on the NHLBI guidelines for asthma education. This guideline recommends that providers educate patients and their caregivers on four major topics: basic facts about the pathophysiology of asthma, correct usage of medications, techniques for monitoring symptoms, and the importance of avoiding triggers [8]. At the end of the education, the children and their mothers were given a self-help booklet entitled 'Living with Asthma'.

Children in the study group were evaluated and assessed again six months later using the 'Follow-up Sheet for Children with Asthma'.

Ethical considerations

The study has been approved by theEthical Committee of the İstanbul Göztepe Training and Research Hospital and an informed content from was obtained from the mothers.

Analysis

The data were evaluated with the SPSS program (v.11.0; Chicago, IL, USA). Percentages, means, Wilcoxon tests, and McNemar tests were used for the statistical analysis. A P value of 0.05 or less was considered significant.

Results

The research questionnaire was completed by 46 paediatric patients with a diagnosis of asthma. Among the children in the study group, 65.2% were boys. The age range of the children was 7–17 years with a mean age of 9.2 (Standart Derivation (SD) = 2.2) years. In addition, 52.2% of the children had a family history of asthma.

There was a significant difference between the frequency of asthma symptoms in the last month before the children came in for the follow-up and the frequency after the education program was over (Z: -2.624, P= .00) (Table 1).

There was a significant drop in the percentage of children waking up with asthma symptoms in the month before they came in for their check-up compared to before the education intervention (Z: -2.400, P=.01) (Table 1). There was a statistically significant decrease (Z: -3.050, P=.00) in the number of children experiencing asthma attacks

Table 1. Clinical Status of Asthmatic Children Before and After Education Intervention

Clinical symptoms	Before education		After education			
Frequency of asthma symptoms	**n**	**%**	**n**	**%**	***Z**	**p**
Less than once a week	23	50.0	34	73.9		
A few times a week	13	28.3	10	21.7	-2.624	.00
Every day	10	21.7	2	4.4		
Waking with asthma symptoms						
Present	30	65.2	21	45.7	-2.400	.01
Absent	16	34.8	25	54.3		
Frequency of symptoms during the night						
Less than twice a month	27	58.7	35	76.1		
More than twice a month	12	26.1	10	21.7	-2.281	.02
A few times a week	4	8.7	1	2.2		
Every night	3	6.5	-	-		
Reduction in daily activity						
Present	23	50.0	7	15.2	-1.935	.05
Absent	23	50.0	39	89.9		
Asthma attack during exercise						
Present	36	78.2	32	69.5	-3.050	.00
Absent	10	21.7	14	30.4		

*Z= Wilcoxon tests

Table 2. Distribution of Clinical Symptoms in Asthmatic Children at Baseline and Follow-Up

Clinical Symptoms	Before Education				After Education					
	Present		Absent		Present		Absent		***Z**	**p**
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**		
Coughing										
Day	25	54.3	21	45.7	20	43.5	26	56.5	-1.091	.27
Night	15	32.7	31	67.4	17	37.0	29	63.0	-447	.65
Wheezing										
Day	18	39.1	28	60.9	13	28.3	33	72.7	-1.043	.29
Night	10	21.7	36	78.3	11	23.9	35	76.1	-229	.81
Dyspnoea										
Day	10	21.7	36	78.3	8	17.4	38	82.6	-500	.61
Night	7	15.2	39	84.8	8	17.4	38	82.6	-258	.79
Sputum										
Day	17	37.0	29	63.0	23	50.0	23	50.0	-1.225	.22
Night	14	30.4	32	69.6	11	23.9	35	76.1	-832	.40

*Z=Wilcoxon tests

during exercise after the education program compared to the period before (Table 1).

In assessing the children's clinical condition on the day of the interview, there was no statistically significant difference in the frequency of the children's day and night coughing, wheezing, dyspnoea, and sputum symptoms compared to before the education intervention (Table 2).

The number of children with asthma who were absent from school due to their illness was determined to average 3.00 ± 1.68 days per semester after the education program, whereas it had averaged 4.73 ± 5.67 days beforehand. School absenteeism decreased significantly after the education program was completed ($Z = -2.22$, $P = .02$).

In the six-month follow-up period after the education intervention, it was determined that 69.6% of the children in the study group did not suffer any attacks, 21.8% experienced one attack, 4.3% had two attacks, and 4.3% had three attacks.

While 4.3% of the children were taken to the emergency room once in the follow-up period, only 2.2% were taken twice; the percentage of children who were not taken was 93.5%.

While 60.9% of the children had noticed an asthma attack before the education program, the percentage of awareness after the education intervention was 84.8%, indicating a statistically significant difference between the two rates (McNemar X: 18.58, $P=.00$).

Discussion

Current guidelines for the management of asthma place great emphasis on the importance of appropriate training and education of those suffering from the disorder [8]. Patients' participation in evaluating and monitoring their symptoms is essential, as is avoiding factors that may release allergens to which the patient is sensitive. Understanding the principles of treatment and the need for systematic medication is equally important [1,3,4].

It is known that the attacks of children with asthma mostly increase in the night and that the children are seriously troubled by the complaints. After the education intervention, there was a reduction in the frequency of asthma symptoms and in waking up with asthma symptoms in the last month before the children came in for their check-

ups. The evidence suggests that paediatric asthma self-management training and education interventions have favourable effects in reducing the number of days of asthma symptoms that a child with asthma experiences [13,14]. The education program may have changed the false knowledge and beliefs of the families and children, thus changing their attitudes toward their disease and teaching them to live with asthma.

Asthma has a great influence on the physical activity of children. This influence is already apparent in pre-school children, and for children of school age, it is associated with their frequently having to be excused from gymnastic classes [1,3,15,16]. Guendelman et al., 2003 reported a statistically significant effect of a decrease in the proportion of children with asthma who reported any restricted-activity days following paediatric asthma self-management education. It was determined that the number of children who had a decrease in daily activity and those who had attacks triggered by exercise decreased after the education program. This evidence shows a favourable effect of paediatric asthma self-management training and education on reducing the mean number of restricted-activity days for children with asthma.

Clinical symptoms reduction is an important goal in asthma. It is expected that symptoms are alleviated in children who learn to live with the disease. On the day of the interview after the education program, it was found that day and night coughing, wheezing, dyspnoea, and sputum symptoms of the children had not decreased significantly compared to the period before the training. It has been reported that asthma symptoms during the day and night decreased with group education and individual training programs [11,17,18]

Children with asthma spend a significant time in school. In this study, school absenteeism among children was found to significantly decrease after the education intervention. Similarly, it has been reported that school absenteeism significantly decreased in groups that received training [4,11,13].

In the follow-up period after the education intervention, it was determined that 69.6% of the children in the study group did not suffer any attacks. Studies have determined that asthma education led to a decrease in emergency room and hospital presentations [7,13,18,19].

There are some limitations in this study. One study limitation was the inability to assess the differences in outcomes between different age groups. In addition, there were difficulties in recruiting participants. While this difficulty is true for any educational program, we used interactive strategies to motivate families to become active participants in the management of their children's asthma. Our program is unique in that it incorporates the principles of group learning for children or for both children and their mothers, and it includes educational intervention. The educational program was originally planned for two sessions, but because the patients in the study group did not wish to attend a second session, only one session took place.

Conclusion

It is shown that giving children asthma management education and teaching them how to live with asthma improved their clinical condition and reduced the frequency of their absences from school.

We suggest that asthma education programs for both children and their mothers will be useful at clinics in which children with asthma are treated. Nurses are a valuable asset in chronic disease management, and with appropriate education and competence, assessments can provide a high standard of care to asthmatic children and their families.

Acknowledgement

References

1. Dolinska, C., Zietkowski, Z., & Bodzenta-Lukaszyk, A. (2005). Knowledge of risk factors and guidelines for the management of asthma. The educational role of nursing. Annales Academiae Medicae Bialostocensis, 50, 177-180.

2. Guttmann, A., Zagorski, B., Austin, P. C., Schull, M., Razzaq, A., & Anderson, G. (2007). Effectiveness of emergency department asthma management strategies on return visits in children: A population-based study. Pediatrics, 120, 1402-1410.

3. Bozkurt, G., & Yildiz, S. (2004). The effect of education given to the school children with asthma about management of the disease, on their quality of life. Jornal of Istanbul UniversityNursing Faculty, 53, 101-113.

4. Brown, G., & Levin, M. (2005). Asthma education. Curr Allergy Clin Im,18, 14-15.

5. Kemp, J. P., & Kemp, J. A. (2001). Management of asthma in children. American Family Physician, 63, 1341-1348.

6. Stadtler A. C, Tronick E. Z, & Brazelton T. B. (2001). The touchpoints pediatric asthma program. Pediatric Nursing, 27, 469-470.

7. Coffman, J. M., Cabana, M. D., Halpin, H. A., & Yelin, E. H. (2008). Effects of asthma education on children's use of acute care services: A meta-analysis. Padiatrics,121, 575-586.

8. National Institute of Health, National Heart, Lung, and Blood Institute, National Asthma Education and Prevention Program, expert panel report 3 guidelines for the diagnosis and management of asthma. (http://www.nhlbi.nih.gov).

9. Clark, N. M, & Partridge, M. R. (2002). Strengthening asthma education to enhance disease control. Chest,121, 1661-1669.

10. Wooler, E. (2001). The role of the nurse in paediatric asthma management. Paediatric Respiratory Reviews, 2, 76-81.

11. Shah S., Peat J. K., Mazurski E. J., Wong H., Wang, H., Sindhusake, D., et al. (2001). Effect of peer led programme for asthma education in adolescents: cluster randomised controlled trial. British Medical Journal, 322, 1-5.

12. Abadoğlu, Ö., Yalazkisa, S., Ülger, G., Pasaoğlu, G., & Misirligil, Z. (2003). The role of education by a well-trained nurse on correct utilization of inhalation devices. Türkiye Klinikleri Journal Allergy-Asthma,5, 11-15.

13. Krishna, S., Francisco, B., Boren, S. A., Balas, E. A., König, P., Graff, G. R., et al. (2003). Internet-enabled interactive multimedia asthma education program: A randomized trial evaluation. Pediatrics, 111, 503-510.

14. Wolf F., Guevara J. P., Grum C. M., Clark N. M., & Cates C. J. (2002). Educational interventions for asthma in children. The Cochrane Database of Systematic Reviews,4,1-191. Retrieved October 10, 2011,from http://onlinelibrary.wiley.com/o/cochrane/clsysrev/articles/CD000326/pdf_fs.html

15. Clark, N. M., Brown, R., Joseph, C. L. M., Anderson, E. W., Lui, M., & Valerio, M. A. (2004). Effects of a comprehensive school-based asthma program on symptoms, parent management, grades, and absenteeism. Chest, 125, 1674-1679.

16. Ram, F. S. F., Robinson, S. M., & Black, P. N. (2000). Effects of physical training in asthma: A systematic review. British Journal of Sports Medicine, 34, 62-167.

17. Clark, N. M., Gong, M., Schork, M. A., Kaciroti, N., Evans, D., Roloff, D., et al. (2000). Long-term effects of asthma education for physicians on patient satisfaction and use of health services. European Respiratory Journal, 16, 5-21.

18. Watson, W. T. A., Gillespie, C., Thomas, N., Filuk, S. E., McColm, J., Michelle, P. P., et al. (2009). Small-group, interactive education and the effect on asthma control by children and their families. Canadian Medical Aassociation Journal, 181, 257-263.

19. Mishra, M., Rao, K. V. R., & Padhi, S. K. (2005). Asthma education for better compliance in disease management. Indian Journal of Allergy Asthma and Immunol, 19, 25-28.

Corresponding Author
Gulcin Bozkurt,
Istanbul University,
Faculty of Health Sciences,
Istanbul,
Turkey,
E-mail: gbozkurt@istanbul.edu.tr
        gulmeh@hotmail.com

Study of metabolic profiling Parkinson's disease

Fariba Fathi[1], Mohsen Tafazzoli[1], Masoud Mehrpour[2], Gholamali Shahidi[3]

[1] Department of Chemistry, Sharif University of Technology, Tehran, Iran,
[2] Department of Neurology, Firoozgar clinical research development center, Behafarin St, ValisrSq, Tehran, Iran,
[3] Department of Neurology, Tehran University of Medical sciences, Tehran, Iran.

Abstract

Objective: Clinical examination is still the significant way to diagnose the Parkinson's disease (PD). The metabolic changes in serum in PD were explored using a metabonomics approach based on ¹H nuclear magnetic resonance (NMR) spectroscopy. The aim of this study is to classify two groups of patients and healthy persons using multiple measured descriptors.

Materials and methods: Fifty-two serum samples were collected in total: twenty-five cases and twenty-seven controls. The main variable selection method in this work was multiple linear regression (MLR) step wise. After arable selection, by applying counter propagation artificial neural network (CP-ANN) classification methods, we significantly separated our patient group from the control group.

Results: Our descriptors consisted of very-low-density lipoprotein (VLDL), 3-hydroxybutyrate, myoinositol, dimethylamine and glutamine. The score and loading plots of the first two components explain 84.09% of the total information.

Conclusions: The findings of the present study reveal new differentiating metabolites for PD. This metabolite may provide diagnostic tools as well as insight into potential targets for prevention and disease therapy.

Key words: Nuclear magnetic resonance, Parkinson's disease, Counter propagation artificial neural network, Multiple linear regression.

Introduction

PD is a progressive disorder and is the second most common neurodegenerative disorder. The incidence is approximately similar in the world, with the prevalence increasing in proportion to regional increases in population longevity with about 1% affected over the age of 65 years and more than 4% of the population affected by the age of 85 years [1]. PD is a challenging diagnosis and the gold standard of diagnosis is still clinical examination. There are many biomarkers that were studied for PD but the results are not conclusive [2]. PD may generate perturbations characteristic in the metabolome and such alteration can be applied as the marker for disease diagnosis. Metabonomics could be considered as "the quantitative measurement of the dynamic multi-parametric metabolic feedback of biosystems to physiological and pathophysiological stimuli or genetic alteration". Meta and nomos means ''change" and ''a set of laws" respectively [3]. Jeremy Nicholson at Imperial College London worked in toxicology, disease diagnosis and a number of other fields using this approach for the first time. Historically, metabonomics was one of the first techniques applying the systems biology approach to study of metabolism [4- 6]. NMR is known as the ideal technology to initiate the fields of metabolomics and metabonomics because of its extensive use for "classical" metabolic studies and its exceptional capability to handle complex metabolite mixtures [7- 8]. NMR still has a number of unique privileges whilst other technologies such as Gas Chromatography–Mass Spectrometry (GC-MS) and Liquid Chromatography–Mass Spectrometry (LC-MS) are highly being applied in metabolomics. NMR is a non-biased, non-destructive and easily quantifiable technique which requires little or no separation and allows the detection of new compounds. NMR is particularly amenable to those compounds which are less compatible with GC-MS or LC-MS analysis such as sugars, amines, volatile ketones. NMR moreover is an insensitive technique, with a lower detection limit of about $1–5 \mu M$ and a need for relatively large sample size $(500 \mu L)$. However, with the recent introduction of higher field magnets (900 MHz), cryogenically cooled probes which enhance signal by a factor of 3 and small-volume microprobes $(60 \mu L)$, some of these sensitivity factors are taking less into concern. This spectral complication has led to the develop-

ment of processing and interpreting metabonomics NMR data.

In chemometrics approach after recording the spectral patterns and intensities, the recorded data will be statistically compared and used to classify the relevant spectral features that differentiate sample groups [7- 10]. The complex NMR spectral profiles resulting from this analysis were interpreted with data reduction and chemometrics analysis [4] such as CP- ANN and MLR.

Materials and methods

Sample collection

Blood was collected from 25 PD positive patients and 27 healthy controls attending the firoozgar hospital in Tehran. Samples were allowed to clot in non-anti-coagulant vacutainers for 20 minute at room temperature and serum was separated after centrifugation for 10 minutes at 2500 rpm and room temperature. Aliquots of the serum were stored at −80 ℃ until assayed.

HNMR spectroscopy

For NMR measurements, 10%D_2O (Deuterium oxide, 99.9%D, Aldrich Chemicals Company) was used to for NMR signal locking. Bruker DRX-500NMR operating at 500.13MHz and 5 mm high quality NMR tubes (Sigma Aldrich., RSA) were used for data acquisition at 300 K. For all NMR samples 4,4-Dimethyl-4-Silapentane-1-Sulfonic acid (DSS) was added as internal reference substance [11] and standard 1D spectrum, Carr–Pucell–Meiboom–Gill (CPMG) spectra with spin echo sequence π/Υ-t_D-π-t_D, were acquired for plasma samples to assuage protein and lipoprotein's broad signals .A total of 128 transients were collected for plasma. Acquisition parameters: 32 k data points, a spectral width of 8389.26 Hz, an acquisition time of 1.95 s and a relaxation delay of 2s. An exponential line-broadening function of 0.30 Hz was utilized to Free Induction Decay (FID) prior to Fourier transformation. Phase and baseline correction were applied for all spectra and the plasma spectra were referenced to DSS (δ=0 ppm).

Data reduction of NMR data

The spectra were reduced to a series of descriptors in order to maximize the chances of using all the metabolic information in the spectra and to provide a reproducible procedure [12-14]. Phase and baseline correction were required as an initial processing step and this is followed usually by a data reduction. Each spectral integral regarded as a metabolic descriptor which can be utilized to explore similarities or differences in the data based on individual's biochemistry [10]. For all plasma ^{1}HNMR spectra, the data were normalized to constant total intensity by means of prometab (version prometab_v1_1).The 0.2- 10.0 parts per million (ppm) spectral regions were decreased to segments of an equal width of 0.04 ppm. The water resonance (4.6-5.0 ppm) was deleted from each subdivided spectrum [15-16].

Statistical analysis
Orthogonal signal correction (OSC)

Metabonomics along with ^{1}H NMR is a proper technique applied to analyze and interpret complex multi parametric metabolic data, and has a wide range of applications in the development of pharmaceuticals and systems biology. Extraneous variation in the data such as fluctuations in either experimental conditions or in physiological status can confound the interpretation of biological data. In order to minimize the effect of inter- and intra-spectrometer variation during data acquisition, and also to reduce intrinsic physiological variation, OSC as a data filtering method can be utilized to biofluid NMR data. This method has several advantages; the elimination of orthogonal variation showed features of interest in the NMR data and also facilitated interpretation of the consequent multivariate models. Moreover, analysis of the orthogonal variation provided a clarification of the systematic biological alterations responsible for mystifying the original NMR data [17-20]. In this study before data analysis of NMR, OSC was used. The data were imported into MATLAB software (Mathworks, MA) installed with the PLS toolbox (version2.0) for OSC and MLR.

Multiple Linear Regression (MLR)

MLR is a multivariate statistical technique for examining the linear correlations between two or more independent variables and a single dependent variable. The general purpose of multiple linear regression is to quantify the relationship between

several independent or predictor variables and a dependent variable. A set of coefficients define the single linear combination of independent variables (molecular descriptors) that best describes selenium. The selenium concentration for each serum sample would then be calculated as a composite of each molecular descriptor weighted by the respective coefficients. After OSC, the Stepwise-MLR was applied to select the best descriptors among 205 variables. Stepwise regression can be achieved 1) by trying out one independent variable and considering it in the regression model if it is statistically significant, 2) by including all independent variables in the model and eliminating those which are not statistically significant, or by a combination of both methods. In the Stepwise method, the independent variables were selected automatically step by step. For variable selection, five variables were detected (Table 1). Then the selected variables were used in order to make a MLR.

Counter-propagation artificial neural networks (CP-ANN)

A wide range of chemometrics method are applied to analyze metabonomics data such as Principal Component Analysis (PCA) [21], Partial Least Square (PLS), Artificial Neural Networks (ANN), CP-ANN and MLR [22-23]. ANN can solve both supervised and unsupervised problems, such as clustering and modeling of qualitative responses (classification). Among the ANN learning strategies, Kohonen Maps and CP-ANN are the most popular approaches and have been applied to our study. Kohonen Maps are self-organizing systems applied to unsupervised problems (e.g., cluster analysis and data structure analysis). Comparatively, CP-ANN, while similar to the Kohonen Maps because they are based on the Kohonen approach, combine characteristics from both supervised and unsupervised learning (i.e., CP-ANN can build both regression and classification models).The weights of the Kohonen layer can be analyzed by means of PCA, in order to examine the relationship between variables and neurons in a global way and not variable by variable [24-25]. The weight vector is adapted according to the learning law used in CP-ANN/ Kohenen method. This method would minimize an euclidean distance between the input vector and the weight vector.

Thus the Kohenen weights are more modified in comparison with original NMR integrals. A data matrix, namely W with N^2 rows and J columns, is applied to arrange the weights of the Kohonen layer. In this matrix N and J are the number of neurons on each side of the map and the number of variables respectively. For instance, the element w_{rj} of the matrix W corresponds to the weight of the j-th variable in the r-th neuron. As a result of applying PCA on the W matrix, two matrices are obtained; a loading matrix with dimension J×F and a score matrix with dimension N^2×F. In these matrices F is the number of significant principal components. The dependencies of neurons to variables can be obtained, with the aid of comparison of the corresponding loading and score plots [25]. The relationship between variables and neurons can also be deduced on the basis of the relationship between variables and classes. This deduction is on basis of the fact that, when dealing with the CP-ANNs, each neuron can be assigned to a class. Kohonen neural network's architecture shows a two-dimensional grid of connected neurons, which are multidimensional vectors.

In the present study CP-ANN toolbox, which is open source software (available at http://www.disat.unimib.it/chm), is employed to calculate the quoted models. Moreover, a graphical user interface (GUI) is provided. This interface assists the model calculation and data analysis.

Results and discussion

Fifty two samples were collected in total; 25 samples were from patients, and 27 were from the control group. The data preprocessing and the modeling was performed utilizing Matlab (version 6.5.1, The Mathworks, Cambridge, U.K.).The dataset was divided into two parts: a training set that was used to build a model and test set that was employed to test predictive ability of the classification model. Test set contain about 1/3 of the samples .To find the important variables influencing the separation of the case and control groups, we performed a stepwise MLR on the training set after application of the OSC. Metabolites present in serum samples were identified on the basis of several previous studies .VLDL, 3-hydroxybutyrate, myoinositol, glutamine and dimethylamine were

Table 1. Specifications of the selected MLR Descriptors

Descriptors	assignment	Coefficients	Mean	Mean effect [a]
1) VLDL	$CH_2CH_2CH_2CO$	659.687	0.0551	36.3487
2) 3-hydroxybutyrate	β-CH	601.413	0.0333	20.02705
3)myoinositol	H4, H6	292.594	0.0239	6.9929
4)glutamine	CH_2	637.359	0.01097	6.9918
5)dimethylamine	half γ-CH_2	817.676	0.0036	2.9436

a. Mean effect of a descriptor is the product of its mean and regression coefficient in the MLR model.

found to be important descriptors in this study. Table 1 shows the important descriptors with their properties, calculated with stepwise MLR. In the next section, these variables (five variables) were applied in CP-ANN to make classification.

Solely applying CP-ANN on the selected variables gave no effective classification for the two groups of patients and control. Once the OSC was applied, an acceptable classification model was made.

Commonly, Kohonen maps are utilized for these comparisons, but they deal with unsupervised issues, which are not directly treated here. Kohonen maps must also be implicitly calculated as Kohonen layers of CP-ANNs. To find which CP-ANN settings are optimal, several networks need to be evaluated by changing the number of neurons and training epochs. Settings are then selected based on the optimization of a cross-validated, classification parameter present in the samples, such as a non-error rate. Our settings were chosen based on personal experience by selecting a reasonable number of epochs (200) and neurons (equaling near the number of samples collected, 52, and constituting a squared map with 7 neurons on each side). In Table 2, the calculated error and non-error rates of the classification index and the classification performances with reference to the test set results are shown. These results show that CP-ANN classification model has great chance in diagnosis of PD.

Table 2. Results of analysis: error rate (ER) and non- error rate (NER) for model and cross validation

	NER	ER
Training set	0.90	0.096
Test set	0.82	0.17

Considering the above-determined settings for the CP-ANNs, we can now gain insight into the model by interpreting the relationships between the samples and their variables through the Kohonen maps, i.e., measure the neurons constituting the network. In a top map, sample results can be projected to evaluate the data structure through the presence of clusters or outliers. Additionally, variable importance can be analyzed by coloring the neurons based on their neuron weights [26].

Our Kohonen top map (Figure 1) represents the space defined by the neurons where the samples were placed. The samples were visualized by randomly scattering their positions within the squares; different samples were placed far apart, whereas similar samples occupied the same neuron. In other words, visual investigation was allowed for the data structure by analyzing the sample positions and their relationships. Because neurons can be colored based on the weight values, it is possible to interpret the sample relationships by this variable influence.
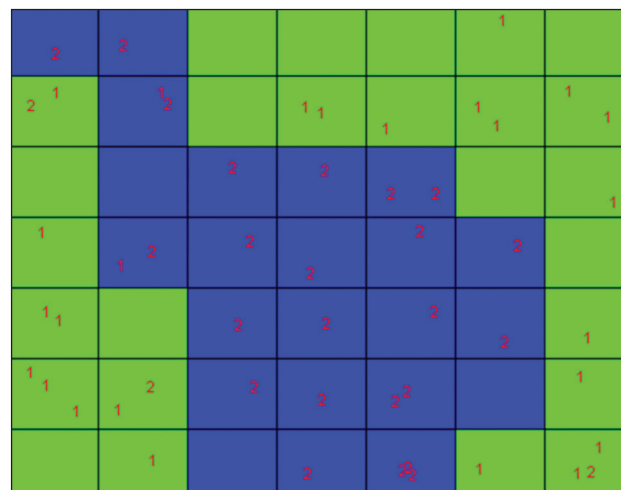
Figure 1. Coordinates of the samples in the Kohonen top map, class 1 (control), class 2 (Parkinson's disease)

In this research, PCA is just a part of CP-ANN results and it shows that which metabolites separate patients from control group and how metabolites' effect could be described (positively or negatively). So PCA has not been used as dimension-decreasing method method. An alternative means of stu-

dy consists of performing a PCA on the Kohonen weights. This technique investigates the relationships between variables and samples in a global way and not just one variable at a time [27]. PCA is a well-known pattern-recognition technique that projects the data in a reduced hyperspace defined by the most significant, principal components [28]. Each neuron can be assigned to a class (when dealing with CP-ANNs), and the relationships between variables and classes can be investigated [29].

In Figures 2 and 3, the score and loading plots of the first two components (explaining 84.09% of the total information) are shown. In the score plot, each point represents a neuron from our CP-ANN model. The neurons assigned to class 1 (the control group) are all clustered and placed at the outer sides of the score plot. However, by comparing both the score and loading plots, one can further see how all the variables characterized this specific class. Variables 1, 3, 4 and 5 fall at the right of the loading plot, which means they directly correlated with class 2 neurons; thus, these variables characterize samples of class 2 instead of class 1.
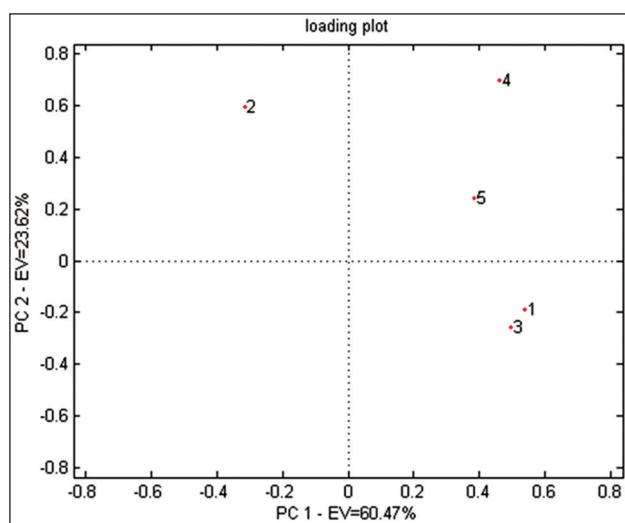
Figure 2. Loading plot of the first two principal components calculated on the Kohonen weights. Each variable is labelled with its identification number: (1) VLDL, (2) 3hydroxybutyrate, (3) myoinositol, (4) glutamine, (5) dimethylamine
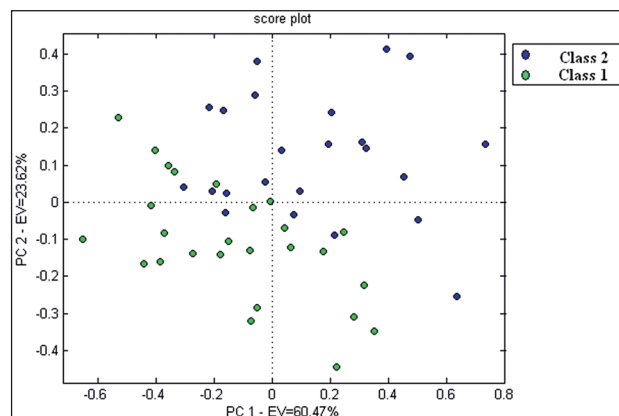
Figure 3. Score plot of the first two principal components calculated on the Kohonen weights

Conclusion

In this paper we evaluated the use of CP-ANN to build an easily interpretable predictive model to distinguish between PD and healthy controls and confirmed that the CP-ANN model is able to distinguish between cases and controls.

In the present work, a ^{1}H NMR based metabonomics approach was gave an evidence for the existence of clear metabolic differentiation between two groups (PD and control group). For the other metabolites especially VLDL, 3-hydroxybutyrate, myoinositol, dimethylamine and glutamine we found a reliable model according to NMR. Also in the related articles of metabolites can be obtained by modeling and examine how they affect disease [29-31].For example, in PD the level of glutamine was increased [33].Another promising aspect in this study may suggest that it could be useful for predicting the disease. Metabonomics can also use in the follow up of PD patients and it may be able to predict the response to treatment. The effects of drug and treatment on changing metabolic models are under study.

Since 1H NMR based metabonomics is effective to monitor the progression of disease, and helpful to discover biomarkers of PD, we can suggest that, NMR based on metabonomics can provide the possibility for assisting in early of PD. Therefore, further investigations are required to establish its real usefulness in clinical practice.

References

1. M.C. deRijk, L.J. Launer, K. Berger, M.M. Breteler, J.F. Dartigues, M. Baldereschi, L. Fratiglioni, A. Lobo, J. Martinez-Lage, C. Trenkwalder, A. Hofman. Prevalence of Parkinson's disease in europe: a collaborative study of population-based cohorts. neurologic diseases in the elderly research group. Neurology. 54, S21–S23(2000).

2. J.C. Morgan, S.H. Mehta, K.D. Sethi, Curr Neurol Neurosci Rep. 10,423-430(2010).

3. J.K. Nicholson, Mol. Syst. Biol. (2006) doi:10.1038/msb4100095.

4. J.K. Nicholson, J.C. Lindon, E. Holmes. 'Metabonomics': understanding the metabolic responses of living systems to pathophysiological stimuli via multivariate statistical analysis of biological NMR spectroscopic data. X enobiotica.29, 1181–1189(1999).

5. J.K. Nicholson, J. Connelly, J.C. Lindon, E. Holmes. Metabonomics: a platform for studying drug toxicity and gene function. Nat Rev Drug Discov. 1, 153–161(2002).

6. E. Holmes, I.D. Wilson, J.K. Nicholson. Metabolic phenotyping in health and disease. Cell. 134, 714–717(2008).

7. J.K. Nicholson, I.D. Wilson. Understanding 'global' systems biology: Metabonomics and the continuum of metabolism. Nat. Rev. Drug Discov. 2, 668-676(2003).

8. J.B. German, B.D. Hammock, S.M. Watkins. Metabolomics: Building on a century of biochemistry to guide human health. Metabolomics. 1, 3-9(2005).

9. J. Trygg, E. Holmes, T. Lundstedt. Chemometrics in metabonomics. J. Proteome Res. 6,469 -479 (2007).

10. M.E. Bollard, E.G. Stanley, J.C. Lindon, J.K. Nicholson, E. Holmes. NMR-based metabonomic approaches for evaluating physiological influences on biofluid composition .NMR Biomed.18, 143–162(2005).

11. M.A. Constantinou, E. Papakonstantinou, M .Spraul, S. Sevastiadou, C .Costalos, M.A. Koupparis, K. Shulpis, A. Tsantili-kakoulidou, E. Mikros. 1HNMR-based metabonomics for the diagnosis of inborn errors of metabolism in urine. Anal.Chim. Acta.542,169–177(2005).

12. E. Holmes, P.J.D. Foxall, J.K. Nicholson, G.H. Neild, S.M. Brown, C.R. Beddell, B.C. Sweatman, E. Rahr, J.C. Lindon, M. Spraul, P. Neidig. Automatic data reduction and pattern recognition methods for analysis of 1H NMR spectra of human urine from normal and pathological states. Anal. Biochem. 220, 284–296(1994).

13. E.Holmes, J.K. Nicholson, A.W. Nicholls, J.C. Lindon, S.C. Connor, S. Polley. The identification of novel biomarkers of renal toxicity using automatic data reduction techniques and PCA of proton NMR spectra of urine. J .Connelly, Chemom. Intell. Lab. Syst. 44,245-255(1998).

14. C.L. Gavaghan , E .Holmes, E. Lenz, I.D. Wilson, J.K. Nicholson. An NMR-based metabonomic approach to investigate the biochemical consequences of genetic strain differences: application to the C57BL10J and Alpk:ApfCD mouse. FEBS Letters. 484, 169–174(2000).

15. M. Coen, Ph. Kuche. Metabonomics based on NMR Spectroscopy .CiA . 71, 13-17(2004).

16. R. Cavill , H.C. Keun, E. Holmes, J. C. Lindon, J.K. Nicholson, T.M.D. Ebbels. Genetic algorithms for simultaneous variable and sample selection in metabonomics. Bioinformatics. 25, 112–118(2009)

17. B.M. Beckwith-Hall , J.T. Brindle, R.H. Barton , M. Coen, E. Holmes , J.K. Nicholson , H. Antti. Application of orthogonal signal correction to minimise the effects of physical and biological variation in high resolution 1 H NMR spectra of biofluids. Analyst. 127, 1283-1288(2002). ccg

18. S. Wold, H. Antti, F. Lindgren, J .Ohman. Orthogonal signal correction of nearinfrared spectra Chemom.Intell.Lab. Syst. 44, 175–185(1998).

19. M. Rantalainen, O. Cloarec, O. Beckonert, I.D. Wilson, D. Jackson, R .Tonge, R. Rowlinson, S. Rayner, J. Nickson, R.W. Wilkinson, J.D. Mills, J. Trygg, J.K. Nicholson, E. Holmes. Statistically Integrated Metabonomic−Proteomic Studies on a Human Prostate Cancer Xenograft Model in Mice. J. Proteome Res. 5, 2642–2655(2006).

20. H.L. Mao, M. Xu, B. Wang, H.M. Wang, X.M. Deng, D.H. Lin. Evaluation of filtering effects of orthogonal signal correction on metabonomics analysis of healthy human serum 1H NMR spectra. ActaChim. Sinica.65, 152–158 (2007).

21. E. Holmes, H. Antti. Chemometric contributions to the evolution of metabonomics: mathematical solutions to characterising and interpreting complex biological NMR spectra. Analyst. 127, 1549-1557(2002).

22. E. Holmes, J.K. Nicholson, G. Tranter. NMR and pattern recognition studies on the time-related meta-

bolic effects of alpha-naphthylisothiocyanate on liver, urine, and plasma in the rat: an integrative metabonomic approach. Chem. Res. Toxicol.14,182-191 (2001).

23. T.M.D. Ebbels, H.C. Keun, O. Beckonert, H. Antti, M.E. Bollard, E. Holmes, J.C. Lindon, J.K Nicholson. Improved analysis of multivariate data by variable stability scaling: application to NMR-based metabolic profiling. Anal. Chim.Acta. 490, 265-276 (2003).

24. D. Ballabio, R. Kokkinofta, R. Todeschini, C.R. Theocharis. Characterization of the traditional Cypriot spirit Zivania by means of Counterpropagation. Artificial Neural Networks Chemometrics&Intell.Lab. Syst. 87, 78-84 (2007).

25. D. Ballabio, V. Consonni, R. Todeschini. The Kohonen and CP-ANN toolbox: a collection of MATLAB modules for Self Organising Maps and Counterpropagation Artificial Neural Networks .Chemometrics& Intell.Lab. Syst. 98, 115-122 (2009).

26. D. T. Manallack, D. J. Livingstone. Neural Networks in Drug Discovery: Have They Lived up to their Promise? Eur. J. Med. Chem. 34, 195-208 (1999).

27. M. Scampicchio, D. Ballabio, A. Arecchi, S.M. Cosio, S. Mannino. Amperometric Electronic Tongue for Food Analysis Microchim. Acta. 163, 11-21 (2008).

28. S. Wold, K. H. Esbensen, P. Geladi. Principal component analysis.Chemometr.Intel.Lab. Systems.2, 37-52 (1987).

29. K.K. Haga, Y.P. Khor, A. Farrall, J.M .Wardlaw. A systematic review of brain metabolite changes, measured with 1H magnetic resonance spectroscopy, in healthy aging. Neurobiol Aging.30, 353–363 (2009).

30. J.M. Zingg. Vitamin E: an overview of major research directions. Mol. Aspects Med. 28, 400–422 (2007).

31. J. Mally, G. Szalai, T.W. Stone. Changes in the concentration of amino acids in serum and cerebrospinal fluid of patients with Parkinson's disease. J Neurol Sci. 151, 159-162(1997).

Corresponding Authors
Mohsen Tafazzoli,
Department of Chemistry,
Sharif University of Technology,
Tehran,
Iran,
E-mail: tafazzoli@sharif.edu

Masoud Mehrpour,
Department of Neurology,
Firoozgar clinical research development center,
Tehran,
Iran,
E-mail: m-mehrpour@tums.ac.ir

Yoga after coronary artery bypass graft surgery: its effect on anxiety and self-care agency

Aysel Gurkan[1], Bilgi Gulseven[1], Aygen Eren[2]

[1] Marmara University Faculty of Health Sciences, Department of Nursing, Istanbul, Turkey,
[2] Memorial Hospital, Cardiovascular Surgery Department, Istanbul, Turkey.

Abstract

Objectives: The aim of this study was to investigate the effect of yoga applied after coronary artery bypass graft surgery on anxiety and self-care agency of the patients.

Methods: A total of 30 patients aged between 40 and 78, who had participated in a yoga program following coronary artery bypass graft surgery, were included in the study. A yoga program, including breathing exercises, asanas, relaxation and meditation, was applied to the patients in a total of 24 sessions in the seated position on the chair twice a week.

The sociodemographic features of the patients were recorded. Patients' stress levels were assessedusing the STAI-I and STAI-II anxiety inventory, and the self-care agency was evaluated using the Exercises of Self-Care Agency (ESCA) before and after the yoga program.

Results: The STAI-I and STAI-II scores of the patients were seen to decrease significantly after the yoga program compared to the scores obtained before the yoga program (p<0.05), and the ESCA scores were seen to increase (p<0.05).

Conclusion: It was concluded that yoga applied after coronary artery baypas graft surgery is a valuable source that aids realize the daily activities through reducing the anxiety levels by providing relaxation and increasing self- care agency.

Key words: Coronary artery bypass graft surgery, yoga, anxiety, self-care agency.

Introduction

Anxiety, a negative mood developing against perceived threats, may lead to medical and psychological outcomes when permanent or severe.[1] Anxiety has been shown to be an independent risk factor in development of cardiovascular diseases[1,2,3] and outcomes of cardiac surgery.[1,3,4] In previous studies, the patients have been reported to feel varying degrees of anxiety prior to, during, and after coronary artery bypass graft (CABG) surgery[1,4]. Although anxiety levels have been reported to decrease after surgery compared to preoperative period,[5] it was reported to continue mildly or moderately.[1,6]Moreover, it has been demonstrated that patients with high level of anxiety have difficulties in coping with the disease[7], the return of these patients to active life has been delayed,[8] and the quality of life has been affected.[1,7]

Self-care is the sum of the activities initiated and achieved by individuals to maintain health and wellness.[9] The ability to fulfil the individual's activities is defined as self-care agency. Having sufficient self-care agency is being able to meet the self-care needs adequately and sufficiently, taking the responsibility of self health, and not being dependent on others.[9,10] In this way, compliance with therapy improves and satisfaction with life increases by prevention of acute and chronic complications. The psychological status of the individual also affects the response to disease.[10] In the literature, early psychological management after cardiovascular surgery has been reported to aid patients in using effective coping strategies in their daily life.[3] Moreover, stress management has been recommended as a part of cardiac rehabilitation programs.[11,12] In this respect, yoga, which is a widely used body-mind therapy method in recent years may be beneficial for stress management and cardiac rehabilitation. Yoga is known to have psychological effects[2,13,14] besides beneficial physical effects in patients with chronic cardiovascular diseases through leading to a decrease in baroreceptor sensitivity and changes in heart rate through relaxation and meditation components.[2,13,15]

It is of great importance for patients to be able to maintain their lives by taking responsibility for their treatments and care. Thus, it is necessary to decrease the anxiety level and enhance self-care

agency. The aim of this study was to determine the patients' self-reported anxiety levels and self-care agency after CABG, and the effect of yoga on anxiety level and self-care agency.

Methods

The study included 30 patients in a private hospital in Turkey, who participated in and completed the yoga program applied in combination with the standard medical therapy one month after CABG. Before the initation of the study, approval from the ethics committe and the hospital was obtained. Informed consents were obtained from all the patients participating in the yoga program.

It was aimed to decrease the blood pressures and pulse rates of the patients with a yoga program applied one month after CABG surgery in the facility in which the study was conducted. The patients were also educated healthy nutrition during the yoga program.

The first interviews with the patients who were to participate in the yoga program were begun one month after CABG surgery. The socio-demographic characteristics were recorded through face-to-face interviews. The State-Trait Anxiety Inventory (STAI) and the Exercise of Self-Care Agency Scale (ESCA) were applied. The yoga program was applied twice a week for three months in a total of 24 sessions. Each session took one hour and included warming and breathing exercises (10 min), asanas (20 min), deep relaxation (15 min) and meditation (15 min) in the seated position on the chair. Asanas yoga was modified according to the clinical conditions of the patients. The yoga sessions were applied by a complementary medicine specialist who had completed her medical education on this topic and who was experienced in cardiac rehabilitation, and a yoga trainer who had received education in Vivekananda Yoga University in India. The STAI and ESCA were re-applied through face-to-face intervals to the patients who completed the yoga program. The patients were asked to make comments on the statements in the scales by themselves. Those not participating in the yoga program twice a week and not regularly participating in the yoga sessions were excluded from the study.

The socio-demographic data were obtained using the self-report questionnaire. The socio-demo-

graphic data included age (years), gender (male/female), years of education, current work-force status (in/out), and partner status (partnered/unpartnered).

The State-Trait Anxiety Inventory (STAI) [State (STAI-I) and Trait (STAI-II)]: STAI, which was developed by Spielberger et al., and the reliability and validity study, which was performed by Oner and Le Compte in the Turkish population, were used to determine the state and trait anxiety levels of the patients. STAI-I and STAI-II are likert-type instruments with 4 options, ranging from "never" to "completely". There are two types of statements in these instruments: direct statements expressing the negative feelings and reversed statements expressing the positive feelings. Answers for direct and reversed statements are tallied individually, and then the total of the answers for the reversed statements are deducted from the total of the answers for the direct statements. A predetermined constant (STAI-I (50) and STAI-II (35)) is added to this number. The final calculated value represents the individual's anxiety score. STAI-I is a very sensitive instrument in assessing the sudden changes in emotional reactions. STAI-II has 20 items addressing an individual's general anxiety level. The lowest possible score is 20 (low anxiety) and the highest possible score is 80 (high anxiety). [16] This scale which was applied to the patients before and after the yoga program was completed in 20 minutes.

The Exercise of Self-Care Agency Scale (ESCA): ESCA was developed by Kearney and Fleischer and adapted to Turkish by Nahcivan who performed the validity and reliability studies. The scale, which focuses on the self-assessment of the individual's self-care actions, is composed of 35 items. Each statement in this quintet likert type scale is scored between 0 to 4 (0=it does not describe me, 4=describes me very well). Eight statements are evaluated as negative and the scoring is reversed. The lowest possible score is 35 and the highest possible score is 140. The score reflects the health of the individual and the ability to maintain wellness.[17] This scale, which was applied to the patients before and after the yoga program, was completed in 10 minutes.

Data analysis: The statistical analyses were carried out using the SPSS package program, with a statistical significance level of $p < 0.05$. Data were presented in percentages and averages. The

difference between the mean values was evaluated using the Paired Sample t-test and Mann-Whitney U test.

Results

Subject had a mean age of 59.4±10.9 (range, 40-78). Of the subject, 56.7% were females, 80% were married, 66.7% were graduates of college or above, and 56.7% worked in a full-time job.

There was no signficant difference between the anxiety levels and self-care agency scores accor-

ding to the sociodemographic characteristics of the patients before and after the yoga program (p>0.05) (Table 1).

STAI-I, which measures the state anxiety, and STAI-II, which measures the trait anxiety, scores were also significantly decreased compared to the scores measured before the yoga program (p<0.05) (Table 2).

ESCA, which measures the patients' self-care agency, were significantly higher after 24 sessions of exercises compared to the score measured before the first session (p<0.05) (Table 2).

Table 1. Anxiety and self-care agency scores of the patients according to individual characteristics (N=30)

Parameters	n	Before sessions			After sessions		
		STAI-I	STAI-II	ESCA	STAI-I	STAI-II	ESCA
Age							
< 60	16	57.3±3.3	58.5±4.2	46.4±6.1	30.9±4.3	31.3±5.1	81.1±6.8
≥ 60	14	57.0±2.8	57.4±4.9	47.3±8.1	31.8±4.5	30.0±3.4	80.3±8.4
p-value		0.933*	0.647*	0.917*	0.545*	0.573*	0.917*
Gender							
Female	17	57.0±3.0	57.4±5.5	47.8±6.9	30.2±3.4	30.1±4.5	80.1±8.3
Male	13	57.4±3.0	58.6±2.9	45.6±7.1	32.8±5.1	31.3±4.1	81.2±6.6
p-value		0.817*	0.675*	0.368*	0.213*	0.408*	1.000*
Marital status							
Married	24	57.0±3.2	57.5±4.8	46.1±6.6	31.5±4.6	31.2±4.4	80.1±7.8
Single	6	58.0±1.6	59.8±2.6	49.8±8.3	30.5±3.1	29.0±4.0	83.5±6.1
p-value		0.403*	0.275*	0.337*	0.677*	0.286*	0.287*
Educational status							
< College	10	57.4±3.3	58.5±5.5	48.0±7.1	33.1±4.8	30.4±3.2	79.2±8.4
≥ College	20	57.1±2.9	57.7±4.1	46.3±7.1	30.5±3.9	30.8±4.9	81.5±7.1
p-value		0.595*	0.321*	0.567*	0.112*	0.1000*	0.597*
Work status							
Employed	17	57.5±3.0	57.8±4.0	48.4±7.5	30.8±3.9	30.8±4.6	81.4±8.5
Unemployed	13	56.7±3.0	58.1±5.3	45.6±6.5	32.1±4.9	30.4±4.2	80.2±6.8
p-value		0.569*	0.621*	0.346*	0.462*	0.834*	0.476*

STAI-I (State anxiety)
STAI-II (Trait anxiety)
ESCA (Self care agency)
*p > 0.05

Table 2. Comparison of stress and self-care agency scores of the patients (N=30)

Parameters	Before sessions x±SD	After sessions x±SD	t	p
Anxiety level				
STAI-I	57.2 ± 3.0	31.3 ± 4.3	**31.155**	p=0.001
STAI-II	58.0 ± 4.5	30.7 ± 4.3	**24.799**	p=0.001
ESCA	46.8 ± 7.0	80.7 ± 7.5	**-21.142**	p=0.001

*p < 0.05

Discussion

The result of the present study demonstrated that the absence of a significant difference in terms of anxiety levels and self-care agency according to the individual characteristics of the patients(p>0.05) (Table 1). It was an important finding in terms of indicating the effect of yoga on anxiety and self-care agency, independent from individual characteristics. In studies investigating the relationship between the individual characteristics of the patients and anxiety levels after CABG surgery, controversial results was reported. [1,4,5] In studies investigating the self-care agency levels of patients with chronic diseases in Turkey, the self-care agency did not show a significant difference in terms of the individual characteristics of the patients, similar to the findings of the present study.[9,10,18]

In this study, the anxiety levels reported by the patients were high and the self-care agency was low one month after CABG surgery (Table 2). This situation may arise from the inadequacy of patients in coping with physiological, psychological and social problems, and the patients' fulfilling their daily activities with the help of others in the early postoperative period, since knowledge about the health status and the disease, and the skills and attitudes for self-care are important for coping with the disease. As reported in the literature, patients experience physiological, psychological and social difficulties during the recovery period following CABG surgery.[19,20] The accompanying symptoms affect the daily activities of the patients.[8] In a study investigating the patients' need for home care after cardiovascular surgery, they were found to experience physiological problems with respect to feeding (95.6%), excretion (86.7%), activity (100%), and sleep (88.9%) one week after discharge; physiological and social problems such as cognition and perception (100%), self-perception (55.5%), role and relationship (80%), sexuality (64.5%), coping with stress and stress tolerance (100%), value and belief (33.3%) were observed. In the same study, an increase was determined in problems concerning feeding, self-perception and sexuality, and a decrease was found in other problems six weeks after discharge.[21]

In studies focusing on the physiological effects of yoga in cardiovascular diseases, yoga has been reported to positive effects.[2,14,15,22] Besides its improving effects on the physiological symptoms through suppressing the autonomous nervous system, the psychological effects of yoga should not be ignored. After CABG surgery, 20-55% of the patients have anxiety and 20-45% experience depression.[23] These conditions may lead to an increase in mortality and a decrease in the quality of life, since increased stress-induced cathecolamine levels have negative effects on the immune system and cardiac health. Yoga has been reported to improve wellness[13], the patients' quality of life,[14] and the health-related attitudes through making changes in the life style, and plays an important role in prevention of cardiovascular diseases.[2] Moreover, in studies focusing on the effect of yoga on anxiety, it was reported that well-being and vigor improved[13] besides the decrease in the state and trait anxiety levels in patients in the yoga group compared to that of the control group.[13,24]. Furthermore, in studies conducted with breast cancer patients, yoga sessions were found to decrease the anxiety level and improved the patients' quality of life.[13,25] In this study, the stress levels of the patients were seen to decrease significantly after the yoga program compared to the stress level before the yoga program (p<0.05) (Table 2). Our results verify the results of previous studies.[13,22,24,25]

In this study, the significant improvement in self-care agency after the yoga sessions compared to the condition before the sessions (p<0.05) (Table 2) may have arisen from: improvement of physical health through yoga exercises, improvement of mental health through learning how to relax, with the yoga sessions being a social group enabling patients to share their problems and providing social support, enabling patients to do their daily activities easier and reduction of anxiety levels. Hence, it was demonstrated in different studies that the physical exercise capacity of the patients and the tolerance to daily life activities improved following yoga sessions applied in combination with medical therapy in cardiovascular diseases,[15] and that yoga is a positive source for social support,[2,23,25] and that yoga decreased the anxiety levels [22] and improved the quality of life.[14] Although we did not encounter any studies investigating the effect of yoga on patients' self-care agency, a positive correlation has been demonstrated betwe-

en the quality of life and self-care agency in studies conducted in Turkey.[10,18] Although the question whether the quality of life improves self-csre agency or vice versa is contraversial, self-care agency and the quality of life have been reported to affect each other parallelly. [10]

Conclusion

Patients feel fear and anxiety due to obscurity about the future after CABG surgery. After surgery, a negative mood such as anxiety and poor self-care agency may negatively affect the therapy process by impairing the compliance with therapy and may lead to an impairment in the quality of life. Hence, it must be taken into consideration that by providing support for physical activity, yoga applied by proffessionals provides positive effects in cardiac surgery for the patient and the family.

References

1. Douki ZE, Vaezzadeh N, Shahmohammadi S, Shahhosseini Z, Tabary SZ, Mohammadpour RA, et al. Anxiety before and after coronary artery bypass grafting surgery: Relationship to QOL. Middle-East Journal of Scientific Research 2011; 7: 103-8.

2. Innes KE, Bourguignon C, Taylor AG. Risk indices associated with the insulin resistance syndrome, cardiovascular disease, and possible protection with yoga: A systematic review. J Am Board Fam Pract 2005; 18: 491-519.

3. Pignay-Demaria V, Lesperance F, Demaria RG, Frasure-Smith N, Perrault LP. Depression and anxiety and outcomes of coronary artery bypass surgery. Ann Thorac Surg 2003; 75: 314-21.

4. Elliott PC, Murphy BM, Oster KA, Le Grande MR, Higgins RO, Worcester MUC. Changes in mood states after coronary artery bypass graft surgery. Eur J Cardiovasc Nurs 2010; 9: 188-94.

5. Kustrzycki W, Rymaszewska J, Malcher K, Szczepanska-Gieracha J, Biecek P. Risk factors of depressive and anxiety sysptoms 8 years after coronary artery bypass grafting. Eur Journal of Cardiothorac Surg 2012; 41: 302-6.

6. Gallagher R, McKinley S. Stressors and anxiety in patients undergoing coronary artery bypass surgery. Am J Crit Care 2007; 16: 248-57.

7. Tung HH, Hunter A, Wei J. Coping, anxiety and quality of life after coronary artery bypass graft surgery. J Adv Nurs 2008; 61: 651-63.

8. Rosenfeldt F, Braun L, Spitzer O, Bradley S, Shepherd J, Bailey M, et al. Physical conditioning and mental stress reduction - a randomized trial in patients undergoing cardiac surgery. BMC Complement Altern Med 2011; 11: 20.

9. Altıparmak S, Fadıloğlu Ç, Gürsoy ŞT, Altıparmak O. Kemoterapi tedavisi alan akciğer kanserli hastalarda öz bakım gücü ve yaşam kalitesi ilişkisi. Ege Tıp Dergisi 2011; 50: 95-102.

10. Akyol AD, Karadakovan A. Hemodiyalize giren hastaların yaşam kalitesi ve öz bakım gücü ile bunlar üzerine etkili değişkenlerin incelenmesi. Ege Tıp Dergisi 2002; 41: 97-102.

11. Ciftçi Ç, Duman BS, Çağatay P, Demiroğlu C, Aytekin V. Koroner baypas geçiren olgularda faz II kardiyak rehabilitasyon programının etkileri. Anadolu Kardiyol Derg 2005; 5: 116-21.

12. Chauhan U, Baker D, Edwards R, Hann M. Improving care in cardiac rehabilitation for minority ethnic populations. Eur J Cardiovasc Nurs 2010; 9: 272-7.

13. Field T. Yoga a clinical research review. Complement Ther Clin Pract 2011: 17; 1-8.

14. Pullen PR, Thompson WR, Benardot D, Brandon LJ, Mehta PK, Rifai L, et al. The benefits of yoga for African American heart failure patients. Med Sci Sports Exerc 2009; 42: 651e7.

15. Kırılmaz B. Kalp yetersizliği olan hastalarda inflamasyon ve egzersiz kapasitesine yoga'nın etkisi. KY Bülteni 2009; 1: 1-5.

16. Le Compte WA Oner N. Development of the Turkish edition of state-trait anxiety inventory. In: Cross-cultural anxiety. Spielberg CD, Diaz Guerro R, (Eds), Washington DC: Hemishere Publishing Co; 1976. pp 51-68.

17. Nursen O, Nahcıvan A. Turkish Language equivalence of the Exercise of Self-Care Agency Scale. West J Nurs Res 2004; 7: 813-24.

18. Düzöz GT, Çatalkaya D, Uysal DD. Tip 2 diyabetes mellituslü hastaların öz bakım gücünün değerlendirilmesi. Yeni Tıp Dergisi 2009; 26: 210-3.

19. Dunkley M, Ellard D, Quinn T, Barlow J. Coronary artery bypass grafting: Patients' and healh professionals' views of recovery after hospital discharge. Eur J Cardiovasc Nurs 2008; 7: 36-42.

20. Mullen-Fortino M, O'Brien N. Caring for a patient after coronary artery bypass graft surgery. Nursing 2008; 38: 46-52.

21. Yılmaz M, Çiftçi ES. Açık kalp ameliyatı geçirmiş bireylerin evde bakım gereksinimlerinin belirlenmesinde bir model: Fonksiyonel sağlık örüntüleri. Türk Göğüs Kalp Damar Cerrahisi Dergisi 2010; 18: 183-9.

22. Yogendra J, Yogendra HJ, Ambardekar S, Lele RD, Shetty S, Dave M, et al. Beneficial effects of yoga lifestyle on reversibility of ischaemic heart disease: caring heart project of International Board of Yoga. J Assoc Physicians India 2004; 52: 283e9.

23. Krannich JHA, Weyers P, Lueger S, Herzog M, Bohrer T, Elert O. Presence of depression and anxiety before and after coronary artery bypass graft surgery and their relationship to age. BMC Psychiatry 2007; 7: 47.

24. Javnbakht M, Hejazi Kenari R, Ghasemi M. Effects of yoga on depression and anxiety of women. Complement Ther Clin Pract 2009; 15: 102-4.

25. Ulger O, Yağlı NV. Effects of yoga on the quality of life in cancer patients. Complement Ther Clin Pract 2010; 16: 60-3.

Correspondence Author
Aysel Gurkan,
Marmara University,
Faculty of Health Sciences,
Department of Nursing,
Istanbul,
Turkey,
E-mail: agurkan@marmara.edu.tr

Prevalence of HIV, Hepatitis B and C infections among inmates in prisons in the Republic of Macedonia

Tanja Jovanovska[1], Biljana Kocic[2], Viktorija Prodanovska-Stojcevska[1], Rozalinda Isjanovska[3]

[1] Medical College, University St. Kliment Ohridski Bitola, R. Macedonia,
[2] Faculty of Medicine, University of Nis, Serbia,
[3] Faculty of Medicine, University of Skopje, R. Macedonia.

Abstract

HIV, hepatitis B (HBV) and hepatitis C (HCV) infections are serious problem at prison population confirmed by the fact that in numerous countries prevalence of these infections is many times higher among prisoners than at general population. The study was aimed at confirming prevalence of HIV, hepatitis B and hepatitis C among prisoners in Bitola's and Prilep's prisons, existing of coinfection and risk factors related to that. In cross sectional study 550 prisoners were included, giving answers to structured questionnaire and in order to analyze blood for HIV, HBV and HCV, rapid blood tests were used in detecting antibodies. Prevalence of HCV is 0.37, HBV 0.15 and HIV prevalence is 0.0036. Co infection prevalence of HCV/HBV is 0.009 from the total number of examinees. Prevalence of total co infection of HCV, HBV and HIV is 0.0018, and total co infection of HCV and HIV is 0.0018. At examines statistical significant connection is registered between risky behavior and HCV, HBV and HIV positive, between intravenous drug using, joint equipment, tattooing, not using sterile needle at tattooing, having or no constant partner, sexual intercourse with non constant partner, homosexual intercourse, sexual intercourse with intravenous drug user for p<0.05.Performing of screening for blood born and sexual transmitted disease is necessary in prisons and undertaking of all measures to prevent further spreading of infections among inmates.

Key words: Hepatitis B, Hepatitis C, HIV, drug abuse, inmates.

Introduction

HIV, hepatitis B and hepatitis C infections are serious public health threat in incarcerated population, which is confiremed by the fact that in numerous countries prevalence of these infections is many times higher among prisoners than in general population. Before admission to correctional institutions people often have history of drug addiction, joint equipment using, risky sexual behaviors (1,2). These risky behaviors frequently continue during imprisonment leading to possibility of transsmision of blood-born viruses such as human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV) in this group of people. (3). High prevalence of the above mentioned viruses is also due to other risk factors such as: inadequate prison health services, previous imprisonment, tattooing (4,5,6).

Prisons are rather convenient for spreading of diseases and there are for their studying and intervention (7). Because of that, a better knowledge of the prevalence rates of these infections in prisons would help better preventive measures undertaking of better planning (8,9).

This study was aimed at: confirming the prevalence of HIV, hepatitis B and C infections in inmates, existing the co infection as well and confirming widespread of behavioral risk factors of occurring the above mentioned infections.

Material and methods

A cross sectional study of prevalence and risk factors for occurring HIV, hepatitis C and hepatitis B infection among inmates was conducted. The research was performed in 3 correctional institutions in the Republic of Macedonia, in Skopje, Bitola and Prilep in the period from July to December 2011. The study sample consisted of 550 examinees, 300 from the prison Idrizovo in Skopje (males), 50 females from prison Idrizovo, 100 from prison in Bitola and 100 from prison in Prilep.

Criteria for including in the research were: age (18 and more) and minimum 3 months stay in correctional facillitiy.

Criteria for excluding were age (less than 18), time at stay less than 3 months, illiteracy, mental ineligibility.

Core questionnaire was used as a research instrument, composed on the base of similar researches, and as a medical diagnostic tool were used rapid tests for detection HIV, hepatitis B and hepatitis C infections. All participants signed an informed consent and provided a blood sample.

The questionnaire is composed of two segments; The first segment comprised data referring general demographic characteristics and socio- economic status (11 questions), second segment comprised of questions referring to habits and risk sexual behaviors and intravenous drug use (18 questions).

As a medical diagnostic tool were used rapid detecting tests for HCV, HBV and HIV. Hexagon HCV is intended for the rapid, qualitative detection of IgG antibodies to the hepatitis C virus in human serum plasma or whole blood. The onsite HIV1/2 Ab plus Combo rapid test is a lateral flow immunoassay for the simultaneous detection and differentiation of anti-HIV1 and anti-HIV2 antibodies in human serum plasma or whole blood. On site HBV5 Parameter rapid test is chromatographic test for qualitative detection of HbsAg, HbsAb, HbeAb, HbeAg and HbcAb in human serum or plasma.

Filling up the questionnaire was anonymous, voluntarily in accordance to previous written approval by the Ethical Committee and Executive Sanction Board of the Ministry of Justice in the Republic of Macedonia.

Statistical analysis

Statistical analysis was made with specific software for its purpose. Descriptive statistics were used to describe the basic features of the data in the study and provide simple summaries about the sample. The distribution of the frequencies was used for individual values using percentages. Pearson chi-square test for statistical significance and odds ratio values.

Results

Within the investigated group of 550 prisoners, 300 examinees (54,50%) are from Skoje's prison males, 50 females (9,10%), 100 (18,20%) from Bitola's prison, and 100 (18,20%) from Prilep's prison, testing was done with rapid detection tests of HCV, HBV and HIV and filling up the questionnaires as well. Average age of all male prisoners is 32.0 years with SD±8.0 (min.17, max 64), and females 35.5±11.3 (min.18, max62.0).

The majority of inmetes from both genderes have a limited education (57.6% males and 48.0% females). Highschool have 37.6% males and 44.0% females. Higher and faculty education is registered in 4.8% males and 8.0% females. Percentage difference registered between limited education versus other degrees of education at males is statistical significant for $p=0.00000$. Percentage difference registered between limited and highschool education versus faculty education at females is statistical significant for $p=0.000$

In Table 1 is presented prevalence of HCV, HBV and HIV. Total prevalence of HCV is 0.37 and accordingly to gender – 0.39 at males and 0.18 at females. Total prevalence of HBV is 0.15 and accordingly to gender- 0.15 at males and 0.1 at females. Total prevalence of HIV is 0.0036 and accordingly to gender- 0.004 at males.

Table 1. Prevalence of infected with HCV, HBVand HIV

Virus	total	males	females
	prevalence	prevalence	prevalence
HCV	0.37	0.39	0.18
HBV	0.15	0.15	0.1
HIV	0.0036	0.004	/

Prevalence of total co infection of HCV and HBV is 0.009 and accordingly to gender 0.102 at males and 0.02 at females. Prevalence of total co infection of HCV, HBV and HIV is 0.0018 and accordingly to gender 0.002 at males. Prevalence of total co infection of HCV and HIV is 0.0018 and accordingly the gender- 0.002 at males.

Distribution of HCV positive accordingly to risk behavior is presented in table 2. 91.6% are intravenous drug users and 72.0% from them used joint equipment (syringe or needle). 73.0% are tattooed and 74.7% from them didn't use sterile needle. At sexual intercourses only 4.9% used condom with constant partner and with non constant partner 13.3%.

Table 2. Distibution HCV+ persons related risky behaviour

risky behaviour		number	%
i.v. drug using	ne	17	8.4
	yes	186	91.6
place of taking for the first time	out of prison	161	86.6
	in prison	25	23.4
Joint equipment	ne	52	28.0
	yes	134	72.0
tatooing	no	53	26.1
	yes	150	73.9
strerile needle for tatoo	no	112	74.7
	yes	38	25.3
sexual intercourse	no	7	3.4
	yes	196	96.6
constant partner	no	100	49.3
	da	96	47.3
	missing	7	3.4
sexual intercourse with person who isn't constant partner	ne	127	62.6
	yes	69	34.0
	missing	7	3.4
homosexual intercourse	ne	153	75.4
	yes	43	21.2
	missing	7	3.4
sexual intercourse with intravenous drug user	ne	147	72.4
	yes	27	13.3
	missing	29	14.3
condom with constant partner	ne	169	83.3
	yes	10	4.9
	missing	24	11.8
condom with non constant partner	ne	147	72.4
	yes	27	13.3
	missing	29	14.3

In table 3 is showed connection between risky behavior and HCV positive. At examines statistical significant connection is registered between risky behavior and HCV positive, between intravenous drug using, joint equipment, tattooing, not using sterile needle at tattooing, having or no constant partner, sexual intercourse with non constant partner, homosexual intercourse, sexual intercourse with intravenous drug user for $p<0.05$.

According to cross sectional relation, intravenous drug using is a risk factor for infection with HCV- OR=56, 86(31,03<OR<105,444), using joint equipment is a risk factor for HCV infection- OR=5,29(2,68<OR<10,51), tattooing is a risk factor for HCV infection - OR=2,83(1,91<OR<4,20), intercourses with non constant partners is risk fac-

tor with HCV-2,11(1,39<OR<3,19), homosexual intercourses increases the risk for HCV infection - OR=4,45(2,45<OR<8,15), and sexual intercourses with intravenous drug users increases the risk for HCV infection- OR=19,53 (5,54<OR<82,13).

Distribution of HBV positive accordingly to risk behavior is shown in table 4. 77.5% are intravenous drug users from whom 74.2% used joint equipment (syringe or needle). 71.25% are tattooed and from them 64.9% didn't use sterile needle. At sexual intercourses condom with constant partner used only 6.25% and with non constant partner 12.5%. Connection between risky behavior and HBV positive is shown in table 5. At examinees is registered statistical significant connection between risky behavior and HBV positive,

Table 3. Presentation of connection between risky behaviour and HCV+

risky behaviour	Pearson Chi-square	p=
i.v. drug using	296.190	0.00000
place of taking for the first time	0.902094	0.342223
Joint equipment	29.1768,	0.00000
tatooing	30.1526	0.00000
strerile needle for tatoo	46.7385	0.00000
sexual intercourse (vaginal or anal)	0.324479	0.568929
constant partner	13.1337	0.000290
sexual intercourse	14.0120	0.000182
homosexual intercourse	30.4533	0.000000
sexual intercourse with intravenous drug user	30.4533	0.000000
condom with constant partner	0.590494	0.442230
condom with non constant partner	3.77166	0.151709

Table 4. Distribution HBV+ persons related risky behavior

risky behaviour		Number	%
i.v. drug using	ne	18	22.5
	yes	62	77.5
place of taking for the first time	out of prison	50	80.6
	in prison	12	19.4
Joint equipment	ne	16	25.8
	yes	46	74.2
tatooing	no	23	28.75
	yes	57	71.25
strerile needle for tatoo	no	37	64.9
	yes	20	35.1
sexual intercourse	no	2	2.5
	yes	78	97.5
constant partner	no	40	50.0
	da	38	47.5
	missing	2	2.5
sexual intercourse with person who isn't constant partner	ne	47	58.75
	yes	31	38.75
	missing	2	2.5
homosexual intercourse	ne	60	75.0
	yes	18	22.5
	missing	2	2.5
sexual intercourse with intravenous drug user	ne	62	77.5
	yes	10	12.5
	missing	8	10.0
condom with constant partner	ne	65	81.25
	yes	5	6.25
	missing	10	12.5
condom with non constant partner	ne	59	73.75
	yes	11	13.75
	missing	10	12.5

Table 5. Presentation of connection between risky behaviour and HBV+

risky behaviour	Pearson Chi-square	p=
i.v. drug using	42.6387	0,000000
place of taking for the first time	3,46929	0,062521
Joint equipment	4,69130	0,030318
tatooing	5,96032	0,014633
strerile needle for tatoo	3,06296	0.080099
sexual intercourse (vaginal or anal)	0,056834	0,811573
constant partner	4,07396	0,043552
sexual intercourse	9,13775	0,002505
homosexual intercourse	11.1090	0,000859
sexual intercourse with intravenous drug user	9,11150	0,002541
condom with constant partner	0,023105	0,879185
condom with non constant partner	2,101550	0,601851

between intravenous drug using, joint equipment, tattooing, having or no constant partner, sexual intercourse with non constant partner, homosexual intercourse, sexual intercourse with intravenous drug user for p<0.05.

According to cross sectional relation, intravenous drug using is a risk factor for HCV- OR=5,55 (3,09<OR<10,8), using joint equipment is a risk factor for HCV infection- OR=2.02 (1,92<OR<4,03), tattooing is a risk factor for HCV infection - OR=1,89(1,10<OR<3,28). According to cross sectional relation having homesexual intercourses increases the risk for HBV infection – OR=2,73 (1,42<OR<5,23). Sexual intercourses with intravenous drug users also increases the risk for HBV infection- OR=3,26 (1,35<OR<7,75).

Two persons are HIV positive and both are intravenous drug users tatooed without sterile needle, practised vaginal and anal sexual intercourse without condom.

Discussion

This research is conducted in three correctional facilitates in the Republic of Macedonia (Prison in Skopje, Prilep and Bitola) indicates significant higher prevalence of HCV and HBV infections at prisoners referring to general population. In the Republic of Macedonia is that 1,5% from general population are infected or around 30.000 are HCV positive cases. Up to recent knowledge, 5% to 7% of the population in the Republic of Macedonia is infected with hepatitis B virus, and the last year 142 cases of HIV-AIDS are registered, only this year 10 new cases

Data obtained by the research comprising 550 examines being condemned to prison using rapid detection tests for HCV, HBV and HIV indicated relatively high prevalence of hepatitis C and hepatitis B. Prevalence of HCV is 0,37, HBV 0,15 and HIV prevalence is 0.0036. Confection prevalence of HCV/HBV is 0.009, HCV/HBV/HIV 0.0018 and HCV/HIV 0.0018 from the total number of examinees.

Researches done in prison institutions in neighbor countries and wider indicated similar results e.g. in the Republic of Croatia prevalence of HBV, HCV and HIV in general population is 8-11%, 0,8-1,3% and 0,002% (10,11) being significantly higher in risky population, intravenous drug users (35%, 56%, 0,8%) and in homosexuals (29,6%, 7,3%, 4,6%.(12). Prevalence of HCV in Croatia prisons is 12,5% and comparing to general population is significantly higher (13). But that percentage is lower than in the USA (16-41%) (14) and much lower than in Ireland 37%(15). In intravenous drug users in Croatia prisons, HCV prevalence is 51,5%, being lower than in mostly other countries where that percentage is from 56%- 74,8%.(16) Results indicated intravenous drug users population is with the highest risk in prisons(17). It's well known that high proportion of prisoners in many countries inject drugs leading to higher possibility of transmission the virus within prisons. According to the research done in Serbia the prevalence of HCV infection among HIV

positive patients was 58, 13% with 225/387 (18). Study results from 5617 voluntary blood donors performed in order to confirm risky behavior for STD at military population in Serbia indicate presence of 36 infected (19 with HCV, 16 with HBV and 1 with syphilis. (19)

In Bulgaria national report referring to 2008 shows high percentage of HCV (13,5%) and HBV (11,8%) in prisoners – due to illegal using drugs and high certainty of tattooing (20). A cross sectional study was done in Hungary's prisons. The rata of HCV was significantly higher among intravenous drug users (22,5%) (21).

It should be noted that in USA prevalence of HCV among prisoners is at least seven times higher than in general population (22,23), whereas prevalence of HBV at least twice higher. Key contribution for higher prevalence of these infections is injecting drugs.

According to the research done in bout prisons in the Republic of Macedonia from total number of examinees, 59 (36%) were intravenous drug users and 21 (36%) from them never used joint equipment (needle and syringe), 3 (5%) at the last taking drug shared the equipment, whereas 35 (59%) shared equipment in the past. From the total number of prisoners, 26 (16%) had tattoo in prison, whereas 89 (55%) out of prison. From all tattooed 115, 13 (11%) used no sterile needle, 8 (7%) used sterile but not always, 64 (56%) have always used sterile needle and 30 (26%) have no idea whether the needle was or was not sterile. Statistical significance is registered referring HCV and HBV status and intravenous drug using and tattoo.

Data from federal and state prison reports in the USA indicate almost 65% prisoners declare regular drug using in 2004 (24).

Numerous countries in the world nowadays show significant percentage of drug addicts people entering the prison and the majority of them continue injecting drugs after entering (25, 26).

Comparing to general not imprisoned population; prisoners worldwide continue showing significantly higher prevalence of HIV, HBV and HCV infections (27). Identification of risk factors and risk behavior in prisoners and determination of stigmatization and discrimination level indicates undertaking preventive measures in due time.

Conclusion

Confirmed knowledge of prisons conditions and conducted study of the prevalence of HCV, HBV and HIV infections suggest the necessity of well organized health service-especially; immunization programs, infectious disease screening, treatment, and promotion of living conditions in prisons.

References

1. Liao KF, Lai SW, Chang WL, Hsu NY. Screening for viral hepatitis among male non-drug abuse prisoners. Scand J Gastroenterol 2006, 41: 961-973.

2. Rotily M, Weilandt C, Bird SM, et al. Surveillance of HIV infection and related risk behavior in European prison. A multicentre pilot study. Eur J Public Health. 2001, 11: 243-50.

3. Adjei AA, Armah HB, Gbagbo F, Ampofo WK, Ouaye IKE, Hesse IFA, Mensah G. Prevalence of human immunodeficiency virus, hepatitis B virus, hepatitis C virus and syphilis among prison inmates and officers at Nsawam and Accra, Ghana. J. Med Microbiol. 2006, 55: 593-597.

4. Macalino G, Vlahov D, Sanford-Colby S, Patel S, Sabim K, Salas C, Rich J. Prevalence and incidence of HIV, hepatitis B virus, hepatitis C virus infections among males in Rhode Island prisons. Am J Public Health. 2004, 94: 1218-1223.

5. Adjei A, Armah H, Gbagbo F, Ampofo W, Ouaye IKE, Hesse I, Mensah G. Correlates of hepatitis C virus infection among incarcerated Ghanains: A national multicenter study. J. Med Microbiol. 2007, 56: 391-397.

6. Vescio M, Longo B, Babundieri S, Starnini G, Carbonara S, Rezza G, Monarca R. Corellates of hepatitis C virus seropositivity in prison inmates: a meta-analysis. J Epidemiol Comm. Health. 2008; 62(4): 305-13

7. Bick JA. Infection control in jails and prisons. Clin Infect Dis. 2007; 45(8): 1047–55.

8. Poulin C, Alary M, Lambert G, Godin G, Landry S, Gagnon H, Demers e, Morarescu E, Rochefort J, Claessencs C. Prevalence of HIV and hepatitis C virus infection among inmates of Quebec provincial prisons. CMAJ 2007; 177: 252-256.

9. Fox RK, Currie SL, Evans J, Wright TL, Tobler L, at al. Hepatitis C virus infection among prisoners in the California State Correctional System. CID 2005, 41: 177-186.

10. Lesnikar V. Epidemiology of hepatitis B and C in Croatia. Acta Medica Croatica 2005; 59: 371-378.

11. Gjenero-Margan I, Kolaric B. Epidemiology of HIV infection and AIDS in Croatia –an overview. Collegium Antropologicum 2006; 2: 11-16.

12. Kribl M, Miskulin M, Bojanic K. Hepatitis B seroprevalence among intravenous users from Baranya County, Croatia. Croatian Journal for Public Health 2008; 4: 13-16.

13. Burek V, Horvat J, Butorac K, Mikulic R. Viral hepatitis B,C and HIV infection in Croation prisons. Epidemiol. Infect 2010; 138 (11): 1610-1620.

14. Centers for Disease Control. Prevention and control of infections with hepatitis viruses in correctional settings. Morbidity and Mortality Weekly Reports 2003; 52: 1-36.

15. Long J, et al. Prevalence of antibodies to hepatitis B, hepatitis C, and HIV and risk factors to entrance to Irish prisons: a national cross-sectional survey. British Medical Journal 2001; 323: 1-6.

16. Weinbaum C, Lyerla R, Margolis HS. Prevention and control of infections with hepatitis viruses in correctional settings. Centers for Disease Control and Prevention. MMWR Recomm Rep. 2003; 52: 1-36.

17. Malliori M, et al. A survey of blood borne viruses and associated risk behaviors in Greek prisons. Addiction 1998; 93: 243-251.

18. Preveden T. Clinical characteristic of co infection with hepatitis C virus in HIV positive patients. Med Pregl 2005; LVIII (11-12): 529-533.

19. Jadranin Ž., Šuljagić V., Todorović V. et al. HIV/AIDS and other sexually transmitted infections among military members of the Armed Forces of Serbia. Vojnosanit Pregl. 2012; 69 (1): 43-8).

20. National Strategy for HIV and STD prevention and control.2008-2015, Ministry of Health, Sofia 2008.

21. Tresó B, Barcsay E, Tarján A, Horváth G, et al. Prevalence and Correlates of HCV, HVB, and HIV Infection among Prison Inmates and Staff, Hungary. J Urban Health. 2012; 89(1): 108-116

22. Weinbaum C, Lyerla R, Margolis HS. Prevention and control of infections with hepatitis viruses in correctional settings. Centers for Disease Control and Prevention . MMWR Recomm Rep. 2003; 52: 1-36.

23. Hammett TM, Harrmon MP, Rhodes W. The burden of infectious disease among inmates of and releases from US correctional facilities. Am J Public Health. 2002; 92: 1789-1794.

24. Bureau of Justice Statistics. Drug Use and Dependence, State and Federal Prisoners, 2004. US Department of Justice, 2006.

25. Way BB, Sawyer DA, Barbosa S, Nash R. Inmate suicide and time spent in special disciplinary housing in New York State prison. Psychiatr. Serv. 2007; 58: 558-560.

26. Dolan KA, Shearer J, White B, Zhou J, Kaldor J, Wodak AD. Four –year follow up of imprisoned male heroin users and methadone treatment: mortality, re- incarceration and hepatitis C infection. Addiction.2005; 100: 820-828.

27. Senok AC, Botta GA. Human immunodeficiency virus, hepatitis virus infection in correctional institutions in Africa: is this the neglected source of an epidemic? Journal of Medicine Microbiology. 2006; 55: 481-482.

Corresponding Author
Tanja Jovanovska,
Medical College in Bitola,
University St Kliment Ohridski,
Bitola,
R. Macedonia,
E-mail: tanjajovanovska42@yahoo.com

Analysis of pedal kinematics and surface EMG parameters during WAT

Murat Cilli

Sakarya University, School of Physical Education and Sport, Department of Coaching Education, Sakarya, Turkey.

Abstract

The aim of this study is to understand the activation pattern of the lower limb muscles during 30 s of maximal pedaling performance. Twenty-eight healthy males (age 25.2 ± 7.1 years, height 176.9 ± 5.2 cm, mass 70.1 ± 9.9 kg) volunteered to participate in this investigation. Surface EMG and kinematic parameters of vastus medialis (VM), vastus lateralis (VL) and rectus femoris (RF) muscles were analyzed during the Wingate Anaerobic Test (WAT) consisting of one 30 s sprint. The active phase of muscles determined by the EMG profile includes signal onset and offset times. Integrated EMG (IEMG), median frequencies (MDF), power values and angular displacement of selected muscles were calculated for the active phase in every crank cycle. Significant differences over time were assessed using a one way analysis of variance with repeated measures. Where significant changes occurred, a Schaffer's post-hoc test was applied to identify individual differences over time. While the active participation rates of the examined muscles in a pedal cycle decreased significantly ($p<0.05$), no significant difference was observed in the angular displacement of the examined muscles between the 5 s phases ($p>0.05$). The MDF of the RF, VM and VL muscles decreased and integrated the EMG of selected muscles significantly increased during WAT ($p<0.05$). Calculated power values of each muscle and WAT power results were similar. On the contrary, power produced at each muscle decreases to a similar level through 30 s. Each muscle follows a similar fatigue profile, while the power values decrease during WAT.

Key words: EMG analysis, pedal kinematics, muscle activation, supramaximal exercise.

Introduction

Pedaling is an ideal human locomotor task to study neuromuscular activity and physical fitness because it is a kinematically constrained repetitive movement. The Wingate Anaerobic Test (WAT) is widely used among different test protocols that have been used for the evaluation of aerobic or anaerobic power and the capacity of subjects. The WAT is outlined by Inbar and consists of a subject pedaling at a maximum level against a measured resistance for a short period (1). This test provides a measure of the maximum power output of the subject, the average power and the work done during a short time period and is used to generate a fatigue index. However, links from these global performance measures to changes in muscle EMG activation or pedal kinematics have not been evaluated. Furthermore, the interaction between muscle properties, individual muscle function and the coordination of multiple muscles to perform the task may not be so simple.

The information required to understand the cycling movement includes identifying the lower limb muscles, which are stimulated and precisely knowing their level/timing of activation. Associated with kinetic and kinematic analyses, it represents a means to clarify the role of each of the muscles through the crank cycle. In addition, it is important to know how the coordination strategies adapt to various constraints. Hug and Dorel (2) showed that the level and/or timing of muscle activation and coordination between muscles, mean power spectrum and amplitude of EMG signals change as a function of numerous factors such as power output, pedaling rate, body position, shoe–pedal interface, training status and fatigue. Furthermore, it is not well known whether movement patterns and power produced in each muscle decrease to a similar level or if each muscle follows a characteristic fatigue profile. Although

the complexity of the interaction between muscle properties and the movement kinematics is well appreciated, very little is known about the actual in vivo performance of muscles during human locomotion due to the difficulty of performing non-invasive evaluations of muscle force (3, 4).

Based on the results of previous studies it was observed that under well-controlled conditions, muscle fatigue during submaximal, isometric contractions has been shown to be accompanied by increases in electromyography (EMG) amplitude (5-8) and decreases in the mean power frequency (MPF) and/or median power frequency (MF) (5, 7, 9-11). While several studies have measured fatigue-related changes in submaximal performance related to mechanical and cardiovascular output, factors like muscle activity and pedal kinematics have been less studied, especially in maximal and supramaximal performance. Furthermore, it was noted that the relationship between EMG power frequency and fatigue development, as observed in isometric protocols, cannot be simply applied in dynamic exercise (12). Pedaling in maximal performance seems to require complex muscle coordination, as evidenced by recorded electromyography (EMG) patterns (13, 14). As cycle frequency increases, activation and deactivation dynamics increase in importance, and can have a significant influence on performance (15-17) and the muscle coordination strategy that is used (18, 19).

In rare studies, EMG parameters have been used by authors to find the activation level of different muscles at maximal and supramaximal pedaling conditions in order to observe the effects of fatigue. Because the relation between the EMG and force is uncertain during nonisometric supramaximal cyclic contractions, how muscles coordinate the delivery of energy to the crank still remains elusive.

The aim of this study is to understand the activation pattern of lower limb muscles during 30 s of supramaximal pedaling performance. The information required to understand the pedaling movement includes identifying the lower limb muscles that are activated and their level/timing of activation. Associated to EMG and kinematic analyses,

it represents a means to clarify the role of each of the muscles along the crank cycle. In addition, it is important to know how the coordination strategies adapt to power output and fatigue.

Method

Twenty-eight healthy males (age 25.2 ± 7.1 years, height 176.9 ± 5.2 cm, mass 70.1 ± 9.9 kg) volunteered to participate in this investigation. All participants completed a health history questionnaire and signed a written informed consent form before the test. Anaerobic capacities of group are shown in Table 1.

Wingate Test

The Wingate Anaerobic Test (WAT) consisted of one 30 s sprint, performed on a modified Monark 834 bicycle ergometer. The repeat of cranks per minute (RPM) and power values were calculated by custom MATLAB (The MathWorks, Natick, MA) software. RPM and power values were synchronized with kinematics values and EMG signals according to the trigger that occurs on a preset load of 0.075 kg/body weight. The subjects were given four seconds of loadless pedaling to reach maximum pedal speed and were subsequently instructed to sustain maximal cadence for 30 seconds. All subjects received vigorous verbal encouragement throughout the 30 seconds. Standard WAT results (Peak Power, Average Power and Endurance) were calculated for each subject.

EMG Data

The overlying skin on the muscles was carefully prepared. Hair was shaved off, the outer layer of epidermal cells abraded, and oil and dirt were removed from the skin with an alcohol pad. Bipolar single differential surface EMG electrodes (DE-2.1, Delsys Inc., Boston, MA USA) were placed on the right leg over the rectus femoris (RF), vastus lateralis (VL), vastus medialis (VM) according to accepted recommendations (20). The surface electrodes were spaced 10 mm apart. The Delsys amplifier had an input impedance of $> 1015\Omega$,

Table 1. Anaerobic capacities of 28 volunteered subjects

Wingate Results	Peak Power (w/kg)	Average Power (w/kg)	Endurance (%)
Average of 28 Subject	13.0 ± 1.6	9.0 ± 1.1 watt/kg	50.9 ± 6.4 %

common mode rejection ratio of -92bB, and overall noise of ≤ 1.2µV rms (Delsys, Inc.). The electrodes were heavily taped down with cotton swabs to minimize sweat-induced interference. Each activity was sampled at1000 Hz and synchronized with the kinematic data. Recordings were taken during the 30 s cycling. The EMG data were filtered with 10 Hz-250 Hz Bandpass Butterworth digital filter and 50 Hz Notch filter to prevent electrical interference from electrical sources.

After warming up with light cycling and stretching, EMG data during the maximal voluntary contraction (MVC) were recorded before the test to ensure normalization of EMG in the trial. The EMG signal of the subject's right knee extensor muscles contracted maximally were measured. Subjects sat on the bicycle ergometer, and pushed the pedals, which were locked in the 110° crank position, maximally for 3 s. EMG data during the WAT were recorded for 30 s.

In order to compare the muscular activity between different muscles and subjects, EMG signals of selected muscles were normalized by means of the full rectified EMG signals of MVC. Normalized EMG (NEMG) signals and *Linear Envelope EMG (LeEMG),* full-wave rectification followed by 4Hz low-pass filter of NEMG was used for further analysis. EMG signals were recorded, processed and analyzed using custom MATLAB software.

Determination of Muscle Activation

The active phase of muscles generally determined by EMG profile includes signal onset and offset times that identify the duration of EMG bursts (13, 21-23). Usually, an EMG threshold value (fixed at 15–25% of the peak EMG recorded during the cycle, or 1, 2 or 3 standard deviations beyond mean of baseline activity) is chosen for onset and offset detection (24). However, because this identification can be disputable with some EMG patterns and strongly dependent on the threshold level used, some authors visually adjust and raise this threshold in the cases for which it is considered inappropriate (23, 25). This study used the mean of the LeEMG signal as the baseline for each muscle activity (Figure1). The time integral of the LeEMG signal is computed over a window of 100 ms samples and then compared to a suitably chosen baseline and in order to determinate muscle activity time for each pedal. The active phase in every cycle was used to display EMG profiles as a function of time expressed in percentage of the total duration of the complete cycle.
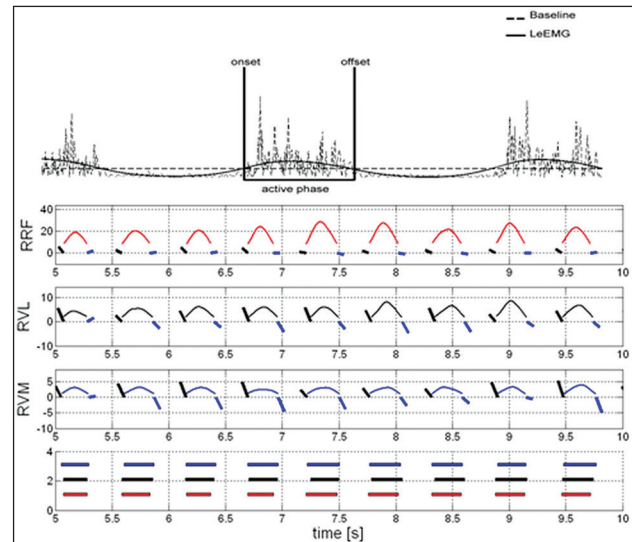
Figure 1. Using baseline for the determination of muscle activation and active phases of examined muscles

Analysis of Muscle Fatigue

In order to observe the effects of muscle fatigue on EMG profiles of the selected muscles, amplitude and median frequency (MDF) of EMG signals were used. Integrated EMG (IEMG) and MDF were calculated for the active phase in every crank cycle. The mean of IEMG and MPF for a 5 s period of the WAT test were compared for selected muscles.

Analysis of Power

Power values of selected muscles were calculated by same method as WAT power calculation. The total distance travelled during the active phase, preset load and the duration of the active phase were used to calculate power values of cycles for selected muscles (Figure2). The mean of power values for a 5 s period of the WAT test were compared for selected muscles.
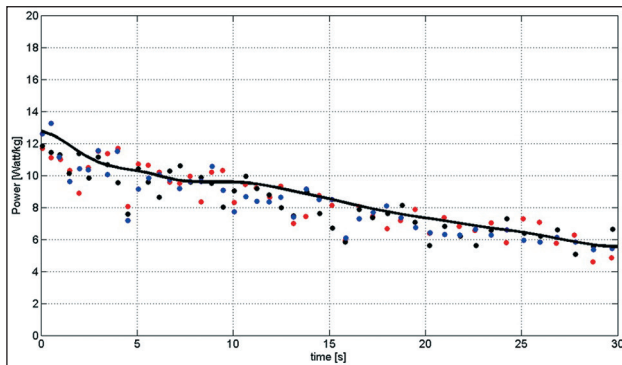
Figure 2. WAT results and calculated active phase power values of 3 examined muscles. Red signs represents RF muscle, black signs represents VM muscle and blue signs represents VL muscle.

Kinematic Data

During the WAT test on the bicycle ergometer, video images were captured at a 50 Hz frame rate with a video camera that was placed perpendicular to the ergometer plane. A reflective marker, attached on the center of the right pedal was digitized automatically by the custom software that uses the image processing toolbox of MATLAB. The displacement data of markers was filtered with a 6 Hz Butterworth digital filter. Crank angles were calculated by the displacement data of the marker. Sample frequency was increased to 1000 Hz by linear interpolation. In order to observe the kinematics differences, mean of the active phase angles (Figure3) of selected muscles for a 5 s period of the WAT test were compared.
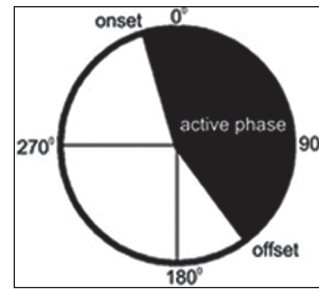
Figure 3. Onset, offset angles and active phase of crank cycle

Statistical Analysis

Data are presented as mean and significant differences over time were assessed using a one way analysis of variance with repeated measures. Where significant changes occurred, a Scheffe's post hoc test was applied to identify the individual differences over time. MATLAB (The MathWorks, Natick, MA) statistics toolbox version 6.2 was used for data analysis.

Results

Changes in the active participation rates of the examined muscles in a pedal cycle were evaluated. Our results showed that the timing of muscle activation and coordination between muscles have changed during the WAT. It was observed that in the first phase of the test, all the three muscles were active shorter period than the second phase of test. Significant differences between phases were obser-
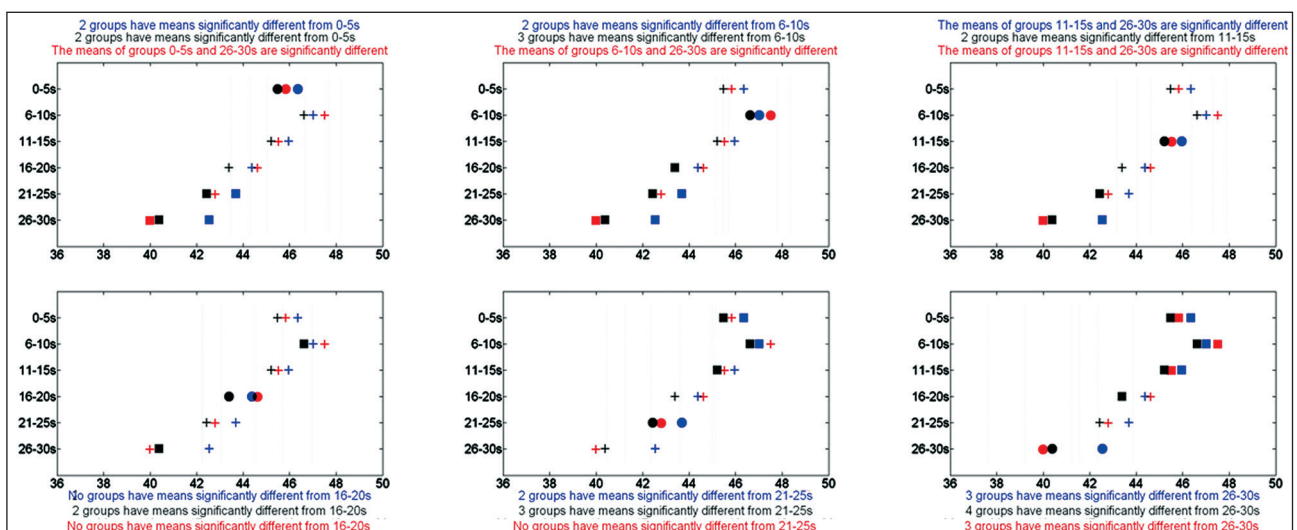
Figure 4. The average of the active participation rates of the examined muscles in a pedal cycle during WAT. Red signs represents RF muscle, black signs represents VM muscle, blue signs represents VL muscle and squares shows statistically significant differences.

ved for all examined muscles (p<0.05). Differences were occurred between first phases and final phases of test. The averages of the participation rates of all three muscles and the individual differences between the phases are shown in Figure 4.

The mean of median frequency changes in the surface EMG signals of the examined muscles have been evaluated in the study. It was observed that the average frequency value of the three muscles relatively decreased towards the later phases of the test. This decrease was less in the RF muscle and the first, second, third, fourth and fifth phases were significantly different from only the last phase (p<0.05). Meanwhile the MDF va-

lues of the VM and VL muscles were observed to decrease significantly in the third, fourth, fifth and sixth phases (p<0.05). The averages of the MDF values and the individual differences between these frequencies are shown in Figure 5.

In the study, the changes in amplitudes of the surface EMG signals of the muscles were evaluated with the IEMG values. The IEMG values of all three muscles increased in the final phases. Significant differences were observed between the average IEMG values in the first phase and the average of IEMG values in the later phases (p<0.05). The averages of IEMG values and the individual differences between phases are shown in Figure 6.
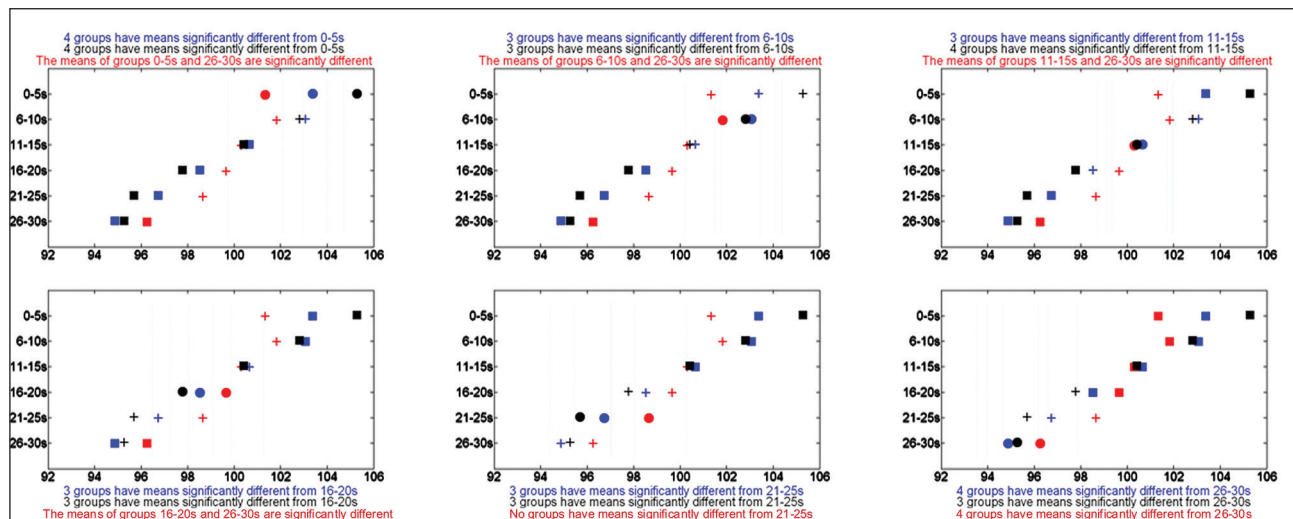
Figure 5. The average of MDF values of the all subject during WAT. Red signs represents RF muscle, black signs represents VM muscle, blue signs represents VL muscle and squares shows statistically significant differences.
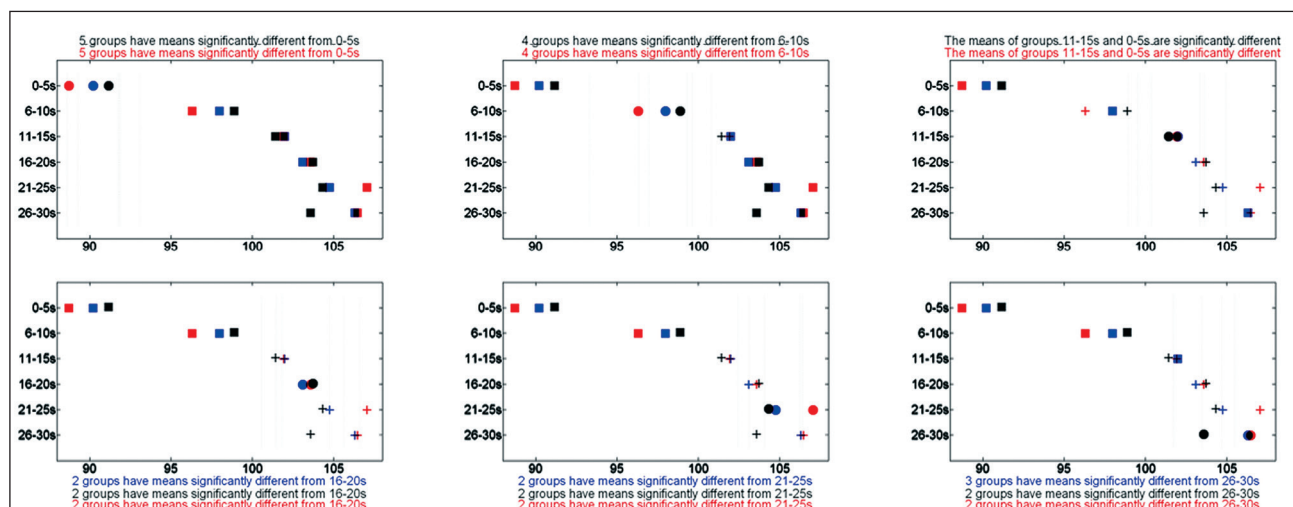
Figure 6. The average of IEMG values of the all subjects during WAT. Red signs represents RF muscle, black signs represents VM muscle, blue signs represents VL muscle and squares shows statistically significant differences.

The parameter that was calculated with the aid of work realized in the active phases and the duration of active phases were accepted as the power values of each muscle, and in this way the changes of power values over time were evaluated. It was observed that all muscles have similar power values and power values of each muscle decreased significantly towards the later phases ($p<0.05$). The averages of power values of all three muscles and the individual differences between phases are shown in Figure 7.

The angular displacement of the examined muscles during the phases they were active and the changes during the test were evaluated. It was ob-

served that the angular displacement values of the all muscles relatively decreased, compared to the first phase. However, no meaningful difference was seen between the phases. The averages of angular displacement values are shown in Figure 8.

Discussion

While several studies have measured fatigue-related changes in submaximal performance related to mechanical and cardiovascular output, factors like muscle activity and pedal kinematics have been less studied, especially in maximal and supramaximal performance. On the other hand

Figure 7. The average of calculated power values of all the 3 muscles examined during the WAT. Red signs represents RF muscle, black signs represents VM muscle, blue signs represents VL muscle and squares shows statistically significant differences.
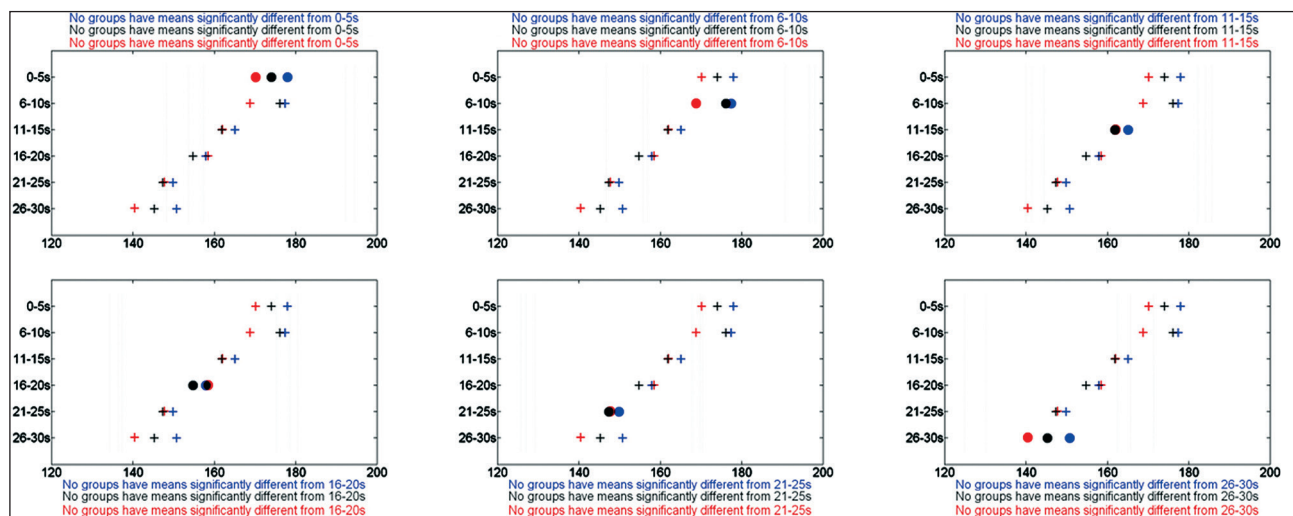
Figure 8. The average of angular displacement values of the all the 3 muscle examined during the WAT. Red signs represents RF muscle, black signs represents VM muscle, blue signs represents VL muscle and squares shows statistically significant differences.
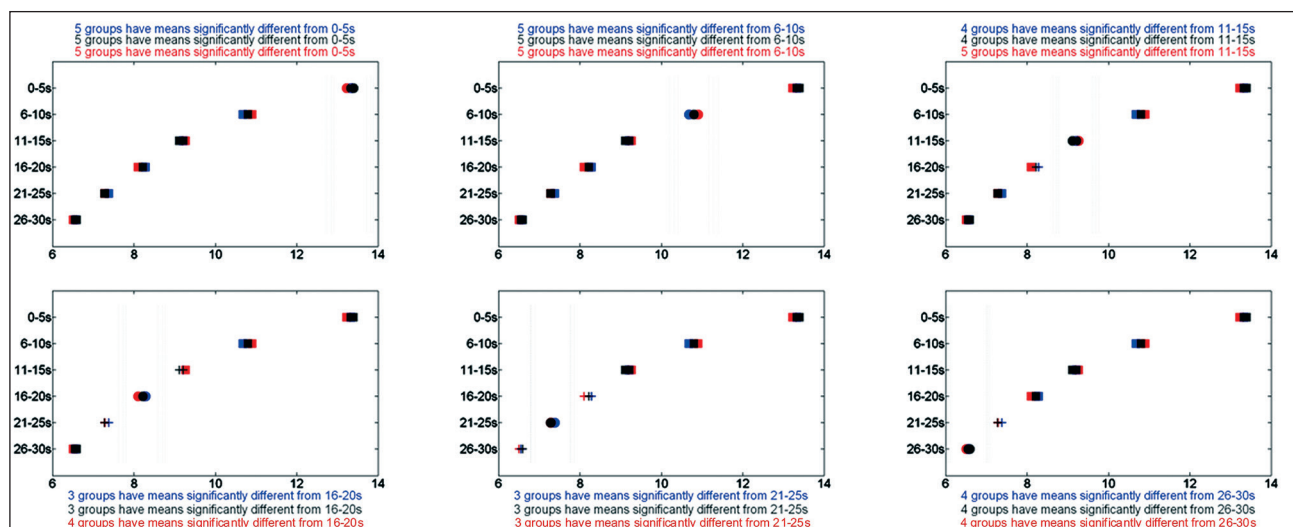
the relationship between EMG power frequency and fatigue development, as observed in isometric protocols, cannot be simply applied to dynamic exercise (12). This study demonstrated that muscle activation can be determined for each crank cycle during maximal bicycle exercise. According to the results, the timing of muscle activation and coordination between muscles changed during the WAT.

Muscle activation

It was observed in the second section of the test that all three muscles were active during approximately 46-48% of a pedal cycle, and this ratio decreased significantly in the later stages of the test (40 -42%) (Figure 4). The RF muscle was active during a longer period of the cycle than the VM and VL muscles. It was not possible for a cyclist to maintain a constant power output due to the decreasing crank velocity and fatigue. The subjects decrease muscle activation to offset the increased capacity for muscle power output. Even though optimal power output occurs at higher pedaling rates (17, 26) the current results revealed that, in the first section of the test, all three muscles were active in a shorter phase of a pedal cycle, compared to the second section. This result may be explained by activation and deactivation dynamics. When activation and deactivation dynamics were included, it was observed that maximum power occurred at approximately 120 rpm (26), which is lower than the pedaling rate observed in the first phase of WAT. Caiozzo and Baldwin (16)showed in the rat soleus that activation and deactivation time delays alone could reduce muscle power by as much as 60% at higher cycle frequencies, and thus shift the optimal cycle frequency to a lower value. Cycle time decreases related to faster cycle frequencies so that a greater portion of the shortening phase must be dedicated to relaxation to avoid excessive negative muscle work (18, 27)

Frequency and integrated EMG

The average frequency value of the three muscles decreased relatively towards the later phases of the test. This decrease was less in the RF muscle and the first, second, third, fourth and fifth phases were significantly different from only the last phase. Meanwhile, the average frequency values of the VM and VL muscles were observed to decrease signi-

ficantly in the third, fourth, fifth and sixth phases (Figure 5). It is well known that MDF decreases and amplitude of EMG increases during static conditions. Other than the minor study by Zwarts, et al. (28) the relationship between MDF and the power spectrum has been investigated only under static contraction and submaximal exercises. Masuda observed that median frequency decreased and the amplitude of EMG increased both the static and dynamic conditions (29). Hunter (2003) reported that there was a highly significant reduction over 30 s during WAT. Some research has explained the shift of the spectrum toward the lower band by a decrease in muscle fiber conduction velocity (30, 31). Besides frequency, the changes in amplitudes of the surface EMG signals of the muscles have been evaluated with the IEMG values. The IEMG values of all the three muscles were observed to increase towards the ending phases. has Although it has a lower EMG activity level, the RF muscle was active during a longer period of the cycle than the VM and VL muscles. EMG activity level is lower for bi-articular muscles such as RF and GL (respectively, 22% and 18% of the IMVC values) (2). Although research by Hunter reported no change in motor unit recruitment strategy during the Wingate anaerobic test (32), a significant difference was observed between the average IEMG values of the whole study group in the first phase and the average values in the later phases (Figure 6). Similar results were observed by Masuda—that EMG amplitude increased from the beginning to the end of the exercise during both types of contractions. The increment from the initial value was 34.4% in the static contraction and 48.0% in the dynamic contraction (29). It would be anticipated that if fatigue was present, the magnitude of EMG would increase over time for a given power output (33). It has been suggested that additional motor units are progressively recruited to compensate for the reduction in contractility due to the impairment of fatigued motor units, resulting in an increased IEMG (34).

Power values

It is not well known whether movement patterns and power produced in each muscle decrease to a similar level or if each muscle follows an individual fatigue profile. Although the complexity of the interaction between muscle properties and the mo-

vement kinematics is studied, very little is known about the actual in vivo performance of muscles during human locomotion, due to the difficulty of performing noninvasive evaluations of muscle force (3, 4). In this study, each muscle activation pattern were compared with the power values of selected muscles, which were calculated by the total distance travelled during the active phase, preset load and duration of the active phase. This study showed that the calculated power values of each muscle have similar power values with the WAT power results. On the contrary, power produced in each muscle decreases to a similar level through the full 30 s. Each muscle follows a similar fatigue profile while the power values decreases during the WAT (Figure 7).

The angular displacement

It was observed that the angular displacement values of the all muscles relatively decreased compared to the first phase, but no meaningful difference was observed between the phases (Figure 8). Additionally, the RF muscle has lower angular displacement values compared to the VM and VL muscles. As hypothesized by various authors, muscles may have different roles depending on how many joints it traverses. It was also noted that the monoarticular muscles (GMax, VL, VM, TA, and SOL) play a relatively invariant role as primary power producers (14). Conversely, the bi-articular muscles (BF, ST, SM, RF, GM, and GL) behave differently and with greater variability (2, 14). Largely reported in the literature, these muscles appear to be primarily active in the transfer of energy between joints at critical times in the pedaling cycle and in the control of the direction of force production on the pedal (2).

In conclusion, EMG parameters and pedal kinematics can be used to evaluate the activation level of lower limb muscles at maximal and supra-maximal pedaling conditions as used in isometric muscle contractions. Hug and Dorel (2009) showed that the level and/or timing of muscle activation and coordination between muscles, MDF, and amplitude of EMG signals change as a function of power output. While the active participation rates of the examined muscles decreased, no difference was observed in the angular displacement of the examined muscles during the 5 s phases of WAT. In addition, the RF muscle has lower

angular displacement values compared to the VM and VL muscles. The MDF of the RF, VM and VL muscles decreased, and the integrated EMG of selected muscles increased during exercise. On the other hand calculated power values of each muscle have similar values to WAT power results. Power produced in each muscle decreased to a similar level throughout the 30 s. It can be said that each muscle follows a similar fatigue profile while the power values decrease during the WAT.

References

1. Inbar GF, Allin J, Kranz H. Surface EMG spectral changes with muscle length. Medical & biological engineering & computing. [Research Support, Non-U.S. Gov't]. 1987 Nov; 25(6): 683-9.

2. Hug F, Dorel S. Electromyographic analysis of pedaling: a review. Journal of electromyography and kinesiology : official journal of the International Society of Electrophysiological Kinesiology. [Research Support, Non-U.S. Gov't Review]. 2009 Apr; 19(2): 182-98.

3. Zajac FE. Muscle and Tendon - Properties, Models, Scaling, and Application to Biomechanics and Motor Control. Crit Rev Biomed Eng 1989; 17(4): 359-411.

4. Marsh RL. How muscles deal with real-world loads: the influence of length trajectory on muscle performance. J Exp Biol1999; 202: 3377-85.

5. Arendtnielsen L, Mills KR. Muscle-Fiber Conduction-Velocity, Mean Power Frequency, Mean Emg Voltage and Force during Submaximal Fatiguing Contractions of Human Quadriceps. Eur J Appl Physiol O1988 Oct; 58(1-2): 20-5.

6. Maton B. Human motor unit activity during the onset of muscle fatigue in submaximal isometric isotonic contraction. Eur J Appl Physiol Occup Physiol1981; 46(3): 271-81.

7. Petrofsky JS, Glaser RM, Phillips CA, Lind AR, Williams C. Evaluation of the Amplitude and Frequency Components of the Surface Emg as an Index of Muscle Fatigue. Ergonomics1982; 25(3): 213-23.

8. Stulen FBD, C J, editor. A noninvasive device for monitoring metabolic correlates of myo-electric signals. 31st Ann Conf Engng Med Biol; 1989.

9. Kadefors R, Kaiser E, Petersen I. Dynamic spectrum analysis of myo-potentials and with special reference to muscle fatigue. Electromyography1968 Jan-Apr; 8(1): 39-74.

10. Moritani T, Nagata A, Muro M. Electromyographic manifestations of muscular fatigue. Medicine and science in sports and exercise1982;14(3):198-202.

11. Viitasalo JH, Komi PV. Signal characteristics of EMG during fatigue. Eur J Appl Physiol Occup Physiol1977 Sep 16;37(2):111-21.

12. Jansen R, Ament W, Verkerke GJ, Hof AL. Median power frequency of the surface electromyogram and blood lactate concentration in incremental cycle ergometry. Eur J Appl Physiol Occup Physiol1997; 75(2): 102-8.

13. Jorge M, Hull ML. Analysis of Emg Measurements during Bicycle Pedaling. Journal of biomechanics1986;19(9):683-94.

14. Ryan MM, Gregor RJ. Emg Profiles of Lower-Extremity Muscles during Cycling at Constant Workload and Cadence. J Electromyogr Kines1992;2(2):69-80.

15. Askew GN, Marsh RL. Optimal shortening velocity (V/Vmax) of skeletal muscle during cyclical contractions: length-force effects and velocity-dependent activation and deactivation. J Exp Biol. [In Vitro Research Support, U.S. Gov't, P.H.S.]. 1998 May;201(Pt 10):1527-40.

16. Caiozzo VJ, Baldwin KM. Determinants of work produced by skeletal muscle: potential limitations of activation and relaxation. The American journal of physiology1997 Sep;273(3 Pt 1):C1049-56.

17. Van Soest AJK, Casius LJR. Which factors determine the optimal pedaling rate in sprint cycling? Medicine and science in sports and exercise2000 Nov;32(11):1927-34.

18. Neptune RR, Herzog W. The association between negative muscle work and pedaling rate. Journal of biomechanics1999 Oct;32(10):1021-6.

19. Neptune RR, Kautz SA, Hull ML. The effect of pedaling rate on coordination in cycling. Journal of biomechanics1997 Oct;30(10):1051-8.

20. Konrad P. The ABC of EMG A Practical Introduction to Kinesiological Electromyography: Noraxon Inc; 2005.

21. Chapman AR, Vicenzino B, Blanch P, Knox JJ, Dowlan S, Hodges PW. The influence of body position on leg kinematics and muscle recruitment during cycling. J Sci Med Sport2008 Nov; 11(6): 519-26.

22. Dorel S, Couturier A, Hug F. Intra-session repeatability of lower limb muscles activation pattern during pedaling. J Electromyogr Kines2008 Oct; 18(5): 857-65.

23. Li L, Caldwell GE. Coefficient of cross correlation and the time domain correspondence. J Electromyogr Kines1999 Dec; 9(6): 385-9.

24. Fonda BSN. Biomechanics of Cycling. Sport Science Review2010; 19(1-2): 187-210.

25. Duc S, Bertucei W, Pernin JN, Grappe F. Muscular activity during uphill cycling: Effect of slope, posture, hand grip position and constrained bicycle lateral sways. J Electromyogr Kines2008 Feb; 18(1): 116-27.

26. Sargeant AJ. Human power output and muscle fatigue. International journal of sports medicine. [Review]. 1994 Apr; 15(3): 116-21.

27. Neptune RR, Kautz SA. Muscle activation and deactivation dynamics: the governing properties in fast cyclical human movement performance? Exercise and sport sciences reviews. [Research Support, U.S. Gov't, Non-P.H.S. Research Support, U.S. Gov't, P.H.S. Review]. 2001 Apr; 29(2): 76-80.

28. Zwarts MJ, Vanweerden TW, Haenen HTM. Relationship between Average Muscle-Fiber Conduction-Velocity and Emg Power Spectra during Isometric Contraction, Recovery and Applied Ischemia. Eur J Appl Physiol O1987; 56(2): 212-6.

29. Masuda K, Masuda T, Sadoyama T, Inaki M, Katsuta S. Changes in surface EMG parameters during static and dynamic fatiguing contractions. Journal of electromyography and kinesiology: official journal of the International Society of Electrophysiological Kinesiology. [Comparative Study]. 1999 Feb;9(1): 39-46.

30. Gamet D, Duchene J, Goubel F. Reproducibility of kinetics of electromyogram spectrum parameters during dynamic exercise. Eur J Appl Physiol Occup Physiol 1996; 74(6): 504-10.

31. Rau G, DisselhorstKlug C, Silny J. Noninvasive approach to motor unit characterization: Muscle structure, membrane dynamics and neuronal control. Journal of biomechanics1997 May; 30(5): 441-6.

32. Hunter AM, Gibson AS, Lambert MI, Nobbs L, Noakes TD. Effects of supramaximal exercise on the electromyographic signal. British journal of sports medicine2003 Aug 1; 37(4): 296-9.

33. MacIntosh BR, Neptune RR, Horton JF. Cadence, power, and muscle activation in cycle ergometry. Medicine and science in sports and exercise2000 Jul;32(7): 1281-7.

34. Vanboxtel A, Schomaker LRB. Influence of Motor Unit Firing Statistics on the Median Frequency of the Emg Power Spectrum. Eur J Appl Physiol O1984; 52(2): 207-13.

Corresponding Authors
Murat Cilli,
Sakarya University,
School of Physical Education and Sport,
Department of Coaching Education,
Serdivan,
Sakarya,
Turkey,
E-mail: mcilli@sakarya.edu.tr

Evaluation of daily living activities and dependence levels of elderly with chronic obstructive pulmonary disease: A pilot study in Turkey

Sevilay Hintistan[1], Nesrin Nural[2], Nermin Birinci[3]

[1] Department of Medical Nursing, Faculty of Health Science, Karadeniz Technical University, Trabzon, Turkey,
[2] Karadeniz Technical University Faculty of Health Science, Trabzon, Turkey,
[3] Internal Disease of Clinic at Vakfikebir State Hospital, Vakfikebir, Turkey.

Abstract

Aim: This study was conducted to evaluate daily living activities of patients who had been hospitalized in a rural area of Northeastern Turkey for treatment of their chronic obstructive pulmonary disease.

Methods: This crosssectional and descriptive study was conducted with 92 patients with chronic obstructive pulmonary disease. Participants had been hospitalized for treatment at Vakfikebir State Hospital. To be included in the study patients had to have been diagnosed with chronic obstructive pulmonary disease, aged ≥60, no known psychiatric or neurological disorders that would interfere with the completion of the measurements, able to communicate verbally, and agreed to participate. Data were obtained using a questionnaire designating patients' socio-demographic characteristics, characteristics of the disease, and information about their daily living routine using the Katz Activities of Daily Living Index.

Results: Study participants comprised 40.2% of the ≥ 80 year-age group. Regarding levels of dependence for their daily activities, our study results showed that 29.3% of the patients needed assistance while bathing, 18.4% in dressing, and 16.3% required help in mobility and eating chronic obstructive pulmonary disease patients' level of dependence in carrying out their daily activities was affected by age, monthly income, family structure, heart disease combined with chronic obstructive pulmonary disease, and the use of antibiotics.

Conclusion: Patients with chronic obstructive pulmonary disease, often experience difficulties in the routine tasks of their daily living. These difficulties may result in patients becoming dependent on others. There is a great need to develop support programs so that these patients may become more independent in activities of daily living.

Key words: Activities of daily living, chronic obstructive pulmonary disease, elderly.

Introduction

With the increase in longevity, the elderly population has also been increasing. Aging means increased disabilities and more dependence on others [1]. Many of the elderly suffer with chronic diseases in their old age [2]. In our country 90% of the elderly aged ≥ 65 have chronic diseases; 35% of them have two chronic illnesses; 23% have three; and 14% have four or more concomitant chronic diseases [3].

An important feature of many of these diseases is that they prevent individuals from leading independent lives [4]. Individuals who are unable to perform such activities of daily living (ADL) as bathing, dressing, eating, etc. alone are considered as dependent. As a person ages and chronic diseases develop, the need for additional support increases [5].

Chronic obstructive pulmonary disease (COPD), a chronic disease which progresses in severity with the advancement of age, is not only progressive, it is also irreversible and characterized by limitation of flow of air [4,5]. COPD is the fourth most common cause of death in the world and is the third most common cause of death in Turkey [6]. Deaths from COPD claim the lives of 2.75 million people each year [7,8]. Although other leading causes of death have shown a sharp decrease, the mortality rate for COPD has increased by 163% [6].

ADL is a term and main method used to determine the self-sufficiency levels of individuals as they carry out their personal self-care and other daily activities [1,9]. ADL includes such self-care activities as eating, bathing, dressing and mobility. Indi-

viduals become independent on other people when these activities cannot be performed. The effects of COPD exert a large negative impact on the physical and psychological health of the elderly which also affects their ability to carry out the usual activities of daily living [1,3,10,11]. Therefore, it is very important that COPD patients remain as independent as possible in carrying out their normal daily activities.

As the disease progresses in COPD, there will be an increase in the severity of the airway obstruction and in symptoms such as dispnea and fatigue. The symptoms generally progress until daily activities such as climbing up/down stairs, walking, bathing, and eating become more difficult for the patient. The chronic disability caused by COPD may become severe enough to affect the patient's independence in daily living [9,10].

People with COPD undergo more functional restrictions and disabilities than their peers. Moreover, in addition to old age COPD patients may face difficult and complicated problems because the disease causes disabilities in ADL. These problems include changes in the areas of emotion and cognition with additional changes occurring in patients' physical activities and social lives. These changes and restrictions, in turn, increase the individual's dependence on others [3,11,12].

It is very important to determine the ADL of COPD patients because their capacities to carry out their daily activities may be weakened due to the direct influence of the disease, patients' past experiences with the disease and changes in their perception of well being [13].

Turkish studies evaluating the ADL of patients with COPD are limited. We believe that determining COPD patients' capacity in their ADL and the factors affecting their daily function will contribute to the development of new ways to promote functional capacity. Furthermore, determining the ADL status of these patients will serve to develop the care and service needs to make their lives easier.

The aim of this study was to evaluate the ADL of patients who had been hospitalized for treatment of their COPD.

Materials and methods

This study included 92 patients with COPD who presented to the inpatient at the Internal Diseases Unit of Vakfikebir State Hospital between March 2011 and July 2011. The study was conducted in a large hospital in Northeastern Turkey and almost all the patients with COPD in this region, particularly those living in the vicinity of Vakfikebir, received COPD treatment in that hospital.

Sample

The present study design involved cross-sectional and descriptive. The inclusion criteria were:
1. A diagnosis of COPD.
2. No known psychiatric or neurological disorders that would interfere with the completion of the measurements.
3. Able to communicate verbally.
4. Age ≥ 60
5. Agreed to participate in the research.

We had hoped to include all patients who met the inclusion criteria, but 42 patients with impaired consciousness disorders, difficulty understanding the scale, or who had refused to participate were excluded from the research. Thus, only 92 cases were used for the final data analysis.

Procedure and data collection

A two part survey was used to collect the data. The questionnaire form included socio-demographic and disease-related characteristics and the Katz Activities of Daily Living Index.

Questionnaire Form

This form was designed by the researchers after a thorough review of the literature. The questionnaire form was divided into two parts. The first section consisted of nine sociodemographic questions: gender, age, marital status, educational status, monthly income, social security coverage, employment status, family structure, and patient's place of residence.

The second section in the questionnaire was comprised of 13 questions related to COPD characteristics: whether other COPD patients are in the family; time of COPD diagnosis; hospital experience; length of hospital stay related to COPD; presence of other disease in addition to COPD; if so, which disease; drugs used; amount of drugs taken per day; regular use of drugs; regular exercise; exercise type, regular sleep, average sleep

time per day and smoking habits.

Katz Activities of Daily Living Index

The ADL index includes 6 questions about performance in the six functions of bathing, dressing, toileting, transferring, continence, and feeding. If the individual performs the activities of daily living independently, the score is 3; if the patient needs help, the score is 2; if the patient is unable to perform the activities, then the score is 1. A score of 0-6 indicates full dependence, 7-12 indicates semidependence and 13-18 indicates independence [14].

Procedure

Each patients was contacted by a research assistant and provided with a detailed explanation of the aim and conduct of the study. The questionnaire form and the ADL used for the data collection were filled in by the researchers using face-to-face interviews with the patients in a separate quiet room of the clinic. If the patients were unable to complete the questionnaire form on their own, the researchers read the questionnaire items to the patient and recorded the answers. The questionnaires took 20-30 mins to complete.

Ethics

The researchers obtained an approval from the Internal Diseases Unit of Vakfikebir State Hospital, and informed consent was obtained from each patient. The aim of the research was explained to the patients and they were informed that if they preferred not to continue, they could withdraw from the study any time they wished. After these explanations, 92 patients consented to participate in the study voluntarily.

Data analysis

The data were analysed using the Statistical Package for Social Sciences (SPSS) version 11.0 for Windows (SPSS, Chicago, IL, USA). Descriptive data on frequency and percentage were used for the sociodemographic variables and COPD-related variables. The Chi-square Test was used to determine the association between sociodemographic variables and patients' COPD-related variables and their dependency status in daily living activities. Mean and standard deviations were

used for the ADL index. The results were analyzed with a 95% confidence interval, and the accepted level of significance for all analyses was $p < 0.05$.

Results

Included in the research were 92 patients who had been diagnosed with COPD and who were treated at the Internal Diseases Unit of Vakfikebir State Hospital. Male patients comprised 65.2% of the study participants and 40.2% were aged ≥80. Additional characteristics were as follows: 70.7% were married and 50.0% were illiterate; 77.2% of the patients had a monthly income over 220€, and the majority had social security coverage (92.4%); 97.8% of the patients said they did not work, 68.5% said they lived in a nuclear family, and 71.7% stated that they lived in a village.

Study results showed that 57.6% of the patients did not have any family members diagnosed with COPD; 47.8% had been COPD patients for ≥20 years; 97.8% had been previously hospitalized due to COPD; 56.5% had been hospitalized approximately once every 2-3 months; 75.8% had another chronic disease apart from COPD, and the most common chronic diseases were hypertension (63.0%) and heart diseases (34.8%).

When the medicines used by the patients were analyzed, the most commonly used medicines were bronchodilators (94.6%), expectorants (94.6%), antibiotics (81.5%) and corticosteroids (70.7%). In addition, 85.9% of the patients used ≥7 medicines daily, and 93.5% used these medicines regularly; 73.9% did not exercise regularly; 72.8% had irregular sleep patterns; 87.0% slept for 4-6 hours daily and 50.0% told researchers they had quit smoking.

Table 1. indicates the dependence status of the participating COPD patients in the ADL according to their sociodemographic characteristics. Although the dependence level of the female COPD patients was higher for those who were widows, literate, did not have any social security coverage, were unemployed, and lived in counties, there was no statistically significant difference ($p > 0.05$).

It was noted that dependence in ADL increased significantly as age increased and patients aged ≥80 became more dependent for assistance in their daily activities. There was a significant difference

Table 1. Dependence status of the patients in the activities of daily living according to their sociodemographic variables

Variables	Activities of daily living								**p
	Dependent		Semidependent		Independent		Total		
	n	%	n	%	n	%	n	*%	
Gender									
Women	4	12.5	5	15.6	23	71.9	32	34.8	0.581
Men	7	11.7	13	25.0	40	63.3	60	65.2	
Age									
60-69	-	-	1	3.6	27	96.4	28	30.4	**0.000**
70-79	2	7.4	5	18.5	20	74.1	27	29.3	
≥ 80	9	24.3	12	37.8	16	37.8	37	40.2	
Marital status									
Married	6	9.2	13	20.0	46	70.8	65	70.7	0.654
Widow	3	20.0	4	26.7	8	53.3	15	16.3	
Single	2	16.7	3	25.0	7	58.3	12	13.0	
Educational level									
Illiterate	4	8.7	7	15.2	35	76.1	46	50.0	0.098
Literate	5	23.8	3	19.0	13	57.1	21	22.8	
Primary school	2	8.0	9	36.0	14	56.0	25	27.2	
Monthly income									
< 220€	5	23.8	8	38.1	8	38.1	21	22.8	0.007
> 220€	6	8.5	11	16.9	54	74.6	71	77.2	
Social security coverage									
Having	10	11.8	17	20.0	58	68.2	85	92.4	0.330
Not having	1	14.3	3	42.9	3	42.9	7	7.6	
Employment status									
Employed	-	-	-	-	2	100.0	2	2.2	0.595
Unemployed	11	12.2	18	22.2	61	65.6	90	97.8	
Family structure									
Nuclear	4	6.3	11	17.5	48	76.2	63	68.5	**0.007**
Extended family	7	24.1	9	31.0	13	44.8	29	31.5	
Residential area									
County	4	15.4	7	26.9	15	57.7	26	28.3	0.546
Village	7	10.6	11	19.7	48	69.7	66	71.7	

* It is the percentage of column and others are percentages of rows.
** Value of chi-square test.

between dependence in ADL and age groups, monthly income, family structure (p<0.05).

Table 2. shows the dependence status of the COPD patients in the activities of daily living according to the characteristics of their diseases. The dependence level was higher for study participants who had family members with COPD; had coped with the disease for 11-19 years; had previous hospitalization for treatment due to COPD; had a frequency of hospitalization once every 2-3 months; had another chronic disease; used 4-6 medicines daily; used medicines irregularly; did not exercise regularly; could not sleep regularly; slept for 4-6 hours daily; and had quit smoking. Nevertheless, there was no statistically significant difference (p>0.05). On the other hand, the dependence rate of those with both heart diseases and COPD and regular use of antibiotics increased significantly (p<0.05).

When patients' dependence status in ADL was analyzed, the highest dependence occurred in bathing (29.3%), dressing (18.5%), transferring and feeding (16.3%), continence (15.2%) and toileting (14.1%), respectively (Table 3).

Table 2. Dependence status of the patients in the activities of daily living according to the variables of their diseases

	Activities of daily living								
Variables	**Dependent**		**Semidependent**		**Independent**		**Total**		****p**
	n	**%**	**n**	**%**	**n**	**%**	**n**	***%**	
Presence of any members with COPD in the family									
Yes	5	12.8	10	25.6	24	61.5	39	42.4	0.688
No	6	11.3	10	18.9	37	69.8	53	57.6	
Disease length									
1-10 years	1	3.2	7	22.6	23	74.2	31	33.7	0.328
11-19 years	4	23.5	3	17.6	10	58.8	17	18.5	
≥20	6	13.6	8	22.7	30	63.6	44	47.8	
Previous hospitalization due to COPD									
Yes	11	12.2	20	22.2	59	65.6	90	97.8	0.595
No	-	-	-	-	2	100.0	2	2.2	
Frequency of hospitalization									
The first time	-	-	-	-	2	100.0	2	2.2	
Once a month	-	-	1	100.0	-	-	1	1.1	0.154
Once 2-3 months	9	17.3	11	25.0	32	57.7	52	56.5	
Once or twice a year	2	5.4	6	6.5	29	31.5	37	40.2	
Presence of another chronic disease									
Yes	11	15.9	16	23.2	3	61.4	70	76.1	0.097
No	-	-	4	18.2	18	81.8	22	23.9	
***Presence of disease together with COPD									
Diabetes mellitus	2	16.7	2	16.7	8	66.7	12	13.0	0.811
Hypertension	10	17.2	13	22.4	35	60.3	58	63.0	0.103
Heart diseases	8	25.0	10	31.3	14	43.8	32	34.8	**0.002**
Rheumatic diseases	-	-	-	-	4	100.0	4	4.3	0.346
Renal diseases	2	33.3	1	16.7	3	50.0	6	6.5	0.248
Neurologic diseases	-	-	1	50.0	1	50.0	2	2.2	0.583
***Medicines used									
Bronchodilator	11	12.6	19	21.8	57	65.5	87	94.6	0.674
Corticosteroids	6	9.2	13	20.0	46	70.8	65	70.7	0.309
Antiinflamatory	-	-	4	50.0	4	50.0	8	8.7	0.099
Antibiotics	6	8.0	11	14.7	58	77.3	75	81.5	**0.000**
Inhaler	2	25.0	3	37.5	3	37.5	8	8.7	0.188
Expectorants	11	12.6	20	23.0	56	64.4	87	94.6	0.261
Amount of medicine taken daily									
4-6	3	23.1	3	23.1	7	53.8	13	14.1	0.380
≥7	8	10.1	17	21.5	54	68.4	79	85.9	
Regular use of medicines									
Yes	9	10.5	18	20.9	59	68.6	86	93.5	0.142
No	2	33.3	2	33.3	2	33.3	6	6.5	
Regular exercise									
Yes	1	4.2	6	25.0	17	70.8	24	26.1	0.385
No	10	14.7	14	20.6	44	64.7	68	73.9	
Regular sleep									
Yes	1	4.0	8	32.0	16	64.0	25	27.2	0.173
No	10	14.9	12	17.9	45	67.2	67	72.8	
Daily sleep length									
4-6 hours	10	12.5	16	20.0	54	67.5	80	87.0	0.566
≥7 hours	1	8.3	4	33.3	7	58.3	12	13.0	
Smoking									
Yes	-	-	2	66.7	1	33.3	3	3.3	0.205
No	5	11.6	6	14.0	32	74.4	43	46.7	
Quitted	6	13.0	12	26.1	28	60.9	46	50.0	

* It is percentage of column and others are percentages of rows. ** Value of chi-square test. *** n was doubled because there were more answers than one.

Table 3. Dependence status of the patients in the activities of daily living

ADL	Dependent		Semidependent		Independent	
	n	**%**	**n**	**%**	**n**	**%**
Bathing	27	29.3	29	31.5	36	39.1
Dressing	17	18.5	22	23.9	53	57.6
Toileting	13	14.1	21	22.8	58	63.0
Transferring	15	16.3	19	20.7	58	63.0
Continence	14	15.2	10	10.9	68	73.9
Feeding	15	16.3	11	12.0	66	71.7

Discussion

COPD, commonly seen all over the world, is a chronic disease that occurs more frequently with old age and causes increased death rates. Individuals with chronic disease are generally unable to perform ADL due to the symptoms of the disease [3].

The present research evaluated the capabilities of elderly patients with COPD in their ADL. Although most of the study particpants with COPD were men, when we analyzed the relation between socio-demographic characteristics of the patients and their status in performing ADL, our results showed that the women experienced more dependence in ADL than the men.

Torres et al. showed in their study that women with COPD had worse dyspnea, exercise capacity, and nutritional status at an earlier stage of the disease and walked a shorter distance in the 6-min walk distance test than men [15]. Chan-Yeung et al. reported that COPD morbidity was higher among men and emphasized that the difference was particularly higher among the ≥45 age group [9]. The reason for this was attributable to the fact that men smoked more and tended to remain in their professional lives longer than women [9,13]. A review of the literature found that other studies researching dependence in ADL showed that women experienced more dependence in ADL than men [16,17,18,19]. Our findings supported the findings of previous researches.

Numerous studies which investigated the capabilities of the elderly in carrying out their ADL found that the ADL dependence level increased significantly in people aged ≥ 65 [2,5,12,16,20]. Similarly, our findings supported the correlation between age and ADL.

Studies have also shown that patients whose spouses have died were more dependent in their ADL. Kaya et al. indicated that most of the needs of the individuals with severe disabilities were met primarily by their spouses [3]. Furthermore, Cecen and Ozbayır reported that 38.1% of the elderly needed help in their daily lives, and 29.2% of them were helped by their spouses [21]. Loss of the spouse increases a person's dependence on others due to a decrease in self-confidence, changes in home conditions, and poor or irregular care.

The illiteracy rate of our study participants was 50%. Patients in the Bahar et al. study had an illiteracy rate of 40.9% [22]. Although the patients' monthly incomes ranged between 150€ and 400€, the dependence level of the patients who had a monthly income below 220€, lived with extended families, did not have any social security coverage and were unemployed was higher.

The income and educational status of this study's research group was in the medium to low socio-economic level. The risk for acquiring COPD is higher for people at a low economic level. They often present with lower lung functions, and their low economic status may be a hindrance to maintaining the necessary hygienic conditions in their living environment [13].

The Tel et al. study reported that instrumental ADL scores of individuals aged ≥81 indicated they had a low economic status, lacked social security coverage, lived in an extended family and were divorced and widoved. Nevertheless, these individuals still exhibited a moderate independence [17]. Patients living in towns tend to be more dependent on others in ADL. This could stem from a weakened traditional extended family structure, which would have usually provided patients with the care they would need.

When patients were evaluated according to the characteristics of the diseases and status in performing ADL, results indicated that those who had

family members with COPD, had coped with the disease for 11-19 years, had previous hospitalizations and had a frequency of hospitalization once every 2-3 months were more dependent in ADL.

We have concluded that having another family member with COPD leads to difficulties in receiving support for care. The study of Ince et al. points out that duration of the disease affects patients' perceptions of daily living. When patients have been ill with COPD over a longer period of time, symptoms are often more pronounced and may significantly affect patients' ability to carry out their daily living tasks [9].

Nevertheless, more than half the rate of independence of patients who had the disease for ≥20 years may be attributable to their ability to learn to live with their COPD and to make the appropriate changes for their lives. It has been reported that when COPD patients do not receive regular and high-quality care, their symptoms can become aggravated, and complications may occur with an increase in the frequency of hospitalizations [3].

In another study in which frequency of hospitalization was investigated in terms of acute attack frequency, it was noted that patients had been hospitalized 1-3 times during the previous year (47.8%) and nearly all of these patients had been hospitalized with the same frequency [23]. Our research found that more than half of the patients had been hospitalized once every 2-3 months and nearly half had been hospitalized once or twice a year. This is considered a high rate of frequency of hospitalization.

Disabilities and disorders may occur among the elderly due to the changes caused by physiological aging. In particular, cardiac, pulmonary, renal and immune functions present a constant decrease which may result in the development of various diseases [24]. Our study results found that those who had another chronic disease apart from COPD were more dependent in ADL. Our findings support similar studies in the literature [17,19]. It is also known that occasional inflammation, history of hospitalization, and other diseases exert an effect on COPD amnesia [25].

Ucku and Ergin reported that the dependence rate of ADL among the elderly with one or more chronic diseases was 28.8% [19]. Our study revealed that patients with another chronic disease were fully dependent or moderately dependent in

performing ADL. Other studies have reported that patients' quality of life deteriorates when disabilities due to aging and the presence of other diseases coexist with COPD symptoms [3].

In the present study, most of the patients had one or more chronic diseases and used medicines continuously. Continuous use of medicines indicated that these elderly patients had at least one chronic disease, and they had been using several medicines for a long time. Since most of the study participants had co-morbid diseases and most were using ≥7 medicines, this may be an indicator that they were dependent in performing ADL.

Most of the patients with COPD are elderly. Additional chronic diseases are common and they might have to face significant losses [5]. When patient's other chronic diseases were analyzed, hypertension was seen most often followed by cardiac diseases. The Berberoglu et al. study reported that hypertension, cerebrovascular events and heart failure were the most commonly seen chronic diseases among the elderly [18].

The Training Guide of the Turkish Health Ministry (2011) indicates that COPD is accompanied mostly by cardiovascular system diseases (CVD), especially during the advanced stages of COPD [6]. In our study, the ADL dependence level of those who had heart diseases as well as COPD increased significantly. Potential factors in COPD leading to increased CVD risk include increased oxygen consumption resulting in elevated cardiovascular stress with the need to increase peripheral oxygen delivery. Finally, COPD patients are likely to be more sedentary due to exercise limitation, in turn worsening their risk for CVD [26]. The study of Sahbaz and Tel reported that those who had chronic diseases, particularly those with neurological and cardiovascular system diseases, were more dependent in their ADL needs [16]. This finding supports the correlation between a chronic disease and ADL dependence.

The aim in COPD treatment is to diagnose the disease early and begin treatment as soon as possible. The treatments cited in the literature generally include pharmacological treatments such as bronchodilators and corticosteroids [13,27]. Other pharmacological treatments for COPD include antibiotics, vaccinations, alpha-1 antitrypsin augmentation therapy and pulmonary rehabilitation [13].

Our patients used mostly bronchodilators, expectorants, antibiotics and corticosteroids. There was a statistically significant difference between ADL dependence status and antibiotics use. The most important criteria for determination of antibiotics indication in COPD is sputum purulence. Patients with the three symptoms of increased shortness of breath, increased sputum amount and purulent sputum should be treated with antibiotics. Antibiotic treatments should be considered for those with two of these symptoms, and antibiotic administration is recommended if one of these symptoms is sputum purulence [6].

ADL dependency was higher among those who did not take their medicines regularly, did not exercise regularly, and had irregular sleep habits. ADL dependence is higher among those who do not use medicines regularly, and some experts in the field believe this may result from poly-drug use, drug interaction and side effects [13,28]. Exercise is a component of physical activity that is performed for the purpose of improving physical fitness, and home walking is a convenient, well-tolerated exercise option for people with COPD [29].

The exercise of choice for all the patients was walking, however, none of them did breathing and coughing exercises which are required for pulmonary rehabilitation. It has been proven that inspiratory muscle trainings improve a patient's breathing capacities and reduce dyspnea [13]. We determined that our patient group required not only medical treatment but also pulmonary rehabilitation programs and trainings. We are of the opinion that health personnel should put more emphasis on the training and rehabilitation needs of COPD patients. Regular pulmonary rehabilitation programs prevent economic losses by reducing the number of hospitalizations as well as unnecessary drug use [30].

Elderly patients should be actively encouraged to engage in exercise as this may increase their self- sufficiency in activities of daily living [1]. A very common complaint among the elderly is poor quality sleep and not enough sleep. The Kaya et al. study found that the usual symptoms for the decreased functions among COPD patients were dyspnea, fatigue and sleep problems [3]. Sleep problems in the elderly may result from psychological and physical diseases as well as the normal aging process [31].

Smoking is one of the leading causes for COPD and is responsible for 90% of the known cases [13]. Inhaled smoke or irritants are thought to trigger alveolar macrophages and the epithelium to secrete tumor necrosis factor-alpha, interleukin 8, and chemokines such as macrophage inflammatory proteins [32]. COPD occurs in 15-20% of smokers, and one of five people who smoke carries risks for COPD development in their lives. In our group of patients 50% had quit smoking due to COPD. It has been reported that giving up smoking may prevent pulmonary dysfunctions except in the advanced stage of the disease [13].

On the other hand patients who continue to smoke may be prevented from taking part in pulmonary rehabilitation programs [9]. Therefore, it is crucial that COPD patients quit smoking as soon as possible.

Some studies have shown that the patients with COPD experience activity restrictions and discomfort during ADL [10,11]. A review of the literature reveals that the elderly are most dependent on others for help in the activities of bathing, dressing and transferring [1,17,20]. Our study demonstrated that the activity in which patients needed the most help was for bathing. The Kesioglu et al., study which evaluated ADL among the elderly, also revealed that the highest dependence occurred in bathing (7% of the patients were fully dependent whereas 10.1% were semi-dependent) [33].

These results were seen again in the Kaya et al. study with COPD patients which showed that patients were most dependent in ADL for their bathing needs [3]. This study, also suggested that patients had a higher dependence in dressing, transferring and eating after bathing. Our findings were similar to those mentioned above.

In the present study 12% of the COPD patients were fully dependent, 21.7% were moderately dependent and 66.3% were independent in terms of activities of daily living. The study of Bektaş and Şahin indicated that individuals aged ≥65 were dependent in one or more activities of daily living, 10% of individuals aged 65-69 needed help, and 47% of the individuals aged ≥85 were dependent in ADL [1].

The mean ADL scores of the participating patients were 14.61±4.23. When the highest score was 18, patients scored higher than average.

Yıldırım and Karadakovan's study related to ADL reported that 160 elderly scored 11.56±1.09 on the ADL scale where the highest score was 12 [34]. These results concurred with ours.

Conclusion

In terms of activities of daily living our study results found that the COPD patients were dependent in bathing, dressing, transferring and eating. Age, monthly ıncome, family structure, presence of heart disease together with COPD, and antibiotic use affected patients' dependence status in ADL.

In conclusion, in caring for the elderly with COPD, medical professonals should do all possible to ensure that these patients are given the opportunity to lead more self-sufficient lives. Therefore, the dependence levels of elderly COPD patients and the affecting factors in performing their ADL must first be accurately assessed. This information will be crucial in developing the necessary programs and patient support systems to render positive and useful assistance to this very vulnerable population.

Limitations

This study was conducted only Turkish elderly patients with COPD and only one county in Turkey. The results of this study may be generalized to the sample group in this study. The sample in this study reflects only one area of Turkey. The findings therefore cannot be generalized to all patients with COPD in Turkey. Thus, further studies with larger Turkish sample sizes are needed. Therefore, the findings of this study will contribute to the literature currently available to health care professionals who provide services related to this issue.

Acknowledgements

References

1. Bektas HA, Sahin H. Daily life activity status and depression levels in geriatric patients. The Journal of Academic Geriatrics 2010; 2: 155-161 (in Turkish).

2. Ulusel B, Soyer A, Ucku R. Dependence in daily living activities among community dwelling elderly: prevelance and risk factors. Turkısh Journal of Geriatrics 2004; 7: 199-205 (in Turkish).

3. Kaya E, Ozbek S, Tekin A, Ergin S, Yaman A. Evaluatıon of actıvıtıes of daıly lıvıng among elderly patients with COPD. Turkısh Journal of Geriatrics 2010; 13: 111-116 (in Turkish).

4. Pauwels RA. National and interventional guidelines for COPD. The need for evidence. Chest 2000; 117: 20-2.

5. Elofsson LC, Öhlen J. Meanings of being old and living with chronic obstructive pulmonary disease. Palliative Medicine, 2004; 18: 611-618.

6. The Ministry of Health of Turkey, The General Directorate of Primary Health Care, Training Modüie for primary care physicians in diagnosis and treatment of Asthma and Chronic Obstructive Pulmonary Disease (COPD). Educator Guide, Ankara. Retrieved June 10, 2011, Available from The Ministry of Health of Turkey Web site: http: //www.saglik.gov.tr/GARD/dosya/1-72027/astim-koah-egitimci-rehberi.pdf.

7. Pauwels RA, Rabe KF. Burden and clinical features of chronic obstructive pulmonary disease (COPD). Lancet 2004; 364: 613-620.

8. Chan-Yeung M, Ait-Khaled N, White N, Ip MS, Tan WC. The burden and impact of COPD in Asia and Africa. International Journal of Tuberculosis Lung Disease, 2004; 8: 159-170.

9. Ince DI, Savcı S, Coplu L, Arıkan H. Evaluatıon of daıly lıvıng actıvıtıes in chronic obstructive pulmonary disease. Turkish Thoracic Journal 2005; 6: 31-36 (in Turkish).

10. Lahaije AJM, Helvoort HAC, Dekhuijzen PNR, Heijdra YF. Physiologic limitations during daily life activities in COPD patients. Respiratory Medicine 2010; 104: 1152-1159.

11. Skumlien S, Hagelund T, Bjortuft Q, Ryg MS. A field test of functional status as performance of activities of daily living in COPD patients. Respiratory Medicine 2006; 100: 316-323.

12. Jeng C, Tsao L, Ho C, Chang P. Experiences of daily activities within two weeks after hospital discharge among Taiwanese elderly patients with chronic obstructive pulmonary disease. Journal of Nursing Research 2002; 10: 168-175.

13. Ovayolu N, Ovayolu O, Ates C. Chronic obstructive pulmonary disease and nursing care. Fırat Saglık Hizmetleri Dergisi 2008; 3: 4-15 (in Turkish).

14. Shelkey M, Wallace M. Katz Index of Independence in Activities of Daily Living. Journal of Gerontological Nursing 1999; 25: 8-9.

15. Torres JP, Casanova C, Garcini AM, Jaime AA, Celli BR. COPD heterogeneity: Gender differences in the multidimensional BODE index. International Journal of COPD 2007; 2: 151–155.

16. Sahbaz M, Tel H. Determınatıon of the relatıonshıp between the dependence status on daıly lıvıng actıvıtıes and home accıdents among 65 years of age and older individuals living at home. Turkish Journal of Geriatrics 2006; 9: 85-93 (in Turkish).

17. Tel H, Tel H, Sabancıogulları S. Status of maıntenance of actıvıtıes of daıly lıvıng and experıence of lonelıness ın elder than 60 years old lıvıng at home and ın ınstıtutıons. Turkish Journal of Geriatrics 2006; 9: 34-40 (in Turkish).

18. Berberoglu U, Gul H, Eskiocak M, Ekuklu G, Saltık A. Some socıo-demographıc specıalıtıes and daıly actıvıtıes of the elderly people accordıng to the Katz ındex who lıve ın Edırne rest house. Turkish Journal of Geriatrics 2002; 5: 144-149 (in Turkish).

19. Ucku R, Ergin S. Activities of daily living in the elderly. Bulletin of Community Medicine 1993; 14, 1-5 (in Turkish).

20. Gunes G, Demircioglu N, Karaoglu L. Daıly lıvıng actıvıtıes, socıal and psychologıcal functıon levels of older women lıvıng ın central Malatya. Turkısh Journal of Geriatrics 2005; 8: 78-83 (in Turkish).

21. Cecen D, Ozbayır T. Evaluation of the general health status of the geriatric patients who are treated in surgical clinics. Ege Universitesi Hemsirelik Yuksek Okulu Dergisi 2010; 26: 11-22 (in Turkish).

22. Bahar A, Tutkun H, Sertbas G. The determination of the level of anxiety and depression of old people who live in the nursing home. Anatolian Journal of Psychiatry 2005; 6: 227-239 (in Turkish).

23. Ulubas B, Sezer C, Cimen F. Demographic characteristics of patients with chronic obstructive pulmonary disease. Turkish Clinics Journal of Medical Science Pulmonary Archive 2003; 4: 27-30 (in Turkish).

24. Kart L. Methods of diagnosis of chronic obstructive pulmonary disease. Journal of Chest Diseases, 2003; 1: 18-25 (in Turkish).

25. Ergun GO, Bozdemir N, Uguz S, Guzel R, Burgut R, Saatcı E, et al. Evaluatıon of the medical and social characteristics of the elderly living at the community residence of Adana and those applyıng to the family medicine outpatient clinic. Turkısh Journal of Geriatrics 2003; 6: 89-94 (in Turkish).

26. Finkelstein J, Cha E, Scharf SM. Chronic obstructive pulmonary disease as an independent risk factor for cardiovascular morbidity. International Journal of COPD 2009; 4: 337–349.

27. Mensing M, Aalbers R. Comparison and optimal use of fixed combinations in the management of COPD. International Journal of COPD 2007; 2: 107–116.

28. Yohannes AM, Connolly MJ, Baldwin RC. A feasibility study of antidepressant drug therapy in depressed elderly patients with chronic obstructive pulmonary disease. International Journal of Geriatric Psychiatry, 2001; 16: 451-454.

29. Donesky D, Janson SL, Nguyen HQ, Neuhaus J, Neilands TB, Carrieri-Kohlman V. Determinants of frequency, duration, and continuity of home walking in patients with COPD. Geriatric Nursing 2011; 32: 178-187.

30. Ulubas B, Cimen OB, Kanık A, Erdogan C. Functional performance scores in patients with COPD and asthma, respiratory muscle strength and evaluation of respiratory function tests. Turkish Clinics Journal of Medical Science Pulmonary Archive 2004; 1: 6-9 (in Turkish).

31. Akgun HS, Bakar C, Budakoglu II. Health and mental status and daıly lıvıng actıvıtıes of 65 years and over hospıtalızed patıents at Baskent unıversıty hospıtals network. Turkısh Journal of Geriatrics 2004; 7: 133-138 (in Turkish).

32. Bozinovski S, Vlahos R, Hansen M, Liu K, Anderson GP. Akt in the pathogenesis of COPD. International Journal of COPD 2006; 1: 31–38.

33. Kesioglu P, Bilgic N, Pıcakcıefe M, Ucku R. The prevalence of the chronic disease and disability in elderly population at Çamdibi-1 health center's region in İzmir. Turkish Journal of Geriatrics 2003; 6: 27-30 (in Turkish).

34. Yıldırım YK, Karadakovan A. The relationship between fear of falling, activities of daily living and quality of life among elderly individuals. Turkısh Journal of Geriatrics 2004; 7: 78-83 (in Turkish).

Corresponding Author
Sevilay Hintistan,
Department of Medical Nursing,
Faculty of Health Science,
Karadeniz Technical University,
Trabzon,
Turkey,
E-mail: sevilayhindistan69@yahoo.com

Integrons and multidrug resistance among *E. coli* and *Klebsiella pneumoniae* isolated from children with urinary tract infections

Sima Sadat Seyedjavadi, Gita Eslami, Mehdi Goudarzi, Hosein Goudarzi, Fateme Fallah

Department of Microbiology, School of medicine, Shahid Beheshti University of Medical sciences, Tehran, Iran.

Abstract

Objectives: UTI is one of the most important causes of morbidity in general population and is the second most common cause of hospital visits. The aim of this study was to investigate the prevalence of integrons in a selection of MDR Escherichia coli and Klebsiella pneumoniae from children and their associations with multiple drug resistance.

Methods: During the 3 month study period, a total 233 urine samples from children having urinary tract infections (UTI) were included in the study. The organisms were identified using standard laboratory procedures. The antimicrobial susceptibility profile for all isolates was determined by estimating susceptibility of the 14 antibiotics using Kirby Bauer disk diffusion method and the frequency of multi-drug resistance and their associations with integron were assessed by PCR.

Results: E. coli and K. pneumoniae were isolated from 204 patients, of which 174(85.3%) belonged to E. coli and 30(14.7%) belonged to K. pneumonia. Of the 174 E. coli and 30 klebsiella isolates, 148 (85 %) and 21(70%) were multi- drug resistant.

Class 1 integrons were found in 34% of the E. coli and in 13.3% of the K. pneumoniae isolates.

Class 2 integrons were found in 12.6% of the E. coli and Class 2 integron was not found in K. pneumoniae isolates. The existence of integron among E.coli clinical isolates was significant association between resistance to ampicillin, gentamicin, tetracycline, cotrimoxazole, ciprofloxacin, nalidixic acid. Resistance to ampicillin and nalidixic acid was significantly more common in K. pneumonia isolates with integron.

Conclusions: Multi-drug resistance suggests that strategy for treatment of patients with E.coli and klebsiella infections needs to be revised. The results of this study indicate that Imipenem and Amikacin were the most effective antibiotics against isolates.

The possibility transmission of resistance genes by integrons would be decreased by treatment of patients with the appropriate antibiotics.

Key words: Escherichia coli, Klebsiella, urinary tract infections, PCR.

Introduction

Urinary tract infections (UTIs) are one of the most common infectious diseases in children and its symptoms range from mild irritative voiding to bacteremia, sepsis, or even death. Urinary tract infection (UTI) is serious health problem which requiring antimicrobial therapy (1, 2). Among bacteria causing UTI, Escherichia coli is the common cause of UTI and responsible for more than 85% of community-acquired and 50% of nosocomial UTI (2, 3). Klebsiella pneumoniae is the second most frequency found bacteria in patients with UTI (4). Although mortality rates associated with UTI is usually low but it is urgent to use of antibiotics for UTI treatment. Widespread use of Antibiotics in treatment of UTI is the main cause of generation and maintenance multidrug-resistant (MDR) bacteria that are frequently found in UTI. In particular, multi drug resistance (MDR) is major problems for the empirical treatment of patients (5).Increase and spread of resistant to antibiotics among UTI-causing organisms is a great concern (4). Many studies shown that the enormous and inappropriate use of antibiotics are the most significant factors for the development of bacterial resistance to several antimicrobial drugs (6). Increase resistant to applied antibiotics in treatment of UTI is steadily increasing and in spite of reduced use, resistance to them has remained high level. It has been shown that, resistance genes can spread through the world's bacterial populations irrespective of the pattern of antimicrobial use in an area (7).Therefore; mechanisms other than selection pressure might exist for maintaining

a resistant bacterial pool. All of drug resistance mechanisms are encoded by resistant genes which there are in bacterial genomes and in extra-chromosomal pieces of DNA. The resistance genes can be acquisition by horizontal transfer mechanism, mediated by mobile genetic elements. The elements that facilitate horizontal transfer of resistance genes include plasmids, transposons and integrons. They are involved in the spread of resistance (8). Horizontal transfers are a major mechanism for dissemination of antibiotic resistance genes and contribute to the rapid spread of multi-drug resistance among clinical isolates of bacteria (9). Multidrug resistance (MDR) may be encoded by chromosomally located resistance determinants or mutations in a resident gene. Integrons are genetic elements that comprise recombination and expression systems capable of integrating and expressing the genes contained in cassette structures (10). Five classes of integron so far have been identified that are recognized by their distinct integrase genes (9-11). Class 1 integrons extremely prevalent among clinical isolates and in many cases are associated with lateral transfer of antibacterial resistance genes. Class 2 integrons are less common than class 1 and have been frequently reported in Gram-negative bacteria. The reported epidemiology of other integrons classes are very rare to date. In total, integrons as a marker of antibiotics resistance have a well-established role in the spread of resistance among Gram negative bacteria and presence of them in clinical isolates is strongly associated with MDR (12) .The aim of this study was to investigate the prevalence of Multi-drug resistance in Escherichia coli and Klebsiella pneumonia isolates from children with UTI and their associations with existence of integron.

Material and methods

Bacterial Isolates

Isolates were collected from early April2011 through the end of June 2011 from children aged below 15 years referred to three hospitals affiliated with Shahid Beheshti University of Medical Science in Tehran, Iran. Children with urinary tract abnormalities, renal failure and history of recent antibiotic use within 15 days before the study were excluded from study. Only patients who had pyuria (>10 white blood cells/μL), acute voiding symptoms and significant bacteriuria (>10^5 CFU/mL) were included in the microbiological analysis. UTI diagnosis was established by the hospital physicians based on clinical symptoms and laboratory investigation. In total, 233 urine samples from children having urinary tract infections (UTI) were included in the study. The organisms were identified using standard laboratory procedures (13).

Antibiotic susceptibility test

The antimicrobial susceptibility profile for all isolates was determined by estimating susceptibility of the 14 antibiotics using Kirby Bauer disk diffusion method. Antibiotic susceptibility testing of each isolates was performed on Mueller Hinton agar with commercial antimicrobial discs (Mast. Co, UC). Clinical Laboratory and Standards Institute (CLSI; formerly National Committee for Clinical Laboratory Standards) criteria were used to interpret of breakpoints (14).

The following antimicrobial agents were tested in this study: ampicillin (10 μg), cotrimoxazole(30 μg), Cefixim (30 μg), ceftriaxone (30 μg) , gentamicin(10 μg), nalidixic acid (30 μg), ciprofloxacin(5 μg), tetracycline (30μg), imipenem (10μg), amikacin (30 μg), chloramphenicol(30 μg), nitrofurantoin(300 μg), norfloxacin (10 μg), Cefotaxime (30 μg). Escherichia coli ATCC 25922 were used as control strains for susceptibility studies. Multi drug resistance was defined as resistance of an isolate to more than two unrelated drugs.

Polymerase chain reaction (PCR)

DNA extraction procedure was done according to the methods described by Solberg et al (15). Bacteria were harvested from 1.5 ml overnight cultures Luria-Bertani broth, suspended in distilled water, and incubated in 95 C for 10 min boiled, after centrifuge supernatant was used as template DNA. Detection of Integron classes were carried out using PCR with degenerate primers designed to hybridize to conserved regions of integron encoded integrase genes intI1and intI2. The primers used for detection of int1 and int2 genes by PCR method are presented in Table (1).

The PCR reactions were done a total volume of 25 mL containing 2.5 ml of 10x PCR, 1.5 ml of 50 mM MgCl2, 2 ml of 2.5 mM dNTP, 1ml of primer (forward and reverse) together with 1 unit of Taq

DNA polymerase (5 U/ml). Volume of the reaction mixture was adjusted by adding filtered deionised water. Positive and negative controls were included in each run.PCR conditions was done by thermocycler (Perkin-Elmer Cetus, Emeryville, 480220/220 V. 50 Hz) as follows: initial denaturation 10 min at 94 °C, followed by 35 cycles of 2 min at 94, 1 min 60 °C for int1 and 1min 48 °C for int2, and 1 min at 72 °C; and final extension at 72 °C for 10 min to end amplification process. Amplicons were separated by horizontal gel electrophoresis in 1.5% agarose gel in TBE (Tris-borate EDTA) buffer at room temperature at 85V for 2h with mix DNA ladder. Finally, fragments were stained by ethidium bromide for 15 minutes and visualized under UV light and photographed.

Statistical analysis

All samples were analyzed using with SPSS software for Windows, version 11.0 (SPSS Inc., Chicago, IL). The significance of results was determined using the chi-square test and fisher's exact test. P values less than 0.05 were considered stastically significant.

Results

During the 3 month study period 233 urine specimens were recovered from children with community acquired UTI from three different university hospitals in Tehran. E. coli and K. pneumoniae were isolated from 204 patients, of which 174 (85.3%) belonged to E. coli and 30 (14.7%) belonged to K. pneumonia. The other isolates recovered from UTI patients were Proteus mirabilis 11 (4.7 %), Enterobacter spp. 9 (3.9%), Pseudomonas aeruginosa 5 (2.1%), Enterococcus spp. 4 (1.7%).One hundred fifty-seven (68.5%) patients were males and seventy two (31.4%) were females (male to female ratio 2.18:1). Antimicrobial susceptibility testing was done to determine the antibacterial suscepti-

bility pattern of the isolates. In vitro susceptibility of 174 E.coli and 30 K. Pneumonia isolates to 14 antibiotics tested are presented in Table (2). Both of these organisms showed variable pattern of susceptibility. Antibiotic susceptibility results of E. coli isolates showed that resistance to ampicillin was in 174 isolates (100%), chloramphenicol in 162 (93.1%), tetracycline in 127 (73%), cotrimoxazole in 90 (51.7%), cefixim in 55 (31.6%), ciprofloxacin in 43 (24.7%), ceftriaxone in 40 (23%), nitrofurantoin in 39 (22.4%), Cefotaxime in 37 (21.3%), norfloxacin in 22 (12.6%), gentamicin in 15 (8.6%), nalidixic acid in 10 (5.7%) and amikacin in 5 (2.9%). No resistance to imipenem was obtained in the isolates studied. Of the 30 K. pneumonia isolates tested resistant to ampicillin, cefixim, cotrimoxazole, Cefotaxime, ceftriaxone, ciprofloxacin, nalidixic acid, tetracycline, chloramphenicol, gentamicin, norfloxacin, nitrofurantoin were observed in 80%, 53.4%, 50%, 4.3%, 36.6%,33.3%, 26.5%, 23.3%, 16.5%,13.2%, 10%,10% respectively. E. coli isolates in this study showed more resistance than Klebsiella isolates. The major difference was observed for chloramphenicol and tetracycline. E. coli isolates showed high resistance to chloramphenicol and tetracycline, while Klebsiella isolates showed low resistance to these agents. None of the K. pneumoniae isolates was found resistant to amikacin and imipenem. Resistance was found to be higher in E. coli strains for antibiotics ampicillin, chloramphenicol, tetracycline, cotrimoxazole, nitrofurantoin, norfloxacin and amikacin. Antibiotic susceptibility results showed that 10.7% of isolates were fully susceptible to all tested antibiotics. None of the strains tested were found to be resistant to all antimicrobial agents. Resistance to three or more than antibiotics was observed in 76.4% of isolates. Of the 174 E. coli isolates, 148 (85 %) were multi-drug resistant and Of the 30 klebsiella isolates, 21 (70%) were multi- drug resistant. Only 4 isolates of Proteus and 2 isolates of Pseudomonas were

Table 1. Primers used in the PCR assay

Primer name	Sequence (50!30)	Target gene or region(s)	PCR product size (bp)	Reference
int-F int-R	GCCACTGCGCCGTTACCACC GGCCGAGCAGATCCTGCACG	intI1	898	35
intI2F intI2R	GCAAATGAAGTGCAACGC ACACGCTTGCTAACGATG	intI2	466	36

multi- drug resistant. Of 174 E. coli strains tested 59 (34%) and 22 (12.6%) isolates had evidence of class 1 and class 2 integron respectively. Class 1 integrons were presented in 4 (13.3%) isolates of K. pneumoniae (Figure 1, 2). Class 2 integron was not found in K. pneumoniae isolates. The int1 and int2 genes were found together only in 3 isolates of E. coli. The existence of integron was not confirmed in none of the multi drug resistant strains of Proteus mirabilis and Pseudomonas aeruginosa. The prevalence of class 1 and 2 integrons among E. coli and K. pneumonia isolates and their association with antibiotic resistance in this study is presented in Table 2. The existence of integron among E.coli clinical isolates was significantly associated with resistance to ampicillin, gentamicin, tetracycline, cotrimoxazole, ciprofloxacin, nalidixic acid. Resistance to ampicillin and nalidixic acid was significantly more common in K. pneumonia isolates with integron compared to those without (Table 2).
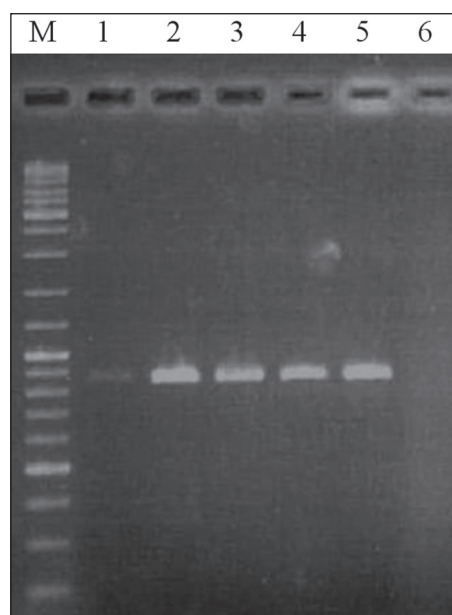
Figure 1. Class 1 integron (int1; 898bp) PCR of Escherichia coli and Klebsiella pneumoniae isolates. Lanes 1-3: int1-positive E. coli isolates; lanes 4, 5: int1-positive K. pneumoniae isolates; Lanes 6: int1-negative. M: Mix DNA ladder

Table 2. Antibiotic sensitivity of E.coli and K. pneumonia strains isolated from children with UTI and correlation with integrons

Antibiotic	Total resistant n (%)		Resistance of int-positive strains n (%)				Association with Integron[1]	
			Class I		Class II			
	E.coli	klebsiella	E.coli	klebsiella	E.coli	klebsiella	E.coli	klebsiella
Ampicillin	174(100)	24(80)	43(24.7)	3	20(34.8)	0(0)	**0.0003**	**0.025**
Chloramphenicol	162(93.1)	5(16.5)	13(8)	1	19(11.7)	0(0)	0.7235	0.107
Tetracycline	127(73)	7(23.3)	27(21.2)	0	21(16.5)	0(0)	**0.0167**	--
Cotrimoxazole	90(51.7)	15(50)	8(8.9)	2	16(17.7)	0(0)	**<0.0001**	<0.074
Cefixim	55(31.6)	16(53.4)	4(7.2)	0	5(9)	0(0)	0.061	--
Ciprofloxacin	43(24.7)	10(33.3)	4(9.3)	0	1(2.3)	0(0)	**<0.0001**	--
Ceftriaxone	40(23)	12(36.6)	2(5)	0	4(10)	0(0)	0.5467	--
Nitrofurantoin	39(22.4)	3(10)	7(17.9)	0	0(0)	0(0)	0.6155	--
Cefotaxime	37(21.3)	1(4.3)	5(13.5)	0	3(8.1)	0(0)	0.3314	--
Norfloxacin	22(12.6)	3(10)	3(13.6)	1	0(0)	0(0)	1.0000	0.214
Gentamicin	15(8.6)	4(13.2)	2(13.3)	0	1(6.6)	0(0)	**0.0253**	--
Nalidixic acid	10(5.7)	8(26.5)	1(10)	2	0(0)	0(0)	**0.0002**	**<0.0001**
Amikacin	5(2.9)	0(0)	0(0)	0	0(0)	0(0)	--	--
Imipenem	0(0)	0(0)	0(0)	0	0(0)	0(0)	--	--

[1]Significant values are in bold.

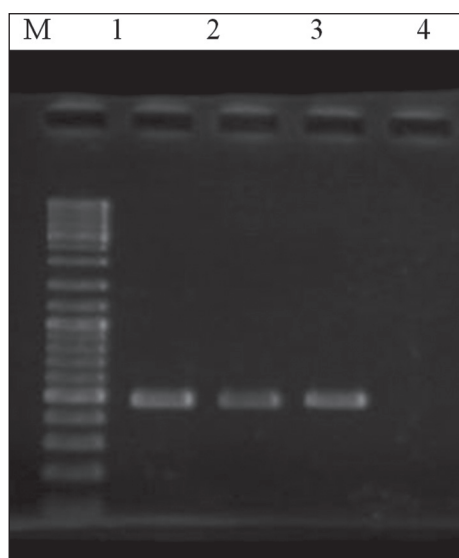*Figure 2. Class 2integron (int1466bp) PCR of Escherichia coli isolates. Lanes 1, 2, 3: int2-positive E. coli isolates; Lanes 4: int2-negative. M: Mix DNA ladder*

Discussion

Urinary tract infection (UTI) is one of the most common infection and the most important cause morbidity in developing countries, including Iran. Resistance to antimicrobial agents among bacteria causing UTI is steadily increasing and appeared as a major problem in hospitals and health care settings (16, 17). This study undertaken to investigated the antibiotic susceptibility pattern and the prevalence of integron and its relation to antimicrobial resistance in to E. coli and K. pneumonia strains isolated from children community acquired UTI that exhibited multi drug resistance pattern. A total of 233 isolates associated with UTI were analyzed. E.coli was observed in 85.3% cases, while K. pneumonia was observed in 14.7%. Consistent with other reported studies, the isolation rates of E. coli was higher than the other organisms isolated from urine sample of patients with UTI (18, 19). Antimicrobial susceptibility pattern of E. coli and K. pneumonia showed that resistance patterns of these organisms are different. In our study, all E. coli isolates were found to be resistance to ampicillin (100%) and resistance to other antibiotics including chloramphenicol (93.1%), tetracycline (73%) and cotrimoxazole (51.7%) appears to be very high. This is in accordance with Rijavec et al who showed a high incidence of antibiotic resistance among E.coli

strains from Slovenia to ampicillin, tetracycline and chloramphenicol (20). High level of resistance to ampicillin, tetracycline and cotrimoxazole among E.coli strains isolated from urine samples has also been reported by many investigators (21, 22). Increased resistance could be explained by high subscription and misuse of these drugs for UTI patients in Tehran hospitals. The most levels of resistance among K. pneumonia strains were belonged to antibiotics ampicillin, cefixim, cotrimoxazole, Cefotaxime respectively. About K. pneumonia isolates, the percentage of resistance to all antibiotics tested was lower in compared to previous studies (23, 24). All K. pneumonia and E. coli isolates were reported to be sensitive to imipenem. This is comfort to other studies (20-25).Imipenem with 100% sensitivity was the most effective antibiotic against isolates. This also was reported by Tariq et al (26). It seems that imipenem can recommend as drug of choice for the treatment of UTI caused by E. coli, K. pneumonia and other Gram-negative isolates. The data from present study exhibited that resistance to nalidixic acid and gentamicin in our E. coli isolates was lower than the resistance reported in other studies (21, 22). About seventy six percent of isolates showed MDR. Rijavec et al reported that 42% of E. coli isolates were MDR (20). Other studies showed the frequency of MDR isolates was 7.1 in the USA (27, 28), 75% in India (21) and 77% in Iran (15). Previous studies have shown that the level of multi drug resistance among UTI isolates in geographic areas is vary and rapidly changing over time. The survey of integrons prevalence and their role in dissemination of antimicrobial resistance in a collection of isolates collected from urine of children in Tehran, Iran exhibited that 46.6% of the E. coli strains and 13.3% of the K. pneumonia strains were integron positive. The prevalence of integron has reported to be varying from 22 to 52% in E. coli clinical isolates (29, 30). Wite et al reported integrons in 49% of the isolates of Enterobacteriaceae (31).other studies found that the prevalence of integrons in E. coli was 48.3% in India (21), 49%% in the USA (32). All this studies propose that integrons are widespread among clinical bacterial isolates especially in Enterobacteriaceae and may be partly associated with the spread of multi-drug resistance. In E. coli isolates selected for this study class 1 integrons were the most prevalent, in line

with the results of other studies (15, 21, 22) while class 2 integrons were detected in a limited number of isolates(13.3%). The high level of integrons in our samples implies that integrons are evolving. The prevalence of class 1 integrons in Klebsiella isolates was lower than the rate reported in other studies (23, 33). High prevalence of integrons in our E. coli isolates (46.6%), suppose that the role of integrons in the spread of resistance may be more highlight than other mobile genetic elements such as plasmids and transpons. In addition, the detection of integrons with high level among E.coli strains confirms the propensity of E.coli to carry and transfer MDR genes between enteric pathogens. In E.coli strains integrons were significantly associated with resistance to ampicillin, gentamicin, tetracycline, cotrimoxazole, ciprofloxacin, nalidixic acid. In klebsiella strains integrons were significantly associated with resistance to ampicillin and nalidixic acid. The high level of resistance observed among our isolates, in conforms to earlier studies, emphasizes that acquisition of resistance determinants may not be a random process (34). Initial acquisition of one or two important resistance genes might therefore act as a platform for acquiring more resistance genes. Our findings indicate that resistance determinants for these drugs are frequently carried by integrons and mobilization of resistance determinants by plasmids or transposons would be alternative approaches.

In summary, our study exhibited that E. coli and Klebsiella are the important causative agents of urinary tract infection in children. Amikacin and imipenem were the most effective antibiotics against strains isolated from children with community acquired UTI in Tehran. The high level of resistance to antibiotics among E. coli strains under the study and its association with integrons suggested that integrons facilitate the spread of antimicrobial drug resistance.

References

1. Sefton AM. The impact of resistance on the management of urinary tract infections. Int J Antimicrob Agents 2000; 16:489–91.

2. Sevanborg C, Godaly G. Bacterial virulence in urinary tract infection. Infect.Dis. Clin. North. Am1997; 11:513-521.

3. Villa L, Pezzella C, Tosini F, Visca P, Petrucca A, Carattoli A. Multiple-antibiotic resistance mediated by structurally related IncL/ M plasmids carrying extended-spectrum beta-lactamase gene and a class 1 integron. Antimicrob. Agents Chemother2000; 48: 2911-2914.

4. Gupta K. Addressing antibiotic resistance. Am J Med2002; 113: 29S-34S.

5. Calbo E, Romani V, Xercavins M, Gomez L , Vidal CG, Quintana S,Vila J, Garau J. Risk factors for community-onset urinary tract infections due to Escherichia coli harboring extended-spectrum beta lactamases. J. Antimicrob. Chemother2006; 57: 780-783.

6. Goossens H, Ferech M, Vander SR, Elseviers M. M. ESAC Project Group. Outpatient antibiotic use in Europe and association with resistance: a cross-national database study. Lancet 2005; 365: 579-87.

7. O'Brien TF. Emergence, spread, and environmental effect of antimicrobial resistance: how use of an antimicrobial anywhere can increase resistance to any antimicrobial anywhere else. Clin Infect Dis 2002; 34 Suppl 3:S78–84.

8. Soulsby L. Resistance to antimicrobials in humans and animals. Br. J. Med 2005; 331: 1219-1220.

9. Ploy M C, Lambert T, Couty J. P, Denis F. Integrons: an antibiotic resistance gene capture and expression system. Clin. Chem. Lab. Med 2000; 38:483–487.

10. Martinez-Freijo P, Fluit AC, Schmitz FJ, Grek VSC, Verhoef J, Jones ME. Class I integrons in gram-negative isolates from different European hospitals and association with decreased susceptibility to multiple antibiotic compounds. J Antimicrob Chemother1998; 42:689–96.

11. Rowe-Magnus DA, Mazel D. The role of integrons in antibiotic resistance gene capture. Int J Med Microbiol2002; 292: 115-125.

12. Fluit AC, Schmitz F. Resistance integrons and super-integrons. Clin Microbiol Infect 2004; 10: 1–17.

13. Cheesebrough M (2004). District laboratory practice in tropical countries. Cambridge University Press. pp.357.

14. Clinical and Laboratory Standards Institute (2007). Performance Standards for Antimicrobial Susceptibility Testing; Seventeenth Information Supplement. CLSI document M100-S17, Clinical and Laboratory Standards Institute Wayne Pennsylvania.

15. Solberg OD, Ajiboye RM, Riley LW. Origin of class 1 and 2 integrons and gene cassettes in a population-based sample of uropathogenic Escherichia coli. J. Clin. Microbiol2006; 44: 1347–1351.

16. Kahlmeter G. Prevalence and antimicrobial susceptibility of pathogens in uncomplicated cyctitis in Europe. The ECO. SENS study. Int. J. Antimicrob Agents2003; 2: 49-52.

17. Biswas D, Gupta P, Prasad R, Singh V, Arya M, Kumar A. Choice of antibiotic for empirical therapy of acute cystitis in a setting of high antimicrobial resistance. Indian J Med Sci 2006, 60(2):53-8.

18. Lipsky BA. Urinary tract infection in men: Epidemiology, Pathophysiology, diagnosis and treatment. Ann Int Med1989; 110: 138-140.

19. Asour HM, Elsharif A. Species distribution and antimicrobial susceptibility of gram-negative aerobic bacteria in hospitalized cancer patients. J. Trans. Med2009; 7: 1-14.

20. Rijavec M, Starcic Erjavec M, Ambrozic Avgustin J, Reissbrodt R, Fruth A, Krizan-Hergouth V, Zgur-Bertok D. High prevalence of multidrug resistance and random distribution of mobile genetic elements among uropathogenic Escherichia coli (UPEC) of the four major phylogenetic groups. Curr. Microbiol2006. 53: 158–162.

21. Mathai E, Grape M, Kronvall G. Integrons and multidrug resistance among Escherichia coli causing community-acquired Urinary tract infection in southern India. APMIS 2004; 112(3):159-64.

22. Japoni A, Gudarzi M, Farshad SH, Basiri E, Ziyaeyan M, Alborzi A, Rafaatpour N. Assay for Integrons and pattern of antibiotic Resistance in clinical Esherishia coli strains by PCR-RFLP in southern Iran.Jpn.J.Infect.Dis2008;61:85-88.

23. Lina TT, Rahman SR, Gomes DJ. Multiple-Antibiotic Resistance Mediated by Plasmids and Integrons in Uropathogenic Escherichia coli and Klebsiella pneumonia. Bangladesh J Microbiol2007; 24(1): pp19-23.

24. Khorvash F, Mostafavizadeh K, Mobasherizadeh S, Behjati M. A Comparison of Antibiotic Susceptibility Patterns of Klebsiella Associated Urinary Tract Infection in Spinal Cord Injured Patients with Nosocomial Infection. Acta Medica Iranica 2009; 47(6):447-50.

25. Adwan K, Abu-Hasan N, Adwan G, Jarrar N, Abu-Shanab B, Al-Masri M. Molecular epidemiology of antibiotic resistant Esherichia Coli isolated from hospitalized oatients with urinary tract infections in Northern Oalestine.Pol.J.Microbiol2004;53:23-26.

26. Tariq N, Jaffery T, Ayub R, Alam AY, Javid MH, Shafique S. Frequency and antimicrobial susceptibility of aerobic bacterial vaginal isolates. J. Coll. Physicians. Surg. Pak2006; 16: 196–199.

27. Gulsun S, Oguzoglu N, Inan A, Ceran N. The virulence factors and antibiotic sensitivities of Escherichia coli isolated from recurrent urinary tract infections. Saudi. Med. J2005; 26: 1755–1758.

28. Sahm DF, Thornsberry C, Mayfield DC, Jones ME, Karlowsky JA. Multi-drug resistant urinary tract isolates of Escherichia coli: prevalence and patient demographics in the United States in 2000. Antimicrob Agents Chemother 2001; 45(5):1402-6.

29. Fluit AC, Schmitz FJ. Class 1 integrons, gene cassettes, mobility, and epidemiology. Eur J Clin Microbiol Infect Dis 1999; 18:761–70.

30. Martinez-Freijo P, Fluit AC, Schmitz FJ, Grek VS, Verhoef J, Jones ME. Class I integrons in Gram-negative isolates from different European hospitals and association with decreased susceptibility to multiple antibiotic compounds. J Antimicrob Chemother1998; 42:689–96.

31. Perer A. White, Christopher J. Mciver, William D. Rawlinson. Integrons and Gene Cassettes in the Enterobacteriaceae. Antimicrob Agents Chemother2001; 45:2658-661.

32. Martinez-Freijo P, Fluit AC, Schmitz FJ, Grek VS, Verhoef J, Jones ME. Class I integrons in gram-negative isolates from different European hospitals and association with decreased susceptibility to multiple antibiotic compounds. J Antimicrob Chemother 1998; 42:689–96.

33. Rao AN, Barlow M, Clark LA, Boring JR 3rd, Tenover FC, McGowan JE Jr. Class 1 integrons in resistant Escherichia coli and Klebsiella spp., US hospitals. Emerg Infect Dis. 2006 Jun; 12(6):1011-4.

34. Leverstein-Van Hall MA, Blok HEM, Donders ART, Paauw A, Fluit AC, Verhoef J. Multidrug resistance among Enterobacteriaceae is strongly associated with the presence of integrons and is independent of species or isolate origin. J Infect Dis 2003; 187:251–9.

35. Kerrn MB, Klemmensen T, Frimodt-Møller N. Susceptibility of Danish Escherichia coli strains isolated from urinary tract infections and bacteraemia, and distribution of sul genes conferring sulphonamide resistance. J Antimicrob Chemother 2002; 50: 513–6.

36. Orman BE, Pineiro SA, Arduino S. Evolution of multiresistance in nontyphoid Salmonella serovars from 1984 to 1998 in Argentina. Antimicrob Agents Chemother 2002; 46: 3963–70.

Corresponding Author
Gita Eslami,
Department of Microbiology,
School of medicine,
Shahid Beheshti University of Medical sciences,
Tehran,
Iran,
E-mail: sima_seyedjavadi@yahoo.com

Evaluation of the blood parameters of stroke patients referring to emergency department

Mustafa Sahin[1], Sevdegul Karadas[1], Aysel Milanlioglu[2], Hayriye Gonullu[1]

[1] Yuzuncu Yil University, School of Medicine, Department of Emergency Medicine, Van, Turkey,
[2] Yuzuncu Yil University, School of Medicine, Department of Neurology, Van, Turkey.

Abstract

Although previous studies have revealed that blood parameters alone in cerebrovascular diseases had no spesificity in diagnosis, the objective of this study was to determine , within the context of a retrospective analysis, whether any differences existed between some blood parameters of various groups of patients who referred to emergency department with a history of cerebrovascular diseases. In the study, some parameters such as alanine and aspartate aminotransferase enzyme, white blood cells and thrombocytes, hematocrite, INR, prothrombin time, sodium, glucose were retrospectively investigated in emergency department in a total of 254 patients suffered from ischemic stroke, temporary ischemic attack, intracerebral hemorrhage and subaracnoid hemorrhage. There was no statistically significant difference between the sub-groups of the patients in all of the parameters apart from glucose value.

In conclusion, we suggest that early detection and management of these abnormalities in these parameters, which play an active role in the pathogenesis and the development of neuronal damage, would be imperative in terms of the clinical pattern, prognosis and recurrence of the disease

Key words: Stroke, emergency department, blood parameters, pathogenesis, neuronal damage.

Introduction

Cerebrovascular Disease(CVD) has been defined as the condition of any brain area being temporarily or permanently affected due to ischemia or hemorrhage and /or as a primary pathology of one or more blood veins related with brain (1). Pathological processes develop as a result of such conditions as lesions in the murals of the veins or permeability change, blockage of lumen with embolism or thrombosis, rupture in the veins, increase in the viscosity of the blood or other changes in the blood content, atherosclerosis, hypertensive atherosclerotic changes, dilatation due to aneurysm, arthritis, developmental malformations (2).

Numerous studies have been conducted so far related with the effects of biochemical parameters in CVD, blood markers indicating glial activation and neuronal damage. However none of these markers were found to be clinically significant in themselves for the diagnosis(3-4). This is due to the heterogenity of the cells, the difference in distribution of these cells across the brain and in their tolerance against ischemia, complexities in ischemic cascade and the blood-brain barier.

In the course of our investigation, our objective was to determine ,within the context of a retrospective analysis, whether any differences existed between some blood parameters of various groups of patients who referred to emergency department with a history of cerebrovascular diseases.

Methods

In this investigation, a total of 254 cases admitted to the Emergency Department of the Faculty of Medicine in Yuzuncu Yıl University and diagnosed with CVD were retrospectively evaluated in the period between 01.01.2008-31.08.2008. These cases, categorized in four sub-groups of CVD as ischemic stroke (IS), temporary ischemic attack (TIA), intracerebral hemorrhage (ICH), subaracnoid hemorrhage (SAH), were investigated in terms of their demographic data and laboratory findings obtained during their admittance to the clinic. Analyses were conducted in order to find out whether there existed any differences between various sub-groups of the patients and different variables.

Statıstıcal Analysıs

The obtained results were statistically analized using t and Pearson Chi-Square test. Kruskal-Wal-

lis One Way ANOVA test was used in multiple comparisons. When p value reached at <0.05, it was accepted as statistically significant

Results

57 % of the patients were males (n:144) and 43% were females (n:110), and their mean age were found to be 62.98±16,18. Based on their diagnoses, patients were categorized as IS (56%), TIA (11%), ICH(28%) ve SAH (5%) in terms of the individual sub-group. As a result of the biochemical and coagulation tests the highest mean glucose value (189,35mg/dl) was found in SAH and the highest sodium value (136,68 mEq/L) was found in TIA. IS revealed the highest scores of prothrombin time (PT) (16,73 seconds) and INR (1,64) scores (Table 1). Whereas there was a difference between glucose values of the patients and stroke types (p=0,03) there was no statistically significant difference between sodium, PT, INR scores and stroke types. The scores were respectively found as thus: (p=0.465, p=0.57 and p=0.751).

In the hemogram parameters of patients, white blood cells, hematocrite and thrombocytes scores were analized and results were shown in Table 2. The highest scores of white blood cells (12,95 mm3) were observed in SAH patients where the highest scores of hematocrite (43,80%) were found in patients with ICH. As for the thrombocytes, their scores (277,23 mm3) were the highest in TIA. No correlation was found to exist between these parameters and the types of stroke (p=0,39). As part of the routine examination of our study, liver function tests (alanine aminotransferase (ALT) and aspartate aminotransferase (AST) scores) were analized. Whereas ALT score was found to be the highest in IS (21.92±16.37 U/L), this score was the lowest in SAH groups (18.42±10.0 U/L). The highest AST scores were found in SAH (30.27±19.23 U/L), whereas these scores were the lowest in TIA group (21.86±7.94 U/L). These scores for each patient group were shown in Table 3 and no statistically significant difference was found between these groups (p=0.297).

Discussion

CVDs are among the diseases of the brain which are most frequently seen. Although the diagnosing property of many of the parameters has not yet been established, their effects are known in the underlying mechanisms of neuronal damage in CVD.

Table 1. The distribution of biochemical and coagulation of the patients among the groups

	Glucose (mg/dl)	Sodium (mEg/L)	PT (Second)	INR
TIA	110.69	136.68	13.43	1.31
ISH	184.86	135.31	14.21	1.35
IS	156.87	135.58	16.73	1.64
SAH	189.35	134.84	14.47	1.18

Table 2. The distribution of white blood cells, hematocrites and thrombocytes in the sub-groups of the patients

	WBC mm³	Hematocrite %	Thrombocytes mm³
TIA	8.99	39.97	277.23
ISH	12.40	43.80	223.77
IS	10.57	41.80	258.04
SAH	12.95	43.44	245.67

Table 3. The distribution of liver function tests of AST and ALT among the groups of the patients

	ALT (U/L)	AST (U/L)
TIA	18.86±10.19	21.86±7.94
ISH	20.92±11.36	27.15±11.80
IS	21.92±16.37	27.70±18.95
SAH	18.42±10.10	30.27±19.23

Song et al. (5) in their studies conducted on the relationship between hyperglycemia and acute CVD reported that lactic acid increase caused acidosis, that ischemic area widened with the increase in metabolite accumulation, and that such complications led to a vicious circle. Therefore, like many other researchers, Pasero et al.(6), too, recommended that blood glucose levels in acute CVD patients should be within the range of 100-150mg/dL. Although, in our investigation, no statistically significat difference could be found between mean serum glucose levels and CVD groups, the higher levels of serum glucose above the normal in all of the groups except for TIA have been evaluated as relevant with literature.

The importance of sodium in the pathogenesis related with brain edema and neuronal damage in CVD has long been known. Betjes et al. (7), in their studies conducted on the relationship between the cerebrovascular disease and hyponatremia, emphasizingly pointed out that mortality rates in hyponatremic patients were higher during the hospitalization process compared to those with no hyponatremia and that the severity of the neurological symptoms due to cerebral edema and ischemia as a result of this condition increased. For this reason the early detection, diagnosis and treatment of hyponatremia in CVD patients are of vital importance. In the course of our investigation, one of the findings which was different from the literature was that sodium levels were the same in all of the groups and that it created no difference between the groups.

The importance of anticoagulation in the management and treatment of the patients referring to emergency service due to IS has long been known and appreciated(8). Therefore in the presence of underlying risk factors like atrial fibrillation (AF) which may create susceptibility to thrombosis, INR scores above the current ones should be taken into consideration. Hylek et al.(9) pointed out that IS risk in AF patients could increase, if INR stays at subtherapeutic level (2,0 below). Levine et al.(10) stressed that if INR rose above the therapeutic level (3,0 plus) it could significantly increase the risk of ICH. In the course of our investigation, the coagulation parameters of our patients were found to be within the normal ranges and no difference between the groups could be proved to exist.

In the numerous studies conducted on the relationship between CVD and inflammation, a progression of inflammation has been observed with the increase in leukocytes count and and the expression of inflammatory cytokines. Pantoni et al. (11) reported that in ischemic stroke and the other cerebrovascular diseases leukocytes increase occured in response to ischemia, and that neurons and astrocytes became active and thus an inflammation cascade was initiated. In the other investigations carried out within the context of human and animal models and trials, inflammatory mechanisms have been shown to contribute to neuronal damage (12,13). Besides, Grau et al. (14) pointed out that leukocytes were not only associated with IS but also increased the likelihood of recurrences in people having a predisposition of stroke. The increase in white blood cells determined in our study in all of the groups except for TIA support the connection between cerebrovascular disease and inflammation. For this reason, hemogram evaluation is imperative in every patient referring to emergency clinic with stroke symptoms and findings. Ishiwaka et al. (15) in a study conducted on the relationship of CVD and thrombocytes levels reported that thrombocytes aggregation in atherom plaques increased predisposition towards thrombosis even if their levels were normal and thus thrombosis risk was not ruled out. All of the groups in our investigation were found to be within the normal ranges of thrombocytes and hematocrite levels, which prove to be relevant with the above data. The brain tissue is considered to be a rich reservoir for various enzymes. Damage in this tissue caused by any factors could lead to an increase of these enzymes in cerebrospinal fluid ,thereby causing a breakdown in blood brain barrier and an increase in serum levels synchronically. Parakh et al. (16) carried out a study showing that AST levels in serum and cerebrospinal fluid of the stroke patients were significantly higher compared with the controls and that the statistical significance in the values of AST were markedly observed in ICH patients. The serum and cerebrospinal ALT values were found to be the highest in IS ,and AST values were considered to be much more crucial in patients with the history of stroke. Although AST was the highest in SAH and the lowest in TIA sub-groups of the patients and ALT the highest in IS and the lowest in SAH, there was no statistically significant difference between the groups.

In conclusion, we are of the conviction that early detection and diagnosis of the abnormalities in these parameters which have an active role in the pathogenesis of neuronal damage and brain edema in stroke patients could be important and beneficial in the improvement of the clinical pattern, the prognosis and even in the recurrence of the disease.

References

1. No authors listed. Special Report From The National Institute of Neurological Disorders and Stroke. Classification of Cerebrovascular Diseases III. Stroke. 1990; 21: 637-76.

2. Raymond D. Adams, Maurice Victor, Allan H. Ropper. Principles of Neurology, 6th edition. Publication date: 1998, pp 777-810.

3. Herrmann M, Vos P, Wunderlich MT, de Bruijn CH, Lamers KJ. Release of glial tissue-specific proteins after acute stroke: a comparative analysis of serum concentrations of protein S-100b and glial fibrillary acidic protein. Stroke 2000; 31: 2670-7.

4. Napoli M, Papa F, Bocola V. C-Reactive Protein in Ischemic Stroke: An Independent Prognostic Factor Stroke 2001; 32; 917-24.

5. Song EC, Chu K, Jeong SW. Hyperglisemia exacerbates brain edema and perihematomal cell death efter intracerebral hemorrhage. Stroke 2003; 34: 2215-20.

6. Pasero S, Ciacci G, Ulivelli M. The influence of diabetes and hyperglycemia on clinical course after intracerebral hemorrhage. Neurol 2003; 61: 1351-6.

7. Betjes MG. Hyponatremia in acute brain disease: The cerebral salt wasting sendrom: A review. Eur J Intern Med 2002; 13: 9-14.

8. Kutluk K. Principles Principles of treatment of acute ischemic stroke. Turkiye Klinikleri J Neur 2004; 2: 74-85.

9. Hylek EM, Skates SJ, Sheehan MA, Singer DE. An analysis of the lowest effective intensity of prophylactic anticoagulation for patients with nonrheumatic atrial fibrillation. N Engl J Med 1996;335:540-6.

10. Levine MN, Raskob G, Beyth RJ, Kearon C, Schulman S. Hemorrhagic complications of anticoagulant treatment: the Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. Chest 2004; 126: 287S–310S.

11. Pantoni L, Sarti C, Inzitari D. Cytokines and cell adhesion molecules in cerebral ischemia: experimental bases and therapeutic perspectives. Arterioscler Thromb Vasc Biol 1998; 18: 503-13.

12. Beamer NB, Coull BM, Clark WM, Briley DP, Wynn M, Sexton G. Persistent inflammatory response in stroke survivors. Neurology. 1998; 50: 1722-8.

13. Garcia JH, Liu KF, Yoshida Y, Lian J, Chen S, del Zoppo GJ. Influx of leukocytes and platelets in an evolving brain infarct (Wistar rat). Am J Pathol. 1994; 144: 188-9.

14. Grau AJ, Boddy AW, Dukovic DA, Buggle F, Lincy C, Brandt T, Hacke W. Leukocyte count as an independent predictor of recurrent ischemic events. Stroke 2004; 35: 1147-52.

15. Ishikawa T, Shimizu M, Kohara S, Takizawa S, Kitagawa Y, Takagi S. Appearance of WBC-Platelet complex in Acute ischemic stroke, predominantly in atherotrombotic infarction. J Atherosclerosis and thrombosis. 2012; 19: 494-501.

16. Parakh N, Gupta HL, Jain A. Evaluation of enzymes in serum and cerebrospinal fluid in cases of stroke. Neurology India 2002; 50: 518-9.

Corresponding author
Hayriye Gonullu,
Yuzuncu Yil University,
Van,
Turkey,
E-mail: drhayriyegonullu@gmail.com

Power Balance® bands, do they work? Short-term effects on postural stability, flexibility, and grip strength

Shereen C Currie, Stuart J Semple, Jeanne M Grace

University of Zululand, Faculty of Science and Agriculture, Department of Biokinetics and Sport Science, Kwazulu Natal, South Africa.

Abstract

Power Balance 'technology' has received considerable attention over the last two years with the manufacturer, as well as many sportsmen and women claiming that the technology can improve performance and/or skill related fitness parameters. To date, only two scientific studies have been published in this area looking at the effect of this 'technology' on balance, flexibility, strength, and power. The purpose of this study was to determine the effect of the Power Balance® Band (PBB) on postural stability, flexibility, and hand grip strength. Seventy individuals (age: 22.2 ± 7.4y; weight: 89.2 ± 16.7kg; height: 1.87 ± 0.7m) volunteered to participate in this partially blind cross-over design study. Two Power Balance® Bands were used for this study, one was left unaltered and still contained the two silver holographic discs (PBB), while the other had both silver holographic discs removed (Placebo). Both bands were covered in such a way that the placebo band appeared identical to the original band. The participants were randomly assigned to one of two groups: Protocol 1 (Baseline-PBB-Placebo) and Protocol 2 (Baseline-Placebo-PBB). All testing was completed on the same day, with sufficient rest between tests. Parameters tested were postural stability (Biodex Balance System), flexibility (sit-and-reach), and hand grip strength (dynamometer). A repeated measures ANOVA together with a Tukey post hoc test was computed to determine if significant differences existed between the three bouts, significance was accepted as $p < 0.05$. There were no significant differences ($p < 0.05$) between the baseline test, PBB test, or placebo test for the postural stability, and hand grip strength test. A significant difference ($p = 0.028$) was observed between the baseline test and both the PBB and placebo for the sit-and-reach flexibility test, however no difference was evident between the PBB and placebo. The findings of this study indicate that balance, strength and flexibility are not enhanced in individuals wearing the Power Balance Band.

Key words: Power Balance technology, postural stability, flexibility, hand grip strength.

Introduction

The Power Balance® Band (PBB) is one of the latest ergogenic aids on the market and claims to restore and optimize the electro-magnetic balance within the human body. The hologram located within the band is purportedly the same material used to keep static electricity from damaging electrical components, and is claimed to be imbedded with an electrical frequency that restores the body's electrical balance. When the Power Balance® Hologram comes in contact with your body's energy field, it supposedly resonates in accordance with each individual's biological rhythm, promoting free exchange of positive and negative ions. This theoretically aligns your body's energy pathways, and creates maximum energy flow, by clearing the pathways so the electro-chemical exchange functions to its full potential (Power Balance, 2010).

Optimal health and peak performance occur when the body maintains ionic balance and free flowing energy pathways at the optimum frequency (Church, 2009; Pomeranz, 2007). Eastern medicine tapped this concept thousands of years ago when health practitioners researched, mapped and developed treatments based on the body's natural energy pathways. Disciplines such as acupuncture, and acupressure have been found to produce positive results because of these fundamental biophysical principals. Studies have shown that stimulation of acupoints in people under stress resulted in lowered heat rate and a reduction in pain and anxiety (Church, 2009; Pomeranz, 2007).

The proposed benefits of the Power Balance® Band include: A faster synaptic response (brain function), enhanced muscle response (in both fast and slow twitch tissues), increased stamina (better oxygen uptake and recovery), more flexibility (faster recovery), strength and vastly improved gravi-

tational balance (Power Balance, 2010). In addition to these benefits the manufacturers also claim that the effect is immediate. That is, balance, strength and flexibility are improved almost instantaneously upon application of the band. Research conducted by Yale University showed that there are no materials within the PBB that could cause negative side effects to the body (The Tennis Shop, 2010).

To date, two scientific studies (Brice et al., 2011; Porcari et al., 2011) have been published on the efficacy of these bands. The study conducted by Brice et al. (2011) focused on balance only, while the study conducted by Porcari et al. (2011) focused on balance, flexibility, strength, and power. The aim of the current study was to validate findings of the previously published studies by focusing on balance, strength and flexibility.

Methods

Participants

Seventy participants (F=5; M=65) (age: 22.2 ± 7.4 y; weight: 89.2 ± 16.7 kg; height: 1.87 ± 0.7 m) volunteered to participate in this partially blind cross-over design study. All participants read and signed a written informed consent form prior to data collection. The study received ethics approval from the Institutions' Faculty of Science & Agriculture Ethics Committee. Participants were excluded from the study if: they had an ankle, knee or wrist injury within the previous six months, they were suffering from any acute infections, acute/chronic pathology that may affect their balance, any neurological condition, or if their BMI was over 40 kg/m² due to obesity. Blaszczyk et al. (2010) found that postural sway in people with a BMI of greater than 40 kg/m² was affected due to greater abdominal mass. Participants who of their own accord had been wearing the Power Balance Band leading up to the study (n = 21) were required to remove it for the duration of the testing.

Procedures

Two Power Balance® Bands were utilized for the study, one was left unaltered (still contained the two silver holographic discs (Power Balance Band)), while the other had both silver holographic discs removed (Placebo). Both bands were covered in such a way that the placebo band appeared identical to the original band. The inside of the bands were still exposed to ensure contact with the skin. The participants were randomly assigned to one of two groups: Protocol 1 (Baseline-Power Balance Band-Placebo) (n = 35) and Protocol 2 (Baseline-Placebo-PBB) (n = 35). The baseline test consisted of two identical test protocols with the Power Balance Band. This was done to ensure that there was no familiarization effect. All testing was completed on the same day, with sufficient rest between testing procedures. The participants' body mass and height was taken first to establish their body mass index (BMI). After the BMI was recorded, participants were then evaluated on their postural stability (Biodex Balance System (Cachupe et al., 2001)), flexibility (sit-and-reach), and hand grip strength (hand grip dynamometer).

The Biodex Balance System (BBS) measured medial-lateral instability and anterior-posterior instability. These two scores were then used to compute the overall instability (OI) index (Biodex, 2010). The OI score is believed to be the best indicator of the overall ability of the subjects to balance on the platform (Letafatkar, 2009). Dynamic balance was assessed at a spring resistance level of 6. Spring resistance levels range from 1 (least stable) to 12 (most stable). Participants performed this test with their eyes open, and a double stance was used to test dynamic stability. Prior to testing, the participants' center of gravity was measured using the static platform of the Biodex Balance System. Once the participants' center of gravity was determined, foot position was recorded according the numeric and alphabetic grid on the platform. For each test completed on the Biodex Balance System, the participants' feet were placed in the same position. Measures were obtained from 20 second trials during which the participants were asked to maintain an upright standing position on the unstable surface of the Biodex Balance System (Cachupe et al., 2001). Participants were given one minute for adaptation to the Biodex Balance System, as well as, three twenty second practice trials, with a 10second rest in-between each trial (Akhbari et al., 2007; Karimi et al., 2008). This accounted for the familiarization effect. Participants were given three practice trials, with a 10 second rest between each trial, with the hand grip dynamometer. Hand grip strength of the dominant hand was tested in accordance to the standard procedure set out by the American Society of Hand Therapy (ASHT) (Ashton et al., 2004).

Following the practice trials for hand grip strength, the participants had three practice trials for the YMCA sit-and-reach flexibility test (ACSM 2010). During the sit-and-reach flexibility test, it was ensured that the participants did not hold the stretch for longer than two seconds. This was done to ensure the participants' did not lengthen their muscles; which would result in inaccurate results for the following testing procedures. Participants were given a two minute rest following the practice trials.

Once the participants' completed the practice trials and had rested for two minutes, the testing procedure was carried out as described in the figure below. A two minute rest was given between each testing procedure.

Figure 1 represents the design of the study. All participants (n = 70) completed test one and two without the Power Balance Band. Participants were then randomly allocated to either group A (n=35) or group B (n = 35) to complete the testing procedure.

To standardize the testing and minimize variations, the following protocol was used: (1) each participant was given the same standardized instructions on testing procedure; (2) each participant was tested barefoot, and requested to remove any accessories such as jewelry, wallets, watches, cell phones etc.; (3) all participants wore the Power Balance Band on their left wrist during the testing; (4) the same tester was used to test all participants; and (5) all tests were completed in the same order.

Statistical analysis

Data are expressed as means and standard deviations. A repeated measures analysis of variance (ANOVA) together with a Tukey-post hoc test was computed to determine if significant differences existed between the three bouts. Significance was accepted as $p < 0.05$.

Results

The mean overall index (OI) balance score for baseline, PBB, and placebo test is represented in figure two above. There were no statistically significant ($p = 0.3081$) differences between the three bouts. A slight decreasing trend is seen in the postural stability, however this decrease is non-significant. Baseline results represent the mean of Test 1 and Test 2.

Figure three represents mean scores for hand grip strength for baseline, PBB, and placebo test. These results show no statistically significant ($p=0.0773$) evidence of a mean change in hand grip strength by either the placebo or PBB group. Figure four represents mean flexibility for baseline, PBB, and placebo test. The graph below shows an increasing trend in flexibility in the PBB and placebo test from baseline. This increase is statistically significant ($p=0.0028$) between baseline (48.9 ± 7.45cm) and PBB (50.0 ± 8.16cm), as well as, baseline and placebo (49.9 ± 7.27cm). There was however no significant difference between the PBB and placebo test.
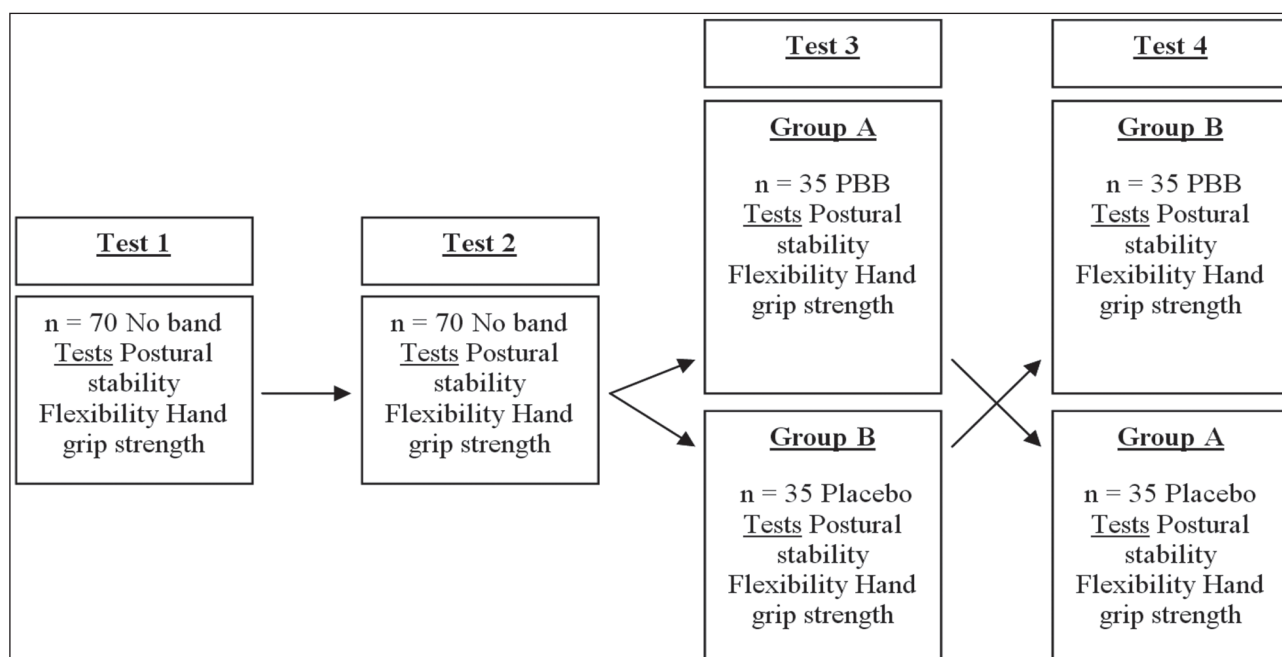

Figure 1. Study design
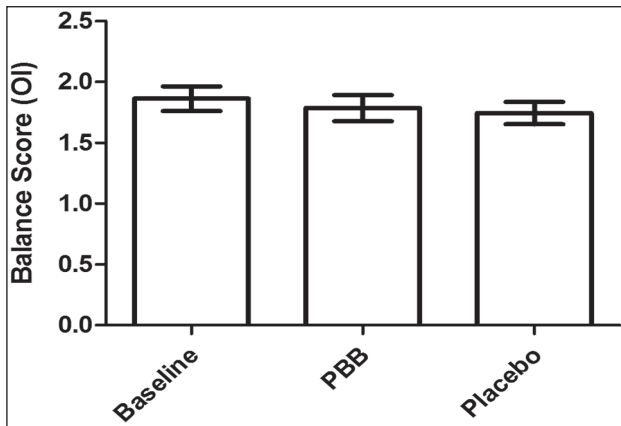
Figure 2. Mean balance score (OI) for baseline, PBB, and placebo test
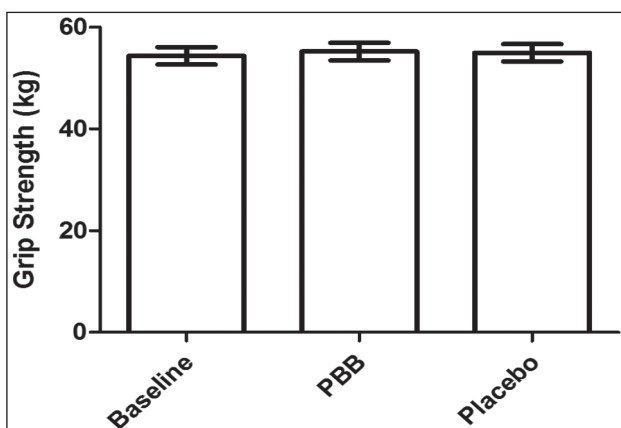
Figure 3. Mean hand grip strength for baseline, PBB, and placebo test
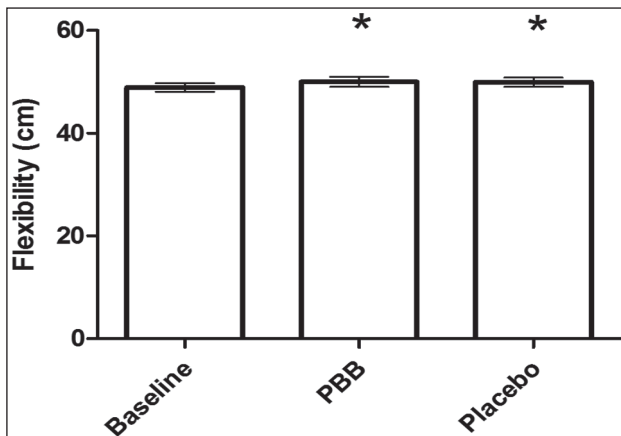
Figure 4. Mean flexibility for baseline, PBB, and placebo test

Discussion

The aim of the current study was to determine the efficacy of the Power Balance Band in effecting measures of hand grip strength, balance and flexibility and to validate findings of previously published studies. There were no significant (p

< 0.05) differences observed between the baseline test, PBB test, or placebo test for the postural stability, and hand grip strength test. A significant difference (p = 0.0028) was found between the baseline test and both the PBB and placebo for the sit-and-reach flexibility test, however no difference was observed between the PBB and placebo.

Flexibility may have increased due to the repeated flexibility tests, even though the stretch was only held for 2 seconds. Performing dynamic balancing on the Biodex Balance System would have also required the muscles to work to maintain balance. Seyed et al. (2010) performed a study on the role of leg and trunk muscles proprioception on static and dynamic postural control. They found that dynamic balance decreased after the leg muscles were fatigued. This suggests that the leg muscles play a large role in stabilizing the body during dynamic balance. To enable muscles to maintain work rate, blood flow to the lower limbs would have to increase as would temperature, this may in part explain why the flexibility scores improved with both the placebo and PBB trials.

Pisch (ECSS Congress Proceedings, 2011) studied the influence of the power-balance hologram on balance, strength, flexibility, and endurance. The parameters tested included: stand-and-reach (cm), thorax rotation, grip strength (kg), balance (mm), and VO_{2max} (ml/kg/min). Nineteen participants were tested under three conditions: (1) placebo, blind without hologram; (2) blind with hologram; (3) not blind with hologram. The results showed no significant differences for any parameter between the three testing conditions. Brice et al. (2011) used holographic technology wristbands to test postural stability on forty two individuals, using a Bertec BP Series Force Plate. Stability was tested on a static surface, dynamic surface, with eyes open and closed for both variables, as well as maximum movements in sagittal and lateral directions (known as limits of stability). The results showed no significant difference between measurements across all protocols for baseline (no wristbands), the placebo device or the real device (Brice et al., 2011).

Porcari et al. (2011) investigated the Power Balance® bracelets effect on balance, flexibility, strength, and power. This double-blind study used forty-two athletes to complete four tests: trunk flexibility, balance, strength, and vertical jump. The tests used

in the study were the same tests that are presented on the Power Balance® website (www.powerbalance.com/test-video), with the addition of the vertical jump test. Participants completed two trials of each test without a warm-up or familiarization test; and the order of bracelets was randomized. The results of this study found no significant difference in flexibility, balance, strength, or vertical jump height between the Power Balance® and placebo conditions. Thus there were no significant performance benefits when wearing the Power Balance® bracelet compared to the placebo bracelet. Interestingly, the results for trial two were significantly greater than trial one for all parameters, regardless of which bracelet was worn for the second trial. These improvements were attributed to the fact that the athletes may have been more warmed-up, or were more familiar with the task.

In the current study one may have expected to have seen a placebo effect however there was a slight decrease in postural stability for both the PBB and placebo tests from baseline. This decrease was non-significant. Interestingly, Brice et al. (2011) found the same result when testing postural stability. Those authors suggested that the lack of a placebo effect may be due to the objective nature of testing.

Further research needs to be done on the long term effects of the Power Balance Band on flexibility, strength, postural stability, and endurance. Furthermore, any additional research should include a randomized testing order.

Conclusion

The results of this study indicate that balance, strength and flexibility are not enhanced in individuals wearing the Power Balance® band. These findings mirror those of the two other published studies and would collectively indicate that individuals are unlikely to receive benefit from wearing the device.

References

1. Akhbari B, Takamjani IE, Salavati M, Sanjari MA. A 4-week Biodex stability exercise program improved ankle musculature onset, peak latency and balance measures in functionally unstable ankles. Journal of Physical Therapy in Sport 2001; 8: 117-129.

2. Ashton LA, Myers S. Serial grip strength testing – Its role in assessment of wrist and hand disability. The Internet Journal of Surgery 2004; 5(2): ISSN: 1528 – 8242.

3. Biodex.(2010) Balance training. Available from URL: http: //www.biodex.com/physical-medicine/products/balance/balance-system-sd (accessed 2010 Sept 13).

4. Blaszczyk JW. Balance control is altered in obese individuals. Journal of Biomechanics 2012; 43(2): 385-6.

5. Brice SR, Jarosz BS, Ames RA, Baglin J, Da Costa C. The effect of close proximity holographic wristbands on human balance and limits of stability: A randomized, placebo-controlled trial. Journal of Bodywork & Movement Therapies 2011; 15: 298-303.

6. Cachupe WJC, Shifflett B, Kahanov L, Wughalter EH. Reliability of Biodex Balance System Measures. Measurement in Physical Education and Exercise Science 2001; 5(2): 97-108.

7. Church D. The Genie in Your Genes: Epigenetic Medicine and the New Biology of intention. Energy Psychology Press; 2009.

8. Karimi N, Ebrahimi I, Kahrizi S, Torkaman G. Evaluation of postural balance using the Biodex Balance System in subjects with and without lower back pain. Pakistani Journal of Medical Science 2008; 24(3): 372-377.

9. Letafatkar K, Alizadeh MH, Kordi, M.R. The Effect of Exhausting Exercise Induced Fatigue on the Double-Leg Balance of Elite Male Athletes. Journal of Social Sciences 2009; 5(4): 445-451.

10. Pisch M. Influence of the power-balance hologram on balance, strength, flexibility and endurance. Congress Proceedings, 2011.

11. Pomeranz B. Scientific Research into Acupuncture for the Relief of Pain. The Journal of Alternative and Complementary Medicine 2007; 2(1): 53-60.

12. Porcari J, Hazuga R, Foster C, Doberstein S, Becker J, Kline D et al. Can the Power Balance® bracelet improve balance, flexibility, strength, and power? Journal of Sports Science and Medicine 2011; 10: 230-231.

13. Power Balance. (2010) Power Balance Band. Available from URL: http: //www.powerbalance.com/PBteam (accessed 2010 Sept 13).

14. Seyed HH, Ali Asghar H. The role of leg and trunk muscles proprioception on static and dynamic postural control. Journal of Physical Education and Sport 2010; 26(1): 83-87.

15. The Tennis Shop. (2010) Negative side effects of the Power Balance Band. Available from URL: http: //www.thetennisshop.com.au/PowerBalance (accessed 2010 Sept 13).

Corresponding Author
Shereen C Currie,
University of Zululand,
Faculty of Science and Agriculture,
Department of Biokinetics and Sport Science,
Kwazulu Natal,
South Africa,
E-mail: scurrie@pan.uzulu.ac.za

Investigation of the effect of different aerobic exercise on health and anaerobic power for sedantary women

Esin Gulu[1], Guner Cicek[2], Abdullah Gulu[1], Kursat Karacabey[3], Faruk Yamaner[2], Tarik Sevindi[4]

[1] University of Inonu, Physical Education and Sports Academy, Malatya, Turkey,
[2] University of Hitit, Physical Education and Sports Academy, Corum, Turkey,
[3] Duzce University School of Physical Education and Sports, Duzce, Turkey,
[4] University of Nigde, Physical Education and Sports Academy, Nigde, Turkey.

Abstract

Background: This study has been done on sedentary women aged between 35- 40 to investigate the effects of 9 week run-walk and aerobic-step exercise on health and anaerobic power.

Material and methods: Groups were constituted among 30 volunteer women who have not regular exercise habits,who are not applying a special diet programme and who have not got health problems to prevent them to make exercise.While one of the groups was making run-walk exercise for 9 weeks,4 days a week,and 70 minutes per day,the other group made aerobic-step exercise for 9 weeks,4 days a week,and 70 minutes per day.

Results: After the study PP and AP values of both groups after the exercise have meaningful increase ($p<0.05$ and $p<0.01$).Besides comparision of the aerobic-step group in itself statistically meaningful increase in MP and FI values have been seen.When we compare the two groups meaningful increase has seen in PP values ($p<0.05$ and $p<0.01$).

Conclusion: As a result it has been seen that 9 week run-walk exercise effects aerobic pover positively.

Key words: Aerobic Exercise, Run-Walk Exercise, Aerobic-Step Exercise, Wingate Test.

Background

For the risks of health the most effective exercise type is aerobic exercise. Especially in health problems such as; fatness,croner heart diseases,deformation of the bones,we can get a high rendement from aerobic exercises.For removing the muscle,joint,and tendon pains; exercise for hardening the muscles and flexibility trainings have a great effect [1].

Step; one of the aerobic exercises is as in the dance includes exercises which are planned before or choreographic notations with music. The exercise of aerobic dance is an excellant fitness and body composition [2].

Nowadays generally exercises are shown as; dance, step, racket sports besides, jogging, running, walking, trekking cycling, rowing,etc. All of these increase aerobic capacity. Treditional step is,consigning burn off calorie,fleetness of twisting hip power,and improving the balance with forward movements.These are; jumping creeping,pushing by crouching and etc [3].

Aerobic performance is a term which has a great importance for sport branches which are finished in a short time and requring explosive power. Because the performance of an athlete may be affected from individual or environmental factors. Trainers and Gymnasts can get a high performance by specifying the power and capacity of an athlete and preparing the suitable training programmes according to this. The regular training of athletes results as an increase on anaerobic performances. In other words this increase on anaerobic performance is, the increase which occurs in ATP-PC storage and the yieldance in lactic acid.Because of this the athletes to understand their energy resources and using these resources,is very important for sporting performance[4].

During exercise it has been shown that; aerobic metabolism is added to anaerobic metabolism, in this alteration area, concentration of arterial blood systematically flow on the level of relaxation [5]. It is known that step-aerobic exercises have possitive effect on; health, coordination,physical activity,body fat rate,ability of sport,general physical adequateness,apperance power, flexibilty, endurance, and self confidence [6].

Usually regular and gradually increasing aerobic trainings increase aerobic power (maxVO2). Also the heart beat during resting decreases [4].

This study aimed to compare the effect of aerobic-step exercise; applied 9 weeks (4 days a week,

60% volume), run-walk exercise and (4 days a week, 60% volume), aerobic-step exercise on anaerobic power.

Material and methods

Research Group

This study has been done on 30 sedentary women aged between 35-40 to investigate the effect of 9 week run-walk, and aerobic-step exercise on anaerobic power.

Groups were constituted among 30 volunteer women who have not regular exercise habits, who are not applying a special diet programme and who have not got health problems to prevent them to make exercise

Groups are constituted randomly as; run-walk group (n=15) average of age and height; 37.20+-2.04 years,161.13+-4.86cm and aerobic-step group (n=15) average of age and height; 37.60+-1.76 years and 157.06+-7.10cm.

Apllied Training Programmes

While (Group I) was mahing run-walk exercise for 9 weeks 4 days a week and 70 minutes per day, (Group II) made aerobic-step exercise for 9 weeks,4 days a week,70 minutes per day.

In this study 30 sedentary women joined run-walk exerciss for 9 weeks,4 days a week,and 70 minutes per day.Each training was identified with the Karvonen formula which was suggested by ACSM (Aerobic-Step Gymnastics Centre) (60% Heart Beat Reserve) [7].The music used during the exercise was choosed as keeping the heart beat reserve of the subjects in 60-70%.For supplying this aim we took measurements for 3 times during; practice,main period, and cooling period by using checking the pulse from carotid artery method.

It has been calculated that the average heart beat for 9 weeks training as 1.4+- 1.28bpm.After aerobic-step training for 10 minutes subjects made flor exercises for abdomen and legs and last 5 minutes cooling exercise.

Run –walk group made before traning 5 minutes free exercise, after 55 minutes walk-run exercise,10 minutes for upper body and lower extremites dorsiflexion and low volumed commitment based on physical culture exercises including some iso termic trainings for cooling [8]. Aerobic-step group made

for heating the body low tempo movements for the first 5 minutes than bland aerobic-step exercises with music and rhythm for 40 minutes for the abdomen and legs,15 minutes floor exercises and last the same cooling exercises of run-walk group for 10 minutes.

Before and after exercises wingate aerobic power test was applied and PP (Peak Pover),MP (Minimum Power),AP (Average Power) FI (Fatigue Index) were measured.

Height and Body Weight

While the weight was measured with a 0.1 micro-balance scale,height was measured 0.01 microbalanced digital height meter.During the measurements women subjects wore T-shirts and shorts,and their heights were measured barefoot or just with socks. During measurements ,head was uprightly,the sole was stepped flat, knees were strained, ankles were adjoint and body was upright [9].

Wingate Anaerobic Power Test

For the test 834E model scaled, Monark brand bcycle ergmeter was used and a computer was connected to the bcycle.The individual of experiment group; cycled maximized speed without standing up from the seddle for 30 seconds.

The person who made the test; when the experiment group individual reached the maximum speed the seddle automaticaly steped down and the test started,During the test the individual of the experiment group especially motivated orally after 10-15 seconds.

After the wingate test; the maximum power in watt (W/kg) which was performed by the subject during 30 seconds; calculated as peak power (PP), The minumum power performed by the subject in 30 seconds (MP) has been taken anaerobic power ,and from the obtained values fatigue index (FI) has been calculated (10.11).

Statistical Analysis

All statistical data obtained from the study was calculated with licanced SPSS 17.0 packet programme.Aritmetic means Standard deviation were calculated with this programme.Test of normality for the datas were made by Shopiro-Wilcoxon test.Then parametric tests applied.The evaluation inside the group was made by Paired Samples –t test,and evaluations between the groups were tested by Independent Samples-t test.If the results

were in p< 0.05 and p<0.01 level of significance or not, has been checked.

Results

In Table 1 we can see that according to the results of the statistical data obtained,the comparison of the run-walk and aerobic-step groups there is a meaningful differance between two groups in weight measurements before and after exercise in p<0.05 meaningfulness degree. When examined the Table 2 we can see that values of PP and AP of run-walk group has a meaningful increase,for the MP and FI values there is no meaningful differance.For PP,AP,MP,values of the aerobic-step group we can see that a meaningful increase (p<0.05 and p<0.01) for the FI values there is a meaningful decrease (p<0.01). When we look at the table above there is no statistically meaningful differances between two groups about the values of PP,MP,AP and FI (p<0.05).When compared after exercise PP value of the aerobic-step group has a meaningful increase.

Table 1. The comparison of some physical variables of the walk-run and aerobic-step groups during, before (B), and after (A) exercise.

Variables	Groups		t value	P value
	Run-Walk (n=15) X±Sd	Aerobic-Step (n=15) X±Sd		
Age (yil)	37.20±2.04	37.60±1.76	-574	0.571
B height (m)	16.13±4.86	157.06±7.10	1.829	0.078
A height(m)	161.20±4.98	157.66±7.52	1.515	0.141
B-weight (kg)	79.78±17.72	63.70±6.31	3.309	0.003*
A- weight(kg)	75.96±17.22	60.19±6.09	3.343	0.002*

*P<0.05 Shows the meaningfulness level according to Independent-Sample-t test results

Table 2. The comparison of the anaerobic power values ,PP,MP,AP,and FI of the run-walk and aerobic-step group in themselves before (B) and after (A) exercise.

Variables	Run-walk group					Aerobic-step group				
	N	X	Sd	t	P	n	X	Sd	t	P
B-peak power (w/kg)	15	5.49	1.28	-3.553	0.003*	15	5.24	0.80	-5.922	0.000**
A-peak power (w/kg)	15	6.10	1.07			15	7.02	1.14		
B-minimum power (w/kg)	15	1.00	0.55	-2.13	0.053	15	0.87	0.56	-3.094	0.008*
A-minimum power (w/kg)	15	1.36	0.58			15	1.58	0.64		
B-average power (w/kg)	15	2.78	0.79	-5.675	0.000**	15	2,67	0,49	-4.971	0.000**
A-average power(w/kg)	15	3.55	0.67			15	3.48	0.90		
B-fatigue index (%)	15	88.04	5.58	2.428	0.29	15	84.41	6.91	4.144	0.001**
A- fatigue index (%)	15	81.32	9.62			15	74.09	7.55		

P<0.05 and **P<0.01 According to resuls of Paired-Samples-t test it shows the meaningfulness level

Table 3. The comparison of the f PP,MP,AP,and FI values of run-walk (A) and aerobic-step group (B).

Variables	Before exercise					After exercise				
	n	X	Sd	t	P	n	X	Sd	t	P
A- peak power (w/kg)	15	5.49	1.28	0.652	0.52	15	6.10	1.07	-2.261	0.030*
B- peak power (w/kg)	15	5.24	0.80			15	7.02	1.14		
A-minimum power (w/kg)	15	1.00	0.55	0.636	0.53	15	1.36	0.58	-1.007	0.32
B-minimum power (w/kg)	15	0.87	0.56			15	1.58	0.64		
A-average power (w/kg)	15	2.78	0.79	0.454	0.65	15	3.55	0.67	0.268	0.79
B-average power (w/kg)	15	2.67	0.49			15	3.48	0,90		
A-fatigue index (%)	15	88.04	5.58	1.585	0.124	15	81.32	9.62	2.289	0.30
B-fatigue index(%)	15	84.41	6.91			15	74.09	7.55		

*P<0.05 It shows the meaningfulness level according to Independent Samples-t Test

Discussion and Conclusion

This study has been done on sedentary women aged between 35-40 to investigate the effect of run-walk and aerobic-step exercises on aerobic power. According to health risks the most effective exercise types that increases aerobic capacity are; walking, running, trekking, cycling, rowing, and swimming. Especially in health problems such as; fatness, croner herat diseases, deformation of the bones we can get a high rendement from aerobic exercises [12].

Regular and effective exercise programs are important and one of the most economic ways of protecting against diseases and supporting treatment as well as improving endurance training in developing countries like ours. However, maintaining a regular, effective and continuous exercise program is not as easy as it seems. Families, schools, institutions, city and town councils, health officers, politicians responsible for health, the media houses, and foremost primary care workers as well as all health workers have crucial roles to play [1].

In a study which Turan and his friends made; it was investigated the 8 week submaximal exercise programme on physiological variables of the 10 sedentary women aged between 23-35.As a result it has been seen that submaximal exercise decreases the maximal oxygen usage percentage [13]. The step study that we have done has been applied as to keep the heart beat of the subjects 60-70%. This supports the study of Turan and his friends. This means after the training programme applied subjects could overcome the same load by using less oxygen.This shows that the economy of aerobic power increases.

Ersoz, Gunduz and Koz (1996) applied aerobic exercise on 17 women for 8 weeks,3 days a week,45-60 minutes per day with a power of 50-70%.After exercise they recorded that systolic blood power 6%,resting heart beat number 10% were decreased, and MaxVO2 26% increased meaningfully [14].

Christine and his friends applied a treadmill exercise on 49 trained women aged between 35-70 to understand the relation of heart fitness on age and menopause level.They have seen that when the age increases MaxVO2 decreases,but between the age groups they could not find a meaningful differance of submaximal VO2.The runners aged between 35-39 and 40-45 MaxVO2 values were meaningfully higher than the women aged between 45-49,50-55,and 55-70.As a result cardiorespiratory fitness of trained female runners was higher than the same age group who have involved in a previous study [15].

Beneke and his friends (2007) made a study on boys and male adolescents they found the results as average age of the boys were 11.8+-0.5 year PP 10.8+-0.7 W/kg, MP 6.1+-0.7 W/kg ,AP 7.9+-0.5 W/kg; average age for the adolescents were 16.3+-0.07 year PP 11.5+-0.6W/kg, MP 6.9+-0.9 W/kg, AP 8.9 +-0.7 W/kg [16].

Marsh and his friends (1999) studied on 8 healthy old males and 8 active young males.They found the results as; for the old males; PP 10.7+-1.1 W/kg ,MP 7.4+- 0.9 W/kg and for the young males; PP 14.6+-1.6 W/kg, MP 10.7+-0.6 W/kg [17].

Arslan (2005) had a study on 98 male and 68 female and he has seen that regular physical activity has a positive effect on wingate test performances [18].

Lin and his friends (2006),had a study on females who are doing teakwondo and have degrees in Olympiads. His results were as; PP 6.64+- 0.42 W/kg, AP 5.45+-0.88 W/kg , FI 42.54 +- 19.73% [19].

Minehan and his friends (2007) evaluated the relationship between the anaerobic power and aerobic capacity.In the study 7 male and 7 female subjects tested with bcycle ergometer 30s Wingate Anaerobic Test.According to the findings of the study; high anaerobic power does not show a beter anaerobic capacity and addition to this; for preserving the power output during the 30s bcycle sprint is releated with anaerobic capacity [20].

In our study in both groups before and after exercise we saw that there is a meaningful increase on PP and AP (p<0.05 and p< 0.01).Also when compared the aerobic step group in itself we found statistically meaningful results for values of MP,and FI.When we compare the two groups we found a meaningful result for the PP value (p<0.05 and p<0.01).

Bencke and his friends (2002) made a study on 185 elite and nonelite 11 years old male and female athletes who are dealing with swimming, tennis, handball, and gymnastics. When they measured anaerobic power the highest PP value was found in elite female hanballers and than elite male handballers. The PP of the male elite hanballers was beter than male elite gymnasts, MP of the elite

female handballers was found beter than elite female gymnasts and elite female swimmers. PP of the elite female swimmers was just lower than elite female handballers and higher than the females from other branches.The lowest FI value found in elite female swimmers.The highest FI value found in elite female swimmers.The highest FI values were found in non elite female tenis players [21].

Boraczynski and Urniaz (2008) in their study made on 15 elite handballers after 6 week training they found PP 11.44+-O.78 and FI 25.3 +- 3.8 (%) [22]. Klasnja and his friends (2010) had a study on 30 sedentary youngs and they found; PP 5.68+- W/kg , MP 3.68+- 0.78W/kg [23]. Melhim has done a study on 19 male who are doing teakwondo and found; PP 8.2+-1.2W/kg, AP 4.5+-0.6W/kg [24]. Kin and Kosar (2006) investigated the effect of 10 week step-aerobic training on anaerobic performance of males and females.Wingate measurements before exercise were; PP 5.69+-1.38W/kg, AP 4.57+-0.85W/kg, FI 36.31+-15.25 (%),the measurements after exercise were ; PP 6.15+- 1.3W/kg, AP 4.84+-0.70W/kg, FI 37.87+-10.57 (%) [25].

According to the results of another study in which exercising subjects were followed for a period of 4–6 months the loss in body weight was 2.4 kg more than that in the controls [26].In contrast, in another study with obese women on no dietary restriction, exercising for 90 minutes 4–5 times a week at 55% their maximal oxygen consumption rate showed improvement in their aerobic capacity while their body weight increased by 2.3–2.8 kg after 6 months of exercising.

As a result of our study; before and after exercise the results of both groups were paralel to the literature. In both groups after long term aerobic exercise there is increase in the values of PP,MP and AP and decrease in the values of FI.Also for the aerobic –step exercise because of the different choreographies and following the step leader with different tempo and rhythm there are much development on anaerobic power parameters.

As a result,we found that 9 week run-walk and aerobic-step exercises on sedentary women has a positive effect on health and anaerobic power.

References

1. Karacabey K. Effect of regular exercise on health and disease. Neuro Endocrinol Lett. 2005; 26(5): 617-23.

2. Wills, J., (1993), "Health And Fitness Magazine"American Chambell, Cambell, D, L, F.,(1994): Human Kinetics, P.O. Box 5076, Champaign, s: 6,8,13. USA.

3. Blair, W. D., (1994)., "Missouri Journal Of Health Phsical Education Program, Recreation And Dance", St Louis-Miss, 65-72 Refs: 7.

4. Astrand, P.O., Rodalh, K., (1986), Text Book Of Work Physiology, Mc Graw Hill Book Co. New York, pp.330-341, 412-427

5. Wasserman K, Hansen JE, Sue DY, Whipp BJ. Principles of Exercise Testing and Interpretation 2. Edition, Edited by HARRIS JM, Lea & Febiger Publishing Company: Philadelphia. 1994: 18-72.

6. Gargari BP, Khadem-Haghighian M, Taklifi E, Hamed-Behzad M, Shahraki M. Eating attitudes, self-esteem and social physique anxiety among Iranian females who participate in fitness programs. J Sports Med Phys Fitness. 2010 Mar; 50(1): 79-84.

7. Dowdy ., B. D., Cureton, K. J., Duval, H. P. And Ouzis, G. H., (1985), Effects Of Aerobic Dance On Physical Qork Capacity, Cardiovascular Function And Boy Composition Of Middle Aged Women. Research Quarterly For Exercise And Sport. Vol. 56, No: 3, pp. 227-233.

8. Zorba, E., Babayigit, G.I., Saygin, O., Irez, G., Karacabey, K., 65-85 Yas Arasindaki Yaslilarda 10 Haftalik Antrenman Programinin Bazi Fiziksel Uygunluk Parametrelerine Etkisinin Arastirilmasi (in Turkish), University of Firat,Journal of Medical Sciences, 18 (4), s: 229-234, 2004.

9. Verducci, F., (1980), Measurements Conceps in Physical Education, The C.V. Mosby Company, London, s: 227

10. Alemdaroglu, U., Arslan, E., Karakas, B. and Koklu, Y., Farkli Seviyelerdeki Liglerde Oynayan Takimlarin Alt Yapisinda Mucadele Eden Genc Futbolcularda Supramaksimal Bacak Egzersizi Yanitlarinin Karsilastirilmasi (in Turkish). Spormetre Pysical Education and Journal of Sports Sciences, 6 (1), s: 21-25, 2008.

11. Bar-Or,O., The Wingate Anaerobic Test: An Update On Methodology Reliability And Validity. Sports Medicine, 4 (6), pp: 381-394, 1987

12. Zorba, E. (1999). Herkes İcin Spor ve Fiziksel Uygunluk (in Turkish) , Meyir Printing, Ankara.

13. Turan T., Kayserilioglu A., Senturk, D., Subasi, F.F., Guler., C., (1992)., "Sedenter Bayanlarda 8 Haftalik Submaksimal Egzersiz Programinin Fizyolojik Degiskenlerine Etkisi"(in Turkish), Sports Science 2nd National Act of Congress,University of Hacettepe, Academy Publication, publication Number:3, s: 214.

14. Ersoz, G., Gunduz, N., Koz, M. (1996, September). 17 Orta Yasli Sedanter Kadinlarda Haftada Iki Gun Yapilan Aerobik Egzersiz Egitiminin Etkileri(in Turkish), Physical Sciences Institution, 22nd National Congress, Bursa.

15. Christine, L.V., Margarot, A.B., Donna, M.R. (1992). Effects of Age and Menopausal Status on Cardiorespiratory Fitnees in Masters Women Runners, Medicine and Science in Sports and Exercise.

16. Beneke, R., Hütler, M., Leithauser, R.M., Anaerobic Performance And Metabolism in Boyss And Male Adolescents, European Journal Of Applied Physiology, 101(6), pp: 671-677, 2007.

17. Marsh G. D, Paterson D. H, Govindasamy D, Cunningham D. A. Anaerobic Power Of The Arms And Legs Of Young And Older Men, Experimental Physiology (1999), 84, 589—597

18. Arslan, C., Relationship Between The 30-Second Wingate Test And Characteristics Of Isometric And Explosive Leg Strength In Young Subjects, The Journal Of Strength And Conditioning Research, 19(3), pp: 658-666, 2005.

19. Lin, W.L., Yen, K.T., Doris Lu, C.Y., Huang, Y.G., Chang, C.K., Anaerobic Capacity Of Elite Taiwanese Taekwondo Athletes, Science And Sports, 2(5), pp: 291-293, 2006.

20. Minahan, C., Chia, M., Inbar, O., Does Power Indicate Capatiy? 30 s Wingate Anaerobic Test Vs Maximal Accumulated O2 Deficit, International Journal Of Sports Medicine , 28 (10), pp: 836-843 2007.

21. Bencke J., Damsgaard R., Saekmose A., Jorgensen P., Jorgensen K., Klausen K. Anaerobic Power and Muscle Strength Charecteristics of 11 Years Old Elite an Non- Elite Boys and Girls From Gymnastics, Team, Handball, Tennis and Swimming. Scand J. Med SCI Sports 2002 : 12: 171-178

22. Boraczyňski T, Urniaz J. The Influence of Physical Training on Anaerobic Fitness of Elite Handball Players, Medsportpress, Volume 14, No 2, 2008, 69-73.

23. Klasnja A, Drapsin M, Lukac D, Drid P, Obadov S, Grujić N. Comparative Analysis of Two Different Methods of Anaerobic Capacity Assessment In Sedentary Young Men, Vojnosanit Pregl. 2010 Mar; 67(3): 220-4.

24. Melhim, A.F. (1993). Investigation of Circadian Rhythms In Peak Power and Mean Power of Female Physical Education Students. Int. Journal of Sport Med., 14 (6), 303-306.

25. [25] Isler A.K and Kosar S.K. The effect of step aerobics training on anaerobic performance of men and women. Journal of Strength and Conditioning Research, 2006, 20(21), 366-371

26. Hammer RL, Barrier CA, Roundy ES, Bradford JM, Fisher AG. Calorie-restricted low-fat diet and exercise in obese women.Am JClin Nutr 1989; 49(1): 77–85.

27. Lane K, Worsley D, McKenzie D. Exercise and the lymphatic system: implications for breast-cancer survivors. Sports Med. 2005; 35(6): 461–71.

Corresponding Author
Kursat Karacabey,
Duzce University School of Physical Education and Sports,
Duzce,
Turkey,
E-mail: kkaracabey@hotmail.com

Physiological profiles of cadet Serbian judokas

Patrik Drid[1], Svetlana Vajnberger-Mihelcic[1], Slavko Obadov[1], Ivan Todorov[2], Miodrag Drapsin[3], Izet Radjo[4]

[1] Faculty of Sport and Physical Education, University of Novi Sad, Serbia,
[2] Olympic Committee of Serbia,
[3] Faculty of Medicine, University of Novi Sad, Serbia,
[4] Faculty of Sport and Physical Education, University of Sarajevo, Bosnia and Herzegovina.

Abstract

The purpose of this study was to determine: 1) physiological profiles of cadet male judokas of the Serbian national team, and, 2) which motor and physiological abilities separate more successful from less successful athletes.

The sample used for this research consisted of the best cadet judokas from the territory of Serbia divided in two groups according to their past results in competitions (groups A and B) which consisted of 16 examinees. The finalists in the Serbian championship were members of the group A, bronze medal winners were members of the group B. Physiological fitness values were measured in all subject.

The structure of discriminant functions clearly indicates that the highest discriminant value in the set of applied variables belongs to the variables agility T-Test, running sideways 20m and Relative Peak power in Wingate test (W/kg). It was concluded that there were statistically significant differences for the variables 10 m sprint from flying start, Running sideways 20 m, Agility T-Test, Continous jump, Shuttle run and Relative Peak power in Wingate test (W/kg) at the level of evaluation which was p < 0,01. In all cases the differences go in favour of the team A, which means that the examinees from this national team had significantly better results in the above mentioned variables than the ones from the team B.

The structure of being in good shape in judo, which is defined by success, can be labeled as invaluable from the point of view of science and practice. The results obtain in this research can offer coaches the information about the aspects that require more attention in order to make up for the results which are under average, in comparison to the model.

Key words: Physiological profiles, cadet, judokas.

Introduction

Every judoka has to express a large number of actions during one match, so physiological demands of every match are very high (Franchini et al., 2011). A judoka tries to recognize the right moment for using the opponent's weakness and reacts quickly, powerfully and explosively. Quick and powerful techniques of throwing or strong counteraction are mostly supported by anaerobic metabolism. As opposed to that, well-developed aerobic mechanisms of energy recovery are necessary throughout a match, including the breaks (Franchini et al., 2003; Drid et al.; 2008, Drid et al., 2009). Aerobic metabolism is especially important for the process of recovery between matches (Franchini et al., 2009). Many authors describe judo as an explosive sport, with large resources of anaerobic capacities, supported by well-developed aerobic characteristics (Callister et al., 1991; Takahashi, 1992). Anaerobic system allows short, fast, explosive demonstration of strength in a match, while aerobic system enables a judoka do endure an effort during fight and recover during short periods of reduced effort. The structure of movements in this sport is considered to be very demanding for most muscle groups (Thomas et al., 1989; Franchini et al., 2005). To be successful in judo, it is necessary to have a high level of various types of strength, speed and flexibility (Banović, 2001; Franchini et al., 2001a; Franchini et al., 2001b; Monteiro et al., 2001; Radjo et al., 2011) and it can be concluded that there are three motor-functional abilities vital for success in judo: strength, coordination and aerobic-anaerobic endurance.

When selection for judo is taking place, it is necessary to focus on those characteristics and abilities which are vital for sports performance (result), as well as those which are predominantly genetic. In the evaluation of the training process itself, the parameters of the state of fitness allow us to follow the abilities which can be altered un-

der the influence of training (e.g. abilities sensitive to the influence of surroundings, specific physical activities, such as programmed training), which have a strong influence on the result.

Therefore, the purpose of this study was to determine: 1) physiological profiles of cadet male judokas of the Serbian national team, and, 2) which motor and physiological abilities separate more successful from less successful athletes.

Method

Sample of examinees

The sample used for this research consisted of the best cadet judokas from the territory of Serbia (N=32) divided in two groups according to their past results in competitions (groups A and B) which consisted of 16 examinees. The finalists in the Serbian championship were members of the group A (16.54±0.53 years, 179.28±9.46 cm, 84.35±22.56 kg). Bronze medal winners were members of the group B (16.59±0.47 year, 177.50±9.62 cm, 84.14±21 kg).

Sample of measuring instruments

For evaluation of motor abilities the following tests were used: speed: 10 m sprint, 10 m sprint from flying start, 20 m sprint; agility: agility T-Test, running sideways 20 m; explosive power: squat jump, counter movement jump; flexibility: over-arm flip, sit-and-reach; endurance: Shuttle run, continuous jump.

Evaluation of aerobic abilities was done by using the following tests: Absolute maximal oxygen uptake - VO_{2max} in a treadmill test (l/min), Relative maximal oxygen uptake - VO_{2max} in a treadmill test (ml·kg-1·min-1).

Evaluation of anaerobic abilities was done by using the following tests: Peak power in Wingate test (W), Relative Peak power in Wingate test (W/kg).

Protocol of testing and description of tests

Testing for the purpose of this research was done by the educated diagnostic experts. Testing of judokas took place at the Faculty of Sport and Physical Education and Department of Physiology at the Faculty of Medicine.

Speed tests

An examinee starts from a standing position at the starting line and at the sign of a person in charge of measuring runs as fast as possible to the finishing line. The result of the test is the time during which an examinee runs for 10 and 20 m, expressed in hundredths of a second. The test is repeated three times with pauses (up to 10 minutes) and the best result is processed. Examinees are tested for 10 m from a flying start.

Tests of agility

Agility T-test. This test requires four marks in the shape of a letter T, in a way that the second (2) mark is nine meters away from the first one (1), while the third (3) and fourth (4) are to its left side and at the distance of 4.5 meters. The task of an examinee is to run straight from the mark 1 to the mark 2 which should be touched, after that they use a sliding hop-step technique to reach the mark 3. When the mark 3 is touched, the same movements are repeated until the mark 4 is reached and after touching it the sliding technique is used again to return to the mark 2. After touching the mark 2 an examinee starts moving backwards, turning their back to the initial position. The time is stopped when any part of their body crosses the mark. Any avoidance of the given principles should result in interruption of the performance. Otherwise, the results are inadequate for the interpretation. In order to achieve objective results, the testing should be done twice and only a better result should be analyzed.

Running sideways for 20 m. Running sideways with hop-steps. The time is measured in seconds from the starting to the finishing line.

Explosive strength tests

As opposed to other methods used for evaluation of parameters of vertical jumps, Quattro Jump (Kistler Quattro Jump, Switzerland) measures exactly the segment which is of great interest. Explosive strength tests of vertical jumps were measured using the QUATTRO JUMP (Kistler, Switzerland) platform for measuring the force. The result of vertical jump was the height of the jump measured in centimeters (cm). Namely, the tests are used to evaluate the explosive power of legs in concentric (SJ), slow excentric-concentric (CMJ) pattern of muscle force and continuous jumps (CJs).

Tests of flexibility

Over-arm flip. During the over-arm flip test an examinee is standing and holding a pole with his/her arms stretched. Following that, they raise their hands over the head. The person in charge of measuring keeps the record of centimeters measured during this exercise.

Sit-and-reach. An examinee sits on the floor with his/her legs apart forming the angle of 45°. A meter is placed on the floor, between their hips. The examinee puts his/her hands together and tries to reach as far as he/she can bending their back. The result is represented by the reached value expressed in centimeters. The test is repeated several times with pauses between (15 seconds) and the best result is used for data processing.

Test of endurance

Shuttle run. Aerobic fitness was determined using maximal multistage 20-m shuttle-run test (Leger & Lambert, 1982).

Aerobic capacity

The following protocols for determination of the subject's functional abilities were applied: 1) Absolute oxygen uptake (VO_2, ml/min); 2) Relative oxygen uptake (VO_2, ml/min/kg).

Aerobic capacity was assessed with a treadmill (COSMED model T-170-Italy), and the data were collected with a gas analyzer (CPET breath-by-breath method). Briefly, expiratory airflow was measured by gas turbine with a mask and expired gases were analyzed for O_2 with a parametric analyzer and for CO_2 with an infrared analyzer. Before each test, the volume was calibrated by five inspiratory and expiratory strokes at different flows with a three-liter pump; the gas analyzer was calibrated with two mixtures of gases of known oxygen and carbon dioxide concentrations (20.9% O_2, 0.03% CO_2, and then 16.0% O_2, 5.0% CO_2). The FSPE1 protocol itself included measurements of ventilator and metabolic parameters during pauses for one minute, and then for one minute at the speed of 3 km/h. Afterwards, subjects took progressive increments of workload at the rate of 0.5 km/h every 30 seconds (started to run at 7km/h) until exhaustion. The inclination was constant at 2%. The test was considered completed when the VO_2 reached plateau, and respiratory and ventilator quotient reached reference

values, while the subjective state of each participant was monitored during the protocol. During the test, subjects had to show the level of rating perceived exertion (RPE) on the modified Borg's Scale where 0 was extremely easy and 13 was extremely hard without capability of proceeding the test (the end of testing).

Anaerobic capacity

Anaerobic capacity was determined by Wingate test (WAnT) and the examination was performed in the Laboratory of functional diagnostics at the Department of Physiology, Faculty of Medicine, Novi Sad. WAnT is a cycle ergometer "all-out" test which lasts 30s. Maximal workload is achieved by turning flywheel with installed blades, previously calibrated by an engine of the adequate power against air resistance (Dotan and Bar-Or, 1983). Testing was performed on a cycle ergometer under the same microclimate conditions. All tests were done by using the same experimental procedure.

Workload was registered directly by the computer which had a module for measuring the number of rotations of the flywheel on a cycle ergometer. A set of programmes which enabled graphic recordings of workload during 30 s, as well as data collection, enabled a software support. Those methods allowed direct monitoring of the testing and a fast analysis of basic indicators of anaerobic capabilities (Peak Power, Peak Power/ body mass, index of fatigue and increase) (MacIntosh et al., 2003). Besides that, programmed support also offered the data about qualitative values of anaerobic energy during any period of time from the 1st to the 30th second of maximal force, together with the automatic evaluation of the absolute and relative values of both registered parameters, as well as a cumulative evaluation of total anaerobic capacity of energy.

Before the test started all examinees were told to warm up by turning pedals of cycle ergometer. That lasted 10 minutes. The goal of warming up was achieving the adaptation of physiological parameters of a body to a higher level which accounted for top results (Bar-Or, 1987).

The test began with a sound signal from a computer which marked the beginning of registration of workload, after which the examinees used their maximal power to move the pedals of cycle ergometer for 30s (Reiser et al., 2002). The height of the

saddle was adjusted to the demands of every examinee before the test started. The conventional length of a crank is 16.5 cm. In our laboratory, as well as in many others, this length was used for all examinees, irrelevant of their height and length of their legs. Compulsory equipment of cycle ergometer also included shoe clips (Capmal and Vandewalle, 1997).

Statistical analysis

All statistical analyses were performed by the SPSS 17.0 software (SPSS Inc., USA). Results are presented as arithmetical means with standard deviation (mean ± SD). Student t-test for small independent samples was applied to determine between-group differences in fitness indicators. Differences between groups were also analyzed by the canonic discriminative analysis. Differences were considered statistically significant at $p < 0.05$.

Results

Comparative analysis of two analyzed subsamples of examinees was done using the Discriminant analysis, in order to detect qualitative characteristics of the differences, besides the analysis of the quantitative differences between the groups.

Taking into account that there were two groups of the examinees, one discriminant function was defined (Table 1). The isolated discriminant function was statistically significant at the level of evaluation $p = 0.003$. That way it can be concluded that there is a statistically significant difference between the analyzed groups in the field of the applied variables.

The structure of discriminant functions (Table 2) clearly indicates that the highest discriminant value in the set of applied variables belongs to the variables agility T-Test, running sideways 20 m and Relative Peak power in Wingate test (W/kg). Other variables have significantly weaker correlations with the isolated discriminant function. First two variables, agility T-Test and running sideways 20 m, have negative coefficients of correlation with discriminant function, but in fact those are logically positive correlations, taking into account that for those variables lower values indicated

qualitatively better results. That is the reason why the values of centroids of analyzed groups must be interpreted taking that into account.

That means that the examinees from the team A have statistically significantly better values of the mentioned variables than the examinees from the team B. The same conclusion can be drawn for the results of the variables Relative Peak power in Wingate test (W/kg) where higher values represented qualitatively better results. That is also indicated by the value of the centroid belonging to the team A which is positive.

Table 2. Structure of discriminant function

Variables	Function
Agility T-Test	**-0.524**
Running sideways 20 m	**-0.493**
Peak power in Wingate test (W/kg)	**0.437**
Shuttle run	0.241
Continuous jump	0.226
10 m sprint from flying start	-0.208
Counter movement jump	0.183
20 m sprint	-0.178
VO$_{2max}$ in a treadmill test (ml·kg-1·min-1)	0.176
Squat jump	0.173
10 m sprint	-0.172
Peak power in Wingate test (W)	0.171
Sit-and-reach	0.084
Maximum oxygen uptake	-0.038
Over-arm flip	-0.029
Centroids of groups	
A team	2.651
B team	-2.461

Analysis of quantitative differences in certain variables between two groups of cadets (Table 3) showed the existence of statistically significant differences in a large number of analysed variables.

It was concluded that there were statistically significant differences for the variables 10 m sprint incuding flying start, Running sideways 20 m, Agility T-Test, Continous jump, Shuttle run and Relative Peak power in Wingate test (W/kg) at the level of evaluation which was $p < 0.01$.

In all cases the differences go in favour of the team A, which means that the examinees from this

Table 1. Discriminant function and its significance

Typical root	R$_C$	Wilks λ	χ^2	df	p
7.045	0.936	0.124	35.447	16	0.003

Table 3. Analysis of the variance between the teams A and B

Variables	A team	B team	F	p
	Mean (SD)	Mean (SD)		
10 m sprint (s)	1.82 (0.08)	1.91 (0.12)	5.21	0.03
10 m sprint from flying start (s)	1.31 (0.06)	1.40 (0.09)	7.60	**0.01**
20 m sprint (s)	3.15 (0.13)	3.31 (0.21)	5.58	0.03
Running sideways 20 m (s)	5.97 (0.33)	6.76 (0.31)	42.75	**0.00**
Agility T-Test (s)	10.68 (0.37)	11.70 (0.40)	48.36	**0.00**
Squat jump (cm)	31.61 (4.28)	27.86 (4.17)	5.29	0.03
Counter movement jump (cm)	36.65 (6.52)	31.34 (8.71)	3.18	0.09
Continuous jump (cm)	34.35 (3.44)	29.20 (5.23)	8.99	**0.01**
Shuttle run (km)	2.05 (0.16)	1.67 (0.40)	10.21	**0.00**
Over-arm flip (cm)	79.23 (13.39)	81.64 (18.37)	0.15	0.70
Sit-and-reach (cm)	22.50 (5.10)	19.93 (6.68)	1.25	0.27
VO_{2max} in a treadmill test (l/min)	3.44 (0.51)	3.57 (0.77)	0.26	0.62
VO_{2max} in a treadmill test (ml·kg-1·min-1)	47.11 (3.93)	42.63 (5.77)	5.45	0.03
Peak power in Wingate test (W)	785.85 (104.49)	668.79 (156.25)	5.15	0.03
Peak power in Wingate test (W/kg)	10.86 (1.72)	7.92 (0.78)	33.59	**0.00**

national team had significantly better results in the above mentioned variables than the ones from the team B. Significant differences at the level $p < 0.05$ were noticed for the variables 10 m sprint, 20 m sprint, Squat jump, Relative VO_{2max} in a treadmill test and Peak power in Wingate test (W).

Discussion

During fight, continuously changing dynamic situations, the fighters need to possess well-acquired technical-tactical stereotypes which they apply, the ability of immediate reorganization of those stereotypes, as well as constant creation of new defensive, attacking and counter-attacking programmes of acting.

The notion of agility cannot be easily defined since it represents the synthesis of almost all physical abilities of one athlete. When it is integrated with coordination, agility enables an athlete to react to a stimulus in a fast and efficient way, move in a desirable direction and be ready to change the direction or stop immediately in order to do a competitive action in a fast, skillful and efficient way. An athlete who has a high level of agility can expect to gain an advantage over other competitors. Having an optimal agility reduces the possibility of injuries, improves sports accomplishment and neutralization of an opponent, which means avoiding contact by quick movements.

Dynamic nature and complexity of making movements in judo fights is represented by movements and actions on tatami, which are performed by maximal power and speed. Actions include a variety of motions the purpose of which is to disturb an opponent's balance, make a protection, as well as throw the opponent in a standing position. On the mat, various rolling movements finally bring about remaining in one position which allows the techniques of a lever, strangling and buttock. If all above mentioned actions and movements in a direct fight with an opponent are taken into account, in constantly changing conditions, it can be noticed that the complexity of technical elements is increased several times. Muscle exertion during fights has both dynamic and static character, but dynamic repetitive strains and explosive movements are dominant.

It is recommendable that sport-specific exercises in judo, such as throwing, pinning, and submission techniques, are restrained to technique drills or actual fighting scenarios on the mat where the desired competitive movement, both in relation to structure and time sequence, can be properly practiced (Henry, 2011).

It is necessary to have a high level of various coordination skills in order to adjust movements to opponent's actions in time and space and apply very complex technical-tactical elements. In order to perform motor tasks in judo in an appropria-

te way it is important to have agility and capability of changing directions fast. In a judo fight the whole body is included at all times and motor tasks must be performed fast in order to be efficient. Combinations in attacks and defense require timely reactions in changing directions of attacks and defense. Agility is expressed not only in moving on the mat at the maximum speed and power, using techniques of fighting, but also in a variety of other movements the purpose of which is regaining balance, disturbing the opponent's balance, making falling easier, etc.

The results of the analysis of variance show that the group A was able to achieve statistically significantly better results in both tests of agility. The ability of changing directions fast has a strong influence on making combinations in the attack, where in most cases the opponent's reaction causes a fast shift of direction or the shift of force direction.

The speed of doing complex motor tasks is invaluable since without a certain speed of implementing techniques there is no necessary efficiency in judo, no matter how well-coordinated a judoka is. Group A also achieved better results of maximum speed than group B. On balance, taking into account the existing research, it seems like agility is a discriminant component among the groups with more significant differences of competitive level.

Certain authors (Borkowsky et al., 2001; Franchini et al., 2005) found no significant differences in VO_{2max} among elite and non-elite judokas, while some results (Muramatsu et al., 1994; Gariod et al., 1995) show that aerobic capacity has a positive influence on the exercises with interruptions in high intensity. Although aerobic power and capacity are considered relevant to judo performance, the available data do not present differences among judo athletes from different competitive levels. Typical maximal oxygen uptake values are around 50-55 mL/kg/min for male and 40-45 mL/kg/min for female judo athletes (Trivic et al., 2009; Franchini et al., 2011). Observing two groups of Serbian cadet judokas and some of their functional capabilities, it can be concluded that there are some positive statistically significant differences in the maximal oxygen uptake (estimated by *Shuttle run* test), as well as relative maximal oxygen uptake, which indicates that higher results in the achieved VO_{2max} of the judokas from the

group A show that they have better functional abilities in comparison to the judokas from the group B. There is some evidence that the judokas who normally get points in the key moments of a fight have a higher value of maximal oxygen uptake (VO2 max) and they are more capable of faster resynthesizing creatine phosphate of the muscle gastrocnemius in comparison to others who get points earlier in the match and have a better performance in the Wingate test for lower body parts (Gariod et al., 1995). This can be important when the structure of judo fights is considered. It has been established (Muramatsu et al., 1994; Castarlenas and Planas, 1997) that judokas with higher VO_2max are in advance in the period of a fight with maximal length (5 min) because the same absolute supermaximal effort has a lower relative intensity in comparison to an athlete who has a lower VO_2max. Changes of the dynamic function of lungs can be used as an indicator of functional fitness even in the activities which are dominantly anaerobic (Radovanovic et al., 2011). Our research has proved that there is a statistically significant difference between the groups of judokas with respect to functional abilities, which includes relative values of maximal oxygen uptake.

The level of general anaerobic endurance depends in the first place on the amount of anaerobic sources of energy (ATP, CP and muscle glycogen), their efficient use (enzyme efficiency) and buffer abilities. Aerobic capacity (oxygen transport system) has no significant influence on the general anaerobic endurance, even though it can be concluded that a higher aerobic capacity ensures longer anaerobic workload since lactic acid is decomposed in the presence of oxygen (1 g of lactic acid requires about 50 ml O_2).

Development of aerobic power and aerobic capacity, as well as muscle power, may be important to some intermittent specific tasks in judo (Detanico et al., 2011). Comparing judokas in the tests of anaerobic capacity, this research proved the existence of certain statistically significant differences, but their value was relative, so it can be concluded that there are some differences in anaerobic capacity between the groups of judokas.

Wingate test for evaluation of anaerobic capacity of judokas was mostly used (Sbriccoli et al., 2007). Comparing different age groups by me-

ans of Wingate tests for the upper part of a body showed that cadet judokas have lower absolute maximal and submaximal power than juniors and seniors, as well as lower relative maximal power than senior judokas. These differences are most likely connected to the aspects of growing up. When the performances of the lower body part are compared by using the Wingate test on the athletes belonging to different competitive levels, it can be concluded that higher maximal and submaximal power was measured on top (state and international medalists) than on other athletes (without medals) (Franchini et al., 2005). Greater maximal power and more efficient use of the muscles of the shoulders, arms and legs, results in lower risk of injury and has a positive effect on athletic performance in terms of speed, agility, power and aerobic endurance (Bratic et al., 2012).

Conclusion

Improved performance of motor functions is typical of a top-quality athlete, while movements represent the essence of sport. Athletes are born with a talent which they can develop by training. Being successful in achieving that goal depends, of course, on athletes themselves. First of all, they should realize that motor functions can be learned. Every step they take in that direction is very important for the improvement of their skills. They become successful in sport only if they insist on perfect technique. Maximum achievement is obtained by the means of perfect training practice, which includes the development of the multi-sensory system of feedback information which enables athletes to learn fast by making attempts and mistakes. It should be pointed out that athletes learn efficiently by means of non-verbal and non-auditory signals. The result of acquiring general and specific motor skills is a reduced risk of injuries, improved general physical condition and joining the efficient motor programmes to the goal of producing efficient, top and specific movements.

Improvement of the dynamic balance is the essence of the development of agility. Athletes should develop all physical qualities, including the central stability, mobility, speed, flexibility, strength, force and energy systems. That way they achieve the exquisite technique which enables them to win in the most important game in a competition – the achievement of their sport potential. In that exciting process of learning and advancing athletes are encouraged to become the people with fully developed motor functions (techniques of movement).

In the process of making selection of athletes for judo, the attention must be paid to those characteristics and skills which have the most important influence on sports performance (result), as well as those which are mostly dominated by genetic factors. During the evaluation of the training process the parameters which show the level of being in good shape allow observation of the variables which are under the influence of training (e.g. abilities susceptible to the influence of the environment; specific physical activities, such as programmed training) which affect the result to a great extent.

The structure of being in good shape in judo, which is defined by success, can be labeled as invaluable from the point of view of science and practice. The results obtain in this research can offer coaches the information about the aspects that require more attention in order to make up for the results which are under average, in comparison to the model.

References

1. Banović, I. (2001). Possible judo performance prediction based on certain motor abilities and technical knowledge (skills) assessment. Kinesiology, 33(2), 191-206.

2. Bar-Or, O. (1987). The Wingate anaerobic test. An update on methodology, reliability and validity. Sport Medicine, 4(6), 381-394.

3. Borkowski, L., Faff, J., Starczewska-Czapowska, J. (2001). Evaluation of the aerobic fitness in judoists from the Polish national team. Biology of Sport, 18(2), 107-117.

4. Bratic, M., Radovanovic, D., Ignjatovic, A., Bojic, I., Stojiljkovic, N. (2012). Changes in the muscular outputs of young judoists during resistance exercises performed on unstable equipment: A case study. Archives of Budo, 8(1), 7-12.

5. Callister, R., Callister, R.J., Staron, R.S., Fleck, S.J., Tesch, P., Dudley, G.A. (1991). Physiological characteristics of elite judo athletes. Int J Sports Med, 12, 196–203.

6. Capmal, S., Vandewalle, H. (1997). Torque-velocity relationship during cycle ergometer sprints with or without toe clips. European Journal of Applied Physiology, 76(4), 375-379.

7. Castarlenas, J.L., Planas, A. (1997). Estudio de la estructura temporal del combate de judo. Apunts, 47, 32–39.

8. Detanico, D, Dal Pupo, J., Franchini, E., Giovana dos Santos, S. (2011). Relationship of aerobic and neuromuscular indexes with specific actions in judo. Science and Sports, In Press, Corrected Proof. Available online: 9 March 2011.

9. Dotan, R, Bar-Or, O. (1983). Load optimization for Wingate anaerobic test. European Journal of Applied Physiology, 51, 409-417.

10. Drid, P., Trivić, T., Obadov, S. (2008). Fizička pripremljenost džudistkinja Srbije procenjena primenom specifičnog fitness judo testa [Physical condition serbian female judokas assessed using judo specific fitness test]. Homo Sporticus, 10(1), 6-9.

11. Drid, P. Maksimovic, N., Matic, R., Obradovic, B., Milosevic, Z., Ostojic, S. M. (2009). Fitness profiles of elite female judokas of the Serbian national team. Medicina Dello Sport, 62, 251-263.

12. Franchini, E., Takito, M.Y., Cavinato, C.C., Matheus, L., Bertuzzi, R.C.M., Vieira, D.E.B. (2001a). Relationship between morphological, physiological and technical variables in high level college judo players. 2nd IJF World Judo Conference Munich, Germany.

13. Franchini, E., Takito, M.Y. Dal Molin Kiss, M.A.P., Sterkowicz, S. (2001b). Physical fitness and anthropometric differences between elite and nonelite judo players. 2nd IJF World Judo Conference Munich, Germany.

14. Franchini, E., Takito, M.Y., Nakamura, F.Y., Matsushigue, K.A., Kiss, M.A. (2003). Effects of recovery type after a judo combat on blood lactate removal and performance in an intermittent anaerobic task. J Sports Med Phys Fitness, 43, 424-431.

15. Franchini, E., Takito, M.Y., Kiss, M.A., Sterkowicz, S. (2005). Physical fitness and anthropometric differences between elite and nonelite judo players. Biol Sport, 22, 315-328.

16. Franchini, E., Bertuzzi, R.C.M., Takito, M.Y., Kiss, M.A. (2009). Effects of recovery type after a judo match on blood lactate and performance in specific and non-specific judo tasks. Eur J Appl Physiol, 107(4), 377-383.

17. Franchini, E., Del Vecchio, F.B., Matsushigue, K.A., Artioli, G.G. (2011). Physiological profiles of elite judo athletes. Sports Medicine, 41(2), 147-66.

18. Gariod, L., Favre-Juvin, A., Novel, V., Reutenauer, H., Majean, H., Rossi, A. (1995). Evaluation du profit energetique des judokas par spectroscopie RMN duP31. Sci Sports, 10, 201-207.

19. Henry, T. (2011). Resistance training for judo: functional strength training concepts and principles. Strength and Conditioning Journal, 33(6), 40-49.

20. Leger, L., Lambert, J.A. (1982). A maximal multistage 20 meter shuttle run test to predict V02 max. Eur J App Phys, 49, 1-12.

21. MacIntosh, B.R., Rishaug, P., Svedahl, K. (2003). Assessment of peak power and short- term work capacity. European Journal of Applied Physiology, 88(6), 572-579.

22. Muramatsu, S., Horiyasu, T., Sato, S.I., Hattori, Y., Yanagisawa, H., Onozawa, K., Tezuka, M. (1994). The relationship between aerobic capacity and peak power during intermittent anaerobic exercise of judo athletes. Bulletin of the Association for the Scientific Study on Judo Kodokan, 8, 151–160. [In Japanese with English abstract]

23. Radjo, I., Mekic, A., Drapsin, M., Trivic, T., Kajmovic, H., Drid, P. (2011). Isokinetic strength profile of shoulder rotators and thigh muscle torques in elite judokas and soccer players. TTEM, 6(3), 631-635

24. Radovanovic, D., Bratic, M., Nurkic, M., Stankovic, N. (2011). Recovery of dynamic lung function in elite judoists after short-term high intensity exercise. Archives of Budo, 7(1), 21-26.

25. Reiser, R.F., Maines, J.M., Eisenmann, J.C., Wilkinson, J.G. (2002). Standing and seated Wingate protocols in human cycling. Comparison of standard parameters. European Journal of Applied Physiology, 88(1-2), 152-157.

26. Sbriccoli, P., Bazzucchi, I., Di Mario, A., Marzattinocci, G., Felici, F. (2007). Assessment of maximal cardiorespiratory performance and muscle power in the Italian Olympic judoka. J. Strength Cond. Res., 21(3), 738–744.

27. Takahashi, R. (1992). Power training for judo: plyometric training eighth medicine balls. International Journals of Sports Medicine, 14(2), 6-71.

28. Thomas, S.G., Cox, M.H., Legal, Y.M., Verde, T.J., Smith, H.K. (1989). Physiological profiles of the Canadian National Judo Team. Can J Sport Sci, 14, 142–147.

29. Trivic, T., Drid, P., Obadov, S. (2009). Aerobic capacity of male judokas in comparison with university students of the Faculty of Sport and Physical Education. Archives of Budo, 5, 143-146.

Corresponding Author
Patrik Drid,
Faculty of Sport and Physical Education,
University of Novi Sad,
Serbia,
E-mail: patrikdrid@gmail.com

Comparison of the efficacy on flexibility and body mass index of salat: prayer versus non-prayer healthy females

F. Filiz Colakoglu[1], Selma Karacan[2], Nevin Atalay Guzel[3], Gul Baltaci[4]

[1] Gazi University, School of Physical Education and Sport, Ankara, Turkey,
[2] Selcuk University, School of Physical Education and Sport, Konya, Turkey,
[3] Gazi University, Faculty of Health Sciences, Department of Physical Therapy and Rehabilitation, Ankara, Turkey,
[4] Hacettepe University, Faculty of Health Sciences, Department of Physical Therapy and Rehabilitation, Ankara, Turkey.

Abstract

Objective: The importance of prayer in Islam is great as it is the foremost duty of Muslims and one of the pillars on which the structure of Islam stands. Prayer is a central part of the life of practicing Muslims. The aims of this study were to investigate the relationship between flexibility and body mass index (BMI) and their differences between age groups of sedentary Muslims woman to perform prayer and to compare with flexibility and BMI between prayer and non-prayers.

Method: Two-hundred forty-five prayer and one-hundred forty-one non-prayer women divided into 3 groups according to age (Group 1 was between age of 20 and 34 years (prayer= 51 and non-prayer= 56), group 2 was between age of 35 and 49 years (prayer= 124 and non-prayer= 67), and group 3 was between age of 50 and 65 years (prayer= 70 and non-prayer= 18). It was evaluated the flexibility by measuring sit and reach test and body mass index (BMI) by dividing the square of body height of body weight between prayer and non-prayer females.

Results: There was a significant difference in flexibility scores between prayer and non-prayers (p<0.05). The results of sit and reach test scores and body mass index correlated with prayers (r=-0.111) and non-prayers (r=-0.063) negatively; and furthermore there were no significant differences both the results of BMI and flexibility the status of salat and age groups to participants (p>0.05).

Conclusion: This study shown that there were no effect on BMI the status of salat and age groups of participants.

Key words: Flexibility, body mass index, prayer, sedentary, salat

Introduction

Salat is the Arabic word for prayers offered by Muslim worshippers, and is the second pillar of the Islamic faith. The various aspects of the prayer ritual include standing, bowing, prostration and sitting. Before performing the prayers, worshippers must brush their teeth, wash the oral and nasal cavities, face, raise the hands up to elbows, and feet up to the ankle. These types of self-care tasks are performed routinely by able -bodied persons, but they can become extraordinary challenges for persons with cognitive, motor, or sensory impairments and disability. Worshippers usually wear loose garments during prayers, which are usually conducted in a calm environment which helps to concentrate the mind of the worshipper. This type of mind concentration has a tranquilizing effect and is different from conventional meditation. *Salat* is a physical activity as well as a spiritual act involving total obedience and submission to Allah (God). The act of prayers is obligatory for all Muslims[1,2].

An abundance of epidemiological research confirms the benefits of physical activity in reducing risk of various age-related morbidities and all-cause mortality. Analysis of the literature focusing on key exercise variables (e.g., intensity, type, and volume) suggests that the requisite beneficial amount of activity is that which engenders improved cardiorespiratory fitness, strength, power, and, indirectly, balance. Age-related declines in these components are such that physical limitations impinge on functional activities of daily living. However, an exercise programme can minimize declines, thus preventing older adults (age 65+ years) from crossing functional thresholds of inability[3].

The aims of this study were to investigate the relationship between flexibility and body mass index (BMI) and their differences between age groups of sedentary Muslims woman to perform prayer and to compare with flexibility and BMI between prayer and non-prayers.

Methods

The pattern of the *salat* prayer performed by Muslims is similar all over the world. This study was randomly conducted on three hundred-eighty-six voluntary female. We determined by survey method the status of salat among participants and provided to prayer group who has done to salat and for least 2 years. The physical characteristics of the participants in this study are shown in Table 1. All participants were divided into three groups according to age groups. Group 1 was between age of 20 and 34 years (prayer= 51 and non-prayer= 56), group 2 was between age of 35 and 49 years (prayer= 124 and non-prayer= 67), and group 3 was between age of 50 and 65 years (prayer= 70 and non-prayer= 18).

In our study, we evaluated the flexibility by measuring sit and reach test and body mass index (BMI) by dividing the square of body height of body weight between prayer (n=245) and non-prayer (n=141) females. Height was measured on a Harpenden stadiometer. Body weight was determined to the nearest 0.1 kg using a bar scale, with the subjects wearing light indoor clothing without shoes. Body mass index (BMI) was calculated as weight per height[2], with weight in kilograms and height in meters[4].

Before testing, all participants performed a three minutes warm up and static stretch routine, emphasizing the lower body. Immediately after the stretching, the flexibility tests were performed in a counterbalanced design. The two tests were assessed on the same day for each participant.

Sit-and-reach Test (SRT):

The SRT was administered using the procedures outlined in the ACSM's manual[5]. A standard sit-and-reach box was placed on the floor, by placing tape at a right angle to the 38 cm mark and the ruler that is centered on the top of the box was used to obtain the SRT scores. The markings on the ruler were positioned so that the zero point represented the point at which the subjects' fingertips were in

line with their toes[6]. Each participant was seated on the floor with knees fully extended and ankles with neutral dorsiflexion against the box. The subject was instructed to place one hand on top of the other and slowly reach forward as far as possible while keeping the knees extended. The hands were kept aligned evenly as the subject reached forward along the surface of the box. Each boy practiced the movement twice, and, on the third repetition, the SRT score in centimeters was recorded as the final position of the fingertips on or towards the ruler. The score was negative if the subject could not touch his toes, "0" if the toes were reached and positive when she reached beyond the toes.

Standing for Prayers

Worshippers have to stand and concentrate their minds on praying. A reactive depression is common in geriatric and disabled persons. The determination to pray has a remedial action on depression, and standing helps to develop balance. When people stand comfortably, the center of pressure is usually midway between the insteps of the two feet. In a standing position, they raise their hands up to the ear lobe and bring them down one after another by holding the left wrist with the right hand on the abdomen, above the navel, or on the chest. During voluntary clenching of the right hand, blood flow is increased in the hand area of the left motor cortex, and the corresponding sensory areas in the post-central gyrus[2].

Bowing

After standing and uttering some verses from the *Quran*, bowing is done by forward movement of the vertebral column, especially at the lumbar joint, and supported by two straight hands grasping the two hyperextended knees. After a few seconds, the worshipper gradually reverts to the previous stat e until the vertebral column is vertical.

Prostration

The act of prostration is the substance of *salat*. It is done from the standing position to kneeling, putting the head down and touching the ground with the forehead, with the palms remaining parallel to the ears, and touching the ground with the flexed elbows for a few seconds. The various positions of *salat* from the vertical natural position to prostration help in the maintenance of steadiness of postural equilibrium. During *salat,* Muslims usually keep their eyes fixed on

the site of prostration. This visual fixation together with proprioceptive systems, vestibular systems, and the various postures provide a complex positional sense in the brain stem and cerebellum.

Sitting and Finishing Salat

After standing and bowing, and proceeding to prostration, sitting is done on the left leg knee flexed with the inverted dorsi flexed ankle and flexed right knee and metatarsophalangeal joint for a couple of minutes. After that, *salat* is concluded by looking over one's right and left shoulder wishing peace for mankind.

Data Analysis

The results of flexibility test and body mass index were analyzed for cross-sectional comparison. The independent variable was the Islamic ritual prayer. Groups were formed according to age classification and consisted of females in age 20-34, 35-49, and 50-65 years-old, respectively.

Data were analyzed using Statistical Package for Social Sciences (SPSS) MS Windows Release 10.0 (SPSS Inc.). Comparisons of groups were made by using one way ANOVA together with posthoc Tukey multiple comparison tests. The improvement of flexibility parameters in relation to prayer was tested with the aid of correlation analysis and Pearson correlation coefficients were computed. The relationships of flexibility parameters with chronologic age, body measures and each other were tested by the Pearson correlation coefficient analysis. Two-tail significance was evaluated designating the 0.05 probability level as significant.

Results

Mean and standard deviations for age, height, weight, BMI and the results of flexibility by accor-

ding to age groups are seen in Table 1. There was no significant difference in age, weight, height and BMI between age groups but only the flexibility in group I, II and III in non-payer females were significantly different from all prayers ($p<0.05$) (Table 1).

The mean SRT and BMI scores in relation to prayers and non-prayers are seen in Figure 1 and Figure 2, respectively. The result of this flexibility test did not correlate with age, height, and body weight; and however, they correlated with the status of prayer (Table 2).

Figure 1. Comparison of flexibility between prayer and non-prayer females according to age groups

There were significantly increased the results of flexibility between age groups in all participants ($p<0.05$).

There were significantly increased the results of BMI in middle and over middle age prayers than non-prayers ($p<0.05$). There were no significant differences in the results of BMI of young age group for all participants ($p>.05$). (Figure 2).

Table 1. Physical characteristics of the subjects.

	Young Prayer n=51	Young Non-Prayer n=56	Middle Age Prayer n=124	Middle Age Non-Prayer n=67	Over Middle Age Prayer n=70	Over Middle Age Non-Prayer n=18
Age(years)	28.8±3.3	27.2±4.6	41.7±4.0	42,5±3,6	54,2±4,2	52,8±2,8
Height (m)	158.3±5.3	159.6±6.0	155,9±4,8	156,7±5,61	154,6±4,3	155,8±5,2
Body Mass(kg)	74.3±10.4	75.0±15.2	77,3±12,4	76,0±12,6	79,5±12,5	74,1±11,4
BMI (kg/m²)	29.7±4.5	29.5±5.9	31,9±5,1	31,0±5,3	33,3±5,3	30,5±4,2
Flexibility(cm)	28.2±6.3	20.±5.4	27,6±5,9	20,5±6,2	28,9±6,0	18,9±4,1

P<0.05

Table 2. Comparison of flexibility and body mass index between prayers and non-prayers according to age groups.

Variables Flexibility (cm)	X	Age F	Prayer-non prayer F	Age x prayer-non prayer F
20-34 year prayer (n=51)	28,2±6,3			
20-34 year non-prayer (n=56)	20,0±5,4			
35-49 year prayer(n=124)	27,6±6,0			
35-49 year non-prayer (n=67)	20,5±6,2	,017	135,006**	1,246
50-65 age prayer (n=70)	28,9±6,0			
50-65 year non-prayer (n=18)	18,9±7,1			
BMI (kg/m²)				
20-34 year prayer (n=51)	29,7±4,5			
20-34 year non-prayer (n=56)	29,6±5,9			
35-49 year prayer (n=124)	31,9±5,1			
35-49 year non-prayer (n=67)	31,0±5,3	5,267**	4,299*	1,234
50-65 year prayer (n=70)	33,3034±5,2795			
50-65 year non-prayer (n=18)	30,4806±4,1793			

Table 3. Correlation with flexibility and BMI in prayer females

		Flexibility	BMI
Flexibility	Pearson Correlation	1,000	-,111
	Sig. (2-tailed)	,	,084
BMI	Pearson Correlation	-,111	1,000
	Sig. (2-tailed)	,084	,
	N	245	245

(r= -0.111, p>.05)

Table 4. Correlation with flexibility and body mass index in non-prayers

		Flexibility	BMI
Flexibility	Pearson Correlation	1,000	-,063
	Sig. (2-tailed)	,	,457
BMI	Pearson Correlation	-,063	1,000
	Sig. (2-tailed)	,457	,
	N	141	141

(r= -0.063, p>.05)

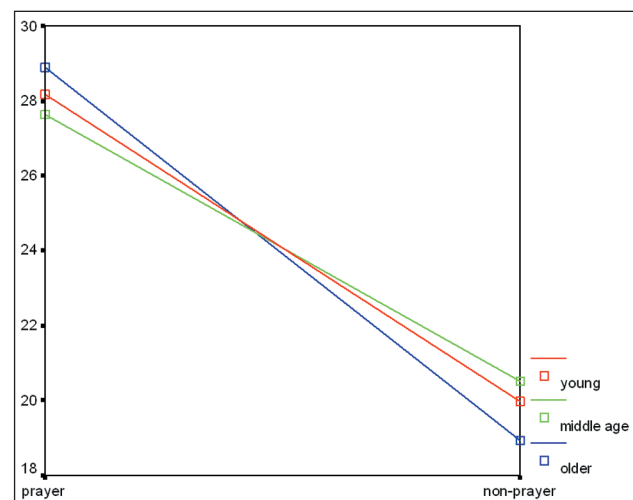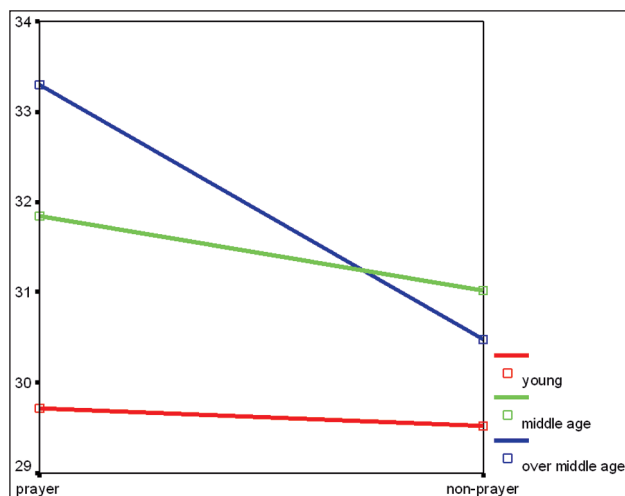*Figure 2. Comparison of BMI between prayer and non-prayer females according to age groups*

There were significant differences in BMI results in all age groups (p<0.05). There were no significant differences both the results of BMI and flexibility the status of salat and age groups to participants (p>0.05). We negatively found a low relationship between the results of BMI and flexibility both prayers (r=-0.111) and non-prayers (r=-0.063) (p <0.05).

There were significantly increased the results of flexibility between age groups in prayers than age groups to non-prayers (p<0.05) (Figure 1).

Discussion

The stated purpose of this study was to determine the relationship between flexibility and body mass index (BMI) and their differences between age groups of sedentary Muslims woman to perform prayer and to compare with flexibility and BMI between prayer and non-prayers. The test protocols for the criterion measures were taken from the literature where their reliability and validity had been demonstrated [7,8,9,10].

As for the compared characteristics, it is primarily the consistent difference between the respective flexibility means that can be related to an obvious anthropological (race) difference. We wish to emphasize particularly that the body composition and flexibility of the present non-prayer sample (this being a control group) have also been affected by the consequences of the generally more hypoactive lifestyle nowadays. Previously the flexibility of the prayer females was also remarkably better.

Present results supported the research findings established by Sai-Chuen[11], Chung[6], and Jackson et al.[12]. They concluded that flexibility of hamstrings is the sole measure of the traditional SR test; however, we provided an indicatory finding by stating that the SRT test was valid in assessing hamstring flexibility of female. Jackson et al.[9] and Jackson etal.[12] reported validity coefficients for the SR test ranging from .64 to .88 in studies involving teenage and middle-age participants, respectively. No participants were eliminated due to their inability to perform the SR test. Also, in spite of our emphasis on proper spotting of the participants in this study, no participant fell backward, hitting her head or did improper position. No injuries occurred during testing on the SRT. However, careful spotting is recommended when assessing frail participants or individuals with balance problems.

The results from this study demonstrated that the young and middle age prayers were more flexible than over middle age prayers, because the SR test not only produce similar validity and reliability in women as other protocols, it also requires no sit-and-reach box. In addition, when selecting a fitness test for flexibility, practitioners should be sensitive to the subject's feelings when administrating the test[13]. Classical SR test is particularly useful in large-scale flexibility evaluation in the field testing. Moreover, Jackson et al.[12], reported that the SR is not related to reported lower back pain in either a cross-sectional or prospective sample of adults. Evidence of the relationship between hamstring flexibility or lower back flexibility and lower back health is not documented.

Future studies are needed to explore the influence of hamstring and lower back health. The need for developing a more practical field test with improved validity for hamstring and lower back flexibility is apparent.

Flexibility resulted as the most important factor to influence salat satisfaction; the second to affect family and social commitment[14,15,16,17] and the ability to do the same job when 60 years old, as well as trauma, overall fatigue, irritability, and headache; and the third to influence heart disease, stomachache, anxiety, injury, and the feeling that health being at risk because of salat. Variability was the third most important factor influencing family and social commitments. Moreover, shift and night work in the salat confirmed to have a significant influence on sleep, digestive and cardiovascular troubles, as well and health and safety at work. Time pressure also showed a relevant influence, both on individual stress and social life. Therefore, suitable arrangements of rigid salat time, aimed at supporting subjects' coping strategies, appear to have a clear beneficial effect on prayer health and well-being, with positive consequences also at the company and social level, as evidenced by the higher "feeling to be able to do salat until 60 years of age".

Furthermore, some authors concluded that the imagery had stronger psychological than physiological effects, but that there was potential for enhancing physiological effects by maximizing imagery vividness, particularly for movement imagery[18,19].

The few studies that have explored minimal or optimal activity requirements suggest that a threshold (intensity) within the moderately vigorous domain[18,20]. Thus, physical activity and (or) exercise prescriptions should emphasize activities of the specificity and type to improve components related to the maintenance of functional capacity and independence; these will also delay morbidity and mortality.

Salat in an Islamic rule is a potent intervention that improved balance, upper- and lower-body muscular strength and endurance, and upper- and lower-body flexibility in these young and older Muslim adults[2]. These findings provide important information for future community-based exercise programs and support current public health initiatives to reduce disability conditions and enhance physical function in young and older adults.

Salat was a culturally appropriate mind-body exercise for these adults, with statistically significant flexibility benefits observed over 2-years. Further research examining Salat exercise using a randomized clinical trial design with an attention-control group may reduce potential confounding effects, while exploring potential mechanisms underlying the relaxation response associated with mind-body exercise.

This study suggests that chronic salat exercises like stretching by themselves can improve specific flexibility performances. It is possible that persons who are unable to participate in traditional strength training activities may be able to experience gains through stretching, which would allow them to transition into a more traditional exercise regimen.

In conclusion, it is assumed that all prayers are more flexible than in young, middle and over middle age non-prayers because all prayers would have done physical activity related salat regularly. However; the other result of this study was shown that BMI of over middle age prayer group was higher than the other subjects due to short and static repetitive activities during salat.

References

1. Reza MF, Urakami Y, Mano Y. Evaluation of a new physical exercise taken from salat (prayer) as a short-duration and frequent physical activity in the rehabilitation of geriatric and disabled patients. Annals of Saudi Medicine. 2002; 22(3-4): 177-80

2. Roudsari RL, Allan HT, Smith PA. Looking at infertility through the lens of religion and spirituality: a review of the literature. Human Fertility (Camb). 2007; 10(3): 141-9.

3. Konopack JF, Marquez DX, Hu L, Elavsky S, McAuley E, Kramer AF. Correlates of Functional Fitness in Older Adults, Int J Behav Med. 2008; 15(4): 311 – 318

4. Baumgartner TA, Jackson AS. Measurement for evaluation in physical education and exercise science. Dubuque, IA: Brown&Benchmark. 1995.

5. American College of Sports Medicine. ACSM's Guidelines for Exercise Testing and Prescription. Seventh Edt, Lippincott Williams & Wilkins, Baltimore, 2005; 85-88 p.

6. Chung PK, Yuen CK. Criterion-related validity of sit-and-reach tests in university men in Hong Kong. Perceptual Motor Skill. 1999; 88: 304-16.

7. Hoeger WW, Hopkins DR. A comparison of the sit and reach and the modified sit and reach in the measurement of flexibility in women. Research Quarterly in Exercise and Sports. 1992; 63(2): 191-195.

8. Hui SC, Yuen PY, Morrow JR, Jackson AW. Comparison of the criterion-related validity of sit-and-reach tests with and without limb length adjustment in Asian adults. Research Quarterly in Exercise and Sports. 1999; 70(4): 401-6.

9. Jackson A, Langford NJ. The criterion-related validity of the sit and reach test: replication and extension of previous findings, Research Quarterly in Exercise and Sports. 1989; 60(4): 384-387.

10. Minkler S, Patterson P. The validity of the modified sit-and-reach test in college-age students. Research Quarterly in Exercise and Sports. 1994; 65(2): 189-92.

11. Sai-Chuen S, Yuen PY. Validity of the modified back-saver sit and-reach test: a comparison with other protocols. Medicine and Science in Sports and Exercise. 2000; 32 (9): 1655-1659.

12. Jackson AW, Morrow JR, Brill PA, Kohl HW, Gordon NF, Blair SN. Relations of sit-up and sit-and-reach tests to low back pain in adults. Journal of Orthopaedic and Sports Physical Therapy. 1998; 27(1): 22-28.

13. Baltaci G, Un N, Tunay V, Besler A, Gerçeker S. Comparison of three different sit and reach tests for measurement of hamstring flexibility in female university students. British Journal of Sports Medicine. 2003; 37: 59-61.

14. Pangrazi RP, Corbin CB. Age as a factor relating to physical fitness test performance. Research Quarterly in Exercise and Sports. 1990; 61: 410-414.

15. Miyatake N, Takanami S, Kawasaki Y, Fujii M. Relationship between visceral fat accumulation and physical fitness in Japanese women. Diabetes Research in Clinical Practice. 2004; 4(3): 173-9.

16. Shaulis D, Golding LA, Tandy RD. Reliability of the AAHPERD functional fitness assessment across multiple practice sessions in older men and women Journal of Aging and Physical Activity. 1994; 2: 273-79.

17. Tseng CN, Chen CC, Wu SC, Lin LC. Effects of a range-of-motion exercise programme. Journal of Advanced Nursing. 2007; 57(2): 181-91.

18. Netz Y, Tomer R, Axelrad S, Argov E, Inbar O. The effect of a single aerobic training session on cognitive flexibility in late middle-aged adults. International Journal of Sports Medicine. 2007; 28(1): 82-7.

19. Vergeer I, Roberts J. Movement and stretching imagery during flexibility training. Journal of Sports Sciences. 2006; 24(2): 197-208.

20. Taylor-Piliae RE, Haskell WL, Stotts NA, Froelicher ES. Improvement in balance, strength, and flexibility after 12 weeks of Tai chi exercise in ethnic Chinese adults with cardiovascular disease risk factors. Alternative Therapy in Health Medicine. 2006; 12(2): 50-8.

Corresponding Author
Nevin Atalay Guzel,
Gazi University,
Faculty of Health Sciences,
Department of Physical Therapy and Rehabilitation,
Ankara,
Turkey,
E-mail: natalay@gazi.edu.tr

Characteristics of speed endurance measured by modified 7x35 meters test and differences between the elite and amateur footballers

Slobodan Andrasic[2], Nenad Zivanovic[1], Zoran Milosevic[4], Veroljub Stankovic[3], Nebojsa Randjelovic[1], Momir Ciric[1]

[1] Faculty of sport and physical education, University of Niš, Serbia,
[2] Faculty of Economics in Subotica, Sports and Recreation centre, University of Novi Sad, Serbia,
[3] Faculty of sport and physical education in Leposavić, University of Prishtina, Serbia,
[4] Faculty of sport and physical education, University of Novi Sad, Serbia.

Abstract

On a sample of 197 footballers of the federal and amateur rank a modified Jens Bangsboa 7x35m test was applied in the form of 7x50m test aiming at the testing of glycogen mechanism of energy compensation and estimating the training level of speed endurance in the elite and amateur footballers subjects. The research aim was to determine: differences between elite and amateur footballers, to form scales of results pointing at excellent, good, average and bad results and possibilities and current state of subjects' speed endurance. Results of MANOVA (.00) and discriminative analyses (.00) between elite football players and amateur football players in relation to 7x50m test results show that there is significant difference between the observed groups of football players and the results divided into four groups formed in relation to the test time results.

The findings of this research show the level of speed endurance development of the tested subjects which is including the total time of test and maximal intensity of its administration, treating glycolitical mechanism of the energy consumption. Above mentioned facts claim the ecxellent applicative value for the testing of the maximal anaerobic capacity, i. e. distance speed endurance.

Key words: Footballers, speed endurance, characteristics, differences.

Introduction

Strain analysis that footballers undergo during matches show slight oscillations in obtained values according to some authors that have researched this problem claiming that footballers perform on average in the course of a match around 400 m sprint, around 700 m high intensity tempo running and around 1700 m medium tempo running. [2-5]. J. Bangsbo's research on physiological strains of footballers during matches refers to speed as three different forms varying in tempo: sprint, heigh and medium tempo running [5]. In sports theory speed is observed according to the mechanisms of energy compensation dominant in their realisation : 1. Sprinter one dominated by ATP and CP mechanism of energy compensation and 2. High and medium intensity running [5] where dominant source of energy compensation glycogen is used, with lactate consequence that research of A. Boženko refers to as distance speed endurance [6].

For the estimation of sprint speed endurance J. Bangsbo [4,5] applies a 7x35m test to obtain data on the efficiency of ATP and CP mechanisms [19-13,14,19,21] that is maximal speed of the footballers, recovery speed and the degree of fatigue. To estimate the level of distance speed endurance the above mentioned 7x35 m test was applied although somewhat modified in that 50 m distance was seven times run in straight line in both directions. Total run distance is 350m, run by professional footballers in 64,49 seconds (the result ranged from 59,03 to 73 sec.), that is for the amateurs it was 66,87 sec. (the result ranged from 59,85 to 77,27 sec.). Considering the fact that the subjects were asked to run at maximal speed this measuring instrument provided parameters good enough to draw conclusions on the level of training of distance speed endurance and the efficiency of the glycogen mechanism of the energy generating, tolerance on the lactates, quick or slow elimination of the lactates, degree of fatigue, etc. Previous research of numerous authors dealt with the problem of the elite athletes, that is anthropological dimensions relevant for their success [15-18, 20].

Material and methods

Participans

Sample of subjects in this test comprised total of 197 footballers, out of which 76 elite ones and 121 amateur rank competition footballers. Testing procedure was administered in the period from January till November 2010.

Instruments

Test 7x50 m is administered on the marked 50 m track on a football court.

Distance is marked by flags. Subjects are asked to run at a maximal speed from one to the other flag and repeat the procedure seven times. Flags are run around. Time is measured from the start till the end of the seventh run. Starter is time measurer and he stands at the finish which is the opposite flag in relation to the start. Administering of this test with photo gates gives more reliable results that reveal a decrease of speed and the level of fatigue.
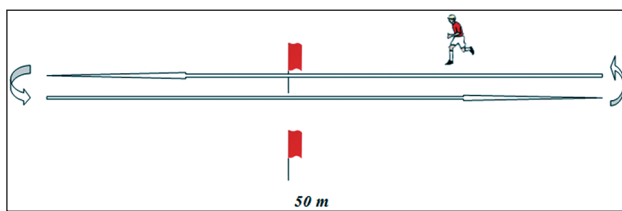

Figure 1. Graphics of the 7x50 m test

7x50 m test is administered with the aim to estimate speed and endurance characteristics of the subjects. It is specially suitable for football because of many reasons:

1. Feature of 50 m distance which is repeated seven times corresponds to a theoretical model of the type and quality of running dominant for football;

2. This test deals with the distance type of running in that the total distance of 350 m which is to be run in the test, is divided into tracks of 50m and can be considered maximal taking into account that football is characterisied with 5 to 40 m sprints. [3-5]. 50 m distance can be said to be typical distance (average one) for half counter and counter attacks and is typical for outer, line and center players.

3. The test is a measuring instrument for the glycogen mechanism of energy

compensation which is going to be dominant in this case having in mind that the test is administered in submaximal regime, that it lasts more than 60sec and that distance run is 350m. Theoretically, in the first 10-15sec of the test administration of the ATP and CP mechanism of energy compensation will be used and after that a dominant source of energy compensation till the end of the test will be a glycogen mechanism [1,3,5,6]. All things considered the obtained facts promote such type of testing of the **distance speed endurance** as a valid measuring instrument.

Statistical analysis

Data were processed by the adequate mathematical-statistical procedures. Applied procedures and the order of their application play certain role in the scientific-research work. Measures wete taken not to lose information gathered by this research study and to correctly observe the order of procedure application which is of paramount importance for conclusion drawings and for timely elimination and inclusion of certain characteristics that will enable more qualitative research. This paper will use descriptive parameters, mean value, standard deviation (Sd), minimum and maximum of all values, coefficient of variation (Cv) interval of reliance, measures of asymmetry Skewniss, measures of flatness Kurtosis and the value of Kolmogorov-Smirnov test. Multivariate analysis MANOVA and discriminative analysis will be applied. Univariate procedures will comprise ANOVA t-test and Roy's test, Pearson coefficient of contingency (χ), coefficient of multiple correlation (R). By application of the procedures that give measures this research gains one new dimension. By calculating the coefficient of discrimination we have isolated parameters that determine the specificity of the subsample and the parameters that are to be eliminated from further data processing, that is we have reduced the observed area. Also by the display of the estimation of the subsample homogeneity, distance between them and by the application of the Cluster analysis, we have tried to as much as possible show better the observed phenomena. By applying mathematical-statistical analysis we have determined characteristics of each subsample, homogeneity and the distance

between them in relation to the derived characteristics so that a precise prediction and prognosis with certain reliability can be obtained[18].

Ethics

Experiments reported in the manuscript were performed in accordance with the ethical standards of the Helsinki Declaration.

Results

The overall research was conducted in two parts. The difference between the amateurs and the elite footballers was analyzed and the achieved result on the test and the results between the observed groups of footballers and the results divided into four groups drawn up in relation to the test performance time. First part of this paper deals with abridged survey of the obtained results of the applied procedures. Then, the table of the contribution of the whole to the characteristics of each of the group of footballers is shown. It is a well known fact that the higher the discrimination between the observed groups of footballers the more prominent the characteristics of each group are. For each whole a percentage of contribution is given (%) and it shows how much the observed whole defines the characteristics of the group in relation to some other group. Then, a survey of characteristics is given with the homogeneity of each group in relation to the measure of discrimination and the degree of the derived characteristics starting from the highest and descending to the lowest one.

In accordance with the previously determined layout of the research a 7x50m test will be analysed in relation to the elite footballers and the amateurs. In the first part central dispersion parameters, measures of asymmetry and flatness in relation to the observed parameters will be given. In the second part the difference between the elite footballers and the amateurs will be analysed, that

is hypotheses will be verified or rejected so as to estimate obtained results and purposefulness of further considerations, directions and methodological priorities will be determined. Then, if conditions exist there will be defined characteristics and homogeneity of each of the analized groups and distance between them will be defined. In the end the obtained results will be graphically displayed.

Basic parameters of 7x50m test in relation to the two groups of subjects

Central and dispersion parameters, measures of asymmetry and flatness of the observed parameters of the 7x50m test represent footballers and focus one to the possibility of the application of parametric procedures.

Minimal (min) and maximal (max) values of the 7x50m test of the elite footballers point to the fact that the values are within the expected range. Values of the coefficient variation (KV) point to the homogeneity of the obtained results (3.47). Increased values of the Skewness (Sk) show that the distribution is *negative asymmetric*, this means that the curve of the results distribution inclines to higher values, that is it has more higher values in relation to the normal distribution (.62). Higher values of Kurtosis (Ku) show that the curve is elongated (1.65). Distribution of the values (p) is mainly within the range of normal distribution (.35). Minimal and maximal values of the 7x50m test results in the amateur footballers point to the values in the expected range. Values of the coefficient of variation (c.var) point to the homogeneity of the obtained results (4.95). Increased values of the Skewness (Sk) point to the distribution which is *negative asymmetric*, that is the distribution curve inclines to the higher values, which means that there are more higher values in relation to the normal distribution (.53). Increased values of the Kurtosis (Ku) show that the curve is elongated (.34). Distribution of the value (p) is mainly within the range of the normal distribution (.27).

Table 1. Central and dispersion parameters and measures of asymmetry and flatness of the elite footballers (76) and amateur footballers (121)

	M	S	min	max	KV	I.p.		Sk	Ku	p
Elite footballers	64.44	2.23	59.0	73.0	3.47	63.93	64.95	.62	1.65	.35
Amateurs	66.93	3.32	59.8	77.3	4.95	66.33	67.52	.53	.34	.27

Legend: *M – arithmetic means, min, max – minimal and maximal results, S - standard deviation, KV – coefficient of variation, I.p. - interval of reliability, Sk - skewness, Ku - kurtosis, p- probability*

Analysis of the differences between the elite footballers and the amateurs in relation to the results obtained in 7x50 m test, and their significance, is determined by means of discrimanitive analysis and multivariate analysis.

Table 2. Significance of differences between the elite and amateur footballers in relation to the 7x50m test results

	F	p	c.dsc
feature	33.22	.00*	.17

Legend: c.dsc – coefficient of discrimination

Since p is <.1 alternative hypothesis is verified this means that there is significant difference between the observed groups of features (.00), and value of the coefficient of discrimination (.17) confirms this difference. On the basis of previous considerations and the analysis of the sample of footballers and congruent with the applied methodology logical sequence of research is determination of the characteristics and homogeneity of each group of the footballers and distance between them. The fact that p is = .00 of the observed groups of footballers, discriminative analysis means that there is clearly defined limit between the groups of footballers, that is, it is possible to determine characteristics of each group in relation to the values of the 7x50m test.

Table 3. Characteristics and homogeneity of the elite and amateur footballers in relation to the 7x50m test results

	elite footballers	amateurs	con %
n/m	56/76	79/121	
%	73.68	65.29	

Legend: hmg - homogeneity; con % - cotribution of the features to the characteristics

All things considered one can say that the characteristics of the elite footballers were observed in 56 out of 76 subjects, homogeneity is 73.7% (higher), which means that 20 footballers display other characteristics; characteristics of the amateurs were found in 79 out of 121 footballers, homogeneity is 65.3% (higher) because 42 footballers display other characteristics. To conclude, among observed and tested footballers of the unknown characteristics, with the reliability of 73.7% one can expect that they belong into the category of the elite footballers, that is, it is possible to give a prognosis with certain reliability.

Table 4. Distance (mahalanobisov) between the elite and amateur footballers in relation to the 7x50m test results

	elite footballers	amateurs
Elite footballers	.00	.84
amateurs	.84	.00

Calculating Mahalanobisov's distance between the tested footballers we have obtained another indicator of the differences or similarities. Distances of different areas can be compared and distances from the tables show that distance between elite and amateur footballers is moderate. In congruence with the original outline of the research the observed groups will be analyzed in relation to the results grouped in the following values:

- Less than 63 sec.;
- From 63,1 to 65 sec.;
- From 65,1 to 67 sec. and
- Results higher than 67,1 sec.

Table 5 displays numeric (n) and percentage (%) results of the observed four groups in relation to the elite and amateur footballers.

Observing the difference between the elite and amateur footballers in set groups of results following conclusion can be drawn: In the first set of resuls the difference is significantly higher to the advantage of the elite footballers (26.32%-10.70% p=.00), as well as in the second set of results (44.70%- 19.80% p=.00). The third group of results did not yield any significant difference while in the fourth group of results this difference is significant to the advantage of the amateur footballers (42.98 -10.53% p=.00). Based on the obtained results it is possible to sort out characteristics of bouth groups in relation to four groups of results which is to conclude that the elite footballers show more prominent results in the first two groups (< 63 sec.*, 63,1-65 sec.*), and the amateur footballers show more prominent results of the fourth group, >67, 1 sec.*. Since $p = .00 \chi^2$ – test it can be said that there is correlation between the amateur footballers and the elite footballers in four groups of results since $\chi^2 = .38$ correlation is low.

Table 5. Numeric (n) and percentage (%) representation of the results of the observed four groups in relation to the elite and amateur footballers

	< 63 sec.		63,1-65 sec.		65,1-67 sec.		>67,1 sec.	
	n	%	n	%	n	%	n	%
Elite footballers	20.	26.3*	34.	44.7*	14.	18.4	8.	10.5
amateurs	13.	10.7	24.	19.8	32.	26.4	52.	43.0*

Analysis of the difference between the elite and amateur footballers in relation to four groups of results is checked by means of MANOVA and discriminative analysis.

Table 6. Significance of differences between the elite and amateur footballers in relation to the four groups of results

analysis	n	F	p
MANOVA	1	40.69	.00*
discriminative	1	40.48	.00*

Based on the value of p = .00 (MANOVA analysis) and p = .00 (discriminative analysis), it is to verify the alternative hypothesis which means that there is difference and clearly defined delineation between the observed groups of footballers.

Table 7. Significance of differences between the elite and amateur footballers in relation to the groups of results

	χ	R	F	p	k.dsk
Groups of results	.38	.41	40.48	.00*	.20

Legend: c.dsc - coefficient of discrimination

Based on the value of p <.1 it is to verify the alternative hypothesis (ANOVA and Roy 's test) which means that there is significant difference between the elite and amateur footballers in relation to some groups of results (.00). Coefficient of discrimination (.20) points to the contribution of the discrimination between the elite and amateur footballers in relatio to some groups of results. Since p= .00 of discriminative analysis this means that there is clearly defined delineation between

the the elite and amateur footballers, that is it is possible to determine the characteristics of each group in relation to four groups of results.

Features of footballers are most prominent as shown in the groups of the results in Table 8 and their contribution to the characteristics is 100.00%. Homogeneity in high in both groups (elite footballers 71.05% and amateur footballers 69.42%). On the basis of the differences it can be said that elite footballers are characterized by the following results < 63 sec.*, and 63, 1-65 sec.*, and amateur footballers are characterized by the following results >67, 1 sec.*.

Table 9. Distance (mahalanobisov) between the elite and amateur footballers in relation to the groups of results

	elite footballers	amateurs
elite footballers	.00	.93
amateurs	.93	.00

Calculations of Mahalanobisov's distance between the amateurs and the elite footballers point to the moderate difference between the observed groups of results.

Discussion and conclusion

In research displayed differences and clearly defined delineation, difference between the amateurs and the elite footballers and the obtained results on the test and between the observed groups of the footballers and the results divided into four groups formed in relation to the time of the test administra-

Table 8. Characteristics and homogeneity of the elite and amateur footballers in relation to the groups of results

	elite footballers	amateurs	Contr. %
Groups of results	< 63 sec.*, 63,1-65 sec.*	>67,1 sec.*	100.00
n/m	54/76	84/121	
%	71.05	69.42	

Legend: hmg – homogenity; dpr % - contribution of the features to the characteristics

Table 10. Contribution of the whole (area) to the characteristics

	Contribution %	in	between
2	52.531	Four groups of results	Two groups of footballers
1	47.469	7x50m test result	Two groups of footballers

tion are given. Connection of the overall research is possible to do in order to get one logical hierarchically modified unity. The contribution of the whole (area) to the characteristics and contribution of features within the whole are values that clearly determine hierarchy between the wholes and the order of the features' characteristics.

Based on the contribution of the whole (area) to the characteristics (%) it is noticed that the biggest contribution of the whole (52.53%) is the result of the test divided into four groups. In congruence with the original aims of the research, methodological procedures and set hypotheses this research analyzes the differences between the elite and the amateur footballers and the results obtained on the test and within the observed groups of footballers and the results divided into four groups formed in relation to the time of the test realization. Based on the obtained results and their interpretation the following conclusions can be drawn:

Results (MANOVA .00 and discriminative analysis .00) between the elite and the amateur footballers in relation to the 7x50m test point to the existance of the significant differences.

It was found that there is sifnificant difference between the observed groups of footballers and the results divided into four groups formed in relation to the achieved test time (MANOVA .00 and discriminative analysisi .00). Since in most cases alternative hypotheses are verified, that is found differences and clearly defined delineations, characteristics and homogeneity of each subsample are determined and the following can be concluded: elite footballers are chaacterized by the results < 63 sec. and 63,1-65 sec., and amateur footballers results are >67,1 sec. Based on all the things said in this research conclusions can be drawn on referential values of the applied test for the elite and the amateur footballers competition ranks.

Referential values for the elite footballers are given in Table 11.

Table 11. Scale of the results of the elite footballers

Excellent	Good	Average	Bad
<62.2	62.30-64.40	64.50-66.70	66.70>

Referential values for the amateur footballers are given in Table 12.

Table 12. Scale of the results of the amateur footballers

Excellent	Good	Average	Bad
<63.6	63.70 -66.90	67 - .70.25	70.30>

7X50 m test is a measuring instrument that reliably measures the level of training of the distance speed of the footballers. Test contains average maximal distance of the distance type [5-10] which repeated seven times gives total distance of 350 m. Based on the achieved times on testing by simple ordering of the referential values in the given tables footballers can be classified according to the level of their training of the speed endurance. Practical value of the test is relatively easy practical application, simple procedure and the clearance of the obtained data that points to further research. Bad results will mean intensified work on training apparatus for the speed endurance and vice versa, good results will point to the thoroughly done previous period and readiness of the footballers to meet the demands of the contemporary football.

References

1. Balsom P.D., Seger J.Y., Sjodin B., Ekblom B. Physiological responses to maximal intensity intermittent exercise. Eur. J. Apll. Physiol. 1992; 65: 144-149.

2. Bangsbo J., Graham T. E., Kiens B, Saltin B. Elevanted muscle glycogen and anaerobic energy production during exhaustive exercise in man. J. Physiol. 1992; 451: 205-227.

3. Bangsbo J. Energy demands in competitive soccer. J. Sport Sci. 1994; 12: 5-12.

4. Bangsbo J., Lindquist F. Comparison of various exercise tests with endurance performance during soccer in professional players. Int. J. Sports Med. 1992; 13: 125-132.

5. Bangsbo J. Fitness training in soccer. Michigan, Auburn: Data reproductions, 2003.

6. Boženko A. Training of the elite footballers. Belgrade: Sports book, 1983.

7. Ekblom B. Applied physiology of soccer. Sports Med. 1986; 3: 50-60.

8. Gabett T., Mulvey M. Time-motion analysis of small-sided training games and competation in elite women soccer players. The Journal of Strength and Conditioning Research. 2008; 22(2): 543-552.

9. Gabett T. The development of a test of repeated-sprint ability for elite womens soccer players. The Journal of Strength and Conditioning Research. 2010; 24(5): 1191-1193.

10. Gelen E. Acute effects of different warm-up methods on sprint, slalom dribbling, and penalty kick performance in soccer players. The Journal of Strength and Conditioning Research. 2010; 24(4): 950-956.

11. Glassford R.G., Baycroft G.H.Y., Sedgwick A.W., MacNab R.B.J. Comparison of maximal oxygen uptake values determined by predicted and actual methods. J. Appl. Physiol. 1965; 20: 509-513.

12. Gonzales-Haro C., Galilea P.A., Escanero J.F. Comparison of different theoretical models estimating peak power output and maximal oxygen uptake in trained and elite triathletes and endurance cyclists in the velodrome. J. Sports Sci. 2008; 26: 591-601.

13. Klusiewicz A., Faff J. Indirect methods of estimating maximal oxygen uptake on the rowing ergometer. Biol. Sport. 2003; 20: 181-194.

14. Nieels Uth., Sorensen H., Overgaard K. Estimation of VO2max from the ratio between HRmax and HRrest – the heart rate ratio method. Eur. J. Appl. Physiol. 2004; 91: 111-115.

15. Stanković V. The basics of applied kinesiology. Leposavić: Faculty of physical education. 2001.

16. Stanković V., Malacko J. Relations between systems of motor, cognitive and conative variables of top-class handball players. Kinesiologia Slovenica. 2008; 3(14): 33-43.

17. Stanković V., Malacko J., Doder D. The differences in morphological characteristics among top handball, basketball and football players. Acta Kinesiologica. 2009; 3(2): 90-94.

18. Verheijen, R. et al. The Complete handbook of conditioning for soccer. Reedswain books, 1998.

19. Vučetić, V. Diagnostics procedure for the estimation of the energy capacity of the athletes. Proceedings. Condition preparation of the athletes, Zagreb, Faculty of kineziology. 2009.

20. Živanović, N. Contribution to the epistemology of physical education. Niš: Panoptikum 2000.

21. Živanović N., Palić R., Stanković V., Ćirić M., Andrašić S. Effects of speed endurance test on the levels of cortisol and testosterone in handball players. Gymnasium – Journal of Physical Education and Sport. 2011; 1(12): 32-34

Corresponding Author
Nenad Zivanovic,
University of Nis,
Faculty of sport and physical education,
Serbia,
E-mail: zivanovic@fsfv.ni.ac.rs

Predictors of academic achievement of nursıng students: A survey of nursing student in Turkey

Yurdanur Dikmen[1], Bedriye Ak[2], Yasemin Yıldırım Usta[3], Sema Kuguoglu[4]

[1] Abant Izzet Baysal University, Bolu School of Nursing, Department of Fundamental Nursing Bolu, Turkey,
[2] Abant Izzet Baysal University, Bolu School of Nursing, Department of Pediactric Nursing, Bolu, Turkey,
[3] Abant Izzet Baysal University, Bolu School of Nursing, Department of Medical Nursing, Bolu, Turkey,
[4] Marmara University College of Nursing, Department of Pediatric Nursing, Haydarpaşa-Uskudar, Istanbul, Turkey.

Abstract

Background: Academic achievement of nursing students is important for benefiting from academic programs, professional knowledge and skills.

Objective: To define the effects of social support, loneliness level and submisive behavior for predicting academic achievement of nursing department of a university in Turkey.

Method: The sample was 166 students in a public university nursing department between 2011-2012. Academic achievement was total grade point average with A=4.0. Data was collected with the University of California, Los Angeles (UCLA) Loneliness and Perceived Social Support Scales, Submissive Behavior Scale and Student Form. The Pearson correlation analysis was used for relationships between students' loneliness levels and social support. Stepwise regression techniques were used to define in which order variables contributed to predicting academic achievement.

Results: The average age was 20.48±1.54, 90.4% were female, 9.6% male and academic average was 2.46±0.47. Negative significant relationships existed among loneliness score, social support and social support subscale score averages (p<0.00). The educator support variable in first stepwise regression analysis model explained 23.4% (R^2=0.373, p<0.001), family and educator support variables in second stepwise regression explained nearly 25.3% (R2=0.327, p<0.001), submissive behaviors, educator and family support variables explained 27.1% (R2=0.442, p<0.001) and educator and family support, submissive behaviors and loneliness variables explained nearly 28% (R2=0.456, p<0.001) of the total variance. The educator support β coefficient was highest (0.382), family support β coefficient (0.376), submissive behaviors β coefficient (-0.342) and loneliness coefficient was lowest (-0.301).

Conclusion: Nursing students' academic achievement was significantly predicted by the educator/family support, submissive behaviors and loneliness variables. In addition, educator support at school significantly affects nursing students' academic achievements.

Key words: Educational achievement, social support, loneliness, students, nursing.

Introduction

Academic achievement is regarded as an implication to what extent students can benefit from a course or academic programs in a school environment. Steinberg (2002) acknowledged that achievement in education is commonly associated with either school performance, academic achievement or educational success (1). Results of relevant studies have illustrated that academic achievement may be influenced by competences, personal and family traits, self-esteem, social support, loneliness, characteristics of the institution attended and study habits as well as intelligence (2,3,4).

Background/Literature Review

An analysis of the recent literature suggested that the leading factors influencing the academic achievement of students are social support and levels of loneliness (2,3,5,6,7,8,9). Moreover, social support from families is considered to be related to higher academic achievement (6,10), while educator support and peer support, which eventually affects school attendance and adaptation (11,12), also plays a significant role in academic achievement (3,13). It is further reported that obedience is a common trait among students with lower levels of academic achievement and family support. Submissive behaviour, or in other words submissive acts, is

recognized as a dominant personal characteristic in interpersonal relations, especially in Oriental cultures. It is often observed in Turkey, which widely reflects such characteristics of Oriental culture, that submissive behaviour is mistaken for respect and parents expect submissive behaviour from their children just as teachers expect from their students, as a sign of respect. A study particularly focusing on submissive acts revealed that cultural formations substantially affect the development of submissive acts (14). It is also suggested that parents are primarily responsible for the development of submissive acts and educator's interaction with students are almost equally decisive. Therefore, submissive acts prove to be a critical issue in predicting academic achievement of students.

Rapidly developing technology and soaring production of information deliberately urge nurses to equip themselves with basic skills in order to ensure safe care, which compels nursing educators to attain the highest academic achievement possible (15). The studies have demonstrated that lower levels of academic achievement among nursing students might result in dropping out of school (16,17,18), which makes the analysis of the factors that may influence academic achievement crucially important. A survey of the relevant literature implied that academic achievement of young adolescents has often been studied (2,7,8,11,19). Pimparyon et al. (2000) conducted a study on the significance of learning styles and perceptions of educational environment of nursing students *(n: 256)* in predicting academic achievement in Thailand and found a weak correlation between the variables (20). Ofori and Charlton (2002), on the other hand, carried out a similar study with nursing students *(n: 344)* and reported that the seeking academic support variable has the strongest value in explaining academic performance (17). However, the survey yielded no particular study on the effects of social support, levels of loneliness and submissive behaviour on academic achievement, which clearly indicates the insufficiency of knowledge on the determinant factors for academic achievement in nursing education. Yet, academic achievement of nursing students is important for benefiting from academic programs, professional knowledge and skills. However, much more information is required to variables related to academic

achievement of students. Thus, the study was conducted to determine the effect of social support, levels of loneliness and submissive behaviors to predict academic achievement of nursing students.

This research seeks the potential answers to the question, "Do certain variables, such as loneliness, submissive behaviours and social support successfully predict academic achievement of students?" The hypotheses of this study based on the study questions have been determined as follows:

1. Is there a correlation between loneliness, social support and submissive behaviours?
2. To what extent can each of these variables, loneliness, submissive behaviors, family, peer and educator support, individually predict academic achievement?
3. To what extent can these variables altogether predict academic achievement?
4. What is the power of these variables in predicting academic achievement?

Method

Study group

The scope of this descriptive and analytical study consisted of 166 students attending a nursing department at a public university in Turkey during the 2011-2012 academic year. No sampling method was chosen for the study, as the whole study universe was targeted for participation. However, the study sample included only 135 students for a variety of excuses, such as sick leaves, school absence and reluctance to participate in the study. The response rate was found to be 81%.

Data collection

The study data were obtained with a Student Questionnaire Form, Perceived Social Support Scale (PSSS), University of California, Los Angeles (UCLA) Loneliness Scale and Submissive Behaviors Scale (SBS).

Student Questionnaire Form: It includes four questions inquiring about their gender, age, grade and academic achievement. Academic achievement is defined as the level of success attained by a student as reflected by a cumulative grade point average (GPA). GPA will be used as a measure of academic performance in this study (based on A=4.0). Academic achievement was calculated

from the cumulative GPA of the students. The cumulative GPA of the students was derived from the records of the previous fall semester.

Perceived Social Support Scale (PSSS): The PSSS was utilized in the study in order to determine the levels of social support from families, peers and educators. The scale was designed by Yıldırım (1997) in Turkey as a Likert-type scale with three subscales and 26 items for each subscale. The scores for each subscale range from 26 to 78. The Cronbach alpha reliability coefficient was found to be 0.88 for the "family" subscale, 0.82 for the "peer" subscale, and 0.85 for the "educator" subscale (21). The Cronbach alpha coefficient was 0.83 for the "family" subscale, 0.78 for the "peer" subscale, and 0.81 for the "educator" subscale in this particular study.

Loneliness Scale (UCLA): The UCLA Loneliness Scale was developed by Russell, Peplau and Ferguson (1978) in order to measure the levels of loneliness of students and adapted by Demir (1989) in Turkey (22,23). Higher scores on the scale are considered to be a sign of more intensely experienced loneliness. As scores range from 1 to 4 for each item, the lowest possible score is 20 and the highest score is 80. Higher scores on the scale signify higher levels of loneliness. The Cronbach alpha internal consistency coefficient of the scale was reported to be 0.96 (23). As for the sample group in the study, the Cronbach alpha reliability coefficient of the UCLA Loneliness Scale was 0.78.

Submissive Behaviors Scale (SBS): This scale was originally developed from the work of Buss and Craik (1986) who asked subjects to identify typical submissive behaviours (24). The most highly agreed upon items (16 items) were chosen to construct the submissive behaviour scale (25). The scale adapted by Sahin and Sahin (1992) in Turkey after testing its reliability and validity (26). The scale includes 16 five-point Likert items with total scores ranging from 16 to 80 and higher scores illustrate higher levels of submissive behaviors. The Cronbach alpha internal consistency of the scale was noted to be 0.74 (27), while the reliability coefficient was 0.81 for this particular study.

Ethical considerations

The required permission was obtained from the directors' board of the school. Then, The participant students were informed about the objective of the study before filling out the forms and they were reminded that participation in this study was completely voluntary. The students, who had agreed to participate in the study, were informed about the participant's right to withdraw from the study at any time if he feels that his personal rights are violated or damaged during the study and permission was obtained from the students throughout the study.

Data analysis

All study data were analyzed using the Statistical Package for the Social Sciences (SPSS) Version 17.O, Chicago, IL. Descriptive data of the students were evaluated with numerical, percentage and mean analysis. The correlation between the levels of loneliness, social support and submissive behaviors was analyzed with the Pearson correlation analysis. The priority order of variables predicting academic achievement was determined by stepwise regression techniques according to their contribution to the student achievement (28). The level of significance was accepted to be 0.05 in the tests of hypotheses.

Results

Of the students participating, 90.4% were female and 9.6% were male. The average age of the students was 20.48±1.54 and the mean academic achievement was found to be 2.46±0.47.

The scores participants obtained from each scale are given in Table 1. The mean score of PSSS was reported to be 130.28±7.16 (family support: 50.50±10.41, peer support: 30.75±6.53, educator support: 44.56±7.41), the mean score of the OBS was 36.11±9.63 and it was 37.68±9.82 for the UCLA (Table 1).

Table 1. Mean Scores from the Scales and Standard Deviation Values (n=135)

Scales and Subscales	X	SD
PSSS Total Score	130.28	7.16
Family Support	50.50	10.41
Peer Support	30.75	6.53
Educator Support	44.56	7.41
SBS	36.11	9.63
UCLA	37.68	9.82

The gender variable from the student form was analyzed with numerical analysis and its coefficient

was correlated with that of grade, social support, loneliness and submissive behaviors. It was consequently found that correlation of the coefficients between the variables and academic achievement varied from 0.101 to 0.527 and perceived educator support was noted to have the highest correlation value (r=0.527; p<0.001) (Table 2).

Linear multilevel regression analysis was used to investigate to what extent gender, grade level, perceived family support, peer support, educator support, loneliness and submissive behaviors predict academic achievement. It was concluded that grade level, gender and peer support variables are not a significant predictor of academic achievement (Table 3).

Gender, grade level and peer support variables were excluded from the stepwise regression analysis, since they reportedly failed to significantly predict academic achievement (Table 4). Both the analysis of standardized regression coefficients and the analysis of double and partial correlations showed a positive significant correlation among academic achievement, family support and educator support, and a negative significant correlation between the submissive behaviors and loneliness

variables. It was also stated that educator support, family support, submissive behaviors and loneliness altogether explained only 28.1% of the total variance in relation to the academic achievement of nursing students (R=0.456, R^2= 0.281) (Table 4).

It was additionally reported that the standardized regression coefficient was β=0.383 for the educator support variable analyzed in the first model of stepwise regression analysis in predicting academic achievement of the students. It was further found that educator support could explain only 23.4% of the academic achievement in nursing students (R=0.373, R^2= 0.234) (Table 4).

In the second step of stepwise regression analysis, family support was added to the educator support variable and providing that the other variables remained constant, the educator variable was β=0.368 and the family variable was β=0.307. These two variables were reported to explain 25.3% (R=0.327, R^2= 0.253) of academic achievement (Table 4).

In the third step of stepwise regression analysis, the submissive behaviors variable was added to former variables. Providing that the other variables remained constant, the β coefficient was 0.380 for ed-

Table 2. The Correlations between the Academic Achievement Variables

	Gender	Grade Level	Family Support	Peer Support	Educator Support	Loneliness	Submissive Behavior
Grade Level	0.094						
Family Support	0.124*	0.102*					
Peer Support	0.036	0.132*	0.041				
Educator Support	0.072	0.101*	0.013	0.074			
Loneliness	0.096	0.063	-0.423*	-0.521*	-0.334*		
Submissive Behavior	0.002	0.103	-0.312*	-0.202*	-0.143*	0.244*	
Academic Achievement	0.052	0.092	0.453*	0.032	0.527*	-0.353*	-0.283*

p<0.001

Table 3. B and Beta Correlation Coefficients of the Variables and their Significance Levels

Predictors	B*	SE**	β***	t	p
Constant (a)	60.765	7.257		6.022	<0.001
Gender	2.888	1.289	0.099	0.640	0.326
Grade	0.759	1.560	0.021	0.487	0.627
Peer Support	0.831	0.080	0.353	6.607	0.113
Family Support	0.474	0.081	0.303	5.529	0.002
Educator Support	0.531	0.086	0.386	6.607	0.001
Loneliness	0.372	0.082	-0.279	5,529	0.001
Submissive Behavior	0.474	0.083	-0.379	6.327	0.001

*B=(unstandardized), ** SE=Standard Error, ***β=(standardized)*

Table 4. Stepwise Regression Analysis Results about Academic Achievement Predictors

Model	Predictors	B	SE*	β	R	R²	t	p
1	(Constant)	96.165	3.335				28.834	0.001
	Educator Support	0.697	0.613	0.383	0.373	0.234	13.154	0.001
2	(Constant)	65.876	6.115				10.772	0.001
	Educator Support	0.535	0.073	0.368	0.327	0.253	7.279	0.001
	Family Support	0.484	0.083	0.307			5.903	0.001
3	(Constant)	62.421	6.337				9.851	0.001
	Educator Support	0.531	0.073	0.380			7.235	0.001
	Family Support	0.467	0.082	0.330	0.442	0.271	5.431	0.001
	Submissive Behavior	-0.472	0.532	-0.301			5.320	0.001
4	(Constant)	60.362	6.123				8.371	0.001
	Educator Support	0.501	0.069	0.382			6.347	0.001
	Family Support	0.426	0.063	0.376			5.672	0.001
	Submissive Behavior	-0.421	0.054	-0.342	0.456	0.281	5.897	0.001
	Loneliness	-0.321	0.095	-0.301			5.236	0.003

*SE=Standard Error

ucator support, 0.330 for family support and -0.301 for submissive behaviors. All three variables could explain 27.1% (R=0.442, R²=0.271) of academic achievement in the students (Table 4).

In the fourth step of stepwise regression analysis, the loneliness variable was added to educator support, family support and submissive behaviors and the β coefficient was noted to be 0.382 for educator support, 0.376 for family support, -0.342 for submissive behaviors and 0.301 for loneliness. With other variables that supposedly influenced academic achievement remaining constant, these four variables were found to explain 28.1% (R=0.456 ve R²=0.281) of academic achievement and each variable succeeded to predict (p=0.001) academic achievement (Table 4).

Educator and family support, submissive behaviors and loneliness variables were studied thoroughly in relation to both regression results and R² and t results. It was pointed out that academic achievement of nursing students was best predicted by educator support, family support, submissive behaviors and loneliness in the same order (Table 4). It was additionally stated that gender, grade level and peer support were incapable of predicting academic achievement (p>0.05) (Table 3)

Discussion

In light of the study results, it was suggested that there was a negative significant correlation between the UCLA mean score and mean scores of the PSSS subscales (Table 2), which clearly implied that loneliness levels of the students decreased as they were provided with higher social support. Ginter et al., (1996) conducted a study with adolescents in Israel and reported a positive correlation between loneliness, social support and anxiety scores (9). On the other hand, Nicpon et al., (2007) carried out a study with American college students and Yılmaz et al., (2008) similarly conducted a study with Turkish nursing students (29,30). They both concluded that there was a negative correlation between loneliness and social support levels. Our results were considered to comply with the results of previous studies. Moreover, a negative significant correlation was found between the mean scores of the SBS and the mean scores of the PSSS subscales, which indicated that submissive behaviors were observed less often as the students attained higher levels of social support. Cultural formations have a prominent role in the development of submissive behaviors (14). Close interpersonal relations can be regarded as a way of providing social support in Oriental cultures like Turkey. On the other hand, it is also true that parents may exhibit overprotective and dependent attitudes towards their children and likewise educators can develop such attitudes towards their students, which may adversely influence the perceived social support and give rise to submissive behaviors.

The study results also maintained that family and educator support positively predicted academic achievement, whereas, loneliness and submissive behaviors negatively predicted academic achievement (Table 4). It was further found that gender, grade level and peer support altogether predicted 28.1% of academic achievement. These findings showed that academic achievement of nursing students could be best predicted significantly by educator support, family support, submissive behaviors and loneliness, respectively (Table 4). Many other studies conducted with young adolescents also confirmed the significant correlation between academic achievement and family and educator support (2,7,11,19), which complied with the results our study. Levitt et al., (1994) interviewed students from different ethnic origins (African, American and Hispanic) and reported both a direct and an indirect correlation between social support and academic achievement (31).

Perceived family social support was considered to be a predictor of academic achievement, while our results did not suggest that perceived peer support was one of these predictors (Table 4), which was already consistent with the results of relevant studies (2,30,32,33). However, Okanlı (1999) acknowledged that perceived family support among nursing students was comparatively higher than perceived peer support (34).

It was also observed that relevant studies were often carried out with students in young adolescent groups in which family support was found to be the leading predictor of academic achievement (7). Our results, in contrast to previous studies, proposed that educator support was the major predictor of academic achievement and educator support alone explained 23.4% of academic achievement of nursing students (Table 4). Ofori and Charlton (2002) carried out a similar study with nursing students (17) and verified our results that seeking academic support was the primary variable in academic achievement with a 30% contribution.

Nursing education is based on a practical education extending into cognitive, perceptive and psychomotor fields of learning. Five levels of professional skills have been defined in nursing education: inexperienced, beginner, advanced, competent and expert (35). In the beginning, nursing students are inexperienced in all professional practices and feel unfamiliar to the field of practice. They commonly undertake an intense learning experience and individual transformation throughout their education, which absolutely necessitates support from their educators (36). Schoening et al., (2006) emphasized the significance of educator support in reassuring positive educational outcomes with nursing students (37). Moreover, Legault et al., (2006) correspondingly stressed the crucial role of perceived educator support, rather than family social support (38). As a result, the perception of educator support is considered to influence the academic achievement of students in several dimensions. The findings of this particular study also supported the evidence that perceived social support from educators increased students' motivation and their enthusiasm to take on responsibilities (13) and therefore, enhanced academic achievement (2).

The results for the loneliness variable also affirmed the results of previous studies in the literature (7), which pointed out lower levels of academic achievement among students who felt lonely in comparison to those who did not. Besides, Benner (2011) carried out a study with Latino adolescents and found a negative correlation between levels of loneliness and academic achievement (8). It was concluded in light of these discussions that parents and educators must pay ultimate attention to social and psychological problems of adolescents and that consultation and guidance services at schools must be reorganized so as to encourage them to tackle their loneliness.

Another important question raised through the analysis of the results was that the submissive behaviors variable was the second most common negative predictor of academic achievement, followed by family support, which already affirmed the results of a study conducted on high school students in Turkey (7). Students who demonstrated submissive behaviors may possibly feel themselves less important and esteemed under the pressure of parents, educators and other adults in their circles. Given that submissive behaviors stem from fear and adversely influences one's audacity (39), it will be reasonable to assume that students with submissive behaviors may fail to attain desired academic achievement and their average academic achievement will be lower than expected.

Conclusion

Results of this particular study showed that social support from educators and families positively predict academic achievement of students, while submissive behaviors and loneliness exhibit a negative tendency. It may be suggested in light of the results that social support provided for students be improved at universities. It may be further argued that it would be beneficial to design and organize workshops to promote social relations between students, educators and families, social support skills programs and seminars to endorse educator-student interaction, which eventually will help students to refine their skills to benefit from social support opportunities. Additionally, the study results illustrated that educator support had a great impact on the academic achievement of nursing students. Therefore, it is strongly believed that nursing educators should adopt a patient, unbiased and supportive attitude towards their students in order to bolster their academic achievements.

This study is considered to make significant contributions to the scientific literature in Turkey, as it is one of the few studies dealing with such a critical issue in nursing education. However, future studies that will focus on other factors (family characteristics, personal traits, etc.) that may influence academic achievement will provide substantial data in detail.

Limitations

The limitation of this study is that it was conducted only with the students of one university and therefore, the results of the study cannot be generalized for all students in nursing departments in Turkey. Moreover, using certain scales in the study to gather data restricted the answers of the students to the statements in the scales. Finally, this study only included the loneliness, social support and submissive behavior variables that were considered to influence academic achievement.

Conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

1. Steinberg, L. (2002). Adolescence, 6th ed. McGraw-Hill Companies, New York.

2. Yıldırım, I. (2000). Loneliness, exam anxiety and social support as predictors of academic achievement. (Akademik başarının yordayıcısı olarak yalnızlık, sınav kaygısı ve sosyal destek- In Turkish). Hacettepe Üniversitesi Eğitim Fakültesi Dergisi. 18: 167-170.

3. Chen, J. J. (2005). Relation of academic support from parents, teachers, and peers to Hong Kong adolescents' academic behavior and achievement: the mediating role of academic engagement. Genetic, Social, and General Psychology Monographs. 131(2): 77-127.

4. Howerton, D. L., Enger, J, M., Cobbs, C. R. (1994). Self-esteem and achievement of at risk adolescent black males. Research in the Schools. 1(2): 23-27.

5. Ozkahraman, Ş., Demir, Y., Gökdoğan, F. (2010). Perceived social support level and related factors in university students. (Üniversite öğrencilerinde algılanan sosyal destek düzeyi ve ilişkili etmenler - In Turkish). Sürekli Tıp Eğitimi Dergisi. 19(1): 7-12

6. Ratelle, C. F., Larose, S., Guay, F., Senecal, C. (2005). Perceptions of parental involvement and support as predictors of college students' persistence in a science curriculum. Journal of Family Psychology. 19(2): 286-293.

7. Yıldırım, İ., Ergene, T. (2003). Social support, submissive acts and test anxiety as predictors of academic achievement among high school students. Lise son sınıf öğrencilerinin akademik başarılarının yordayıcısı olarak sınav kaygısı, boyun eğici davranışlar ve sosyal destek- In Turkish). Hacettepe Üniversitesi Eğitim Fakültesi Dergisi. 25: 224-234.

8. Benner, A. (2011). Latino adolescents' loneliness, academic performance, and the buffering nature of friendships. Journal of Youth and Adolescence. 40 (5): 556-567.

9. Ginter, E. J., Lufi, D., Dwinell, P. L. (1996). Loneliness, perceived social support, and anxiety among Israeli adolescents. Psychological Reports. 79(1): 335-341.

10. Unger, D. G., McLeod, L. E., Brown, M. B., Tressell, P. A. (2000). The role of family support in interparental conflict and adolescent academic achievement. Journal of Child and Family Studies. 9(2): 191-202.

11. Lopez, E. J., Ehly, S., Garcia-Vasquez, E. (2002). Acculturation, social support and academic achievement of Mexican and Mexican American high school students: an exploratory study. Psychology in the Schools. 39(3): 245-257.

12. Yıldırım, İ. (2004). (Prevalence of submissive acts among high school students. (Lise öğrencilerinde boyun eğici davranışların yaygınlığı- In Turkish) Hacettepe Üniversitesi Eğitim Fakültesi Dergisi. 26: 220-228.

13. Wentzel, K. R. (1998). Social relationships and motivation in middle school: the role of parents, teachers, and peers. Journal of Educational Psychology. 90(2): 202-209.

14. Türküm, A. S. (2005). Do optimism, social network richness and submissive behaviors predict well-being? Study with a Turkish sample. Social Behavior and Personality. 33(6): 619-628.

15. Ali, P. A., Gavino, M. I., Memon, A. A. (2007). Predictors of academic performance in the first year of basic nursing diploma programme in Sindh, Pakistan. Journal of the Pakistan Medical Association. 57 (4): 202-204.

16. White, J., Williams, R. W., Green, B. F. (1999). Discontinuation, leaving reasons and course evaluation comments of students on the common foundation programme. Nurse Education Today. 19(2): 142-150.

17. Ofori, R., Charlton, J. P. (2002). A path model of factors influencing the academic performance of nursing students. Journal of Advanced Nursing. 38 (5): 507-515.

18. Richardson. J. (1996). Why won't you stay?. Nursing Times. 92(32): 28-30.

19. Fan, X., Chen, M. (2001). Parental involvement and students' academic achievement: A meta-analysis. Educational Psychology Review. 13(1): 1-22.

20. Pimparyon, P., Caleer, S. M., Pemba, S., Roff, S. (2000). Educational environment, student approaches to learning and academic achievement in a Thai nursing school. Medical Teacher. 22(4): 359-364.

21. Yıldırım, İ. (1997). Reliability and validity for development of perceived social support scale. (Algılanan sosyal destek ölçeğinin geliştirilmesi güvenirliği ve geçerliği - In Turkish) Hacettepe Üniversitesi Eğitim Fakültesi Dergisi. 13: 81-87

22. Russell, D., Peplau, L. A., Ferguson, M. L. (1978). Developing a measure of loneliness. Journal of Personality Assessment. 42 (3): 290-294.

23. Demir, A. (1989). The validity and reliability of UCLA loneliness scale (UCLA yalnızlık ölçeğinin geçerlik ve güvenirliği- In Turkish). Psikoloji Dergisi. 7(23): 14-18

24. Buss, D. M., Craik, K. H. (1986). Acts, dispositions and clinical assessment: The psychopathology of everyday conduct. Clinical Psychology Review. 6: 387–406.

25. Allan, S., Gilbert, P. (1997). Submissive behaviour and psychopathology. British Journal of Clinical Psychology. 36: 467–488.

26. Sahin, N., H., Sahin, N. (1992). Adolescent guilt, shame, and depression in relation to sociotropy and autonomy. The World Congress of Cognitive Therapy. June 17–21, Toronto.

27. Savasır, I., and Sahin, N. H. (1997). Cognitive-Behaviorist Therapies: Scales Used the Most Association of Turkish Psychologists Publications. Bilişsel Davranışçı Terapiler: En Sık Kullanılan Ölçekler- In Turkish) Türk Psikologlar Derneği Yayınları. Ankara, 61-70: 115-122.

28. Polit, D. F., Tatano Beck, C. (2006). Essentials of Nursing Research: Methods, Appraisal and Utilization, 6th ed. Lippincott Williams and Wilkins, Philadelphia.

29. Nicpon, M. F., Huser, L., Blanks, E. H., Sollenberger, S., Befort, C., Kurpius, S. E. R. (2007). The relationship of loneliness and social support with college freshmen's academic performance and persistence. Journal of College Student Retention: Research, Theory and Practice. 8 (3): 345-358.

30. Yılmaz, E., Yılmaz, E., Karaca, F. (2008). Examining the level of social support and loneliness of university students. Üniversite öğrencilerinin sosyal destek ve yalnızlık düzeylerinin incelenmesi - In Turkish). Genel Tıp Dergisi.18 (2): 71-79.

31. Levitt, M. J., Guacci-Franco, N., Levitt, J. L. (1994). Social support and achievement in childhood and early adolescence: a multicultural study. Journal of Applied Developmental Psychology. 15(2): 207-222.

32. Kahriman, İ. (2006). The correlation between the levels of anxiety and social support students at the Karadeniz Technical University Trabzon School of Health Nursing Department perceived from their families and peers. Karadeniz Teknik Üniversitesi Trabzon Sağlık Yüksekokulu öğrencilerinin aileden ve arkadaşlarından algıladıkları sosyal destek ile anksiyete düzeyi arasındaki ilişki. - In Turkish). Hemşirelik Forumu. 2(2): Mayis-Haziran-Ağustos. 78-87.

33. Sertbas, G., Cuhadar, D., Demirli, F. (2004). Determination of the relationship between anxiety and perceived social support in students at Gaziantep University, School of Health, Nursing Department from their families and peers. Gaziantep Üniversitesi Sağlık Yüksekokulu Hemşirelik Bölümü

öğrencilerinde aile ve arkadaşlardan algılanan sosyal destek ile anksiyete düzeyi arasındaki ilişkinin belirlenmesi- In Turkish). Hemşirelik Forumu. 6 (6): Ekim-Kasım, 42-48.

34. *Okanlı, A. (1999). The relationship between anxiety level and social support nursing students perceive from their families and friends. Master's thesis, Atatürk University, Institute of Health Sciences, Erzurum. (Hemşirelik öğrencilerinin aile ve arkadaşlarından algıladıkları sosyal destek ile anksiyete düzeyi arasındaki ilişki - In Turkish). Turkey.*

35. *Andrews, M., Roberts, D. (2003). Supporting student nurses learning in and through clinical practice: the role of the clinical guide. Nurse Education Today. 23 (7): 474-481.*

36. *Dalton, L. (2005). Use of clinical space as an indicator of student nurse's professional development and changing need for support. Nurse Education Today. 25(2): 126-131.*

37. *Schoening, A. M., Sittner, B. J., Todd, M. J. (2006). Simulated clinical experience: nursing students' perceptions and the educators' role. Nurse Educator. 31(6): 253-258.*

38. *Legault, L., Green-Demers, I., Pelletier, L. (2006). Why do high school students lack motivation in the classroom? toward an understanding of academic amotivation and the role of social support. Journal of Educational Psychology. 98(3): 567-582.*

39. *Gilbert, P., Cheung, M. S. P., Grandfield, T., Campey, F., Irons, C. (2003). Recall of threat and submissiveness in childhood: development of a new scale and its relationship with depression, social comparison and shame. Clinical Psychology and Psychotherapy. 10(2): 108-115.*

Corresponding Aurthor
Yurdanur Dikmen,
Abant Izzet Baysal University,
Bolu School of Nursing,
Department of Fundamental Nursing, Bolu,
Turkey,
E-mail: nurdem35@gmail.com,
*   yndemir@hotmail.com*

Decreasing of functional fitness among elderly men and women

Bojan Jorgic, Sasa Pantelic, Zoran Milanovic, Marko Aleksandrovic, Radmila Kostic

Faculty of Sport and Physical Education, University of Nis, Nis, Serbia.

Abstract

Aim: The primary aim of this study was to determine the differences in functional fitness between young elderly (60-69 years of age) and old elderly (70-80 years of age), for men and women respectively. The secondary aim was to determine the differences between elderly men and women in parameters of functional fitness.

Methods: The research was conducted on a sample of 1288 subjects from southeast Serbia, out of whom 594 were male (mean ± SD: body height 175.62 ± 9.78 cm, body weight 82.26 ± 31.33 kg) and 694 female (mean ± SD: body height 165.17 ± 23:12 cm, body weight 69.74 kg ± 12:44). The examinees were divided into two age groups: 60-69 years of age group and 70-80 years of age group. Senior Fitness Test battery was used to assess the functional fitness.

Results: In men aged 70 - 80 years, in comparison to the men aged 60-69 years, there has been a statistically significant decline in strength, flexibility, aerobic endurance and agility / balance. In women, the trend of declining physical abilities has been the same as in men in terms of strength and agility / balance. In terms of flexibility and aerobic endurance, there has also been a decline in the test results, but without statistical significance. In relation to gender, men aged between 60 and 80 have had higher strength and aerobic endurance, while women have better developed flexibility. In terms of agility / balance, there have been no statistically significant differences between the sexes.

Conclusion: The results of this study suggest that in people over 60 who live in the southeast of Serbia, there is a decline in the parameters of functional fitness with the aging process, which is compatible with the similar studies conducted in other countries.

Key words: Functional fitness, old people, decline, aging process.

Introduction

The term aging refers to a process or group of processes occurring in living organisms that with the passage of time lead to a loss of adaptability, functional impairment and eventually death (1). The aging process is a biological reality which has its own dynamic, largely beyond human control (2). Changes that occur during the aging process are greatly affected by the inherited or genetic factors (3). In addition to genetic factors, many aspects of aging depend on external factors such as diet, stress, smoking and physical activity (4). In many developed countries the period between 60 and 65 years of age is considered as the beginning of old age (2). Elderly population is growing both in size and in proportion of the total population (5). Projected growth of elderly population in the United States (6), as well as in other developed countries has led to increased interest in raising their quality of life, which, among other things means that the elderly should be, as long as possible, physically healthy and independent in their everyday activities. Physical independence can be defined as the physical capacity to perform the activities of daily living without additional help (7). Simple activities of daily living refer to a set of basic, everyday tasks, performance of which is required for personal self-care and independent living. To be physically independent and able to perform various activities, old people need to have the adequate physiological reserves (physical parameters), such as muscular strength, aerobic endurance, flexibility and agility / dynamic balance (8). Adequate physical activity and exercise programs are necessary for the development of these parameters (9,10). The lack of adequate level of physical activity can lead to a decline in physical and physiological function of man, which can have negative effects on their normal daily functioning (11). Although physical activity cannot stop the normal biological process of aging, there is evidence that regular exercise can

minimize the physiological effects of sedentary life-style and increase active life expectancy, by limiting the development and progression of chronic disease and disability (12). According to the World Health Organization (13) physical activity has positive and long-term effects in improving muscle strength, flexibility, aerobic endurance and balance in older people. Numerous studies indicate that there are positive effects of exercise on the development of strength, endurance and flexibility for old people (14-19). Appropriate physical activity and exercise can positively influence the body composition change in the elderly (19,20). By applying the appropriate physical activity, physically active older people can increase their physical abilities to the level of young people. For example, strength training of the knee extensor muscle enable older men (60 years of age) to have better results than the majority of normally active young men (21). Also, the level of flexibility, balance and agility of physically active older women is similar to younger women, unlike inactive older women (22). These physical parameters (muscular strength, aerobic endurance, flexibility and agility / dynamic balance) are considered as functional fitness (8). According to Rikli (8), functional fitness is defined as having the physical capacity to perform normal everyday activities safely and independently without undue fatigue. Increased level of functional fitness leads to physical, social and economic benefits for the elderly (23). According to the author's knowledge of this study, in the last decades of the 21st century, there have been a significant number of researches regarding older persons. Numerous studies have shown that the measurement of these physical parameters allows detection of changes in functional fitness during the aging process, as well as establishing performance norms (standards) in relation to gender, age and fitness level (7,11,24-29). We hypothesize that there are larger differences in functional fitness between old elderly persons aged 70-80, compared to younger elderly persons who are 60-69 years old.

The primary aim of this study was to determine the differences in the functional fitness between young elderly (60-69 years) and old elderly (70-80years) people, for men and women respectively. The secondary aim was to determine the differences between elderly men and women in parameters of functional fitness.

Methods

Subjects

The sample consisted of 1288 people aged between 60 and 80 living independently in the community in the territory of southeastern Serbia. Out of total number of examinees, there were 594 men and 694 women. The subjects were divided into two age groups: young elderly group (60-69 years old) and elderly group (70-80 years old). Basic descriptive parameters have been shown in Table 1. The criteria for selecting participants were: people between 60 and 80 years of age, physically independent persons - able to walk 20 feet without assistance or rest, lack of cognitive impairment and dementia, achieved 24 points for the educated and 18 points for the unqualified respondents in mini mental state evaluation (30). The participants who were in the recovery phase of an acute illness, the deaf and the blind were excluded. The research did not include the subjects with cardiovascular system disorders because of the potential risks during the functional fitness tests.

Anthropometric measures

Anthropometric measures of height and weight were measured by standard protocol recommended by the International Biological Programme - IBP (31). Body height was measured using an anthropometer with 0.1 cm accuracy. Body weight was measured using the decimal weighing scale with 0.1 kg accuracy. Body mass index (BMI) was calculated indirectly based on the value of weight and body height, according to the formula: BMI = body weight (kg) / height (m²).

Senior Fitnes Test (SFT)

Senior Fitness Test has been used to assess functional fitness (8). SFT is a battery of tests that measure the physical capacity of elderly people to perform the activities of daily living. This battery of tests can be used for testing independent-living people over 60 years of age. 5 tests that are part of SFT batteries were used for the purposes of this study. Those are: Chair Stand Test (for assessing lower-body strength), 2. Arm Curl Test (for assessing upper-body strength), 3. 2-Minute Step Test (for assessing aerobic endurance), 4. Chair Sit-and-Reach Test (for assessing lower-body flexibility) and 5. 8-Foot Up-and-Go Test (for assessing

agility/ dynamic balance). In cases where 6-minute walk test cannot be used due to certain limitations in space or other reasons, a 2-minute step test can be a successful substitute for the assessment of aerobic endurance (8).

Rikli & Jones (32) have confirmed the adequate reliability of all test items used in the SFT test. The validity of test items in the SFT test has also been confirmed by Rikli and Jones (8). Two persons were involved in SFT measuring – one was writing down the data, while the other was explaining the method of conducting tests. All subjects were familiar with the research aim and its implementation, and there were no contraindications in SFT. The study was approved by the Research Ethics Committee of the Faculty of Physical Education and Sport, University in Niš, according to the Declaration of Helsinki. All participants were fully informed about the risks and the benefits that this research have on their age group. Qualified researchers have conducted standard interviews with potential participants individually or in small groups before the testing, at their homes or in the active centers for the elderly.

Testing of all participants was performed in the period from August to December 2011. Participation in the study was voluntary and each participant could redraw from the study in any moment.

Statistical Analysis

Collected data have been analyzed in the statistical program SPSS 17.0 (SPSS Inc., Chicago, IL). Each variable has been represented by the mean value and standard deviation (mean ± SD). To determine statistically significant differences in the components of functional fitness between the two age groups, as well as between genders, an independent sample T-test has been used. The significance level $p \leq 0.05$ has been used for statistically significant difference.

Results

The total number of examinees was 1288, out of whom there were 594 male and 694 female subjects. Of total number of men, 349 of them (58.7%) were in the 60 - 69 years age group, while 41.3%

Table 1. General descriptive parameters (Mean±SD)

Total N=1288	Men (N=594)		Women (N=694)	
	60-69 year N=349	70-80 year N=245	60-69 year N=354	70-80 year N=340
Age (years)	63.87±2.77	74.28±3.12	63.75±2.89	73.93±2.94
Body height (cm)	176.34±8.78	174.50±11.79	164.67±6.48	166.48±37.35
Body mass (kg)	82.33±12.01	82.65±15.10	70.64±12.81	68.84±11.74
BMI (kg/m²)	26.65±6.26	27.95±2.72	26.10±4.94	25.46±4.48

BMI-body mass index

Table 2. Differences in parameters of functional fitness (Mean±SD)

Men	60-69 year N=349	70-80 year N=245	p
Chair sit-and-reach test (cm +/-)	1.98±11.57	-0.11±9.86	.014
8-foot up-and-go test (seconds)	6.41±1.44	7.46±1.62	.000
Chair stand test (no. of stands)	14.26±5.53	12.51±5.77	.000
Arm curl test (no. of reps)	17.24±6.27	15.76±6.88	.003
2-minute step test (no of steps)	95.06±21.64	84.73±24.24	.000
Women	60-69 year N=354	70-80 year N=340	p
Chair sit-and-reach test (cm +/-)	2.05±14.40	1.87±10.95	.840
8-foot up-and-go test (seconds)	6.67±1.48	7.27±1.42	.000
Chair stand test (no. of stands)	13.75±5.25	11.70±5.15	.000
Arm curl test (no. of reps)	13.67±5.69	12.18±6.51	.002
2-minute step test (no of steps)	82.48±26.19	81.68±23.27	.658

Table 3. Differences between men and women in parameteres of functional fitness (Mean±SD)

	60-69 year			70-80 year			Total		
	Men	Women	p	Men	Women	p	Men	Women	p
Chair sit-and-reach test	1.98±11.57	2.05±14.40	.928	-0.11±9.86	1.87±10.95	.007	0.61±10.52	1.92±12.37	.037
8-foot up-and-go test	6.41±1.44	6.67±1.48	.039	7.46±1.62	7.27±1.42	.223	6.77±1.59	6.86±1.48	.378
Chair stand test	14.26±5.53	13.75±5.25	.140	12.51±5.77	11.70±5.15	.133	13.66±5.67	12.92±5.28	.015
Arm curl test	17.24±6.27	13.67±5.69	.000	15.76±6.88	12.18±6.51	.000	16.73±6.52	13.06±6.06	.000
2-minute step test	95.06±21.64	82.48±26.19	.000	84.73±24.24	81.68±23.27	.300	91.52±23.07	82.20±24.97	.000

were in 70 - 80 years age group. Female age division was more balanced than male. 51% of female subjects were in 60 - 69 years group, whereas 49% were in 70-80 years group. The results of arithmetic mean show that in men, there 2 cm of height loss with increasing age, while in women, there was 2 cm height gain. In men, the weight was balanced between the age groups, while it reduced by about 2 kg in women. The difference in average weight in relation to age groups was less than 1 kg in men. BMI was also consistent in both men and women, observed by age groups (Table 1).

The results shown in Table 2 indicate that men aged 60-69 years have had statistically significant results in all SFT tests, than men aged 70-80 years ($p < 0.05$). Women who belong to 60-69 years age group have had significantly better results than women aged 70-80 years in three SFT tests (8-foot up-and-go test, Chair stand test and Arm curl test ($p < 0.05$). In the remaining two tests, Chair sit-and-reach test and a 2-minute step test, younger group of women also have had better results than the older group of women, but without statistically significant difference.

Gender differences in SFT results have been shown in Table 3. In 60-69 years age group, men have had statistically better results in 8-foot up-and-go test, Arm curl test and a 2-minute step test ($p < 0.05$). Men have had better results than women in Chair stand test but without statistical significance, while women have had numerically better results in Chair sit-and-reach test. In 70-80 years age group, men have had significantly better results in the Arm curl test, while women have had significantly better results in Chair sit-and-reach test ($p < 0.05$). In the remaining three tests, there have been no statistically significant differences between men and women aged 70-80 years. Overall results of the differences between men and women aged 60-80 years indicate that in Chair stand test, Arm curl test and a 2-minute step test men have had statistically significant better results than women, while women have had statistically significantl results in Chair sit-and-reach test. In 8-foot up-and-go test, men have had only numerically better results than women.

Discussion

The average height and weight of men in this study were 175.62 ± 9.78 cm and 82.26 ± 31.33 kg. These results of male body height and weight are similar to the survey results by Rikli and Jones (24), and they were higher than those in the research by Cicioglu (33). In women, the average height and weight were 165.17 cm $\pm$ 23:12 and 12:44 $\pm$ 69.74 kg, which was higher than in the research (24,34). The differences in average height and weight of the elderly in different surveys are expected, taking into account the diverse ethnicity of the subjects, place of residence, socio-economic factors, etc. In two male age groups, there has been a height loss during the aging process, which is consistent with the results of a large number of researches (24,33,35). In this study, women aged 70-80 years were on average 2 cm higher than women aged 60-69, which is contrary to the results of the research by Perissinoto et al. (35). Increasing age in women brought about approximately 2 kg weight loss, which is consistent with the research by Martins and Rosely (34). The average values of BMI in both men and women, taking into account both age groups, were greater than 25 kg/m². According to WHO (36) BMI over 25 kg/m² means overweight, suggesting that a large number of subjects in our survey is overweight or obese. Such results are not good because it has been known that excess weight and obesity are closely associated with increased risk of cardiovascular disease and other chronic disorders (37). Therefore, Kostić et al. (38) recommend physical activity with weight loss for normal daily functioning of older people.

In a male group, there has been a statistically significant decrease in SFT test results in 70-80 years age group, in comparison to the 60-69 years age group (Table 2). Knowing that these tests are used to assess the functional fitness, it can be concluded that, in this group of men, there has been a statistically significant decline of upper and lower body strength, aerobic endurance, lower body flexibility and agility / dynamic balance under the influence of the aging process. In the female study group, on the basis of these results, it can be concluded that the aging process influenced statistically significant decline of the upper and lower body strength and agility / dynamic balance

(Table 2). In terms of lower body flexibility and aerobic endurance, there has also been a reduction in numerical results but without statistical significance. These results are consistent with the results of the previous studies (24,28,29) except for the Chair sit-and-reach test, and 2-minute step test used to assess female performance. Rikli and Jones (24) found that in the period between 60 to 94 years of age, there is a decline in all parameters of functional fitness, with decreased muscle strength, aerobic endurance and agility / balance for about 10% to 15% per decade of life. Chen et al. (28) also found a statistically significant decrease in muscle strength, lower body strength, aerobic endurance and flexibility in both men and women with the aging process, after 60 years of age. Macfarlane et al. (27), similar to our study, found a statistically significant decrease in the results of the Chair stand test, between 60-69 years group and 70-80 years group. Changes in physical parameters, such as aerobic endurance, strength, flexibility and agility / balance inevitably appear as a result of the aging process. With the aging process, there are also changes in musculoskeletal and sensory system that disturb the balance and postural status, which can lead to undesirable falls in the elderly (39). Isles et al. (26) found that the ability to maintain balance significantly decreases in women during the aging process. We also managed to determine the decline in the ability to maintain balance in women aged 70-80, in comparison to women aged 60-69. Aerobic endurance (capacity) expressed by maximum consumption also declines by about 9% per decade in sedentary adults (12). The amount and the intensity of physical activities have statistically significant influence on the level of aerobic capacity decline of aerobic capacity (40). The process of loss of muscle mass and strength, also known as sacropenia, accompanies the process of aging (40), whereas in elderly, a major factor of muscular atrophy is the loss of type II muscle fibers (5). Based on previous research by Faigenbaum and Hoffman (41), in the period between 60 and 70 years of age, strength level drops by about 15%, and in the period after it declines by 30%. In an eight-year longitudinal study, Bassey (42) discovered a decline in hand grip strength by almost 2% per each year in people over 65 years of age. According to ACSM (12),

lower body strength rapidly declines in comparison to the upper body strength, which has been confirmed by our survey. During the aging process, there is a decreased elasticity of muscles and tendons, which is one of the causes of decreased range of motion and flexibility (12). In addition, irregular shape, tighter meshing and decreased linear pull in collagen tissue leads to decreased flexibility with aging (5). Analyzing the results of our study and comparing them with the results of the already existing researches (24,28,29), it can be concluded that certain rules of decline in functional fitness during the aging process can also be recognized among old population in Serbia.

Taking into account the overall differences in the functional fitness according to gender, the findings show that the men aged between 60 and 80 have significantly better results in terms of upper and lower body strength and aerobic endurance, while women of the same age have had significantly better results in terms of lower body flexibility (Table 3). In terms of agility / dynamic balance, there have been no statistically significant differences between the sexes in the overal result. Regarding the age groups, women have higher flexibility of lower body in both age groups, taking into account statistically significant difference among the females who belonged to 70-80 years group. Men have had statistically significant greater upper body muscle strength than women in both age groups. Lower body muscle strength in both age groups is higher in men than in women, but not statistically significant. In the age group of 60-69 years, men have developed statistically significant aerobic endurance in comparison to women. In the second age group, men also have better results in terms of aerobic endurance but without statistical significance. Men aged 60-69 years have statistically better results in terms of agility / balance, while in 70-80 years group, there have been no statistically significant differences. The obtained results are similar to the research by Rikli and Jones (24); if examined by age groups - starting from 60 to 94 years of age - men always have higher strength and stamina, while women always have better results in terms of flexibility. In their study, unlike in ours, the differences in physical parameters in terms of gender are statistically significant in all age groups. Guzi et al. (29), in a

sample of 6449 people aged 60-99 who live in the region Extremadura in Spain, also found that women have better developed flexibility, while men have better results in other tests which were used to assess the functional fitness. Chen et al. (28), in a sample of 1104 elderly people from Taiwan, used Chair stand test to prove that men over 60 years of age have higher lower body strength, while women over 60 have better results in the Chair sit-and-reach test, which means they have better flexibility than men of the same age. Unlike our study, these studies did not find any differences between the sexes in terms of aerobic endurance. In accordance with our research, Macfarlane et al. (27), in a sample of 1038 people from Hong Kong (China), aged 60-96, found that men have better results in the Chair stand test which is used to assess lower body strength. Barbosa et al. (25), in a sample of 1894 elderly people living in Sao Paolo (Brazil) and by applying different tests to assess the strength (dynamometer time and five chair stands), also found that men have greater upper and lower body strength than women of the same age age. Applying the dynamometer, Desrosiers et al. (43) found that men over 60 have higher grip strength than women. Peiffer et al. (44) discovered that, in terms of absolute and relative muscle strength, men over 65 have statistically better results than women of the same age. In terms of flexibility, Araujo (45) found that, even from their childhood, women are more flexible than men of the same age, whereas this difference becomes particularly evident with the aging process. Taking into consideration that the subjects in our research are from various countries and parts of the world, and are of different ethnicities, it can be concluded that older men have better muscle strength than women of the same age, while women have better developed flexibility.

Conclusion

Monitoring physical abilities in elderly in order to determine the changes in functional fitness during the aging process is necessary. The results of this study suggest that parameters of functional fitness in people older than 60, who live in the southeast of Serbia, decline with the aging process. In men aged 70 - 80 years, in comparison to men aged 60-

69 years, there is a statistically significant decline in strength, flexibility, aerobic endurance and agility / balance. In women, the trend of declining physical abilities is the same as in men in terms of strength and agility / balance. In terms of flexibility and aerobic endurance, there has also been a decline in the results of the tests used, but without statistical significance. In terms of gender, men between 60 and 80 years of age have higher strength and aerobic endurance, while women have better developed flexibility. In terms of agility / balance, there have been no statistically significant differences between the sexes. Changes in functional fitness during the aging process affect the quality of life and functional independence among elderly. Due to this, it is necessary to conduct further research that would determine the standards for the parameters of functional fitness for old people living in the south-east Serbia, in terms of age, gender, level of physical activity and health condition. On the basis of the obtained norms (standards), the appropriate training programs which would raise the quality of elderly could be carried out.

Acknowledgments

Reference

1. Spirduso W, Francis K, MacRae P. Physical Dimensions of Aging-2nd Edition. Champaign: Human Kinetics, 2005.

2. Gorman M. Development and the rights of older people. In: Randel J, Ed. The ageing and development report: poverty, independence and the world's older people. London: Earthscan Publications Ltd; 1999, pp. 3-21.

3. Chodzko-Zajko W. Physiology of Aging and Exercise, In: Cotton RT, Ekeroth CJ, Yancy H, Eds. Exercise for Older Adults : ACE's Guide for Fitness Professionals. Champaign: Human Kinetics; 1998, pp. 1-23.

4. Bokovy JL, Blair SN. Aging and exercise and health perspective. J Aging Phys Act. 1994; 2(3): 243-260.

5. Daley M, Spinks W. Exercise, mobility and aging. Sports Med. 2000; 29(1): 1-12.

6. U.S. Census Bureau. Projections of the population of the United States by age, sex and race: 1983-2080. Current Population Reports, Series P-25. Washington DC: U.S. Govt Printing Office, 1990.

7. Rikli RE, Jones CJ. Development and Validation of Criterion-Referenced Clinically Relevant Fitness Standards for Maintaining Physical Independence in Later Years. Gerontologist. 2012; Epub ahead of print

8. Rikli RE, Jones CJ. Senior fitness test manual. Champaign: Human Kinetics, 2001.

9. American College of Sports Medicine. ACSM's Guidelines for exercise testing and prescription 8th. Baltimore: Lippincott Williams & Wilkins; 2009b.

10. Nelson ME, Rejeski WJ, Blair SN, Duncan PW, Judge JO, King AC, Macera CA, Castaneda-Sceppa C. Physical Activity and Public Health in Older Adults: Recommendation from the American College of Sports Medicine and the American Heart Association. Med Sci Sports Exerc. 2007; 39(8): 1435–1445.

11. Collins K, Rooney BL, Smalley KJ, Havens S. Functional fitness, disease and independence in community-dwelling older adults in Western-Wisconsin. Wisconsin Med J. 2004; 103(1): 42-48.

12. American College of Sports Medicine. Exercise and physical activity for older adults. Position stand. Med. Sci. Sports Exerc. 2009a; 41(7): 1510–1530.

13. World Health Organization. The Heidelberg Guidelines for Promoting Physical Activity Among Older Persons. J Aging Phys Act. 1997a; 5(1): 2-8.

14. Hopkins DR, Murrah B, Hoeger WK, Rhodes RC. Effect of low-impact aerobic dance on the functional fitness of elderly woman. Gerontologist. 1990; 30(2): 189-192.

15. Nakamura Y, Tanaka K, Yabushita N, Sakai T, Shigematsu R. Effects of exercise frequency on functional fitness in older adult women. Arch Gerontol Geriatr. 2007; 44(2): 163–173.

16. Simons R, Andel R. The Effects of Resistance Training and Walking on Functional Fitness in Advanced Old Age. J Aging Health. 2006; 18(1): 91-105.

17. Takeshima N, Rogers NL, Rogers ME, Islam MM, Koizumi D, Lee S. Functional Fitness Gain Varies in Older Adults Depending on Exercise Mode. Med Sci Sports Exerc. 2007; 39(11): 2036–2043.

18. Haykowsky M, McGavock J, Muhll IV, Koller M, Mandić S, Welsh R, Taylor, D. Effect of Exercise Training on Peak Aerobic Power, Left Ventricular Morphology, and Muscle Strength in Healthy Older Women. J Gerontol. 2005; 60(3): 307-311.

19. Milanović Z, Pantelić S, Trajković N, Sporiš G, Aleksandrović M. The Effects of Physical Exercises on Reducing Body Weight and Body Composition of Obese Middle Aged People. A systematic review. HealthMED 2012; (in press)

20. Jorgić B, Pantelić S, Milanović Z, Kostić R. The effects of physical exercise on the body composition of the elderly: a systematic review. Facta Universitatis, Series: Physical Education and Sport. 2011; 9(S4): 439 – 453.

21. Radovanović D, Ignjatović APhysiological Basics of Power and Strength Training. Niš: Faculty of Sport and Physical Education, 2009.

22. Rikli RE, Busch S. Motor performance of women as a function of age and physical activity level. J Gerontol. 1986; 41(5): 645–649.

23. Bril PA. Functional fitness for old people. Champaign: Human Kinetics, 2004.

24. Rikli RE, Jones CJ. Functional fitness normative scores for community-residing adults, ages 60-94. J Aging Phys Act. 1999b; 7(2): 160-179.

25. Barbosa AR, Souza JMP, Lebrao ML, Laurenti R, Marucci MN. Functional limitations of Brazilian elderly by age and gender differences: data from SABE Survey. Ca. Saúde Pública. 2005; 21(4): 1177-1185.

26. Isles RC, Low Choy NL, Steer M, Nitz JC. Normal Values of Balance Tests in Women Aged 20–80. J Am Geriatr Soc. 2004; 52(8): 1367–1372.

27. Macfarlane DJ, Chou KL, Cheng YH, Chi I. Validity and Normative Data for Thirty-Second Chair Stand Test in Elderly Community-Dwelling Hong Kong Chinese. Am J Hum Biol. 2006; 18(3): 418–421.

28. Chen H, Lin C, Yu L. Normative Physical Fitness Scores for Community-Dwelling Older Adults. J Nurs Res. 2009; 17(1): 30-41.

29. Gusi N, Prieto J, Olivares PR, Delgado S, Quesada F, Cebrian C. Normative fitness performance scores of community-dwelling older adults in Spain. J Aging Phys Act. 2012; 20(1): 106-126.

30. McDowell I, Newell C. Mental status testing Measuring health: a guide to rating scales and questionnaire. New York: Oxford University Press; 1996.

31. Weiner J, Lourie E. Human Biology. A Guide to Field Metods, International Biological programme. Oxford – Edinburgh: Blackwell Scientific Publications, 1969.

32. Rikli RE, Jones CJ. Development and validation of a functional fitness test for community –residing older adults. J Aging Phys Act. 1999a; 7(2): 127-159.

33. Cicioglu, I. Assessment of Physical Fitness Levels of Elderly Turkish Males over 60 Years. Coll Antropol. 2010; 34(4): 1323–1327.

34. Martins DS, Rosely S. Body mass index and measures of adiposity among elderly adults. Rev Saude Publica. 2005; 39(2): 2-6.

35. Perissinotto E, Pisent C, Sergi G, Grigoletto F. Anthropometric measurements in the elderly, age and gender differences. Br J Nutr. 2002; 87(2): 177-86.

36. World Health Organization. Preventing and Managing the Global Epidemic of Obesity. Report of the World Health Organization. Geneva: Consultation of Obesity, 1997b.

37. Musta A, Spadano J, Coakley EH, Field AE, Colditz G, Dietz WH. The disease burden with overweight and obesity. J American Med Assoc 1999; 282(16): 1523-1532.

38. Kostić R, Uzunović S, Pantelić S, Đurašković R. A comparative analysis of the indicators of the functional fitness of the elderly. Facta universitatis Series: Physical Education and Sport. 2011; 9(2): 161–171.

39. Lord SR, Ward JA. Age-associated differences in sensori-motor function and balance in community dwelling women. Age Ageing. 1994; 23(6): 452–460.

40. American College of Sports Medicine. ACSM's resource manual for guidelines for Exercise Testing and Prescription 5th ed. Baltimore: Lippincott Williams & Wilkins; 2006.

41. Faigenbaum A, Hoffman J. Senior programs. In: Brown LE, Ed. Strength training / National Strength and Conditioning Association (NSCA). Champaign: Human Kinetics; 2007, pp. 333-342.

42. Bassey EJ. Longitudinal changes in selected physical capabilities: muscle strength, flexibility and body size. Age Ageing. 1998; 27(S3): 12-16.

43. Desrosiers J, Bravo G, Hebert R, Dutil E. Normative Data for Grip Strength of Elderly Men and Women. Am J Occup Ther. 1995; 49(7): 637-644.

44. Peiffer JJ, Galvao DA, Gibbs Z, Smith K, Turner D, Foster J, Martins R, Newton RU. Strength and functional characteristics of men and women 65 years and older. Rejuvenation Research. 2010; 13(1): 75-82.

45. Araujo CG. Flexibility assessment: normative values for flexitest from 5 to 91 years of age. Arq Bras Cardiol. 2008; 90(4): 257-263.

Corresponding Author
Zoran Milanovic,
Faculty of Sport and Physical Education,
University of Nis,
Nis,
Serbia,
E-mail: zoooro_85@yahoo.com

Factors associated with burnout syndrome in physiotherapy staff: A questionnaire study

Maghsoud Eivazi Gh[1,2], Amin Alilou[1], Sara Fereidounnia[1], Zohre Zaki[1]

[1] Physiotherapy Department, Faculty of Rehabilitation Sciences, Tabriz University of Medical Sciences, Iran,
[2] Physiotherapy & Rehabilitation Department, Okan University, Tuzla Kampusu Istanbul, Turkey.

Abstract

Objectives: To investigate the level of burnout syndrome in Iranian physiotherapists and the factors associated with this syndrome in three subscales.

Research design: A sample of 243 physiotherapists who were active in delivering physiotherapy service in Iran completed the designed questionnaire comprising demographic, job related factors data and unpublished Persian version of Maslach Burnout Syndrome.

Main results: 58.2% of therapists believed that their job is stressful. 86.7 % had good cooperation with other therapists. 56.8% had financial anxiety, 52% had job related musculoskeletal problems. 89.6% indicated that physiotherapy service charge was unfair. The MBI score represented that the degree of burnout level in those therapists who were happy with their work was significantly different from the therapists who were dissatisfied with their occupation in all three subscales of Emotional Exhaustion (EE) (P= 0.000), Depersonalization (DP) (P= 0.013) and Personal Accomplishment (PA) (P=0.000). Those therapists who had work related musculoskeletal problems were significantly different in the EE scale (P<0.001) but there was no difference in PA and DP (P>0.05).

Conclusions: The results showed that burnout is a problem for Iranian physiotherapists. High burnout levels had an association with low income, type of employment sector, age group and job-related stress.

Key words: Burnout syndrome, stress, physiotherapists.

Introduction

Burnout syndrome was described by Herbert Freudenberg in 1974 for the first time. It is characterized by a series of physical and mental exhaustion which has been observed in healthcare providers.[1] This phenomenon has been investigated by Maslach and Jackson in depth.[2] The initial symptoms of burnout are detected by energy loss, reduced performance capability, inefficiency in accomplishments and a chronic absence of successful goals-oriented work with people.[3]

The allocation of a limited health budget causes critical problems to both healthcare professionals and care recipients in developing countries such as Iran. Studies show that in Iran, out-of-pocket expenditure is still an important obstacle to healthcare recipients especially among the economically intermediate and poor population [4, 5], in spite of a health insurance system presence even in very distant rural regions in recent years. According to statistics, the growth of healthcare fees has been 14% more than the consumer price index in recent decades, while the average cost of healthcare for the family and the average expenditure on medicines and Para clinics was 19% and 28% respectively in the same years. [6]

There is no doubt that physiotherapists and health personnel are reacting to rigid fiscal constraints and reduced economic resources. As a result, therapists are more restricted in their use of fiscal resources. This situation can produce a contradiction between organization demands and personal and professional values. Therapists may feel caught between economic restrictions and responsibilities towards their organizations as well as towards their professional principles. Such feelings are powerful sources of stress for therapists especially for those who experience a profound gap between the needs of the hospital or private clinic, department and their individual and professional commitment.[7]

Therefore, physiotherapists are prone to chronic fatigue syndrome, because most of the time they work so closely with clients who have chronic problems. There are just a few studies in literature about the extent of burnout syndrome in physiotherapists. According to a survey in Cyprus, one-fifth of physiotherapists had high levels of burnout sign

and symptoms related to professional-bound stress, low payment, employment uncertainty and age. That this is more pronounced in the private sector than the public may be due to external environment swings.[8]Demirci et al in a study on oncology personnel indicated that burnout affects almost half of the staff. According to their research, using methods such as physical activity, having recreation, conversation group therapy, having support meetings, counseling, using stress management tactics, efficient time management, allocating time for record keeping from clients, reduction of overload and accepting the fact that dealing with some patients needs the help of another discipline, allows for the recovery of physical and mental loss of energy and prevents the development of such problems in healthcare providers.[9-11]

In another survey on therapists, time mismanagement especially the inability to allocate adequate treatment time in high demand periods in hospitals, working on unnecessary documentation of patients data, an insufficient number of therapists working in the physiotherapy units and the inadequacy of financial resources are among the most significant stressors which have a role in lowering the emotional and physical well-being of physical therapists. Some of the reactions shown by therapists were short temper, inappropriate behavior with patients and co-workers, a feeling of energy depletion, a diminution of therapists sensitivity towards patient needs, and an unwillingness to accept new patients.[7]

It has been illustrated that in young and inexperienced nurses burnout level decreased with increasing professional experience as their uncertainty of attitude towards their work reduced, and they developed a degree of tolerance towards the expectations and reality of professional life and thus feelings of competency increased. Nurses are considered to be a high risk group for burnout symptoms, related to an early active professional life, long working hours including night shifts, dissatisfaction with co-workers and supervisors, poor health and financial problems.[12]

To the best of our knowledge, the phenomenon of burnout has not yet been investigated in Iranian physiotherapists, so this research was carried out to examine burnout syndrome in this population. The purpose of this study was to investigate the factors associated with burnout syndrome in Iranian physiotherapists who work with self-employed status in private physiotherapy clinics or in the Physiotherapy Units of state and private hospitals.

Methods

The subjects of the study were voluntary participants with the only inclusion criteria being the status of registered physiotherapist of the Iranian Physiotherapy Association (IPA) or the Iranian Medical Council, which grants legal permission to therapists to work publicly or privately in Iran.

Subjects

The participants were recruited at the Iranian Physiotherapy Congress which is held annually in May. They were approached by the researcher and after explanation of the aims of the research, written consent was obtained and the questionnaire was completed. According to the Iranian Medical Council unofficial information there are a total of 4254 registered physiotherapists in different regions of the country. Approximately 1000 therapists attend the annual physiotherapy congress meeting and of 400 forms issued, 245 were filled out and returned to the collectors. Two questionnaires were removed because of missing data.

Demographic characteristics

The personal demographic details of the therapists collected in this study were, age, sex, work experience, activity sector, working hours, their opinion about physiotherapy as a stressful job, level of satisfaction with payment/ income, communication with superiors or other personnel, level of support from superiors, allocation of sufficient funds for career progression, educational opportunities in the workplace, working hours per week and number of patients treated per day, and a few others parameters which are attached in Appendix 1.

Instruments

Burnout level

To evaluate the degree of professional burnout of the participants in this study, the Maslach Burnout Inventory (MBI) was used. The MBI is a worldwide well-known questionnaire of professi-

onal burnout assessment, developed by Maslach.[2] It has been translated into the Persian language and its validity and reliability was calculated by Filian in a dissertation on nurses in Iran.[13] The MBI consists of 22 items on a five-point rating scale and three subscales. The three subscales are as follows: Emotional Exhaustion (EE) evaluates the degree of mental or emotional tiredness and lack of energy. Depersonalization (DP), deals with the behavior of the physiotherapist towards the caregivers. Personal Accomplishment (PA) addresses feelings of inefficiency in work environment. High scores in the EE or DP subscales or low scores in the PA subscale signifies a high level of professional burnout.

- EE was considered high at ≥31 points, intermediate at 21-30 points, and low at ≤20 points. This item evaluates the feeling of emotional boredom and exhaustion from work itself.
- DP was scored as high at ≥11 points, intermediate at 6-10 points and low at ≤5 points. DP indicates the level of feeling of therapist coldness, impersonal and inhospitable feelings towards caregivers.
- PA was scored as high at ≤35 points, average at 41-36 points and low at 42 points or more. This indicates the level of the therapist's performance and feelings of competency in their career.

Procedure

Permission for the study was obtained from the executive chairman of the Congress, and then questionnaires were distributed to the voluntary participants. The first part was concerned with demographic information; work environment conditions and the subjects' feelings about their profession. The other part of the questionnaire was the Persian version of the Maslach Burnout Inventory (MBI). After anonymous completion, the forms were collected immediately or the following day. The participants were asked to give complete answers to all items. The response rate was 61%.

Statistical analyses

All the items of the Persian MBI scale and demographic data were coded, scored and analyzed by SPSS Version 17. The results are shown as frequencies and percentages. Multiple regression analysis was used to detect the factors that had associations with levels of burnout. The independent T-test was used to evaluate whether the means of two groups were statistically different from each other. P values were set at 0.05.

Results

Of the 243 physiotherapists participating in this study 117 (48.1%) were male and 126 (51.9%) were female. 43.9% had their own physiotherapy center, and well above half worked as an employee in a hospital or physiotherapy center. Three fifths of the physiotherapists were over thirty years old and more than two thirds of the therapists had more than ten years' experience (Table 1).

Table 1. Demographic characteristic of Iranian physiotherapists

Variable	(%) N
Gender	
Male	(47.8) 117
Female	(51.4) 126
Age	
≤30	(39.2) 96
31-50	(47.3) 116
≥51	(6.5) 16
Marital status	
Married	(60.7) 148
Single	(38.1) 93
Separated/divorced	(1.2) 3

A little less than three fifth of therapists reported physiotherapy as a stressful job, but the others did not share the same opinion. Well under ninety percent of therapists had good cooperation with other therapists and in the work environment.

A little less than half of the physiotherapists reported they had been supported by superior staff in their work environment. 62.3% of therapists did not have any training opportunities in their workplace. On the issue of workload, the majority of the physiotherapists delivered physioservice to between ten to thirty patients per day, for about 20% the workload was less than 10 patients per day and for a minority, the workload was higher than 30 patients per day.

The majority of therapists reported using manual techniques for the treatment of patients, and

about more than half had financial anxieties. About 70% estimated themselves as a physically suitable person in a professional career. A little more than half of the therapists reported job related musculoskeletal disorders because of the work hazards.

Approximately less than one third of therapists reported that they had psychological tension in their family which influenced their efficiency in the work environment. The majority of the therapists did not approve of the physiotherapy services charge which is established by the Iranian Ministry of Health each year and considered it too far removed from current Iranian socioeconomic realities. More than half of the therapists were not satisfied with their income.

Characteristics of burnout syndrome in Iranian physiotherapists

Table 2 shows a summary of the mean scores calculated for each of the three MBI subscales (EE, DP, PA). 11% of the subjects were in the high range of EE, 24% scored high on the PA scale and 4.9% scored high on the DP subscale. For all the therapists the mean EE subscale score was 16.4, the mean PA subscale score was 35.54 and the mean DP subscale score was 3.34.

According to Table 3, the MBI score indicated that the degree of burnout level in those therapists who were happy with their work was significantly different from the therapists who were not satisfied with their occupation in all three subscales of EE (P= 0.000), DP (P= 0.013) and PA (P=0.000). There was a statistically significant difference between the therapists who considered themselves physically fit for their profession on the scales of EE (P= 0.004) and DP (P= 0.022) but it was not significant on the PA scale (P= 0.112). The therapists who had work related musculoskeletal problems showed a significant difference in EE (P= 0.000) but there was no difference in PA (P= 0.288) and DP (P= 0.146). There was a significant difference in PA (P= 0.001) and DP (P= 0.018) for the therapists who were up-

to-date in their field, however there was no statistical difference in EE (P= 0.185).

According to our results the presence of familial conflict did not have any influence on the EE (P= 0.206), PA (P= 0.312) and DP (P= 0.590) scores. For those therapists who had made their own decision to be a therapist themselves, EE scores were significantly different (P= 0.000) but there was no statistical difference in the PA (P= 0.062) and DP (P= 0.163) scores. The therapists who were happy with physiotherapy service system and the amount of payment were significantly different in EE (P= 0.013), but there was no difference in PA (P= 0.628) and DP (P= 0.212). It was detected that there was no significant difference between experienced and inexperienced or less experienced therapists in all the three subscales of EE (P=0.852), PA (P=0.075) and DP (P=0.082) between the two groups.

In this study, there was a marked difference between male and female in the EE subscale, but it did not reach significance level (P<0.07). In the other subscales there were no significant differences between men and women. Furthermore, there was no statistical difference between married and single physiotherapists in all subscales.

With increasing age there was an increase in PA and a decrease in EE and DP scores. We detected statistically significant differences in the PA (P=0.004) and DP (P=0.011) subscales between younger and older therapists, but it was no significantly different in the EE (P=0.110) scale. The therapists who considered physiotherapy to be a stressful job were different in the EE scale (P=0.001) but it was not different in the PA (P=0.221) and DP (P=0.541). These findings illustrated that therapists who were satisfied with their income were significantly different in the area of EE (P=0.000) but there was no statistical difference in DP (P=0.405) and PA (P=0.255). According to these findings the therapists who were worried about their career in the future were significantly different in the EE scale (P=0.000) but there was no difference in DP (P=0.458) and PA (P=0.889).

Table 2. Mean scores of the Iranian physiotherapists in the MBI subscale

MBI Group	Mean±sd	Low	Intermediate	High
EE	16.49±10.52	(72.1)124	(16.9)29	(11)19
PA	35.54±7.91	(49.7)86	(26)45	(24.3)42
DP	3.34±3.94	(79.7)145	(15.4)28	(4.9)9

Table 3. The relation between variables and the three burnout subscales (mean scores) as determined by t-test and ANOVA tests as appropriate

Variables	EE *	DP *	PA *
Gender			
Men	14.77(12.67-16.87)	3.08 (2.30 - 3.86)	35.23 (33.37-37.09)
Women	17.61(15.36-19.85)	3.5 (2.63-4.31)	35.96(34.38-37.53)
P value	0.07**	0.5	0.5
Marital status			
Married	15.87(14.92-20.03)	3.79(2.90-4.69)	35.90(34.05-37.76)
Single	17.48(13.80-17.93)	3.06(2.29-3.82)	35.22(33.64-36.81)
P value	0.331	0.217	0.579
Sector			
Public	15.94(13.77-18.71)	4.13 (2.39-4.21)	33.87 (32.62-36.76)
Private	17.22(14.15-20.29)	3.02 (1.90-4.14)	35.70 (33.34-38.05)
P value	0.670	0.337	0.430
Job selection			
Own Choice	15.98(14.34-17.69)	3.15(2.58-3.73)	35.63(34.39-36.88)
Others decision	21.94(14.78-29.01)	4.85(1.98-7.72)	33.74(28.75-38.72)
P value	0.104	0.240	0.328
Physio perceived as stressful job			
yes	18.79(16.43-21.15)	3.18(2.31-4.04)	36.20(34.64-37.76)
No	13.59(11.75-15.44)	3.54(2.81-4.27)	34.71(32.87-36.56)
P value	0.001	0.541	0.221
Having low income			
yes	12.54(10.58-14.50)	3.03(2.31-3.75)	36.49(34.65-38.33)
No	18.90(16.76-21.04)	3.53(2.70-4.37)	35.06(33.50-36.62)
P value	0.001	0.405	0.255
Inadequate cooperation with coworkers			
yes	16.00(14.28-17.72)	3.23(2.63-3.83)	35.75(34.49-37.01)
No	19.64(15.12-24.16)	3.91(1.60-6.21)	34.90(30.75-39.06)
P value	0.131	0.453	0.648
Lack of professional opportunity			
yes	13.62(11.52-15.72)	2.56(1.84-3.28)	38.12(36.42-39.81)
No	18.35(16.17-20.53)	3.78(2.92-4.64)	34.12(32.48-35.76)
P value	0.002	0.031	0.002
Use of manual tech			
yes	16.61	3.19	35.65
no	14.90	5.90	33.60
p-value	0.619	0.035	0.429
Anxiety of future			
Yes	19.30	3.55	35.58
No	12.58	3.11	35.40
p-value	0.001	0.458	0.889

* Emotional Exhaustion (EE); Depersonalization (DP); Personal Accomplishment (PA)
** Mean (95% Confidence Interval)

More than half of the therapists believed that their job was stressful. In comparison with therapists who worked in their own physiotherapy center, more therapists who worked in the public sector reported that their occupation was stressful.

Linear multiple regression analyses indicated that the predictors of: (1) EE were considering physiotherapy as a stressful job (P<0.015), job related musculoskeletal injury (P<0.003), and feeling anxious about the future (P<0.002) but the model was not significant; (2) there were no predictors for DP; (3) PA predictors were age group (P<0.008), marital status (P<0.042) and use of manual techniques (P<0.001). In both EE and PA, the model was significant.

Reliability analysis

For the internal consistency of subscales, Cronbach's alpha for all subscales was determined as 0.647.

Discussion

This research has detected the factors associated with burnout level in Iranian physiotherapists. The Iranian Medical Council has 4254 registered physiotherapists and this study was able to survey 245 physiotherapists who worked in different regions of Iran. As far as we know this is the first published article about burnout level of Iranian physiotherapists, and could therefore be used for the development of an action plan for the prevention and management of burnout syndrome in Iranian physiotherapists.

The percentage of Iranian physiotherapists with high EE was higher in our findings in comparison with Pavlakis et al. According to the Maslach et al criteria, the emotional exhaustion subscale reflects the organization and social work environment;[3] therefore Iranian physiotherapists indicated high feelings of EE perhaps because of adaptation to their organizations.

It has been reported that physiotherapists who work in the private sector versus governmental organizations would influence burnout levels because therapists who work in their own physiotherapy center have more autonomy and a higher income than those who are employed in a state hospital.

According to a study by Santos et al, more than half of 55 physiotherapists rated themselves to be in an average or highly stressed situation. These findings are in line with other stress related occupational problems. Lack of professional autonomy in the work environment, lack of organization in the hierarchal command chain, unevenness of task dis-

Table 4. Regression analysis by using mean score of the three burnout subscales as dependent variable

Variable	EE		DP		PA	
	Beta	Sig	Beta	Sig	Beta	Sig
Sex	0.027	0.822	-0.191	0.13	0.19	0.102
Age group	-0.106	0.430	-0.22	0.117	0.37	0.008
Marital status	-0.163	0.250	0.055	0.69	-0.289	0.042
Employment sect	-0.081	0.490	-0.03	0.75	-0.039	0.738
Job decision	0.020	0.85	0.06	0.57	0.021	0.84
Consider physio as stressful job	-0.320	0.015	0.146	0.25	-0.117	0.343
low income	0.105	0.300	0.149	0.22	-0.045	0.7
Lack of synergy with coworkers	0.009	0.900	-0.112	0.35	0.119	0.31
Lack of support from the employers	0.071	0.5	-0.078	0.51	-0.005	0.96
Lack of training opportunities	0.134	0.248	0.104	0.37	-0.198	0.084
Job-relate Musculoskeletal injury	-0.248	0.003	-0.132	0.141	-0.095	0.282
Feeling anxious about future	-0.251	0.002.	-0.075	0.385	0.026	0.755
Work experiences	0.017	0.836	0.117	0.191	-0.102	0.241
Patient No. per session	-0.089	0.51	0.224	0.105	0.003	0.983
Use of manual techniques	0.275	0.047	-0.162	0.219	0.487	0.001
R^2 change	38.2%		41.4%		29.9%	

* Emotional Exhaustion (EE); Depersonalization (DP); Personal Accomplishment (PA)

tribution, work overload of treating a large number of patients, low income and being anxious about the future were among the main factors related to a stressful job.[14] In line with Santos et al, participants in this research reported that a lack of social professional identity and lack of coordination with superiors and co-workers were the main sources of stress.

Another survey on radiologists, nurses and physiotherapists reported that lack of autonomy, lack of social identity among health professionals and role confusion were the major stressful factors. The fact is that recent scientific advancement and state of the art technological developments have brought about a longer training period which has not run parallel with increased social recognition and or higher autonomous professionalism. According to Wolfe, this situation produces a deep gap between a higher level of education and actual professional accomplishment, thus leading to feelings of professional hopelessness.[10]

The present study demonstrated that a little more than half of the physiotherapists had job related musculoskeletal problems, therefore it seems logical to presume that Iranian physiotherapists do not pay sufficient attention to their own health.

Burnout may be associated with a higher workload in the physiotherapy setting or related to a lack of support from superiors and workplace specifications.[14, 15] According to our findings there was an increased level of burnout with less work experience and vice versa which is in line with the findings of Ilhan et al, and Pavlakis et al.[8, 12] Young therapists recorded higher scores of burnout level in comparison with experienced ones. Novice therapists may experience shock when first confronted with the realities of the occupation they have chosen; they start their professional career with great expectations and sometimes far more than the community realities, and then have adaptation difficulties for a short period of time and because of insufficient capabilities, they feel professional incompetency and unsteadiness in their work which represents itself in an initial increase in the degree of burnout level in the first years of experience. However, as their experience increases over time there is a reduction in such feelings and they may adapt to such situations by increasing their tolerance towards the gap between expectations and present realities which may then be accompanied by a reduction in the degree of burnout level as shown

by older therapists and those of a higher professional status. It is also probable that increasing age and level of professionalism go together with increased job satisfaction which is represented by a reduction of burnout level in later years.[8, 12]

In previous studies on nurses there was a difference in burnout level in terms of place of work including surgical or medical unit. The EE and DP scores reported by nurses who worked in emergency service, operating room, and intensive care represented a higher burnout level in comparison with medical unit nurses.[12, 16] The current study did not examine this issue in terms of specialization of physiotherapists and the different patients being treated, such as cerebral palsied children, neurological patients and overly anxious patients, which are considered to constitute a heavy workload and could be a source of development of stress and burnout in the therapists.[12, 17]

Some researchers have reported that a feeling of career dissatisfaction is a primary factor in the creating and substantiation of burnout syndrome. The presence of elements such as low salary, considering the job as unsuitable and being anxious about the career in the future or being unhappy with their job to some extent representing job dissatisfaction could have influenced burnout levels in the three subscales in our study population. Factors such as these could be regarded as work-related dissatisfaction. In the present study we found that perceived poor health due to development of work-related musculoskeletal problems was also found to have influenced the EE scale, but it was not meaningful in the other subscales. Although it is possible to find a correlation between job dissatisfaction and burnout level in the three major subscales, it is not possible to identify the cause and effect in this relationship.

In a study of physiotherapists at Massachusetts rehabilitation hospitals in the United States of America, the majority reported burnout syndrome at an intermediate level. As they were young therapists with less than 3 years' clinical experience, the author cited extreme idealism and an overwhelming desire to display professional skill as possibly contributing to early burnout.[18]

In Ishikawa prefecture in Japan, a survey of physiotherapists indicated that novice physiotherapists experienced a higher degree of burnout. According to the findings, male therapists had

higher scores for PA than female. It was also reported that emotional and physical fatigue were caused by interpersonal exchange and lack of staff .[11]

A study of junior physiotherapists indicated that work factors such as, quality and quantity of work, responsibility and authority of physiotherapists, degree of satisfaction, job satisfaction, and workload, were considered to be risk factors for a moderate level of burnout.[19]

Limitation

A limitation of this study was that the research covered only about 6% of the total 4254 Iranian physiotherapists working throughout the country. Therefore, because of the relatively small sample size it is not possible to generalize the results for the whole Iranian physiotherapist population. Nevertheless, these results can be used as a guide for future work and an action plan for this population.

Personal characteristics of the therapists may play a primary role in the production of burnout syndrome.[17]However,we did not survey this aspect. In this connection, job dissatisfaction has many dimensions but in our survey only a few questions were asked. Therefore, each should be addressed comprehensively in future studies with suitable instruments.

Conclusion

The results of this study indicate that burnout is a problem for Iranian physiotherapists. The high burnout levels seen in the present study have an association with variables such as low income, type of employment sector, age group and job related stress.

Conflict of interests

The authors have agreed to follow the Uniform Requirements for Manuscripts submitted to Biomedical Journals. The authors certify that no party having a direct interest in the results of the research supporting this article has or will confer a benefit on us or on any organization with which we are associated. By the way we didn't receive any payment or services from a 3th party for any aspect of the submitted article.

References

1. Freudenberger HJ: Staff Burnout. J Soc Issues 1974; 30: 159-165.

2. Maslach C, Jackson SE: Maslach Burnout Inventory (manual) Palo AltoCalifornia, Consulting Psychologists Press, 2 1986.

3. Maslach C, Jackson SE,Leiter MP. Maslach Burnout Inventory; Manual 3rd Edition. University of California, ConsultingPsychologists Press, Palo Alto, CA, USA; 1996.

4. Keshaverz Haddad Gh, Zomorrodi Anbaji M. Analysis of adverse selection and moral hazard in the health insurance market of Iran. Palgrave Macmillan2010; 35: 581-599.

5. Asghari A, Willis K, Taghvaei AA, et al. Estimating rural house-holds willingness to pay for health insurance. Euro J Health Econom 2004; 5: 209-215.

6. Hajizadeh M, Connelly L, Butler J, et al. Measuring horizontal inequities in Iran's health care system using a wealth index. Australian Health Economics Society Conference(2009). http://www.acerh.edu.au/News/Hajizadeh_ACHE2009_slides.pdf

7. Deckard GJ and Present RM. Impact of role stress on physical therapists' emotional andphysical well-being. Phys Ther 1989; 69: 713-718.

8. Pavlakis A, Raftopoulos V, Theodorou M. Burnout syndrome in Cypriot physiotherapists: a national survey. BMC Health Services Research 2010. doi: 10.1186/1472-6963-10-63.

9. Demirci S, Yildirim YK, Ozsaran Z, et al. Evaluation of burnout syndrome in oncology employees. Med Onco 2009.doi: 10.1007/s12032-009-9318-5.

10. Wolfe GA. Burnout of therapists: inevitable or preventable? PhysTher 1981; 61: 1046-50

11. Ogiwara S, Hayashi H: Burnout amongst Physiotherapists in IshikawaPrefecture. J PhysTherSci 2002; 14: 7-13.

12. *Ilhan MN, Durukan E, Taner E, et al. Burnout and its correlates among nursing staff: questionnaire survey. Journal of Advanced Nursing 2008; 61(1): 100-106.*

13. *Filian E. Evaluation of burnout and its correlation with coping mechanisms in nurses of educational hospitals of Tehran [dissertation]. Tehran University of Medical Sciences. 1993. [Persian]*

14. *Santos MC, Barros L, Carolino E. Occupational stress and coping resources in physiotherapists: A survey of physiotherapists in three general hospitals. Physiotherapy 2010, doi: 10.1016/j. physio.2010.03.001.*

15. *Alvarez-Hernandez G, Medecigo-Vite S, and Ibarra-Garcia C. Prevalence of burnout syndrome in medical residents from a pediatric hospital in Sonora, Mexico. Bol Med Hosp Infant Mex 2010; 67: 40-46.*

16. *Gillespie M, Melby V. Burnout among nursing staff in accident and emergency and acute medicine: a comparative study.Journal of Clinical Nursing 2003; 12: 842–851.*

17. *Shimizu T, Feng Q, Nagata S. Relationship betwe-enturnover and burnout among Japanese hospital nurses. Journal of Occupational Health 2005; 47: 334–336.*

18. *Donahoe E, Nawawl A, Wllker L, et al. Factors associated with burnout of physiotherapists in Massachusetts rehabilitation hospitals. PhysTher 1993; 73: 750-761.*

19. *Mandy A, Rouse S. Burnout and work stress in junior physiotherapists. International Journal of Therapy and Rehabilitation 1997; 4(11): 597-603.*

Corresponding Author
Amin Alilou,
Department of Physiotherapy,
Faculty of Rehabilitation Sciences,
Tabriz University of Medical Sciences,
Tabriz,
Iran,
E-mail: aminalilo303@yahoo.com

Exploring european doctors´ well-being by applying a neural network

Ana Maria Lucia-Casademunt, Jose Antonio Ariza-Montes, Alfonso Carlos Morales-Gutierrez.

Department of Sociology, University of Cordoba, Spain.

Abstract

Objective: This research underlines the importance of doctors´ well-being in the workplace by analyzing three dimensions (their job satisfaction, comfort and enthusiasm) and the effect of job-related factors on each one of these. On the one hand, the current study analyzes well-being by taking the *General Model* of *Mental Health* as its point of departure. And on the other hand, the Vitamin Model is adopted to test the impact of certain working conditions on well-being.

Methods: The methodology used to achieve our research objective is based on an alternative econometric method: the artificial neural network called ELM (Extreme Learning Machine). A model is estimated to classify European doctors into those who do feel satisfied with their jobs, feel calm and relaxed, and feel cheerful and in good spirits, and those who do not. Furthermore, the weight that job-related factors exert on these dimensions of well-being has been determined through a sensitivity analysis.

Results: A sample of 54 female and 50 male doctors collected from the 5th European Working Conditions Survey-2010 has provided valuable information about their working environment and employment situation. Based on the participants' responses, a high degree of efficiency has been achieved for each artificial neural network. These models correctly classify doctors with respect to three dimensions of their well-being: 100% in the case of job satisfaction, 88.46% for comfort and 92.3% for enthusiasm.

Conclusions: Employee well-being becomes an organizational strategy in order to achieve successful organizations. Three artificial neural networks have been calculated with good classification results to predict the dimensions of affective well-being. These results have many practical implications , which means that human resource managers in HealthCare organizations can check with a very small margin of error if doctors are satisfied in their workplace, and feel calm, relaxed, cheerful and in good spirits. Thus, these managers can design management practices focused on aiming for a healthy work context or environment.

Key words: Environment determinants, mental health, well-being, artificial neural network, Vitamin Model.

Introduction

There seems to be more and more concern about the quality of the medical care provided by health services. Deficits in care are frequently found to be associated with a lack of well-being when they occur in doctors. While considerable research has been devoted to well-being felt by employees in general, little information has been available to analyze the sources of well-being levels among doctors. The purpose of this research is to analyse how the well-being of European doctors is in a current transition period from traditional work patterns to others that are still undefined. The nature of work is changing with far-reaching implications for individual well-being in the workplace and personal life: globalization, growing intensification of work, managerial competence, new technology, the development of economics from manufacturing to services or from an employee-centred role to a managerially-focused role, the composition of the workforce, etc. (1). In general, jobs have a multiplicative impact, both positive and negative, on individuals' well-being by affecting their behaviour in social, personal and familiar contexts and ultimately in their competitiveness or efficiency. Employee well-being is substantial, mainly because work is a very important part of a person´s life and as such plays an indispensable role, that is, a significant or integrating role as a source of self-esteem or personal fulfillment. However, work conditions and characteristics of can also be dysfunctional for an individual and have a substantial impact on mental health (2, 3).

Over the past few years, employee well-being is coming to occupy an increasingly prominent place in organisational psychology and is taking giant steps in the priorities of companies and governments in Europe. However, in practice, progress is rather slow because there is not a holistic approach for the articulation of such diverse interests as both employee well-being and the profitability of a business monopoly. Managers can influence the degree of employees' well-being by changing some dimensions of organizational contexts: tasks, rewards, social and physical aspects… (4). The promotion of well-being is of interest for employees but also for employers. Companies spend a lot of resources on recruitment and if these candidates experience poor health and a lack of well-being, they will be less productive, will make worse quality decisions, will be more prone to absenteeism (5) and consequently will decrease their contributions to organization performance (6).

This research sets out with the Warr´s *General Model* of *Mental Health* (7). This model assumes that mental health is a multidimensional and complex concept indentifying a set of its own hypothetical environmental determinants. According to this author, the five principal components of mental health are affective well-being, competence, autonomy, aspiration and integrated functioning. Precisely, the purpose of this research is to focus on affective well-being through the Vitamin Model proposed by Warr (7). Traditionally, affective well-being has been evaluated as a bipolar continuum constituted by feelings of well-being at one end, and feelings of discomfort at the other opposite end. However, recent research defends a bidimensional focus (8). These two basic dimensions have been conceptualized as "pleasure" and "activation or arousal" in numerous studies (7, 9) and are represented by the horizontal and vertical axes respectively in Figure 1. The individual´s psychological well-being can be described depending on his/her relative location in these two dimensions (which represent the content of emotion) and its distance from the mid-point of the figure (more distance is more intensity). On the other hand, Warr suggests that three main axes should be considered to measure how well-being is affected (7). The first axis is one of the two orthogonal and original dimensions that represent only pleasure

while the other two cross the figure obliquely with a certain degree of arousal or activation and pleasure, and are drawn in Figures such as (2a,2b) and (3a,3b). According to Warr, the diagram is represented by an ellipse instead of a circle because of the dimension of pleasure rather than arousal (7).
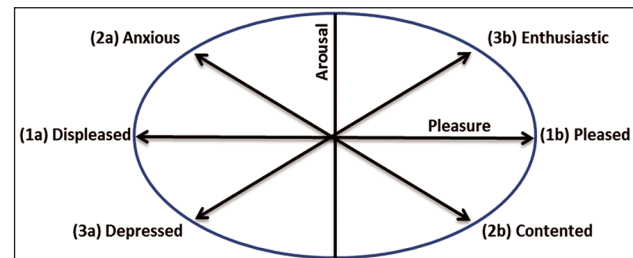
Source: (7, 10, 11).

Figure 1. *Bidimensional focus of affective well-being*

Some researchers agree that employee well-being can be considered through the interrelationship of the three axes proposed by Warr (12, 13). These axes are measured by:

Dimension 1: *Displeased-Pleased*. This dimension incorporates concepts such as job satisfaction, fulfillment or organisational commitment. This is the only pure and original one whereas the other two dimensions combine a certain degree of arousal with a certain degree of pleasure.

Dimension 2: *Anxiety or Discomfort-Comfort*. This dimension places the individual in a continuum, on the one hand, with feelings or experiences of anxiety, discomfort or concern, and on the other hand with calm, cheerful or content feelings.

Dimension 3: *Depression-Enthusiasm*. This dimension is opposite the first one, and places the individual in a continuum with feelings of pessimism, misfortune or depression on the one hand and of optimism or enthusiasm, on the other hand.

Warr´s Vitamin Model is studied and it is hypothesized that environmental features are related to the three key dimensions of psychological well-being (7). The impact of these features on psychological well-being is viewed as analogous to the influence of vitamins on physical health, with an explicit non-linearity in the relationship. Warr considers that there are ten environmental categories of well-being determinants in the workplace (7, 14). The categories and their related items are presented in Table 1. Many empirical studies dem-

onstrate the effect that different categories of environment determinants have on well-being (14, 15, 16, 17, 18, 19).

Methods

Design and sample

Data used in this research have been obtained from the 5th European Working Conditions Survey, carried out in 2010 by the European Foundation for the Improvement of Living and Working Conditions. The survey provides insight into the working environment and employment situation throughout the 27 EU Member States as well as in Turkey, Croatia, Norway, Macedonia, Montenegro, Albania and Kosovo. The sample is multi-stage, stratified and random. The total number of interviews in 2010 was 43,816. In light of the objective of this investigation, we obtained a sub-sample of 110 employees who are doctors: 82.7% of whom reported that they were satisfied in their workplace (job satisfaction); 76% felt calm and relaxed (comfort); and 81.7% were cheerful and in good spirits (enthusiasm). 48.1% were men and 51.9% women. Finally, the average age was 42.9 years old.

The classification of dependent and independent variables are now shown. in *Dependent* variables: three of the items related to psychological well-be-

ing have been used to measure affective well-being: Job satisfaction (How satisfied do you feel about the working conditions in your main paying job?), Comfort (How calm and relaxed have you felt over the last two weeks?) and Enthusiasm (To what degree have you felt cheerful and in good spirits over the last two weeks?). The responses were measured on a Likert scale of 1-5; the employees who felt satisfied, or calm and relaxed, or cheerful and in good spirits were each coded as 1, while each of those who were not received the code of 0.

Independent variables: In the current study, 18 independent variables have been introduced that are related to ten categories of well-being (see Table 1).

Statistical analyses

In this research, artificial intelligence is combined with the field of human resource management to determine the environmental factors that influence affective well-being. Its evaluation is classified by artificial neural networks (ANNs) which are inherently non-linear models that recognize patterns and make classifications accordingly. Specifically, this research applies a neural network called the Extreme Learning Machine (20) to classify doctors in the European context according to their affective well-being in order to

Table 1. Categories and variables of well-being

Category	Variables
1. Variety	1. Variety of tasks.
2. Opportunity for interpersonal contact	2. Social support (Colleagues)
	3. Good friends at work.
3. Supportive supervision	4. Social support (Manager)
4. Opportunity for personal control	5. Consulted before targets for your work are set.
	6. Involved in improving the work organisation or work processes of your department or organisation.
	7. Take a break when you wish.
	8. Apply your own ideas in your work.
	9. Influence decisions that are important for your work.
	10. Feel 'at home' in this organisation.
5. Valued social position	11. Your job gives you the feeling of work well done.
	12. You feel you are doing useful work.
6. Environmental clarity	13. Task feedback
7. Externally generated goals	14. You know what is expected of you at work.
8. Opportunity for skill use	15. No items exist on survey related to this topic
9. Physical security	16. Do you think your health or safety is at risk because of your work?
	17. Does your work affect your health, or not?
10. Availability of money	18. I am well paid for the work I do

improve productivity and the quality of working life in a new labour context. Three artificial neural networks have been calculated which are able to predict three dimensions of affective well-being. Each neural network designed contains 3 layers (an input layer, a hidden layer, and an output layer). The input layer has 18 predictor variables, the hidden one has 30 nodes and the output layer has two nodes, one for each class: job satisfaction, comfort and enthusiasm. The ANN has a total of 930 parameters (30 for bias, plus 30x30 between input layer and hidden layer).

Recently, artificial neural networks have shown satisfactory results in the solution of complex problems, providing a useful methodology for a variety of disciplines: medicine, biology, economy, engineering and psychology (21). In the field of organizations, the use of this methodology is at a very early stage. Specifically, in social psychology these models enable us to predict or to model social behaviors, such as the well-known prisoner's dilemma (22) or burnout syndrome. However, until now few research studies have dealt with attitudinal variables addressed with artificial neural networks (23, 24, 25). For further information of analysis using ANNS, information can be found in the research report of Montaño *et al*. (26).

Results

Based on the participants' responses, a high degree of performance for each of the ANNS has been achieved. In this research, performance is carried out based on sensitivity, specificity and efficiency rates. The sensitivity of a diagnostic instrument is measured by the percentage of correctly classified individuals who are satisfied in their workplace (job satisfaction), feel calm and relaxed (comfort) or feel cheerful and in good spirits (enthusiasm). On the other hand, specificity shows the percentage of correctly classified individuals who are not satisfied in their workplace, do not feel calm and relaxed or do not feel cheerful and in good spirits. Finally, efficiency shows the total percentage of individuals (who feel or do not feel these sensations) that the model classifies correctly. One of the main objectives of this research is to identify whether an artificial neural network is effective in the classification of European doctors' well-being.

The results of the model based on the ELM algorithm turn out to be solid in terms of accuracy (see Table 2), reaching a high level of efficiency: 100%, 88.46% and 92.30%.

Table 2. Performance rates of artificial neural networks

Performance index	ANN (ELM)		
	Efficiency	Sensitivity	Specificity
Job satisfaction	100%	100%	100%
Comfort	88.46%	50%	100%
Enthusiasm	92.30%	80%	95.23%

One of the most important criticisms about the use of ANN is how difficult it is to understand the content of internal representations generated by the neural network. The sensitivity analysis has made it possible to overcome some difficult issues in interpreting results generally associated with this methodology (27, 28). In this way, the sensitivity analysis allows the relative importance of each one of the independent variables to be determined in the resulting model. The weight of the most relevant independent variables on the state of employee´s well-being is shown in Table 3 arranged in an increasing order of sensitivity. The results obtained indicate that the most influential attribute related to each dimension´s well-being is feedback in the case of job satisfaction (S=0.7896), autonomy in the case of the dimension of comfort (S=0.5652) and, finally, a variety of tasks for the dimension of well-being known as enthusiasm (S=0.5390).

Discussions

An employee´s well-being in the health context is an extremely important topic because there is a direct relation between doctors' well-being and the quality of medical care they provide (29). Specifically, this author links the increase in stress and the lack of recognition of psychological problems related to healthcare activities with a lower level of occupational well-being. Gothe *et al*. conclude that doctors´ psychological well-being and doctor-patient relationships are affected if these doctors are exposed to work-related stress factors (30).

Freeborn states that those individuals who perceive greater control over their immediate work environment, who perceive that their work de-

Table 3. Sensitivity analysis

Input variables	Job satisfaction	Input variables	Comfort	Input variables	Enthusiasm
Your supervisor: Provides you with feedback on your work	78.96	You can take a break when you wish (autonomy)	56.52	Generally, what variety of tasks does your main paying job involve?	53.90
You are able to apply your own ideas in your work.	58.03	Your manager helps and supports you.	49.79	You are able to apply your own ideas in your work.	46.55
Your manager helps and supports you.	50.13	You can influence decisions that are important for your work	44.90	Do you think your health or safety is at risk because of your work?	45.99
Does your work affect your health, or not?	35.72	Are you satisfied, with working conditions in your main paying job?	40.46	You can take a break when you wish	45.43
I am well paid for the work I do	30.26	Do you think your health or safety is at risk because of your work?	41.41	Your supervisor: Provides you with feedback on your work.	42.18
I have very good friends at work	27.46	Your supervisor: Provides you with feedback on your work	36.82	Your colleagues help and support you.	40.4638

mands are reasonable and who have more support from colleagues also have higher levels of psychological well-being (31). In order to successfully achieve healthy work organizations in the healthcare environment, well-being in the workplace should be a motivating and encouraging force in the management of human resources so that employees, organizational structure, strategies and goals are given equal importance. In this research, it is shown that doctors present a high level of well-being in the workplace.

With regard to the first dimension of occupational well-being, earlier research has proven that the working environment is one of the central determinants of doctors' job satisfaction. Some studies conclude that lack of proper service structures, low salaries, high work demands and insufficient social support from colleagues are fundamental predictors of non-satisfaction and a lack of well-being among doctors (31, 32). This is consistent with our research findings.

Firstly, the artificial neural network analysis concludes that doctors' job satisfaction is chiefly determined by working conditions. In fact, the results in Table 3 show that doctors would feel more satisfied if: they were provided with feedback from their superiors, they could apply their own

ideas, they were provided with help and social support from superiors, they considered that their professional activity did not directly concern their health and safety, they were properly paid for their work and, finally, if they considered that they had ties of friendship with their colleagues.

Secondly, the degree of doctors' comfort in the workplace constitutes a key factor of occupational well-being. Previous studies highlight the importance of comfort in doctors´ professional lives due to the consequences that this factor has on the quality of service that is provided to the patient. For example, Tyssen claims that mental doctors´ health problems are known to be associated with low work control (33). In fact, the present research shows that doctors would feel more comfortable in the workplace if they could exercise some discretion and influence in some decisions affecting their work, if they are provided with help and social support from superiors, feel satisfied with work conditions that the organization has provided them with, if they perceive that their work does not involve any risk for health and safety and, finally, when their superiors provide them with feedback about their performance (see Table 3).

Finally, regarding the third dimension of well-being, feeling cheerful and in good spirits (enthu-

siasm), Gander *et al.* concludes that health professionals are prone to more emotional behaviour due to the peculiar characteristics of their tasks, which generate a good deal of physical and mental strain (34). Also, continuous contact with people suffering from health problems that often cannot be reversed affects doctors, who can become more vulnerable to psychological risk factors. In this line, Nettleton *et al.* conclude that doctors' enthusiasm is ambivalent because it is determined by the contextual tension which characterizes the medical profession (35). Voltmer *et al.* agree with earlier observations and research findings about the potential health risks resulting from the strain and emotional burden associated with the medical profession (36). In relation to these feelings, the results in Table 3 demonstrate that the enthusiasm of doctors in working environments is characterized by a variety of tasks, broad discretion for decision-making, the perception that their work does not involve any risk for their health and safety, task feedback and lastly, social support from colleagues involves another fundamental element for feeling content with professional life.

The doctors' perceptions of their environmental context affect how they relate to their job and see their future in the organization, ultimately having an impact upon their work adjustment, health and well-being. This research demonstrates that there is a set of working conditions which determine the degree of occupational well-being of doctors' in the wider European context. The identification of some factors with a higher incidence in the phenomenon under investigation can help to design and define specific management programmes that will lead to substantial benefits for doctors who suffer from a low degree of occupational well-being.

Conclusions

Employee well-being is becoming an organizational strategy to achieve successful organizations, because of the direct and significant impact it has upon them. With regard to the health sector, patient satisfaction and improved health status are both central goals of effective medical care. Deficits in care are frequently found to be associated with problems affecting well-being when they occur in doctors. Thus, it is important to examine the relationships between working conditions and certain dimensions of well-being among doctors. Three artificial neural networks have been calculated to predict the dimensions of affective well-being with good classification results. The practical implications of these results are multiple, which means that human resource managers in healthcare organizations can check with a very small margin of error if doctors are satisfied in their workplace, and feel calm, relaxed, cheerful and in good spirits. Thus, these managers can design management practices aiming for a healthy work context or environment. These research findings demonstrate which organizational actions are fundamental for creating or maintaining a healthy work organization, in order to establish proposals for interventions to address psychological problems which ultimately affect performance and organisational costs. According to the Foresight Mental Capital and Wellbeing Project, each year stress from work is estimated to cost employers an estimated £ 3.7 billion, and around 13 million working days are lost (37). Although only a few mental health problems can be attributed exclusively to work conditions, there are, however, many significant cases which have had a tremendous impact on organizations and governments.

The empirical design used to obtain these results is based on a new statistical methodology: artificial neural networks. The good classification results obtained in this research confirm that practical NNA applications demonstrated in other disciplines can also be extended to organizational psychology. Furthermore, the current study shows that the weight of input variables in NNA models can be interpreted by sensitivity analysis and provides valuable information about their degree of influence on output variables. Based on these results, it is important to note that feedback on job performance is the most important factor contributing to satisfaction in the workplace. Furthermore, a doctor's comfort in the workplace can be improved by providing him with greater autonomy and social support. And finally, enthusiasm would be promoted in these professionals by being able to perform a variety of tasks with decision-making power.

Limitations of the study

Despite the scientific interest of the findings mentioned, some methodological limitations should be considered. The first limitation of our study is the small sample size and the fact that the sample is self-selected. Secondly, affective well-being has been measured through self-awareness and, therefore, the corresponding bias in the key variable must be assumed. Finally, the casual relationship between well-being and the variables taken into account in our study must be relativised, as the data under study are cross-sectional and not experimental. Future research needs to be conducted with larger samples in a longitudinal study.

References

1. Brown M, Metz I, Cregan C, Kulik, CT. Irreconcilable differences? Strategic human resource management and employee well-being. Asia Pacific Journal of Human Resources 2009; 47 (3): 270–94.

2. Warr P. Well-being and the workplace. In: Kahneman D, Diener E, Schwarz N. (Eds.). Well-being: The foundations of hedonic psychology. Nueva York: Russell Sage Foundation; 2003; 392-412.

3. Peiró JM, Prieto F. Tratado de Psicología del Trabajo. Volumen II: Aspectos Psicosociales del Trabajo. Madrid: Editorial Síntesis; 1996.

4. Danna K, Griffin RW. Health and well-being in the workplace: a review and synthesis of the literature. Journal of Management 1999; 25 (3): 357-84.

5. Boyd A. Employee traps-corruption in the workplace. Management Review 1997; 86 (8): 9-22.

6. Price RH, Hooijberg R. Organizational exit pressures and role stress: Impact on mental health. Journal of Organizational Behavior 1992; 13 (7): 641-51.

7. Warr P. Work, Unemployment and Mental Health. Oxford: Clarendon Press; 1987

8. Russell JA. A circumflex model of affect. J Pers Soc Psychol 1980; 39: 1161–78.

9. Matthews G, Jones DM, Chamberlain AG. Refining the measurement of mood: The UWIST Mood Adjective Checklist. Br J Psychol 1990; 81 (17): 17-42.

10. Kahneman D, Diener E, Schwarz N. Well-being: The foundations of hedonic psychology. New York: Russell Sage Foundation; 2009.

11. Warr P. A conceptual framework fot the study of work and mental health. Work and stress 1994; 8: 84-97.

12. Daniels K, Guppy A. Occupational stress, social support, job control, and psychological well-being. Human relations 1994; 47: 1523-44.

13. Lucas RE, Diener E, Suh E. Discriminat validity of well-being measures. J Pers Soc Psychol 1996; 71: 616-28.

14. Warr P. The measurement of well-being and other aspects of mental health. Journal of occupational Psychology 1990; 63: 193-210.

15. Xie JL, Johns G. Job scope and stress can job scope be too high. Acad Manage J 1995; 38: 1288-1309.

16. Campion MA, McClelland CL. Follow-up and extension of the interdisciplinary costs and benefits of enlarged jobs. J Appl Psychol 1993; 78: 339-51.

17. Spector PE, O´Connell BJ. The contribution of personality traits negative affectivity, locus of control and Type A to the subsequent reports of job stressors and job strains. Journal of Occupational and Organizational Psychology 1994; 6: 1-11.

18. Sevastos P, Smith L, Cordery JL. Evidence on the reliability and construct validity of Warr's (1990) well-being and mental health measures, Journal of Occupational and Organizational Psychology 1992; 65: 33–49.

19. Landeweerd JA, Boumans NPG. The effect of work dimensions and need for autonomy on nurses´work satisfaction and health. Journal of Occupational and Organizational Psychology 1994; 67: 201-17.

20. Huang GB, Qin-Yu Z, Siew CK. Extreme learning machine: A new learning scheme of feedforward neural networks. In Proceedings of the IEEE International Joint Conference on Neural Networks, 1-4 Aug 2004, San Jose, California.

21. Cajal B, Jiménez B, Losilla R, Montaño, JM, Navarro JB, Alfonso A, Portell MI, Rodrigo MF, Ruíz JC, Vives J. Las redes neuronales artificiales en psicología: un estudio bibliométrico. Metodología de las Ciencias del Comportamiento 2001; 3 (1): 53-64.

22. Macy M. Natural selection and social learning in prisoner's dilemma: coadaptation with genetic algorithms and artificial neural networks. Sociological Methods and Research 1996; 25 (1): 103-37.

23. Wan-I LWI, Bih-Yaw SB, Chung YS. The exploration of consumers' behavior in choosing hospital by the application of neural network. Expert Systems with Applications 2008; 34: 806-16.

24. Audrain AF. The attribute-satisfaction link over time: A study on panel data. In Proceedings of the 31st EMAC Conference, 28–31 May 2002, University of Minho and European Marketing Academy (EMAC), Braga, Portugal.

25. Somers M. Application of two neural network paradigms to the study of voluntary employee turnover. J Appl Psychol 1999; 84 (2): 177-85.

26. Montaño J, Palmer A, Fernández C. Redes neuronales artificiales: abriendo la caja negra. Metodología de las Ciencias del Comportamiento 2002; 4 (1): 77-93.

27. Masters T. Practical neural networks recipes in C++. London: Academic Press; 1993.

28. Lisboa PJG, Mehridehnavi AR, Martin PA. Neural Network Apllications and tools. IEEE Conference publications 1994: 11-17.

29. Firth-Cozens J. Doctors, their well-being, and their stress. BMJ 2003; 326: 670–1.

30. Gothe H, Köster AD, Storz P, Nolting HD, Häussler B. Job Satisfaction among Doctors. Dtsch Arztebl 2007; 104 (20): 1394-9.

31. Freeborn DK. Satisfaction, commitment, and psychological well-being among HMO physicians. West J Med 2001; 174 (1): 13–18.

32. Van Ham I, Verhoeven AAH, Groenier KH, Grooothoff JW, De Haan J. Job satisfaction among general practitioners: A systematic literature review. Eur J Gen Pract 2006; 12 (4): 174-80.

33. Tyssen R. Health problems and the use of health services among physicians: a review article with particular emphasis. Ind Health 2007; 45 (5): 599-610.

34. Gander P, Purnell H, Garden A, Woodward A. Work patterns and fatigue related risk among junior doctors. Occup Environ Med 2007; 64 (11): 733-8.

35. Nettlenton S, Burrows R, Watt I. How do You Feel Doctor? An Analysis of Emotional Aspects of Routine Professional Medical Work. Social Theory & Health 2008; 6: 18–36.

36. Voltmer E, Kieschke ULF, Schwappach DLB, Wirsching M, Spahn C. Psychosocial health risk factors and resources of medical students and physicians: a cross-sectional study. BMC Med Educ 2008; 8: 46.

37. Foresight Mental Capital and Wellbeing Project Final Project report. London: The Government Office for Science; 2008.

Corresponding Author
Ana Lucia-Casademunt,
Cordoba University,
Faculty of Business Administration,
Department of Sociology,
Spain,
E-mail: alucia@etea.com

Stress research among employees in the agricultural sector

Leposava Grubic-Nesic[1], Slavica Mitrovic[1], Boban Melovic[2], Stevan Milisavljevic[1]

[1] Faculty of Technical Sciences, University of Novi Sad, Novi Sad, Serbia,

[2] Faculty of Economics, Podgorica, Montenegro.

Abstract

This paper analyzes the staff-related sources of stress in the organization, in terms of economic and social changes in Serbia that have been going on for many years. As indicated by the results, employees experience stress on an individual level, and respondents are not particularly stressed, while factors as low income, lack of feedback on the well done job and overtime work were identified as the main behavior-affecting stressors. This low level of stress might have been explained by the small size of community that was subjected to research. In this community most people have other sources of income as well (land, grey economy), as well as fear of job loss and poor condition in terms of wages and hiring.

Key words: stress, sources of stress, employees, organizations.

Introduction

Stress is defined as an external force expressed in the form of a stimulator or stimulus causing the change of energy and exciting the receptors, leading the human ego to the state of embarrassment, excitement or depression. It is a mental and physical strain experienced by an individual as a result of impact of external factors or stressors.

Stress is also a sense created in response to certain events; it is the way the body responds to the challenge and prepares for facing a difficult situation through increased vigilance, focus, strength and persistence. Stress is an adaptive response, mediated by individual differences and/or psychological processes, which is the consequence of some action from the environment, situation or event that imposes excessive and unusual psychological and/or physical requirements (1). It is the individual's response to new and threatening factors in his working environment (2).

Despite many definitions and studies, stress remains rather vague term and a highly relative category. It is a process – an interaction between man and environment. Operative definition of stress, as for most of the explorers and doctors, refers to situations appearing when living challenges and pressure noticeably exceed man's ability to fight. Stress of employees may be well demonstrated through their dissatisfaction by shorter or longer industrial action and constantly poor execution. Stress may also be a factor contributing to frequent and sometimes severe injuries. Nowadays, conditions for stress occurrence are induced by modern business conditions. Sources of stress are usually classified into those arising from personality itself and its propensity to stress reactions and those imposed by the environment. Thus, "extrinsic motivation is perceived to help achieve valued outcomes that are distinct from the activity itself, such as improving job performance, pay, etc. Intrinsic motivation refers to the performance of activity for no reason other than the process of performing it" (3).

According to systematization, stress sources are perceived as organizational and individual sources. The following stress related problems are studied in organizations: describing the nature of job stress and its effect on performance, examining the causes, types and effects of job stress on the individual, and the organization, highlighting workable stress management techniques in the workplace (4-5).

Some professions are certainly more stressful than others, indicating that professions have an inherent stress potential. Recent reviews of literature dealing with stress (6-7) indicate that only few studies examined the multivariate linkages between causes and consequences of stress in organizational settings. Furthermore, only limited attention has been devoted (8) to assessing empirically the causal relationship among sets of organizational, task, role, and individual variables posited in theoretical models of stress (6).

Professions vary not only by the amount of stress, but also by the type of stress to which they

are exposed to. If the individual does more work (or even less) than personally expected, especially when working under time constraints, stress is an indispensable category. Also, stress is present in situations when job requires making many decisions, if frequent business trips and overtime work are required, in conditions of constant and unexpected changes, which are part of the job, as well as the broader social and political situation.

Requirements imposed by the specific job and workplace to the employee can also become source of stress. The mismatch between job requirements and individual capabilities can be a lasting source of stress. Too low or too high demands that are below the individual's capabilities are frustrating and make him unhappy. There are an increasing number of modern jobs imposing specific demands to personality and feelings, implying the prevalence of the process of commercialization of human feelings and the appearance of personality as a market commodity.

Each of the above features may be a potential source of stress reaction. However, what is difficult to determine is the level of their impact, as well as the level of democracy, the policy, culture and climate in companies that might prevent stress in employees.

The effects and consequences of stress are multiple. They are manifested in all areas of our lives and can be perceived as subjective effects (e.g. anxiety, apathy, aggression, depression, fatigue, frustration), behavioural effects (e.g. alcoholism, excessive use of drugs, impulsive behaviour, excessive appetite), cognitive effects (e.g. poor concentration, narrow attention span, hypersensitivity to criticism, mental blockings), physiological effects (e.g. high blood pressure, rapid heartbeat, sweating, dilated pupils, alternating heat and cold waves), organizational effects (including absenteeism, fluctuation, job dissatisfaction, alienation of associates, low degree of loyalty) and health effects (e.g. cardiovascular diseases, gastrointestinal disorders, headaches, migraines, skin disorders, mental illness). One of the positive impacts of the stress is that sometimes it is great motivating force. In individual cases it increases work motivation and encourages greater involvement and success in work.

Research Methodology

The subjects of this research are the causes of stress and stress itself as one of the most important problems occurring within an organization, especially due to the ongoing great organizational and social changes in our country, which are also a source of stress (9).

The primary objective of this research was to analyze the current situation in the enterprise, the degree to which employees are exposed to stress and identify the most influential stressors. This objective is followed by the identification of necessary strategy for minimizing stress (if possible) among employees in the company X based on the obtained research results.

Based on the research objectives the following hypotheses were defined:

- H1 - The organization of work is a source of stress for most employees.
- H2 - Immediate superiors are sources of stress for employees.
- H3 - The reward system is a source of stress for employees.
- H4 - Working conditions are sources of stress for employees.

The research sample:

In order to obtain as realistic results as possible, this study surveyed 55 employees in the agricultural organization X. Respondents were male and female workers aged 20 to 60 years, of various professional qualifications, from trainees to people close to retirement and employees in different functions, from the deputy director general, to the receptionist and a cleaner. Since the survey was part of a pilot study for preparing instruments for a major research, it covered 55 individuals: 44 females and 11 males. The age structure of respondents was as follows: 9% of respondents were up to 30 years old, 15% were 31-40 years old, 51% were 41-50 years old, while 25% of respondents were 51-60 years old. The educational structure of respondents was as follows: 62% of respondents hold high school degree, 13% were college educated, 25% faculty educated. The number of service years was distributed as follows: 7% had up to 5 years of service, 55 respondents 6-10 years, 7% of respondents had 11-15 years of service, 155 respondents had 16-20

years, and 15% had 21-25 years, while 51% of respondents had more than 25 years of service.

The study was conducted using a questionnaire consisting of thirty questions, through which employees could evaluate the presence of various stressors in their working environment on the scale of 1 to 5. The survey was voluntary, anonymous, noting that it will be used solely for scientific purposes. The study was aided by the MS Excel and MS Word software programs, as well as by the descriptive methods of result analysis.

Research results and discussion

The results of the survey of current stressors in the organization pointed to the importance of the following indicators of stress, which are explained in the subsequent part of this work. Only 4% of employees in the company are constantly faced with stress, while 2% of them have stated that stress is present to a great extent due to this phenomenon. 14% of respondents believe that stress is present in specific situations, while 80% of them believe that the presence of unmotivated associates are present to less extent or not present at all, and therefore fails to cause stress.

Lack of time for personal life is not stressful for 20% of respondents, while 42% of them partially agree with this and believes that stress is present but to a lower degree. In contrast, 29% of employees believe that stress is present due to the lack of time for personal life, while 9% of them experience this as a serious stress-causing factor.

As indicated by the survey results, there is extensive documentation present in the company, which is a stress causing factor. This is believed by 38% of respondents, while 28% of them think that extensive documentation is present to a higher degree or even persistently and contributes significantly to stress. For 27% of employees extensive documentation is present to a lower degree, while 7% of them stated that there is no extensive documentation at all, and therefore induces no stress.

Based on the survey results we conclude that interruptions and distractions at work are rarely present. Only 4% of workers are confronted with this problem on daily basis, 7% of them believe that stress caused by this phenomenon is present significantly, 16% of respondents believe that

this stressor is present, while 73% think that this phenomenon is unimportant, stating that even if it is possibly present to a lower degree, it insignificantly influences the occurrence of stress in the organization and their lives.

Nearly half of the examinees (45%) believe that stress is present to a lower degree due to poor or inadequate supervision, while 22% of them agreed that this phenomenon is present in the company. In contrast, as much as 29% of respondents think that this phenomenon is not present in the company.

As believed by the employees of the company X, inadequate wages are a phenomenon that is closely related with the occurrence of stress given that as much as 47% of respondents considered this phenomenon permanently present. Similar is the percentage of respondents that believe this category causes stress in a lower (11%) or higher degree (20%), while only 7% of workers are satisfied with their income, implying that inadequate wages does not result in stress at all.

From the above we can conclude that the presence of insults at the workplace is at a very low level with only 4% of respondents seeing it as a serious source of stress, while 14% of them are aware of its presence. As much as 53% of respondents do not think that insults at the workplace cause stress in their working environment.

When it comes to the lack of knowledge or competence for performing the job, one quarter of employees in these situations are not stressed at all, 42% of them are faced with stress to a lower degree, 5% of them is constantly being subjected to pressure and 6% experience stress at most of working hours.

Only 2% of workers are faced with the problem of disagreements with superiors on a constant basis, while 7% believe that this phenomenon is present to a large extent; 73% of respondents experience the relationship with their superiors in a completely different way.

Based on the results, we can conclude that employees of the company cope with the increased responsibility in different ways. 9% of all respondents do not feel the presence of stress at all, 9% experience constant presence of discomfort and stress, while for the others this presence is in a lower (33%), medium (36%) or higher (13%) degree.

Interestingly, none of the respondents feel constant presence of stress when it comes to doing

jobs which are not exactly in the description of their workplace, while only 7% experience stress to a higher degree. The stress caused by these additional activities is experienced by almost half of the workers only sometimes, while 20% of workers do not experience it at all.

Crisis situations occasionally arise in every company, and employees in the X organization faced stress while resolving these situations in the following proportions: 13% of them do not experience pressure at all, the vast majority experiences it at lower (42%) or medium (27%) degree, while 18% of respondents are generally stressed.

While coping with this problem, 42% of the surveyed workers are not under stress at all, while the same number of respondents experience stress to a lower degree. Only 4% of workers are constantly exposed to stress; 4% of them are exposed to a higher degree in such situations.

When it comes to opportunities for training and acquiring new knowledge, workers have very different attitudes and views on the way this category affects stress. One quarter of respondents are not stressed at all if there is a lack of opportunities for training, another quarter believes that stress is present, while 18% of them believe that stress is present at higher degree and 13% of them believe that stress is always present.

As indicated by research results, employees in the company X cope very well with stress when forced to perform an unpleasant task. Most respondents (42%) experience stress at lower degree, a few of them (40%) do not experience it at all, while only 5% feel constant presence of stress in these situations.

Overtime work as stress causing factor is present also in the X company, having the following impact on the employees: 16% do not feel stress of overtime work, 48% experience stress at low degree, 38% at medium degree and only 4% at high degree.

Slightly more than half of the respondents perform new and unfamiliar tasks with the presence of less stress, 7% do not feel stress at all, 2% of examinees constantly experience it, and 9% and 28% of them at high and medium degree, respectively.

In situations with a lack of support from superiors, 4% of respondents said that stress was always present, 7% that it was present at higher degree, 22% and 51% of respondents said that stress was present at medium or low degree, respectively, while in the aforementioned situation 16 % of workers do not feel the presence of stress at all.

The respondents agreed that the stress due to the lack of recognition for a well done job is present at low (26%) or high (20%) degree. Only 16% of respondents stated that stress induced by this phenomenon is not present at all, while 11% believe that stress is constantly present.

Inadequate/non-performing equipment is the cause of stress in the following proportions: 5% of respondents are constantly exposed to stress due to this factor, 9% said that stress was present at high degree, 15% of employees were aware of its presence, while the vast majority (71%) believed that this phenomenon was not significant.

Based on the survey results we see that interruptions in performing the job cause stress only for 9% of employees, 20% of them agreed that this type of stress was present, while 71% did not feel the presence of stress (31%) or felt it at low degree (40%).

When it comes to thinking negatively about the organization, 35% of respondents opted for the minimum presence of stress; the same was the percentage of those who believe that this type of stress is not present, as opposed to 5% of respondents who believe that stress is always present due to this phenomenon.

In these situations, 20% of workers do not feel any pressure, 47% of them feel pressure at low degree; for 29% of respondents stress is present at medium degree, and only 4% of respondents experience the presence of stress at high degree.

As for the lack of participation in planning, 4% of respondents are constantly under stress, 6% experience it at high degree, while the vast majority (45%) do not feel stress or feel it at low degree (36%).

In the company X the surveyed employees perceive competition in different ways. The majority of workers (36%) do not feel the presence of stress at all, somewhat lower (26%) is the percentage of those who feel the presence of slight stress, while only 9% of them think about competition seriously, with a somewhat higher presence of stress.

As indicated by the survey results, the conclusion is that noise generally fails to contribute to stress given that as much as 55% of workers are not stressed at all, 25% are stressed at low degree. The remaining 20% feel stress to somewhat higher

degree, of which only 4% believe that they are constantly exposed to stress due to this phenomenon.

Due to changes of this type 20% of respondents believe that stress is present at high degree, 27% at medium level, while more than half of them are either not stressed (11%), or stressed to a lower degree (42%). Stress caused by the presence of tight deadlines is highly present in this company. Its presence is characterized by the employees in the following way: only 11% of them are not under stress, as opposed to 7% of employees who are constantly exposed to it, while the rest of the employees are experiencing stress at low (25%), medium (42%) and high degree (15%).

Therefore, we can see that cooperation among the different departments in the company works very well and half of the respondents believe that this phenomenon fail to cause stress at all, 30% of them experience stress at low degree. Only 2% of workers are under pressure on constant basis, with the percentage of those experiencing stress at high degree when it comes to conflicts of this kind.

When it comes to covering the job of associates, we see that 20% of employees know how to cope with this problem and they are not stressed at all, while 43% are under stress at low degree. The presence of stress is experienced by 30% of respondents at medium degree, 5% experience stress at high degree, while only 2% of respondents are constantly under pressure due to this phenomenon.

Conclusion

Stress in the organization is clearly present and its presence is not dependent on a specific job, given that absolutely all employees are exposed to it to a higher or lower degree. The current insolvency proceeding in the organization could be highlighted as the main stress-causing factor. The reduction in the number of employees from over 700 workers in recent years is also a major cause of concern of employees for their future within the company. According to the survey results, one of the major causes of stress is certainly inadequate financial compensation for the work performed, which, in addition to the global economic situation, is the consequence of the insolvency proceeding that has led to a further reduction of income of individuals. In addition to financial compensati-

on, employees believe that the presence of stress is largely influenced by the lack of recognition for a well-done job, the lack of opportunities for advancement, increased responsibility, tight deadlines, extensive documentation, support provided by superiors, and by many other factors such as inability of management to influence the economic situation in our country, as well as the potential reorganization, which may lead to some additional dismisses, for the sake of recovery of the former agricultural giant.

Globalization of business means that many organizations will increasingly operate in different countries, making it vital that we understand how national/cultural differences might affect employees' work behaviour (10). The impact of such differences on interpersonal conflict at work is of particular interest, and one of the most important job stressors (i.e., source of stress at work) in both Western and Eastern societies (11-15).

References

1. Inacevich M. J., Matteson T. M. Stress and work. Glenview; 1980.

2. Arnold H. J., Feldman D. C. Organizational behavior. New York: McGraw-Hill; 1986.

3. Safranj J. Reflections of English Language Teachers Concerning Computer Assisted Language Learning (CALL). The New Educational Review, 2011; 23(1): 269-282.

4. Selye H. History and present status of the stress concept. New York; 1985.

5. Salami A. O., Ojokuku R. M., Ilesanmi O. A. Impact of Job Stress on Managers' Performance. European Journal of Scientific Research, 2010; 45(2): 249-260.

6. Beehr T. A., Newman J. E. Job stress, employee health, and organizational effectiveness: A facet analysis, model, and literature review, 1978; Personnel Psychology, 31: 665-699.

7. Beehr T. A., Schuler R. S. Current and future perspectives on stress in organization. In K. Rowland, G. Fettis (Eds.), Personnel management: New perspectives, Boston: Alian and Bacon, p. 390-419; 1982.

8. Bedeian A. G., Armenakis A. A. A Path-Analytic Study of the Consequences of Role Conflict and Ambiguity. Academy of Management Journal, 1981; 417-424.

9. Hannan M. T., Freeman J. Structural inertia and organizational change, American Sociological Review, 1984; 49(2): 149–164.

10. Liu C., Spector P. E., Liu Y., Shi L. The Interaction of Job Autonomy and Conflict with Supervisor in China and the United States: A Qualitative and Quantitative Comparison. International Journal of Stress Management, 2011; 18(3): 222-245.

11. Frone M. R. Interpersonal conflict at work and psychological outcomes: Testing a model among young workers. Journal of Occupational Health Psychology, 2000; 5: 246-255.

12. Inoue A., Kawakami N. Interpersonal conflict and depression among Japanese workers with high or low socioeconomic status: Findings from the Japan Work Stress and Health Cohort Study. Social Science & Medicine, 2010; 71: 173-180.

13. Jamal M. Burnout among Canadian, Chinese, Malaysian and Pakistani employees: An empirical examination. International Management Review, 2010; 6: 32-42.

14. Liu C., Spector P., Shi L. Cross-national job stress: A quantitative and qualitative study. Journal of Organizational Behavior, 2007; 28: 209-239.

15. Stefansdottie S. I., Sutherland, V. J. Preference awareness education as stress management training for academic staff. Stress & Health, 2005; 21: 311-323.

Corresponding Author
Leposava Grubic-Nesic,
Faculty of Technical Sciences,
University of Novi Sad,
Novi Sad,
Serbia,
E-mail: nesle@uns.ac.rs

Narratives across childhood depression: The focus on family relationships

Maria de Fatima Bezerra de Alencar[1], Modesto Leite Rolim-Neto[1,2], Alberto Olavo Advíncula Reis[3], Marina Lucena de Aguiar Ferreira[1], Saulo Araújo Teixeira[1], Nadia Nara Rolim Lima[1]

[1] Suicidology Research Group, Barbalha, Brazil,
[2] Universidade Federal Ceará, Fortaleza, Brazil,
[3] Universidade de São Paulo, São Paulo, Brazil.

Abstract

Background: Here we analyze the current situation of child depression, focusing on the reconstruction of the expressions encountered by family members, based on the actions developed at the Center for Psychosocial Care of Children and Adolescents - CAPSi, justified by the need to evaluate the use of narratives in helping the family recognition of psychological distress existing in those living with the disorder.

Methods: This study is descriptive and observational, with a qualitative approach. It was performed in Juazeiro do Norte, Brazil, using narratives with the purpose of social research. The sample consisted of 12 families, according to inclusion criteria and in accordance with the ethical principles in research.

Results: The depressive phenomenon generates an excessive disappointment and discomfort over time, leading back family members to question a variety of facts and episodes that they were unsatisfactory in the past, comparing them with what they now face. There is a search for an answer to what is unexplainable: suffering of their children. Thus, the family creates an own peculiar statement for the experienced situation.

Conclusion: It was concluded that narratives can contribute to the process of facing psychological distress, establishing an informational approach that inspires and enhances the dialogue, engaged with a view to the exercise of institutional practices with humanized care.

Key words: Epidemiology, psychiatry, childhood depression, family narratives.

Background

It is estimated that worldwide, according to data from the World Health Organization (WHO), something about 20% of children and adolescents present some problemof mental health. This situation can brings negative consequences in short and long term in the development of such individuals[1,2].

In Brazil, some studies have confirmed a great prevalence of mental disorders among children and adolescents[3,4,5,6,7]. According to them, 12.7% to 23.3% of total brazilian children and adolescents suffer of some kind of psychopathology or mental disorder[2,8,9,10,11], what represents prevalence levels near to those presented by the World Health Organization.

In this context, interdisciplinary approach it is essential for including and building a network of referrals for care and protection to individuals with psychiatric disorders, preserving the family's role, especially, making it emerge as a factor promoting psychological health, considering the importance of good-quality relationships linked to coping styles at the situation. These styles consist in the emotional relationships between parents and children, in which more specific parenting practices are implemented, especially regarding the care and supervision of children[12,13].

As such, parental practices and communication strategies with children and adolescents in the understanding of childhood depression becomes on through the narratives of involvement with the disease, practice emotional, empathic and linked in the description of the routes of psychic pain and suffering as well as the relationships established in the construction of meaning in life with the child / adolescent depression, particularly in the communication of distress that brings out every day and the impact on care[14,15].

It is observed, in this regard, the development of meaning for understanding and coping with the disease is a process that demonstrates the phenomenon of disease as a narrative construction and

is an explanatory model, a conceptual system that underlies the relationship between mediator disease, child and family reality[16].

The understanding, therefore, of the narrative of childhood depression gives us an interpretation about what the families are saying and doing at any given time, considering the areas of language,historicizing that reflects them in a condition of existence of the disease, social and built culturally through the meanings set out for himself and the other from the expository nature of the disease[17].

Foucault[18] notes that the speech event have psychological reality for the participants and is recognized and culturally recognizable, its identification should be considered the objectives of the event, the organization timeline, participants to distinguish their roles, the organization of shifts the standards by which the participants perform and interpret the speech in the interaction.

Accordingly, the words spoken by family members bring with them more statements that attempt to shine, but also carry on their activities myriad interactional expectations forbidden[19], closeted in his speech, as it erupts as a series of reflections and specificities in the recognition of producers of meaning through the translation of his narrative. In this context, the disease is rooted in human history, in its time, being composed of a network perspective[20,21].

The care of psychosocial problems among children and adolescents in Brazil, in the ambit of public health, it is performed on institutions called CAPSi, as are known the Centers for Psychosocial Care of Children and Adolescents, present in most of Brazilian cities[22].

Considering these aspects, this study aimed to describe and analyze the current situation of child depression, focusing on reconstruction of the experiences of the family. Recognizing these experiences in Psychosocial Care Centers Children and Youth - CAPSi allows us to understand the link between the different messages produced within the context of depression and child, especially when staging the meanings of the story of the disease as a description of information constructed in the interactive process by relatives.

Methods

Discussing the authenticity of the particular perspective of the family, we call attention to the fact that the stories are rich placements indexed[23]. It is this option that will appear in what the prime interest refers to the lived experience, in the course of events and actions that, in profusion, make us understand the process of pain and mental suffering, linked to the senses set by passwords, expressed the plot of the depression.

As a method of generating data, we fix our attention on the use of narrative interviews (written in full), which aims at a situation that encourages and stimulates the respondent (called the informant) to tell the story about some important event of his life and examples of social context. It is considered as a method of qualitative research[24,25].

The narrative interview is a form of non-structured interviews, in depth, with specific characteristics. She contrasts different perspectives, and takes seriously the idea that language, as well as the medium of exchange, is not neutral, but is a particular worldview. We analyzed the narratives told in the speech and interdict the family through six steps, here simplified in five[27,28]:

1) Transcribing carefully the expressions;
2) Dividing the text in indexed and non-indexed;
3) Using indexed components to analyze every person's happenings;
4) Investigating the non-indexed dimensions, as a "knowledge analysis".
5) Comprehending and comparing cases and individual trajectories, in the context, and establish differences between them.

The universe of the study comprised 24 families, ranging in age from 45 to 70 years who sought CAPSi care services in the city Juazeiro do Norte, Ceará. The consultations were motivated by the circumstances surrounding mental pain or suffering, through the handling of passwords in the narrative that included the use of spoken words and banned in the form of concepts such as depression, nervous disease.

At first, it was made through medical records, a survey of the family, from case reports in the transit of medical and psychological. With this in-

formation, proceed to chart our sample, considering: family (parents or guardians) who had children diagnosed with childhood depression increased, according to the criteria of ICD-10, agreed to participate and signed an Informed Consent Term (ICT). This has been, therefore, a sample of (purposeful sampling), which is the case selection information rich to in-depth study, the standard sample mode all cases constituted by satisfying the criterion. 12 family members were chosen, by approximation with the inclusion criteria[25,26].

It is noteworthy that all measures, with regard to ethics in research with humans, were made, particularly in care not to denote, in this mapping, any identifying features of the respondents as a means of preserving the confidentiality inherent in the narrative interviews, especially because this has always been the position we have taken in all practical activities, carried out this research and also outside it[27].

Results

The family narratives include regional dialects, metaphors, onomatopoeia, allegories which denote an understanding that the primary purpose of speech are texts looking for a context to explain them, or explained by them, forming a kind of complementarity between the enunciation and the real interpreters for their first-narrators and, only later, for the interpreter[28,29].

The narrative transcribed traits make us realize factual lived, or a culture insert in the social practice of each. Let's see what we teach about childhood depression a mother heard, at 57 years old, "is distress, it is cold, it's war [...] a bad thing that will kill the son of the people. It starts slowly, then increases, taking the life. It's weird stuff, do not have hours to arrive. It seems time fire drill."

The narrator makes a metaphorical switch between acts of everyday life, dependent on agriculture, linking it to the phenomenon of depression that afflicted his son. His speech is straightforward, although melancholic. The mother recognizes the disease as cyclical, it comes and goes, "and burning off," but it never comes to an end, so she seeks.

Another testimony expresses the conflicting relationship of a father with time: "Life is slow and everything is going slow. Nothing draws attention. Only the fourth pays for my daughter, only saves the bed. I no longer plan to that dream? Live this past time. Nobody understands my daughter. Even I know understand what she feels. The understanding is complicated. It is loneliness, fear, anguish she died."

Such phenomenon generates depressed child chagrin excessive and cumbersome over time, to bring family members to past situations and then ask a variety of facts and episodes, after exhaustive attempts and after a long time to translate the child, between what was and what it is now. Finally, there is the relentless pursuit of a truth, an answer to what is considered inexplicable to their pain. In this lineage, the family lends his story through an own peculiar utterance in living with the disease that, for him, is able to guide the bewildered. Thus, the interpreter is the person to whom this statement is intended to be translated to symbols that provide knowledge about this condition. Another family, 42, who works as a blacksmith, reveals that: "Depression of my son is like caustic soda, corrodes everything inside."

The family, not having feedback from the professional, becomes confuse about the disease and the symptoms found. For example, statements that depression is fatigue, dizziness is, is stirring, is pessimism, are associations or analogies that clearly demonstrates that family members do not have information, even preliminary, what effectively will be the phenomenon of depression but the status of incorporating the concept of reality, really.

Discussion

Depression is seen with a double optical, regarding to the cultural perspective of conceptualization. That, called mythical, comprehends an imaginative representation, while the other contemplates eloquent aspects of society, and how people see and interpret it.

The feeling of pain and mental suffering arising from depression is more focused on the family because it is that triggers the most discomfort, given its difficult domination. While physical symptoms are palpable, tolerable, mental suffering becomes an endless, permanent, and then there is a need to say. And these words spoken by family members are prohibited and that can effectively guide the concept of depression, there are far too important to listen.

The "pain of being" is the symptom that most bothers the family, because they understand how the triggering factor of social exclusion, since it affects their interpersonal relationships. Thus arose the conflict of ideas, statements, starting to glimpse the following question: Why my son? And the answer is not found, since it comes with the aid of hearing impaired and not just the "box of prescription drug."

In this context, family members confuse pain with suffering, just as confusing depression with the expectations and meanings circularizados the symptom. This factor is, intimately linked to the fact that family members do not have the empowering benefits translate the diagnostic reasoning to endorse, in fact, pain and psychological distress, and then associated with physical pain[22,30].

For the family, hastily, it is necessary to say words to lessen the pain, at least momentarily, because they imagine that expose your feelings is a way to suppress the pain bothers you too much. However, the depressive status is difficult to understand, since each has its own story to tell, quite particularized, and, above all, because every story that is customized for the effects of depression in body and mind[18,31].

For most of the surveyed families, the healing of depression, above all, becomes from faith in God, through good works, patience, attendance at religious ceremonies and penances. All this takes place in the face of religiosity inherent in the backcountry people that can not be envisioned only as a means of healing, but as a justification for unexplained facts[32]. And the inexplicable depression is not because science has not yet obtained advances thereon, but because that population sample does not have linear concrete elements of assessment of the disease.

Thus, childhood depression is regarded as a disease emerges, and lack of meaning, of signification rescued by the sensations, the motor and language. In this context, language plays a role of defining institutions steeped in the interior of each person, to the detriment of their degree of importance given to the disease. Thus, this axiological aspect dismissed the phenomenon in a greater or lesser potential for the patient, determines the level of the enunciation of their expressions and the naturalness of their concepts[33].

The disease itself is faced with a somewhat anomalous, unnamed in the historical existence, as an entity unknown, incomprehensible, even to the point of being related to "something from another world", "bad thing", "disease who do not have what do. This informational gap is due, however, to the doctor/patient relationship in primary health centersand to the contrasts in the level of information.

In this sense, the social phenomenon of childhood depression and mental conquered its space in the path of life as a family something abrupt, overwhelming, fierce and destructive, while the desire aroused too much to extract a consistent response in fact arising from a knowledge clinician for early diagnosis as well as potential benefits of early intervention also[26,34].

In terms of suggestions for intervention and treatment of depression in the field of practical layout, the proposal we have to be performed consists of a systematic sequence of actions which comprise the structural form of review and rethink how to address the phenomenon, and especially the person to which it incorporates, or see the child depression.

Conclusion

Fears, insecurities, uncertainties reflect, of all sorts, the intrinsic relationship between the knower and the phenomenon it seeks to understand, investigate. The hope and yearning for a better quality of interpersonal and social relationships, the desire for a more competent and humane future still depends on how we deal with the knowledge and the way we develop our cohabitation. It is possible that fears good line with good insights.

In parallel, we must establish a framework of mapped information from the narratives in the fields of mental health in order to envision a future perspective of supply failures continuously. Thus, this reference information in substantially the center of narratives of depression may support the recognition of families of depressed children, it says, and explains the disease as their expectations about the experience with the disease. Therefore, it becomes a mapping of a phenomenon, taking into account its area of occurrence, movement and evolution.

Thus, recognition of utterances of the family's own culture in order to better understand the disease characteristics corroborates with the proposed approach to the rhetoric of the professional and anonymous poetry translated by the disease

in place of narratives, which outlines a differential profile of the old professional prospects lay on the discourse rather than the diagnosis. Lima helps us develop the idea of hearing the subaltern voices and recognize in them the potential for social criticism. Put another way, through a dialogue between the encrypted vertigo of analogy and disenchantment.

This recognition must be based on understanding and comprehension of the words themselves of the disease, stemming from the popular culture, specific terminology of the social body, through a work of leveling the relationship of pathology with the problems of exclusion and lack of listening.

A more comprehensive way, the introduction of public health policies can provide the rethinking of the treatment, intervention and treatment of disease. The primary purpose of these policies is a unique opportunity to restructure the professional body at the expense of the needs identified in the course of childhood depression.

Finally, partnerships should be sealed with other institutions in order to expand treatment and intervention of disease, specifically in directing the patient towards the depressive profile, from the clinical wisdom. This approach seeks to remedy disability issues in the treatment of disease, especially with the supply failure of an institution in a new alliance with another, promoting an alliance based on a hybrid look that focuses on the scriptural knowledge of belonging to an institution in what is believed to be the polyphonic dialogue.

List of abbreviations

CAPSi – Centro de Atenção Psicossocial Infanto-Juvenil, from portuguese Center for Psychosocial Care of Children and Adolescents.

ICD-10 – International Classification of Diseases, 10th edition.

WHO – World Health Organization.

Authors' contributions

MLRN and AOAR contributed in the design and development of the study, acquisition, analysis and interpretation of data, and wrote the manuscript. MLAF and SAT and NNRL and MFBA advised on the study design, development of the research and revised the manuscript. All authors read and approved the final manuscript.

References

1. World Health Organization. Caring for children and adolescents with mental disorders. Setting WHO directions, Geneva: OMS, 2003.

2. Benetti SPC, Pizetta A, Schwartz CB, Hass RA, Melo VL. Problemas de saúde mental na adolescência: características familiares, eventos traumáticos e violência. PsicoUSF.2010; 15(3): 321-332.

3. Guerra AMC. Tecendo a rede na assistência em saúde mental infanto-juvenil: interfaces entre adimensão-clínicaeadimensãopolítica. In: Guerra AMC, Lima NL(org.). Aclínicade crianças com transtornos no desenvolvimento – uma contribuição no campo da psicanálise e da saúde mental. Belo Horizonte: Autêntica, 2003, p.171-189.

4. Ribeiro PRM. História da saúde mental infantil: a criança brasileira dacolôniaàRepública Velha. Psicologia em Estudo. 2006; (11)1: p.29-38.

5. Santos PL. Problemasde saúde mental de crianças e adolescentes atendidos em um serviço público de psicologia infantil. Psicologia em Estudo.2006; 11(2): p.315-321.

6. Sposito BP, Savoia MG. Atendimento especializado a adolescentes portadores de transtornos psiquiátricos: um estudo descritivo. Psicologia: teoria e prática 2006; 8(1): p.31-47.

7. Hoffman MCCL, Santos DN, Mota ELA. Caracterização dos usuários e dos serviços prestados por Centro de Atenção Psicossocial Infanto-Juvenil. Cadernos de Saúde Pública. 2008; 24(3): p-633-642.

8. Ferrioli SHT, MaturanoEM, Puntel LP. Contexto familiar e problemasde saúde mental no Programa Saúde da Família. Revista de Saúde Pública. 2007; 41(2): p.251-259.

9. PaulaCS, Duarte SC, Bordin IAS. Prevalênciade problemas de saúde mental em crianças e adolescentes da região metropolitana de São Paulo: necessidades de tratamento e capacidade de atendimento. Revista Brasileira de Psiquiatria 2007; 29(1): p.11-17.

10. FleitlichBW, Goodman NR. Editorial: implantação e implementação de serviços de saúde mental comunitários para crianças e adolescentes. Revista Brasileira de Psiquiatria 2002; 24(1): p.2.

11. Ronchi JP, Avellar LZ. Saúde mental da criança e do adolescente: a experiência do CAPSi da cidade de Vitória - ES. Psicologia: Teoria e Prática 2010; 12(1): p.71-84.

12. Assis SE, Avanci JQ, Pesce RP, Ximenes LF. Situação de crianças e adolescentes brasileiros em relação à saúde mental e à violência. Ciência & Saúde Coletiva 2009; 14(2): p.349-361.

13. Victal-Bastos LHC. Ilhas de invenção e solidão: um estudo da atenção à saúde mental para a infânciae a adolescência em unidades básicas de saúde em Vitória - ES. Riode Janeiro, 2003.[Dissertação de Mestrado - Fundação Oswaldo Cruz].

14. AlmeidaFilho N, Mary JJ, Coutinho E. Estudo Multicêntricode morbidade psiquiátrica em áreas urbanas brasileiras (Brasília, São Paulo, Porto Alegre). Revista ABP-APAL 1992; 14: 93-104.

15. Kleinman, A. Patients and healers in the context of culture.Berkeley: University of California Press, 1980.

16. Rabelo MC. A construção narrativa da doença. In: 18ªReunião daANPOCS. Grupo de trabalho pessoa, corpo e doença. Salvador, 1994.

17. Gancho CV. Como analisar narrativas. 7ª ed. São Paulo: Ática, 2003.

18. Foucault M. L'Archéologiedusavoir. Paris: Gallimard, 1969.

19. Good BJ. Medicine, rationality, and experience: an anthropological perspective. Cambridge: Morgan, 1995.

20. Ricouer P. Time and narrative. Chicago: The University of Chicago Press, 1988.

21. Jamison KR. Quando a noite cai: entendendo o suicídio. Rio de Janeiro: Gryphos, 2002.

22. JovchelovitchS,Bauer MW. Entrevistanarrativa. In: Bauer MW, Gaskell G. Pesquisa qualitativa com texto, imagem e som: um manual prático. Petrópolis, RJ: Vozes, 2002. p. 91.

23. Lanmek S. Qualitative sozialforschung. Munich: PsychologieVerlags Union, 1989.

24. Hatch JA, Wisnewki R. Life history and narrative. London: Falmer, 1995.

25. Farr RM.Interviewing: the social psychology of the interview. In: Fransella F. Psychology for occupational therapists. London: Macmillan, 1982. p. 151-70.

26. SchutzeF.Die technic des narrative interviewsin interaktionsfeldstudien-dargestellian Einemprojektzurerforschung vonkommunalenmachtstrukturen. Bielefeld: Departament of sociology, 1977.

27. SantosBS. Umacartografia simbólica das representações sociais. RevistaCrítica de Ciências Sociais 1988; 24: 139-172.

28. Cortesão L, Stoer SR. Cartografando a transnacionalização do campo educativo: o caso português. In: Santos BS (org.). A globalização e as ciências sociais. São Paulo: Cortez, 2002.

29. Nogueira-Martins MCF. Humanização das relações assistenciais: a formação do profissional de saúde. São Paulo: Casa do Psicólogo, 2001.

30. Guareschi PA. Pressupostos metafísicos e epistemológicos na pesquisa. Psicol Reflexão Critica. 2003; 16(2): 245-255.

31. Lima NC. Narrativas orais: uma poética da vida social. Brasília: Editora da Universidade de Brasília, 2003.

32. Rodrigues ML. Os bons medos. In: Almeida MC, Knobb M, Almeida AM. Polifônicas ideias: por uma ciência aberta. Porto Alegre: Sulina, 2003.

33. Motta RD. Entre a metáfora e o silêncio. In: Almeida MC, Knobb M, Almeida AM (org.). Polifônicas idéias: por uma ciência aberta. Porto Alegre: Sulina, 2003.

34. Almeida MCX. As artes da nova ciência. In: Almeida MCX, Knobb M, Almeida AM. Polifônicas ideias: por uma ciência aberta. Porto Alegre: Sulina, 2003.

Corresponding Author
Modesto Leite Rolim-Neto,
Universidade Federal do Ceara,
Faculty of Medicine,
Barbalha,
Ceara,
Brazil,
E-mail: modestorolim@yahoo.com.br

Effect of Nigella Sativa and Fumaria Parviflora on serum protein profiles of naturally infected buffaloes (*Bubalus Bubalis*) with Fasciola Sp.

Asma Waheed Qureshi, Tanveer Akhtar, Nadeem Sheikh

Department of Zoology, University of the Punjab, Quaid-e-Azam campus, Lahore, Pakistan.

Abstract

Sera of control and Fasciola sp. infected buffaloes (*Bubalus bubalis*), after treatment with Nigella sativa seeds and Fumaria parviflora, were studied by SDS-PAGE. The serum protein profile showed a total of nine peaks corresponding to nine different protein fractions (107, 98, 67, 56, 48, 43, 25, 19 and 15 kDa) as observed in densitometric analysis, before treatment in all infected samples, by Image J gel documentation. Sera of healthy animals showed eight peaks, which corresponded to peaks in infected samples except peak 8 (19kDa), which was absent in healthy control subjects. Before treatment, all protein fractions showed significant increase in terms of density than normal control values except fraction 56kDa. After treatment all fractions decreased and reached to normal level except 56kDa, which increased. The protein fraction of 19kDa was either significantly diffused or completely disappeared after treatment, thereby indicating its association with fasciolosis in buffaloes. However the nature of this fraction needs a detailed investigation using proteomics or western-blot analysis.

Key words: Fasciolosis, therapy, herbal medicine, serum protein profile.

Introduction

Fasciolosis is caused by the most common species of liver flukes i.e., Fasciola hepatica and F. gigantica. It has worldwide distribution and great impact on human and animal development (1).

Usually coprological examination is used to diagnose this parasitic disease. To improve serological tests many researchers are working to obtain purified Fasciola sp. E/S antigens or recombinant molecules, because coprological examination has many problems. It is positive only after 3–4 months of post infection. If only one or a few fluke adults are present in host, it shows very low or even absence of egg shedding (2, 3, 4,).

The most abundant proteins among E/S products from fasciolids are cysteine proteinases which have shown to be a very valuable source of antigens for diagnosis. These highly antigenic enzymes are secreted by the adult and juvenile and offer highly sensitive and specific markers for serodiagnosis for F. hepatica as well as for F. gigantica infection (5-14). F. hepatica recombinant cysteine proteinases provide similar results to native antigens when used in ELISA methods for diagnosis of human fasciolosis (4, 15-18).

In present study protein fraction changes in sera of control and Fasciola sp. infected buffaloes, after treatment with Nigella sativa seeds and Fumaria parviflora, were analyzed by SDS-PAGE. So that, the protein fractions associated with fasciolosis can be identified.

Methodology

A total of 62 buffaloes (*Bubalus bubalis*) of Nili Ravi breed, naturally infected with fasciolosis were used for this study at Military dairy farm Barki road, Lahore, Pakistan (1 acre area). Animals were 6.0±1.0 years of ages and both sexes. All these animals were kept under similar feeding and managmental condition throughout the course of treatment and given seasonal food and water ad labitum. The studies were conducted in September-October 2007 when average temperature ranges 22.6 to 33.2°C. All animals were tagged so as to distinguish from others. A veterinary doctor was available for routine checkup throughout the course of experiment.

Preparation of herbal drugs

Nigella sativa (seeds) and Fumaria parviflora (ariel parts) were washed in tap water, then dried in oven and powdered. These powdered medicines were given orally in capsules (19).

Experimental design

The infected buffaloes were randomly divided into 4 main groups' i.e. A, B, C and D. Animals in groups A and B were further sub divided into three sub groups i.e. A1, A2, A3 and B1, B2, B3, each having 9 animals.

Buffaloes in sub-group A1, A2 and A3 were given separately, 50, 100 and 150mg/kg body weight Nigella sativa (seeds) and sub-Group B1, B2 and B3 Fumaria parviflora (ariel parts), respectively. Animals of group D (having 9 infected buffaloes) were served as untreated control. Faecal samples of all experimental buffaloes were monitored for Fasciola eggs before treatment (on zero day) and after treatment on 3rd, 7th, 11th and 18th day. Animals were given medicine on zero day and which were found positive for eggs on 18th day, were given a second dose of their respective medicines and their faecal samples were again monitored for eggs on 21st and 28th day of post-treatment.

Another group E having 9 healthy animals without any infection was served as normal control for the comparison of all infected groups. Blood samples of all animals were collected at zero day (pre-treatment) and on 28th day (post- treatment).

Protein Electrophoresis by SDS-PAGE

Blood sera of buffaloes were run on 12% gel by using Sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS-PAGE) technique (20) low molecular weight protein markers of 66 to 14.2 kDa were used as standards.

Image Capture and Quantification for Protein Fractions

The gels were scanned to identify and quantify the electrophoretically resolved protein fractions by Gene Genius and Image J Gel Documentation Systems. Data was analyzed statistically by using Microsoft SPSS 10.0 (U.S.A). $P < 0.05$ was considered RESULTS

Sera of control and treated animals were studied by SDS-PAGE. Low molecular weight protein marker was used as standard which represented seven protein fractions of 66-14.2 kDa (Figure 1 M).

Serum protein profile of Pre-treatment animals

The serum protein profile of control and treated represents a total of nine peaks corresponding to nine different protein bands as observed by densitometric analysis in pre-treatment infected serum samples while healthy control sera had eight peaks The peaks labeled numerically from 1 to 9 correspond to protein fractions of 107, 98, 67, 56, 48, 43, 25, 19 and 15 kDa, respectively (Figure 1 I). Peak 8 representing protein fraction 19kDa was absent in healthy control subjects (Figure 1D).

The three peaks representing protein fractions of high molecular weight i.e., 107, 98 and 67kDa were conspicuous before treatment in infected samples while the peak numbers 4 and 5 were diffused and peaks 6 to 9 were prominent. However, in healthy control animals the density of these protein bands was not as much as in the infected samples except peak 4, with higher density as revealed by densitometric analysis. The percent densities of all the protein fractions in all infected and healthy animals were significantly different (Figure 1).

Serum protein profile of post-treatment animals

The protein levels in the serum were significantly ($P < 0.05$) changed when they were treated with 50, 100 and 150mg/kg body weight of Nigella sativa and Fumaria parviflora, Saussurea, respectively. The post treatment serum analysis has shown a significant decline in the densities of peaks 1-9 ($P < 0.05$) except peak 4 and 8. Peak number 4 (56kDa) demonstrated a significant elevation whereas peak 8 (19kDa) was either diminished or completely disappeared. The protein fraction of 43kDa (peak 6), present in infected as well as in normal subjects was also diffused considerably after treatment (Figure 1 A1-B3).

Discussion

The local herbs used in this therapy were found effective against fasciolosis. Present paper representing the pre and post-treatment serum protein profile changes, studied by SDS-PAGE. A total of nine
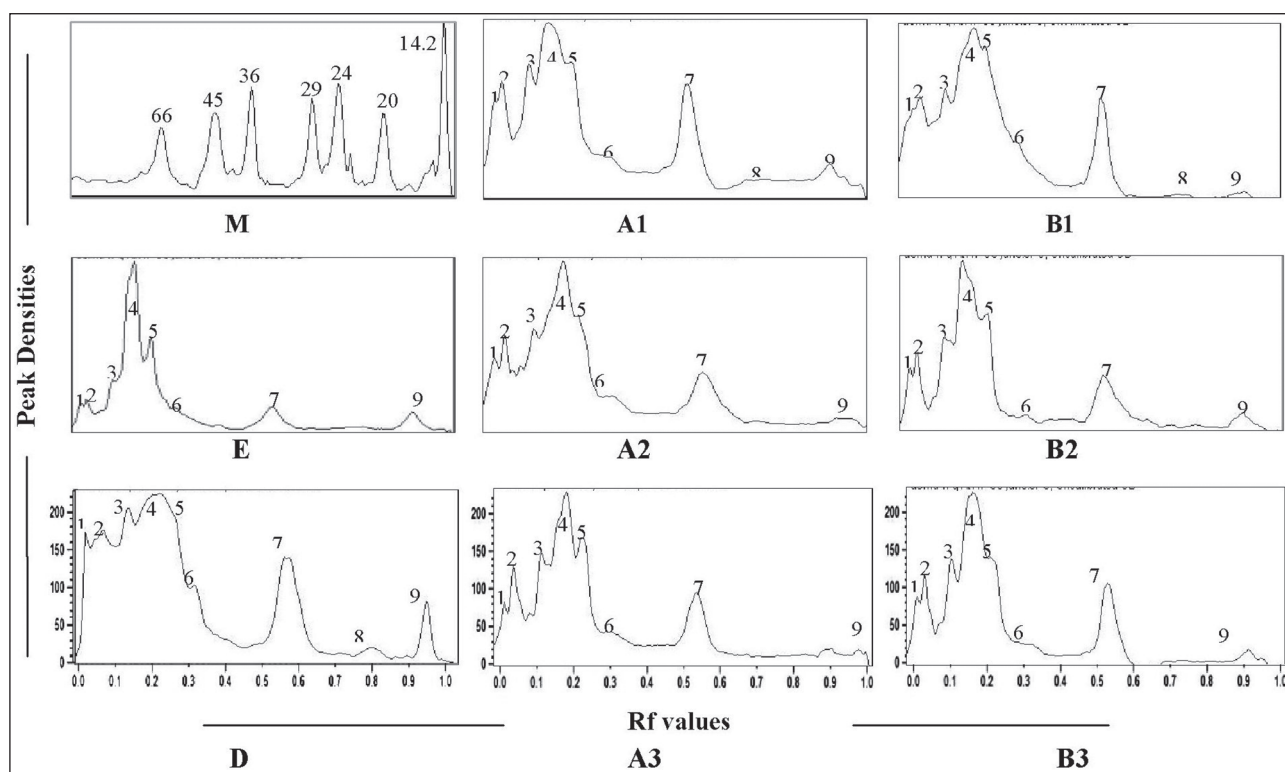
Figure 1. Densitometric curve showing protein profile of different groups of experimental animals: M=Protein markers, D=Healthy control, I=Infected control, A1 and B2 given Nigella sativa and Fumaria parviflora 50mg/kg body weight, A2 and B2 100mg/kg bw and A3and B3 150mg/kg bw, respectively. Peaks 1-9 representing the corresponding densities of protein fractions (107, 98, 67, 56, 48, 43, 25, 19 and 15 kDa, respectively).

peaks corresponding to nine different protein bands were observed by densitometric analysis before treatment in all infected serum samples while healthy control sera had eight peaks. The peaks from 1 to 9 represented the protein fractions of 107, 98, 67, 56, 48, 43, 25, 19 and 15 kDa, respectively. Peak 8 representing protein fraction 19kDa was absent in healthy control subjects. Significant changes were observed in the densities of all fractions before and after treatment. The protein fraction 19kDa was either significantly diffused or completely disappeared after treatment indicating its association with fasciolosis. This fraction may be antigen or antibody. Acute fasciolosis can lead to expression of acute phase proteins by liver, which can be released in blood. Infection due to fasciolosis can lead to the activation of immune system resulting in the antibody production by immune cells.

Many workers have reported association of different protein fractions, ranging 14 to 191 kDa, with fasciolosis. Protein fractions of present study fall within this range. Some researchers indicated 60-66kDa protein fractions as promising candidate for immunodiagnosis of fasciolosis (21, 22), while 25-29kDa fractions were also reported as immunoreactive antigens of Fasciola (23, 24, 25). In another investigation, eight protein fractions 191, 178, 148, 118, 111, 101, 98.5 and 45kDa were depicted as immunogenic components (26). The difference in immunoreactivity of these fractions in different studies may be attributing to difference in parasite as well as host species for immunoreactivity.

The nature of all the protein fractions observed in present study is further needs an investigation using proteomics to confirm them as antigen or antibody associated with fasciolosis.

Acknowledgements

I extremely thankful to Dr. Umer Zaman (Veterinary doctor) for his co-operation throughout the course of this research work. I am also gratefully thankful to owner of Military dairy farm Barki road Lahore, for providing facilities for this study.

References

1. Mas-coma, S., Bargues, M. D. & Valerio, M. A. (2005). Fasciolosis and other plant boren trematodes zonoses . Int. J. Parasitol.; 35: 1253-1278.

2. Esteban, J.G., Bargues, M.D. & Mas-Coma, S. (1998). Geographical distribution, diagnosis and treatment of human fascioliasis: a review. Research and reviews in parasitology; 58: 13-48.

3. Mas-coma, S., Bargues, M. D. & Esteban, J. G. (1999b). Human Fasciolosis. In: Dalton, J.P. (Ed.), Fasciolosis. CAB International Publishing, Wallingford, Oxon, UK, pp. 411–434.

4. Charlier, J., De Meulemeester, L., Claerebout, E., Williams, D. & Vercruysse, J. (2008). Qualitative and quantitative evaluation of coprological and serological techniques for the diagnosis of fasciolosis in cattle. Vet Parasitol.; 153: 44-45.

5. Cornelissen, J. B., Gaasenbeek, C. P., Boersma, W., Borgsteede, F. H. & Van Millingen, F. J. (1999). Use of a pre-selected epitope of cathepsin-L1 in a highly specific peptide-based immunoassay for the diagnosis of Fasciola hepatica infections in cattle. Int. J. Parasitol.; 29: 685–696.

6. Cornelissen, J. B., Gaasenbeek,C. P., Borgsteede, F. H., Holland, W.G., Harmsen, M. M., Boersma, W. J. (2001). Early immunodiagnosis of fasciolosis in ruminants using recombinant Fasciola hepatica cathepsin L-like protease. Int. J. Parasitol.; 31: 728-737.

7. Neyra, V., Chavarry, E., Espinoza, J. R. (2002). Cysteine proteinases Fas1 and Fas2 are diagnostic markers for Fasciola hepatica infection in alpacas (Lama pacos). Vet. Parasitol.; 105: 21–32.

8. Dalton, J. P., Neill, S. O., Stack, C., Collins, P., Walshe, A., Sekiya, M., Doyle, S., Mulcahy, G., Hoyle, D., Khaznadji, E., Moire, N., Brennan, G., Mousley, A., Kreshcenko, N., Maule, A. G. & Donnelly, S. M. (2003). Fasciola hepatica cathepsin L-like proteases: biology, function, and potential in the development of first generation liver fluke vaccines. Int. J. Parasitol.; 33: 1173–1181.

9. Law, R. H., Smooker, P. M., Irving, J. A., Pidrafita, D., Pointing, R., Kennedy, N. J., Whisstock, J. C., Pike, R. N. & Spithill, T. W. (2003). Cloning and expression of the major secreted cathepsin B-like protein from juvenile Fasciola hepatica and analysis of immunogenicity following liver fluke infection. Inf. Immun.; 71: 6921–6932.

10. Maleewong, W., Wongkham, C., Intapan, P. M. & Pipitgol, V. (1999). Fasciola gigantica-specific antigens: purification by a continuouselution method and its evaluation for the diagnosis of human fascioliasis. Am. J. Trop. Med. Hyg.; 61: 648–651.

11. Ikeda, T. (2001). Protein A immunocapture assay detecting antibodies to fluke cysteine proteinases for immunodiagnosis of human paragonimiasis and fascioliasis. J. Helminthol.; 75: 245-249.

12. Rokni, M. B., Massoud, J., O'Neill, S. M., Parkinson, M. & Dalton, J. P. (2002). Diagnosis of human fasciolosis in the Gilan province of Northern Iran: application of cathepsin L-ELISA. Diag. Micr. Inf. Dis.; 44: 175–179.

13. Intapan, P. M., Sadee, P., Wongkham, C. & Maleewong, W. (2004). Development of rapid agglutination test using Fasciola gigantica specific antigen for serodiagnosis of human fasciliasis. Southeast Asian J. Trop. Med. Public Health; 35: 313–317.

14. Tantrawatpan, C., Maleewong, W., Wongkham, C., Wongkham, S., Intapan, P.M. & Nakashima, K. (2005). Serodiagnosis of human fascioliasis by cystatin capture enzyme-linked immunosorbent assay with recombinant Fasciola gigantica capthespsin L antigen. Am. J. Trop. Med. Hyg.; 72: 82–86.

15. O'Neill, S. M., Parkinson, S. M., Dowd, A. J., Strauss, W., Angles, R. & Dalton, J. P. (1999). Immunodiagnosis of human fasciliasis using recombinant Fasciola hepatica cathepsin L1 cysteine proteinase. Am. J. Trop. Med. Hyg.; 60: 749–751.

16. Carnevale, S., Rodriguez, M.I., Santillan, G., Labbe, J. H., Cabrera, M. G., Bellegarde, E. J., Velasquez, J. N., Trgovcic, J. E. & Guarnera, E. A. (2001). Immunodiagnosis of human fascioliasis by an enzyme-linked immunosorbent assay (ELISA) and a micro-ELISA. Clin. Diagn Lab. Immunol.; 8: 174-177.

17. El-Ridi, R., Salah, M., Wagih , A., William, H., Tallima, H., El –Shafie, M. H., Abdel Khalek, T., El-Amir, A., Abo- Ammou, F. F. & Motawi, H. (2007). Fasciola gigantica excretory-secretory products for immunodiagnosis and prevention of sheep fasciolosis. Vet .Parasitol.; 10: 219-228.

18. Rapsch, C., Dahinden, T., Heinzamann. N., Torgerson, P. R. & Hurni, L. (2008). An interactive map to assess the potential spread of free living stages of Fasciola hepatica in Switzerland, Vet. Parasitol.; 154: 242-249.

19. Jhangir, M., Maqbool, A., Tanveer, A. & Mahfooz, A. (2003). Therapy of Ancylostomasis in dogs with Nigella sativa (Khalongi) and Saussurea lappa (Quste-shireen). Haryana Vet. J. India; 40: 48-51.

20. Laemmli, U.K. (1970). Cleavage of structural proteins during the assembly of head of bacteriophage T4. Nature; 227: 697-703.

21. Krailias, D., Viyanant, V., Sobhon, P., Uptham, E. S. & Keawjam, R. (1999). Identifecation of circulating antibodies in fasciolosis and localization of 66kDa antigens target using monoclonal antibodies. Asian Pac. J. Immunol.; 17: 53-58.

22. Ortiz, P. L., Claxton, J. R., Clarkson, M. J., McGarry, J. & Williams, D. J. (2000). The specificity of antibody responses in cattle naturally exposed to Fasciola hepatica. Vet. Parasitol.; 93: 121-134.

23. Abdel-Rahman, S., O'Reilly, K. L. & Malone, J. B. (1999). Biochemical characterization and localization of Fasciola hepatica 26-28 kDa diagnostic coproantigen. Parasite Immunol.; 21: 279-286.

24. Attallah, A.M., Karawia, E.A., Ismail, H., Tabll, A.A., Nawar, A.A., Ragab, W. A., Abdel Aziz, M.M. & El-Dosoky, I. (2002). Identification and characterization of a 26-28kDa circulating antigen of Fasciola gigantica. Ann. Trop. Med. Parasitol.; 96: 271-282.

25. Mohamed, M. M., Al-Sherbiny, M. M., Sharaf, A. A. & Elmamlouk, T. H. (2004). Immunological identification of Fasciola hepatica antigens containing major human T-cell and B-cell epitopes. J. Egypt Soc. Parasitol.; 34: 751-756.

26. Abdel-Rehman, E. H. & Abdel-Mageed, K. N. (2004). Immunization of rabbits with proteins isolated from coprontigen, J. Soc. Parasitol.; 34: 631-642.

Corresponding Author
Tanveer Akhtar;
Parasitology laboratory,
Department of Zoology,
University of the Punjab,
Lahore,
Pakistan,
E-mail: asmawqureshi@yahoo.com
         dr_tanveerakhtar@yahoo.com
         s_nadeem77@yahoo.com

Intra-amniotic administration of exogenous pulmonary surfactant for improving the expression of SP-A in fetal rabbit lung tissues with intrauterine infection related to premature rupture of membranes

Jing Liu[1], Jing Wu[2], Xiao-Feng Wang[1], Zhi-Chun Feng[1], Xiao Xiao[3]

[1] Department of Neonatology & NICU of Bayi Children's Hospital, General Hospital of Beijing Military Command, Beijing, China,

[2] Department of Neonatology, He-Xian Memorial Hospital Affiliated to Southern Medical University, Guangzhou City, China,

[3] Northwestern University Feinberg School of Medicine, Illinois, United States of America.
Every author contributes equally to this paper

Abstract

Objective: Previou studies have shown that intra-amniotic administration of exogenous pulmonary surfactant (EPS) can improve lung maturity of fetal rabbits, but the mechanism remains unknown. The study explores the possible mechanisms of intra-amniotic administration of EPS for improving lung maturity of fetal rabbits.

Methods: Thirty pregnant rabbits were divided into three groups of 10 rabbits each: (1) intrauterine infection, (2) intrauterine infection with intra-amniotic administration of exogenous pulmonary surfactant, (3) healthy controls). Each group was further divided into 2 subgroups of 21 days gestation and 24 days gestation. Reverse transcriptase PCR, immunohistochemistry staining, and western blot were used to analyze changes in the expression of SP-A mRNA and protein.

Result: Compared with the intrauterine infection group without EPS, the intrauterine infection group with EPS group showed significantly greater expression of SP-A mRNA and SP-a protein in fetal rabbit lungs of both 21 days gestation and 24 days gestation.

Conclusion: Antenatal intra-amniotic administration of PS can increase the expression of SP-A in fetal lungs, which may be the mechanism of which exogenous pulmonary surfactant improves fetal lung maturity.

Key words: premature rupture of membranes, exogenous pulmonary surfactant, surfactant protein-A, lung maturity, fetal rabbit

Introduction

Premature rupture of membranes (PROM) is a common clinical complication in pregnancy with an incidence as high as 21.4% [1]. Prolonged PROM can adversely affect fetal lung development, which results in fetal-neonatal lung injuries or neonatal pulmonary diseases; such as respiratory distress syndrome (RDS) and pulmonary or bronchopulmonary dysplasia [2,3] which are major causes of fetal and neonatal mortality. In our previous study, we found that intra-amniotic administration of exogenous pulmonary surfactant (EPS) can improve lung maturity of fetal rabbits with intrauterine infection caused by PROM [4],; however, the mechanism of which EPS improves lung maturity remains unknown. The aim of this study was to explore the possible mechanism of intra-amniotic administration of EPS for improving lung maturity of fetal rabbits by studying the expression of surfactant protein-A (SP-A) in fetal rabbit lung tissues with intrauterine bacterial infection at different gestational ages and the influence of intra-amniotic administration of EPS in the expression of SP-A.

Materials and Methods

Preparation of animal models: this study was approved by the Animal Care and Use Committee of General Hospital of Beijing Military Command. Preparation of the bacterium liquid: standard Escherichia Coli (E. coli) strain (ATCC 25922 strain, offered by the National Institute for Pharmaceutical and Biological Products) was in-

oculated in blood agar and cultivated at 37℃ for 16 to 18 hours to acquire purified E. coli. This was first diluted in physiological saline, and then to 10,000 colonies per milliliter with Maxwell turbidimetry. The intrauterine infection model was made according to Guen et al [5] with appropriate modifications. Thirty healthy and pregnant Japanese white rabbits, purchased from Beijing Baierkangnate Experimental Rabbit Breeding Biotechnology Development Co.Ltd, were divided into three groups of 10 rabbits each: (1) intrauterine infection without administration of EPS, (2) intrauterine infection with administration of EPS, and (3) healthy controls. The EPS used in this study is Calsurf, made by Beijing Double-Crane Pharmaceutical Co. Ltd, China. Each group was further divided by the length of gestation into 2 subgroups of 5 rabbits each, 21 days gestation (equivalent to 26 gestational weeks of humanity) and 24 days gestation (equivalent to 30 gestational weeks of humanity). After rabbits were deeply anesthetized with 25mg of ketamine/kg, a 2cm vertical incision was performed along the median line below the gravid uterus. In the intrauterine infection groups, 1,000 colonies (0.1ml) of E. coli was administered into the bilateral uterine horns of the pregnant rabbits. The intrauterine infection with administration of EPS group also had 200mg/kg of Calsurf injected into the amniotic cavity of each pregnant rabbit. The incision was then closed up level by level,then the animals were returned to their cages. The healthy control group did not have E. coli nor EPS adminstered. Five fetal rabbits of each group were randomly selected to prepare the fresh lung tissue samples for the following study.

Reverse transcriptase PCR (RT-PCR): the expression of SP-A mRNA **of** fetal rabbit lung tissue was detected **by** using RT-PCR. Total RNA was extracted from lung tissues of 5 rabbits, randomly chosen from each group. Extraction was performed according to instructions of TRI zol kit (Invitrogen, USA). 1.5 μg of total RNA was treated with oligo dT primers, reverse transcription (RT) was performed with the SuperScript First-Strand System for RT-PCR (Invitrogen, Carlsbad, CA) according to instructor's protocol. The sequences of primers and probes for SP-A gene were designed and synthesized by Sangon Biological Engineering Technology & Services Co., Ltd

(Shanghai, China) according to the serial number from GenBank, which were as following: the forward primer for SP-A: 5′- ATGTTGCTG CTCT CCCTG -3′, and the reverse primer: 5′- GAAC TCAC AGAT GACCAG -3′; the lengths of amplified fragments was 740bp. The forward primer for β-actin：5′-ATGG ATG ATGAT ATCGC CG-3′, and the reverse primer 5′- GAAGCAT TT GC G GTGGACG-3′; the length of amplified fragments was 1000 bp. RT-amplification was performed with the following optimized incubation program: preheating for 3 minutes at 94°C, denaturation for 1 minute at 94°C, annealing for 1 minute at 48°C, renaturation for 1 minute at 54℃, extending for 1 minute at 70℃, re-extending for 2 minutes at 72℃ after 15 cycles. RT-PCR amplification products (7.5 μl) were analyzed by gel electrophoresis on a 1% agarose gel, and the density of each band was analyzed **by** the Automatic Gel Image Analysis System (Shanghai Jiapeng Technology Co., Ltd.,Shanghai,China). The levels of SP-A mRNA were determined by the density ratio of SP-A mRNA/β-actin mRNA.

Immunohistochemistry staining：(1) Dewaxing and antigen retrieval. (2) Close catalase using fresh 3% H_2O_2 solution at room temperature, then drop 5% bovine serum albumin (BSA) for 20 minutes at room temperature. (3) Add rabbit polyclonal antibody (first antibody, 1: 100) at 4℃ overnight, 0. I M phosphate buffer solution (PBS) flushing for 2 minutes for 3 times. (4) Add monoclonal mice-anti-rabbit IgG marked with biotin at 37°C for 20 minutes. (5) Add SABC at 37°C for 20 minutes, wash for 2 minutes in PBS 3 times. (6) DAB dyeing: use the DAB (3.3'-diaminobenzidine tetrahydrochloride) dyeing kit, take out 1 ml distilled water, add 1 drop of ABC agentia at room temperature for 25 minutes. (7) Re-dyeing by haematoxylin, dehydration, transparent, and then seal the slices for observation under a microscope.

Western blot analysis: The whole protein was extracted, and sodium dodecyl sulfate– polyacrylamide gel (10%) was performed. The protein on the gel was subsequently transferred to the polyvinylidine diflouride transfer membrane (Bio Lab, Hercules, California, USA). The membrane was being blocked for 1 hour. The membrane was then incubated with a rabbit multiclonal antibody to SP-A (1: 2000; Santa Cruz) at 4℃ overnight. The

membrane was then washed and incubated with horseradish peroxideconjugated anti-rabbit IgG secondary antibody (1: 10 000, BioRad, Hercules, California, USA) for 1 hour. After being washed thoroughly, the positive band was revealed by Western blotting detection reagents (KPL, Gaithersburg, Maryland, USA) and autoradiography film. Glyceraldehyde-3-phosphate dehydrogenase (Kangchen Biology, Shanghai, China) was used as a reference protein for the densitometric analyses.

Lung tissues pathological changes: Lower left lung tissues obtained from one fetal rabbit of each group at 24 days of gestation were examined for pathological changes.

Statistical analysis

Datas were expressed as mean ± standard deviation (x±s) and the analyses were conducted by using SPSS 16.0 for Windows (SPSS Inc, Chicago, IL).The differences between groups were examined for statistical significance by using one-way analysis of variance. $p < 0.05$ was considered to be statistically significant.

Results

The expression of SP-A mRNA in different groups: Whether at 21 days or 24 days gestation, the expression of SP-A mRNA in fetal rabbit lungs was significantly decreased in intrauterine bacterial infection groups than of controls ($p < 0.001$), However, it was significantly higher in the intrauterine infection with EPS group than in the intrauterine infection without EPS group ($p < 0.001$) (Table 1 & Figure 1).
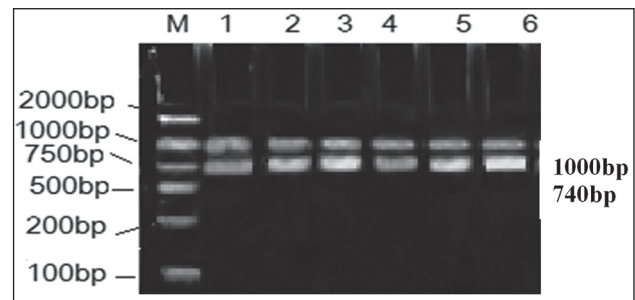

Figure 1. The expression of SP-A mRNA in different groups

Lanes 1, 2, 3: expression at 21 days gestation in the control group, infection without EPS group, and infection with EPS group, respectively. Lane 4,5,6: expression at 24 days gestation in the control group, infection without EPS group, and infection with EPS group, respectively.

The immunoreactive positive expression of SP-A in fetal rabbit lung tissues in different groups: SP-A expression was noted in cells mainly located along the respiratory tract in columnar epithelial cells without cilia and terminal peribronchiolar cuboidal epithelium cells at 21 and 24 days gestation. At 24 days gestation, alveolar type II epithelial cells (AT-II) were also found of expressing SP-A. The number of SP-A expression positive cells is more than that of 21 days gestation. It can be seen in Table 2 & Figure 2 (A-C) that the number of SP-A expression positive cells was significantly larger in the intrauterine infecton with EPS group compared with the intrauterine infection without EPS group ($p < 0.001$).

Table 1. The expression of SP-A mRNA in different groups gestational ages (x ± s)

Gestational Ages	Infection group	Infection+PS group	Control group	F	P
21 days	1.505±0.157	2.741±0.228	2.939±0.242	134.358	0.000
24 days	1.422±0.040	2.737±0.025	3.347±0.249	456.341	0.000

Table 2. Immunoreactive positive expression of SP-A in fetal rabbit lung tissues in different groups (x ± s)

Gestational Ages	Infection group	Infection+PS group	Control group	F	P
21 days	1371±318	3326±259	3261±390	64.451	0.000
24 days	1324±208	3203±664	3648±659	24.815	0.000

Table 3. The expression of SP-A proteins detected by western blot in different groups (x ± s)

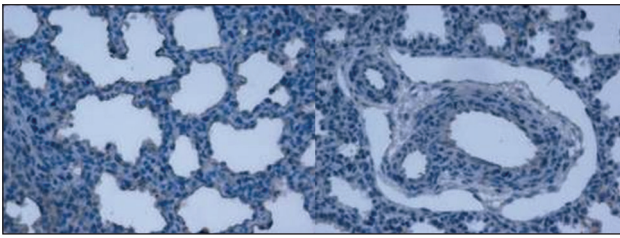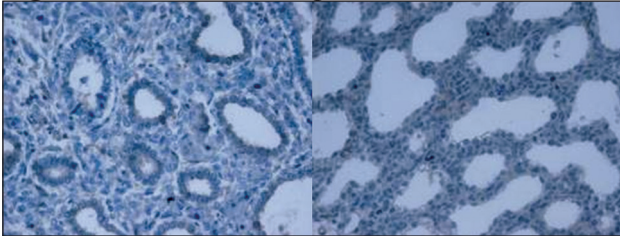| Gestational Ages	Infection group	Infection+PS group	Control group	F	P
21 days	0.772±0.212	1.103±0.477	1.239±0.097	5.243	0.012
24 days	0.478±0.218	1.235±0.406	1.275±0.233	22.651	0.000

Figure 2 a. Control Group

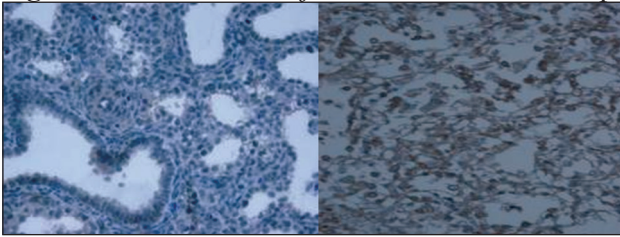*Figure 2 b. Intrauterine infection without EPS Group*

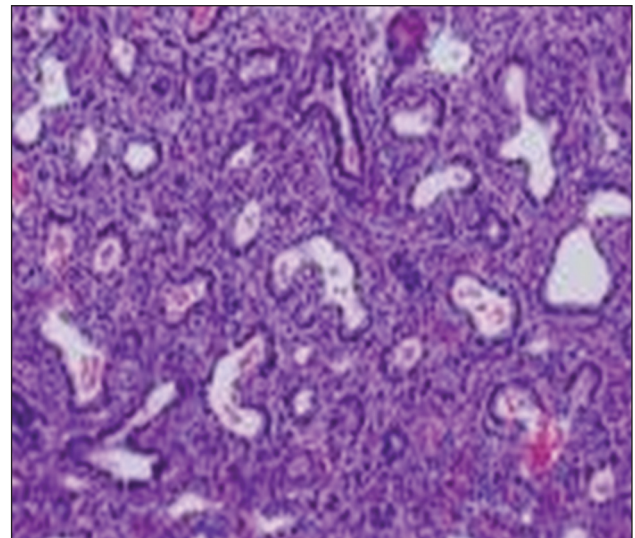*Figure 2 c. Intrauterine infection with EPS Group*
Figure 2. SP-A immunoreactive positive cells in different groups

The expression of SP-A proteins in fetal rabbit lungs detected by western blot in different groups: The results of western blot showed, whether at 21 days or 24 days gestation, the expression of SP-A proteins was decreased more significantly in infection groups compared with controls ($p < 0.05$). It also showed that intra-amniotic administration of EPS in the setting of intrauterine infection significantly increased the expression of SP-A proteins ($p < 0.05$) (Table 3 & Figure 3).


Figure 3. The expression of SP-A proteins detected by western blot in different groups
Lanes 1, 2, 3: expression at 21 days gestation in the control group, infection without EPS group, and infection with EPS group, respectively. Lane 4,5,6: expression at 24 days gestation in the control group, infection without EPS group, and infection with EPS group, respectively.

Pathological changes of fetal rabbit lung tissues at 24 days gestation of different groups: for fetal rabbit lung tissues of 24 days gestational age, morphologically normal alveoli of control groups have thinner alveolar septa (Figure 4-A). In the intrauterine infection groups, lung tissues had septal thickening, diffuse pulmonary interstitial and alveolar edema, alveolar wall thickening, variable alveolar size, some alveolar collapse, partial atelectasis, some alveolar rupture and fusion, bleeding into alveolar spaces, protein exudates, and hyaline membrane formed (Figure 4-B). When compared with the intrauterine infection without EPS group, the lung tissue of intrauterine infection with EPS group demonstrated with less alveolar wall thickening, larger and regular alveolar cavity-like structures, less hemorrhage, less edema, less atelectasis, and less hyaline membrane formation (Figure 4-C).

A
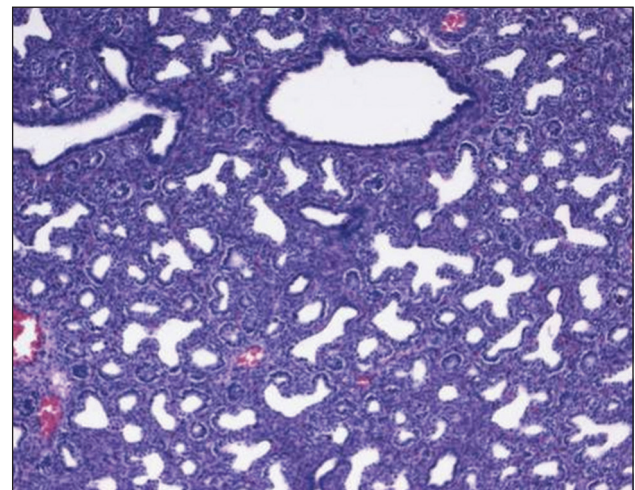
B
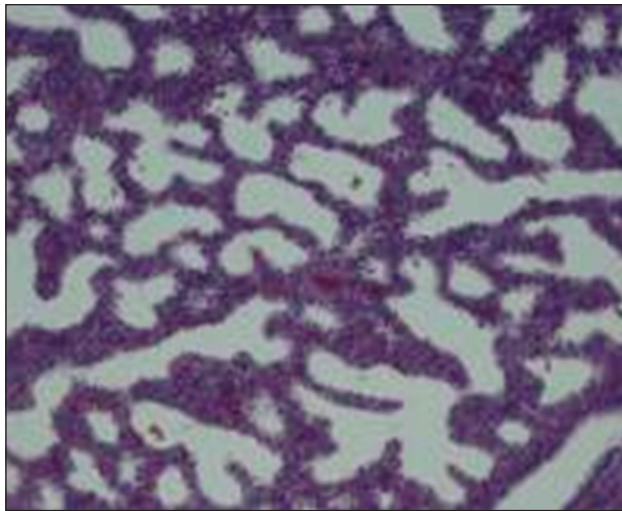
C

Figure 4. Pathological changes in different groups at 24 days gestation (A- Control group, B- intrauterine infection without EPS group, C-intrauterine infection with EPS group)

Discussion

PROM is one of the most common clinical complications in the perinatal period, which is closely related to adverse outcomes of fetus and newborns,. It can lead to fetal intrauterine infection and impede fetal lung development, such as neonatal RDS and other lung diseases[1-3,6-9]. Intra-amniotic administration of EPS has been proved of improving pulmonary development in both human and animal trials [10,11].Galan et al [10] has demonstrated that rabbits received **exogenous pulmonary surfactant** had significantly better pressure-volume relationships and lower opening pressure than that of rabbits with no treatment. They concluded that intrauterine **administration of** exogenous surfactant results in uptake **of** the surfactant solution into the lung tissues and alters the pulmonary characteristics **of** the preterm rabbit pups. Zhang et al [11] has shown that ***intra-amniotic administration of*** EPS significantly reduces the proportion **of neonatal** RDS. Our previous study demonstrated that intra-amniotic administration of EPS after the occurrence of PROM with intrauterine infection could improve the lung maturity and the ultrastructure of fetal rabbits [4]. These results suggest that administration of EPS is an effective method for the **prophylaxis** of neonatal RDS, however, the exact mechanism of which remains unclear.

The main results of this study are as following: (1)the expression of SP-A was decreased more in intrauterine infection fetal rabbits than that of healthy controls.(2)intra-amniotic administration of exogenous pulmonary surfactant (Calsurf) can improve the expression of SP-A mRNA and SP-A protein.(3)fetal rabbit lung tissue structure in the setting of intrauterine infection was significantly improved with the administraton of EPS. Thus, we can conclude that: (1)decreasing expression of SP-A in fetal rabbit lungs in the the setting of intrauterine infection is a cause of decreased lung maturity (2) the increasing expression of SP-A is an important mechanism of which EPS improves fetal lung maturity. We also conclude that SP-A is one of the main elements of PS; SP-A is essential for the maturation of fetal lungs [12] and deficiency in PS or **genetic variance of PS** plays an important role in many lung diseases [13-15]. The results of this study provide an important basis of which the intra-amniotic administration of EPS improves fetal lung maturity and prophylaxs against lung diseases.

The results of this study also showed that intra-amniotic administration of EPS at both 21 and 24 days gestations could improve the expression of SP-A of fetal rabbit lungs. Consequently, we believe that once PROM occurred and the prematurity is unavoidable, thus EPS should be administered intra-amniotically to improve fetal lung development.

References

1. Liu J, Feng ZC, Wu J. The Incidence rate of premature rupture of membranes and its influence on fetal–neonatal health: A report from mainland China. J Tropi Pediatr,2010; 56: 36-42.

2. Schmidt B, Cao L, Mackensen-Haen S, Kendziorra H, Klingel K, Speer CP. Chorioamnionitis and inflammation of the fetal lung. Am J Obstet Gynecol,2001; 185: 173-177.

3. Gras-Le GC, Denis C, Franco-Montoya ML, et al. Antenatal infection in the rabbit impairs postnatal growth and lung alveolarisation. Eur Respir J, 2008; 32: 1520-1528.

4. Liu J, Wu J, Yang N, Feng ZH. Intra-amniotic administration of exogenous pulmonary surfactant for improving in lung maturity of fetal rabbits with intrauterine infection caused by premature rupture of membranes. Bosn J Basic Med Sci,2011; 11: 103-107.

5. Guen Gras-Le C, Debillon T, Toquet C, et al. Persistent bacteremia in rabbit fetuses despite maternal antibiotic therapy in a novel intrauterine-infection model. Antimicrobial Agents and Chemotherapy, 2003; 47: 2125-2130.

6. Mateus J, Fox K, Jain S, Jain S, Latta R, Cohen J. Preterm premature rupture of membranes: clinical outcomes of late-preterm infants. Clinical Pediatrics, 2010; 49: 60-65.

7. Lahiri S, Houghton S. Outcome of expectant management of extreme preterm prematurerupture of membranes. Arch. Dis. Child. Fetal Neonatal Ed,2010; 95: Fa105.

8. Ye G, Jiang Z, Lu S, et al. Premature infants born after preterm premature rupture of membraneswith 24-34 weeks of gestation: a study of factors influencing length of neonatal intensive care unit stay. J Matern Fetal Neonatal Med,2011; 24: 960-965.

9. Shiyong Erke, Linchuang Zazhi. Correlation analysis of premature rupture of membranes and term neonates with respiratory syndrome. J Appl Clin Pediatr, 2012; 27: 604-606.

10. Galan HL, Kuehl TJ. Effect of intra-amniotic administration of Exosurf in preterm rabbit fetuses. Obstet Gynecol, 1992; 80: 604-608.

11. Zhang JP, Wang YlL, Wang YH, Zhang R, Chen H, Su HB. Prophylaxis of neonatal respiratory distress syndrome by intra-amniotic administration of pulmonary surfactant. Chin Med J,2004; 117: 120-124.

12. Benlhabib H, Mendelson CR. Epigenetic regulation of surfactant protein A gene (SP-A) expression in fetal lung reveals a critical role for Suv39h methyltransferases during Development and Hypoxia. Mol Cell Biol, 2011, 31: 1949-1958.

13. Kitamura Y, Otsuka M, Umeda Y, Shiratori M, Takahashi H. Relationship between serum SP-A and pulmonary hypertension in interstitial lung diseases. Am J Respir Crit Care Med, 2012; 185: A4467.

14. Silveyra P, Floros J. Genetic variant associations of human SP-A and SP-D with acute and chronic lung injury. Front Biosci, 2012; 17: 407-429.

15. Liu DY, Wu J, Zhang XY, Feng ZH. Expression of IL-8, SP-A and TGF-beta$_1$ in bronchoalveolar lavage fluid of neonates with bronchopulmonary dysplasia. Zhongguo Dang Dai Er Ke Za Zhi, 2010; 12: 444-446.

Corresponding Author
Jing Liu,
Department of Neonatology &NICU of Bayi Children's Hospital,
General Hospital of Beijing Military Command,
Dongcheng District,
Beijing 100700,
China,
E-mail: Liujingbj@live.cn

Instructions for the authors

All papers need to be sent to e-mail: healthmedjournal@gmail.com

Preparing Article for HealthMED Journal

First Author[1], Second Author[2], Third Author[3]

[1] First affiliation, Address, City, Country,
[2] Second affiliation, Address, City, Country,
[3] Third affiliation, Address, City, Country.

Abstract

In this paper the instructions for preparing camera ready paper for the Journal are given. The recommmended, but not limited text processor is Microsoft Word. Insert an abstract of 50-100 words, giving a brief account of the most relevant aspects of the paper. It is recommended to use up to 5 key words.

Key words: Camera ready paper, Journal, ksdh.

Introduction

In order to effect high quality of Papers, the authors are requested to follow instructions given in this sample paper. Regular length of the papers is 5 to 12 pages. Articles must be proofread by an expert native speaker of English language. Can't be accepted articles with grammatical and spelling errors.

Instructions for the authors

Times New Roman 12 points font should be used for normal text. Manuscript have to be prepared in a two column separated by 5 mm. The margins for A4 (210×297 mm2) paper are given in Table 1.

Table 1. Page layout description

Paper size	A4
Top margin	20 mm
Bottom margin	20 mm
Left margin	20 mm
Right margin	18 mm
Column Spacing	5 mm

Regular paper may be divided in a number of sections. Section titles (including references and acknowledge-ment) should be typed using 12 pt fonts with **bold** option. For numbering use Times New Roman number. Sections can be split in subsection, which should be typed 12 pt *Italic* option.

Figures should be one column wide. If it is impossible to place figure in one column, two column wide figures is allowed. Each figure must have a caption under the figure. Figures must be a resolution of 300 DPI, saved in TIFF format, width 10 cm min. For the figure captions 12 pt *Italic* font should be used. (1)
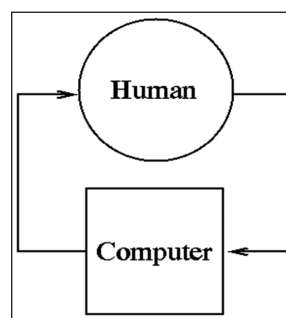

Figure 1. Text here

Conclusion

Be brief and give most important conclusion from your paper. Do not use equations and figures here.

Acknowledgements (If any)

These and the Reference headings are in bold but have no numbers.

References

1. *Sakane T, Takeno M, Suzuki N, Inaba G. Behcet's disease. N Engl J Med 1999; 341: 1284–1291.*
2. *Stewart SM, Lam TH, Beston CL, et al. A Prospective Analysis of Stress and Academic Performance in the first two years of Medical School. Med Educ 1999; 33(4): 243- 50.*

Corresponding Author
Name Surname,
Institution,
City,
Country,
E-mail: