ANALYSIS OF DIFFERENCES IN BLOOD PRESSURE OF WOMEN BELONGING TO DIFFERENT AGE GROUPS

ANALIZA RAZLIKA U KRVNOM PRITISKU KOD ŽENA IZ RAZLIČITIH STAROSNIH GRUPA

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Summary

Introduction. One of the risk factors for the occurrence of arteriosclerosis and coronary heart diseases is physical inactivity. Together with hypokinesia, excessive feeding, age and other factors, make a multifactorial cause of cardiovascular disease. Positive effects of physical activities have been proved in the primary, secondary and tertiary prevention of coronary heart diseases. **Material and Methods.** This study included 119 women from 20 to 76 years of age. All subjects were nonsmokers who did not have a cardiovascular disease, and were divided into five different age groups. Systolic and diastolic blood pressure was measured by the digital blood pressure measuring device with cuff OMRON M4-1. The evaluation of blood pressure was performed at the Faculty of Sport and Physical Education in Novi Sad. The data processing was done by the statistical package SPSS 20.0. **Results**. According to the obtained data it can be concluded that there are statistically significant differences in both individual and general system of the observed variables in different age groups. In addition, there are statistically significant differences between pairs of groups, which were observed when comparing with the oldest age group. **Conclusion**. The programmes of prevention and control of cardiovascular diseases should decrease the influence of risk factors and improve diagnostics and therapy of cardiovascular diseases.
Key words: Women's Health; Age Factors; Blood Pressure; Hypertension; Cardiovascular Disases; Risk Factors

Sažetak

Uvod. Jedan od faktora rizika za nastanak ateroskleroze i srčanih oboljenja je fizička neaktivnost. Zajedno sa hipokinezijom, prekomernom ishranom, starosti i drugim faktorima, čine multifaktorijalni uzrok kardiovaskularnih bolesti. Pozitivni efekti fizičke aktivnosti su dokazani u primarnoj, sekundarnoj i tercijarnoj prevenciji srčanih oboljenja. **Materijal i metode.** Ova studija je obuhvatila 119 žena starosti od 20 do 76 godina. Sve ispitanice su bile nepušači i nisu imale kardiovaskularna oboljenja. Podeljene su u pet različitih starosnih grupa Sistolni i dijastolni krvni pritisak je meren digitalnom uređajem sa manžetnom OMRON M4-1. Merenje krvnog pritiska je izvedeno na Fakultetu sporta i fizičkog vaspitanja u Novom Sadu. Obrada podataka urađena je statističkim paketom SPSS 20.0. **Rezultati**. Prema dobijenim podacima može se primetiti da postoje statistički značajne razlike u individualnom i grupnom sistemu posmatranih varijabli kod različitih starosnih grupa. Takođe postoje statistički značajne razlike između parova grupa, gde smo zabeležili primetne razlike prilikom poređenja sa najstarijom starosnom grupom. **Zaključak**. Programi prevencije i kontrole kardiovaskularnih bolesti treba da smanje uticaj faktora rizika i unaprede dijagnostiku i terapiju kardiovaskularnih bolesti.
Ključne reči: Zdravlje žene; Starosna dob; Krvni pritisak; Hipertenzija; Kardiovaskularna oboljenja; Faktori rizika

Introduction

One of the risk factors for the occurrence of arteriosclerosis and coronary heart diseases is physical inactivity, as well as hypokinesia, overeating, age and other factors. Positive effects of physical activities have been proved in the primary, secondary and tertiary prevention of coronary heart diseases. It has also been accepted that physical activity is a significant factor in preservation of normal physical and mental health. Meyer et al. have shown that those who are in good shape have a twice lower risk of getting a cardiovascular disease even in the presence of main risk factors, such as hypertension, diabetes, smoking, etc. In addition, there has been a significant decrease of people's physical activity in the modern civilization [1]. The trend of sedentary life-style has resulted from the occurrence and improvement of technological developments. The necessity to use physical force while performing various tasks tends to disappear very quickly and human work is being replaced by machines and new technological achievements, so people's energy loss during a working day has been reduced to its minimum. Such inactive lifestyle has added to the development of a range of associated diseases which mostly include chronic diseases of locomotor system and deterioration of the general body resistance, especially the cardio-respiratory system. One of the leading diseases of such inactive lifestyle is in-

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Table 1. Multivariate and univariate analyses of variance for the differences in blood pressure.
Tabela 1. *Multivarijantne i univarijantne analize varijanse za razlike u krvnom pritisku*

Variable/*Varijabila*	Groups/*Grupe*	N	AM	SD	f	p
	20-29	16	107.18	8.93		
	30-39	23	107.17	11.16		
SBP	40-49	29	112.41	13.60	5,96	0.000
	50-59	28	110.17	15.24		
	60+	23	125.86	19.86		
	20-29	16	69.37	7.50		
	30-39	23	71.08	9.64		
DBP	40-49	29	70.17	7.13	3.22	0.015
	50-59	28	73.21	10.38		
	60+	23	78.04	9.01		
	F=3.81			**P=0.000**		

Legend: SBP – Systolic blood pressure, DBP – Diastolic blood pressure, AM – arithmetic mean, SD- standard deviation, f – the value of f-test of the univariate analysis of the variance, p – the level of significance of the univariate analysis, F- the value of f-test of multivariate analysis of variance P- the level of significance of the multivariate analysis.
Legenda: SBP – sistolni krvni pritisak, DBP –dijastolni krvni pritisak, AM – aritmetička sredina, SD – standardna devija-cija, f – vrednost f-testa univarijantne analize varijanse, p – nivo signifikantnosti univarijantne analize, F – vrednost f-testa multivarijantne analize varijanse, P – nivo signifikantnosti multivarijantne analize

creased blood pressure. High blood pressure or hypertension increases the pressure on circulatory and excretion organs, simultaneously increasing the risk of heart attack, stroke and kidney diseases [2]. In some instances, high blood pressure causes a headache, ear tingling, dizziness, feeling of tension in chests and short breath, nausea, sight obstructions. However, the largest numbers of people with hypertension have no symptoms at all and do not know that they have high blood pressure since they

Table 2. T-test for independent samples of systolic and diastolic blood pressure between the pairs of all age groups.
Tabela 2. *T-test za nezavisne uzorke sistolnog i dijastolnog krvnog pritiska između parova svih starosnih grupa*

Variable/*Varijabila*	Pairs/*Parovi*	t	p
	20-29 – 30-39	0,00	0,997
	20-29 – 40-49	-1,37	0,175
	20-29 – 50-59	-0,31	0,478
	20-29 – 60+	-3,40	0,002
	30-39 – 40-49	-1,49	0,142
Systolic B.P./*Sistolni krvni pritisak*	30-39 – 50-59	0,78	0,435
	30-39 – 60+	-3,76	0,001
	40-49 – 50-59	0,38	0,561
	40-49 – 60+	-2,64	0,012
	50-59 – 60+	-2,98	0,005
	20-29 – 30-39	-0,59	0,556
	20-29 – 40-49	0,35	0,726
	20-29 – 50-59	-1,29	0,002
	20-29 – 60+	-3,05	0,004
	30-39 – 40-49	0,39	0,696
Diastolic B.P/*Dijastolni krvni pritisak*	30-39 – 50-59	-0,75	0,456
	30-39 – 60+	-2,44	0,019
	40-49 – 50-59	-1,28	0,205
	40-49 – 60+	-3,28	0,002
	50-59 – 60+	-1,68	0,099

Legend: t – value of t-test, p – the level of significance of t-test
Legenda: t – vrednost t-testa, p – nivo signifikantnosti t-testa

Table 3. Categorization of patients according to the values of their blood pressure (based on European Society for Hypertension and European Association of Cardiologists, 2007)
Tabela 3. Kategorizacija pacijenata prema vrednostima njihovog krvnog pritiska (na osnovu Evropskog društva za hipertenziju i Evropske asocijacije kardiologa, 2007)

Category/*Kategorija*	Systolic (mmHg)/*Sistolni (mmHg)*	Diastolic (mmHg)/*Dijastolni (mmHg)*
Optimal/*Optimalne*	< 120	< 80
Normal/*Normalne*	120 – 129	80 – 84
Increased/*Povišene*	130 – 139	85 – 89
Level 1 hypertension/*Hipertenzija 1. nivoa*	140 – 159	90 – 99
Level 2 hypertension/*Hipertenzija 2. nivoa*	160 – 179	100 – 109
Level 3 hypertension/*Hipertenzija 3. nivoa*	≥ 180	≥ 110

do not have regular medical check-ups. Besides, the majority of people do not know that hypertension can be successfully controlled by having a healthy lifestyle [3].

Cardiovascular diseases are the leading cause of premature deaths in Serbia. During 2008, heart and blood vessel diseases accounted for over half of all causes of death (55.8%); 57,343 people died, while this group of diseases occurred more often in women (54.9%) than in men (45.1%). In the period from 2002 to 2008, death rates for this disease increased by 5.5% in women and 0.2% in men. Risk factors for the occurrence of this disease are present in a high percentage in all citizens of Serbia. In addition, blood pressure is increased in 46.5% of adults. It is important to mention the fact that 67.7% of citizens of Serbia are inactive, which is very disturbing. There are over 4,500 cardiac interventions, while the number of interventions on blood vessels is significantly higher [4]. The aim of this study is to determine whether there are differences between different categories of females in blood pressure and to emphasize the importance of aging and its negative impact on cardiovascular system.

Material and Methods

The study sample consisted of 119 women from Novi Sad, aged 20-76. Regarding their education, 93 had high school certificate, 21 graduated from a faculty and 5 completed postgraduate studies (master or doctor of science and the majority of them were employed. Of 119 women, 75 had one or more births and 43 women were in menopause. The patients included in the study sample did not have a cardiovascular disease, and were not active smokers. The data obtained were used for the scientific research project called "The Anthropological Status and Physical Activity of the Citizens of Vojvodina" which was carried out by the Faculty of Sport and Physical Education in Novi Sad and financed by the Regional Secretariat for Science and Technological Development.

Systolic and diastolic blood pressure was measured with the digital blood pressure measuring device with cuff OMRON M4-1 (Omron Healthcare Europe BV, the Netherlands). The cuff was placed firmly on the upper arm 2-3 cm above the elbow. During the measurement, the subjects were sitting for 15 minutes. Blood pressure was taken three times. The values of blood pressure varied at each measurement, being highest at the first measurement, and lowest at the third one. Since the measured values did not differ for more than 4.5 mmHg for diastolic pressure, the mean value was the average of all three measurements, not the average of the second and third measurement, as recommended by the World Health Organization (WHO, 2005) in order to increase the level of freedom for the mean values. The results are given in mmHg.

The evaluation of blood pressure was performed at the Faculty of Sport and Physical Education in Novi Sad. During the process of testing, all rules were followed. Transversal measurement was also performed.

The univariate and multivariate analyses of variance were applied in order to show the differences on the quantitative level. For all statistical analyses, the level of statistical significance was 0.05. The data processing was done by the statistical package „SPSS 20.0".

Results

The obtained data show that in the sample of women belonging to various age groups there were statistically significant differences in both individual and general system of the observed variables (**Table 1**).

Besides, there are statistically significant differences between pairs of groups, which can be observed when comparing with the oldest age group (**Table 2**).

If the values of arithmetic means of systolic and diastolic blood pressure from the first four age groups are taken into account and compared with the values from the T**able 3** [5], it can be noticed that they belong to the category of optimal blood pressure, while the fifth group (aged 60+) has normal blood pressure. It is also important to say that differences between the pairs of groups only occurred when comparing younger groups with the oldest groups, 50-59 and 60+. The differences in the obtained values can be explained by a number of rea-

sons, such as inactivity, the type of regular diet, social status and many more.

Discussion

Hypertension is a disease with increased risk in older and obese population [6, 7]. The fact that physical activities can normalize blood pressure was confirmed in the research [8] where the decreased values in the final measurement after the experimental treatment were the confirmation that the exercising by using Nordic poles influenced the stability of heart rate during inactivity, as well as systolic and diastolic blood pressure.

According to Czech authors [9] there is a relationship between obesity, age and blood pressure. Their study included the sample of middle-aged men and women. They concluded that obesity was a reliable parameter of influence on blood pressure, but, the age could be a good predictor of high blood pressure as well.

In the introduction to this article we can notice that large numbers of countries in the world, including Serbia, have a high rate of cardiovascular diseases, one of the most frequent being hypertension. In the developed countries, the programs of prevention and control over cardiovascular diseases are mainly aimed at decreasing the influence of risk factors, as well as the improvement of diagnostics and therapy of cardiovascular diseases. It has been established that 46.5% of adults have increased blood pressure [4]. Prevention of cardiovascular diseases includes education of people aimed at increasing the level of awareness and knowledge about risk factors and diseases related to heart and blood vessels, systematic medical check-ups for the people aged above 40, early detection of cardiovascular diseases and risk factors, implementation of contemporary diagnostic methods, therapy and control over cardiovascular diseases, etc. The programs of prevention and control of cardiovascular diseases ought to decrease the influence of risk factors and improve diagnostics and therapy of cardiovascular diseases [10]. One of the ways is taking up various physical exercises, especially those which contain natural movements and are therefore adequate for all age groups, especially the elderly [11].

The Ministry of Health of the Republic of Serbia has adopted the "National Program of Prevention and Control of Cardiovascular Diseases in the Republic of Serbia until 2020", with the purpose to decrease the number of premature deaths and reduce the diseases related to heart and blood vessels by taking integrated actions in order to improve the quality of life and prolong the life expectancy in the population in Serbia [12]. The program included a number of objectives and principles, among which the most important are the early recognition of cardio-vascular diseases, better diagnostics, reduced mortality and disability, improved quality of life of patients. One of the frames of the program is the prevention of risk factors primarily addressing the objective of this research which is to point out the significance of the consequences of aging on the cardiovascular system [13].

Conclusion

The results of our study confirmed presence of differences in blood pressure between the women of different age groups.

In addition to the efforts to prolong the life expectancy within the Program of Prevention and Control of Cardiovascular Diseases, it is important to follow the recommendations of the World Health Organization regarding the prevention of increased blood pressure.

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