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LIPID PROFILE AND ANTHROPOMETRIC PARAMETERS OF WOMEN WITH ARTERIAL HYPERTENSION FROM THE REGION OF EASTERN SLOVAKIA

Hrabčáková M.[1], Poráčová J.[1], Mydlárová Blaščáková M.[1], Sedlák V.[1], Konečná M.[1], Gogáľová Z.[1], Majherová M.[2], Kotosová J.[3], Uhrínová L.[4], Franková L.[1], Tomková S.[5], Nagy M.[6], Odlerová E.[7]

Lipid profile and anthropometric parameters of women with arterial hypertension from the region of Eastern Slovakia. – M. Hrabčáková[1], J. Poráčová[1], M. Mydlárová Blaščáková[1], V. Sedlák[1], M. Konečná[1], Z. Gogáľová[1], M. Majherová[2], J. Kotosová[3], L. Uhrínová[4], L. Franková[1], S. Tomková[5], M. Nagy[6], E. Odlerová[7] – *Arterial hypertension is one of the most common and most serious, risk factors leading to the development of certain cardiovascular disease, particularly ischemic heart disease, atherosclerosis, stroke, and cardiac arrhythmias. In the Slovak Republic 40% of the population suffer from hypertension. Hypertension increases with age. The exogenous factors causing the initiation of arterial hypertension are: lifestyle – particularly drinking alcohol, smoking, being overweight, and the environment. The endogenous factors include age and inheritance. The model research was attended by 40 women aged 30-75 years who reside in Eastern Slovakia. Two groups were set up - control (CG, n = 20 females, mean age = 42.65 years), and experimental (EG, n = 20 females, mean age = 57.85 years) diagnosed with arterial hypertension. We have studied the association between age, BMI, WHR, blood pressure and lipid profile (total cholesterol, triglycerides, LDL, HDL) of women with arterial hypertension and the control sample. The analysis of the lipid profile was done on automatic biochemical analyzer ADVIA 1800 and AU600 IVD-Beckman. Individual parameters in different groups were compared by the Shapiro-Wilk test, Pearson correlation coefficient, and parametric unpaired t-test. Statistically significant differences ($p<0,01$) were found in diameters of somatic indicators in addition to body size. Considerable significant differences were confirmed by average variables - systole (CG = 119.2 mmHg; EG = 139.8 mmHg), diastole (CG = 74.5; EG = 86.4) and total cholesterol (CG = 4.55 mmol/l; EG = 5.67 mmol/ l) between the control and the experimental group ($p<0,01$).*

Key words: *somatic indicators, arterial hypertension, biochemical parameters, women.*

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Ліпідний профіль та антропометричні параметри жінок з артеріальною гіпертензією з регіону Східної Словакії. – М. Грабчакова[1], Я. Порачева[1], М. Мидларова Блашчакова[1], В. Седлак[1], М. Конечна[1], З. Гогалова[1], М. Майгерова[2], Я. Котосова[3], Л. Угрінова[4], Л. Франкова[1], С. Томкова[5], М. Нодь[6], Е. Одлерова[7] – *Артеріальна гіпертензія є одним з найпоширеніших та найбільш серйозних факторів ризику, що призводить до розвитку ряду серцево-судинних захворювань, зокрема ішемічної хвороби серця, атеросклерозу, інсульту та серцевих аритмій. У Словацькій республіці 40% населення страждають на гіпертензію, причому цей відсоток з віком зростає. Екзогенними факторами, що викликають початок артеріальної гіпертензії, є: спосіб життя – зокрема, алкоголь, куріння, надмірна вага та навколишнє середовище. Ендогенні фактори включають вік та спадковість. У модельному дослідженні взяли участь 40 жінок у віці 30-75 років, які проживають у Східній Словаччині. Було досліджено дві групи – контрольна (КГ, n = 20 жінок, середній вік 42,65 років), експериментальна (ЕГ, n = 20 жінок, середній вік 57,85 років) з діагнозом артеріальної гіпертензії. Ми вивчали зв'язок між віком, ІВТ (індекс ваги тіла), СТС (співвідношення талія-стегна), артеріальним тиском і ліпідним профілем (загальний холестерин,*

тригліцериди, ЛПНЩ, ЛПВЩ) у жінок з артеріальною гіпертензією та контрольною групою. Аналіз ліпідного профілю проводився на автоматичному біохімічному аналізаторі ADVIA 1800 та AU600 IVD-Beckman. Індивідуальні параметри в різних групах порівнювалися за допомогою тесту Шапіро-Вілка, кореляційного коефіцієнта Пірсона та параметричного непарного t-теста. Статистично значимі відмінності ($p<0,01$) були виявлені в діаметрах соматичних індикаторів на додачу до розмірів тіла. Значні суттєві відмінності були підтверджені середніми змінами систоли (КГ = 119,2 мм рт. ст., ЕГ = 139,8 мм рт. ст.), діастоли (КГ = 74,5; ЕГ = 86,4) та загального холестерину (КГ = 4,55 ммоль/л; ЕГ = 5,67 ммоль/л) між контролем та експериментальною групою ($p<0,01$).
Ключові слова: *соматичні показники, артеріальна гіпертензія, біохімічні показники, жінки.*
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Introduction

Arterial hypertension is the most common cardiovascular disease that leads to morbidity and mortality of the population. It is a major risk factor for vascular stroke, ischemic heart disease, dyslipidemia, diabetes mellitus, and obesity (Gašpar et al. 2013). Arterial hypertension in an adult population is defined by WHO as a condition when systolic blood pressure (sBP) acquires values ≥ 140 mmHg and/or diastolic blood pressure (dBP) ≥ 90 mmHg in two or more measurements (Amrani et al. 2013). High blood pressure is characterized by a constant increase in blood pressure in blood vessels. The most common symptoms of an individual with arterial hypertension are dizziness in general, headache, dizziness after physical exertion, pale or red skin, weakness, ringing in the ears, feeling hot, has problems sleeping, vision, nervousness in stressful situations (Horáková 2015; WHO 2015). Globally, approximately 15% of the population has a blood pressure value that is above 160/95 mmHg. In the Slovak Republic, 40% of the population has been diagnosed with arterial hypertension. Hypertension increases with age and is more common in men over 55 years of age and women after menopause or after 65 years of age (Horáková 2015). Diagnosis of arterial hypertension is based on the basic examination of the individual, which includes monitoring blood pressure and determining the overall cardiovascular risk. These are all investigated: Family history of the patient (focus on familial occurrence of arterial hypertension, alcohol consumption, lifestyle of the individual, and use of addictive substances), physical examinations (basic anthropometric parameters - height and weight of the individual, BMI) and laboratory examinations (test of glucose, cholesterol, creatinine, lipid spectrum, urine, uric acid, uricemia, hemoglobin, hematocrit, serum sodium and potassium levels (Filipová et al., 2014). The formation of arterial hypertension causes exogenous and endogenous factors. Exogenous factors include excessive use of table salt, alcohol, smoking, elevated cholesterol and being overweight. Endogeneous factors include age and inheritance (Veselý and Václavík 2013; Horáková 2015).

In our work, we focused on the determination and evaluation of the lipid profile in blood serum and selected anthropometric parameters in women diagnosed with arterial hypertension in comparison with healthy women.

Material and methods

The model experiment included 40 women aged 30-75 years. 20 women (average age 57.9 years) were diagnosed with arterial hypertension, 20 women were a control group that were not diagnosed with arterial hypertension (average age 42.7 years). Women came from eastern Slovakia (Bardejov and the surrounding area). The research was done in the morning at a doctor's clinic. Venous blood was taken from all women. Measurements in patients and in a healthy control group were provided to find out the basic anthropometric parameters - height, weight, waist circumference and hips.

Concentrations of lipid profile values (total cholesterol, HDL-cholesterol, LDL-cholesterol and TAG) were determined in the female serum by the Cobas Integra 400 plus automatic analyzer (Roche, Switzerland). BMI values were calculated from taking measurements of body height and body weight. WHR values were calculated from the measured waist circumference and hips.

We processed the results of the measured data using the Statistics no. 12. To determine the normality of data layout, we used the Shapiro-Wilkov test. To find out the relationship between the monitored groups, we used a Pearson correlation coefficient ranging from -1 to 1. To compare the statistically significant differences between the observed parameters between the two groups, we used the parametric unpaired t-test.

Results and discussions

The average systolic value in women diagnosed with arterial hypertension was 139.80 mmHg; In the control group was 119.20 mmHg. The average diastole value in women in the control group was 84.40 mmHg; In women with arterial hypertension it was 72.25 mmHg.

The average value of BMI in women with arterial hypertension was 30,518, and in the control group it was lower (24,201). In the female control group - an average WHR was found to be 0.917; In women diagnosed with arterial hypertension it was 0.796.

The average value of total cholesterol in women with arterial hypertension it was 5.669 mmol/l; In the control group it was 4.445 mmol/l. In women with arterial hypertension the average value of HDL cholesterol was 1.587 mmol/l, and in the control group was higher - 1.901 mmol/l. The average values of LDL cholesterol were higher in women with arterial hypertension - 3.525 mmol/l, than in the female control group - 2.732 mmol/l. Women with classified arterial hypertension were found to have an average value of TAG 1.461 mmol/l, in the control group the value was lower - 1.154 mmol/l.

To find out the relationships between the monitored groups, we used Pearson's correlation coefficient. We found a positive correlation between BMI values and hip circumference. A negative correlation was found between total cholesterol and WHR (-0.512), which means that if the total cholesterol is higher, the WHR decreases.

In the control group a positive correlation was found between total cholesterol and WHR (0.478).

To compare the statistically significant differences between somatic variables between two groups (arterial hypertension group and control group), we used the parametric unpaired t-test (Table 1). Significant differences in the mean level were confirmed in all variable indicators except height (** $p<0,01$, * $p<0,05$).

Tab. 1: Parametric unpaired t-test - comparison of somatic markers between the arterial hypertension group and the control group

Parameter	Average values - patients with arterial hypertension	Average values – control group	p
Age (years)	57,85±10,85	42,65±8,06	0,00001**
Body height (cm)	163,05±7,12	165,20±5,61	0,29535
Body weight (kg)	81,00±12,54	65,80±8,41	0,00006**
BMI	30,518±4,89	24,201±3,54	0,00003**
Waist circumference (cm)	103,25±13,93	78,90±12,06	0,00001**
Hip circumference (cm)	112,30±9,84	98,850±6,56	0,00001**
WHR	0,917±0,07	0,796±0,09	0,00002**

Parametric unpaired t-test in comparison of the lipid profile and blood pressure values of both groups confirmed the difference between variations in the variable total cholesterol (** $p < 0.01$). Significantly important differences were confirmed at the median level for variable systole, diastole and total cholesterol (** $p < 0.01$). In the blood serum HDL and LDL concentration between control and experimental groups, statistical significance and importance $p < 0.05$ were confirmed (Table 2).

Su et al. (2016) found that high or low BMI values are a risk factor for developing disability in older people. High blood pressure increases the risk of disability in obese people. 75% of individuals diagnosed with AH also suffer from being overweight (Smetana 2010). A study of biometric dimensions and bioelectric indices suggests that the percentage of body fat is the best marker in identifying hypertension. The statistically significant difference was the value of WHR. (Jiang et al. 2016). Obesity is a serious risk factor for arterial hypertension. Higher BMI and WHR values represent risk factors for an increase in systolic blood pressure (Pantelič et al. 2013). BMI and waist circumference are significantly associated with arterial hypertension (Kalani, Salimi and Rafae 2015). Waist circumference is associated with the risk of high blood pressure. Women with a waistline of 88 cm have a twice the risk of developing hypertension than women with a waist circumference less than 80 cm (Guagnano et al. 2001). In the diagnosis of hypertension, WHR values are a more important

classification factor than BMI and waist circumference (Ashwell et al. 2011). Levine et al. (2011) found in their study that a mildly larger waist circumference in women (80-88 cm) is a risk factor for arterial hypertension.

Tab. 2: Parametric unpaired test - comparison of the lipid profile and blood pressure between the arterial hypertension group and the control group

Parameter	Average values – patients with arterial hypertension	Average values – control group	p
Systole (mmHg)	139,80±13,95	119,20±13,32	0,00002**
Diastole (mmHg)	84,40±9,51	72,25±10,42	0,00043**
Total cholesterol (mmol/l)	5,669±1,40	4,445±0,68	0,00125**
HDL (mmol/l)	1,587±0,37	1,901±0,45	0,02171*
LDL (mmol/l)	3,525±1,12	2,732±0,82	0,01479*
TAG (mmol/l)	1,461±0,66	1,154±0,48	0,10200

Legend: HDL – high density lipoprotein , LDL – low density lipoprotein , TAG -triacylglycerols

Approximately a quarter of hypertensive patients (15-31%) have higher cholesterol levels - "dyslipidemic hypertension" (Lopez, Tang et al. 2006). Interaction of high blood pressure and higher level of total cholesterol affect the mortality of cardiovascular diseases (Yang et al. 2011). Oda and Kawai (2011) have shown a positive association of hypertension and HDL cholesterol in healthy individuals. Basic value of LDL cholesterol is likely to cause the rapid onset of hypertension to normal or slightly higher blood pressure (Cicero et al. 2014). Snack says that in the diagnosis of hypertension it is necessary to assess the weight of the patient to verify if he or she is obese or overweight (Svačina 2005). People diagnosed with hypertension have higher BMI values. Elevated levels of total cholesterol, HDL cholesterol and TAG are significantly higher in people diagnosed with arterial hypertension (Goyal, Sarwate 2014).

Conclusion

In this model study we compared a group of women diagnosed with arterial hypertension and a control group of women, where we monitored the association of somatic markers and lipid profile values to arterial hypertension. Were found significant differences in systolic, diastolic and total cholesterol ($p<0.01$) and in blood serum HDL and LDL concentration between the control and experimental groups ($p <0.05$).

High blood pressure can be successfully treated, but not completely cured. An early diagnosis of the disease is therefore very important. The prevention of arterial hypertension is based on measures aimed at eliminating the risk factors that cause the disease.

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