Original article

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PREVALENCE OF METABOLIC SYNDROME IN PATIENTS WITH ARTERIAL HYPERTENSION IN RELATION TO SEX IN THE MUNICIPALITY OF NIS

SUMMARY

The metabolic syndrome encompasses a group of clinical entities which point to an increased risk of development of cardiovascular disease and diabetes.

Guided by highly predictive value of the metabolic syndrome (MS) in patients with arterial hypertension, the aim of the study was to examine the prevalence of MS in the patients of both sexes within the Municipality of Nis.

The study involved 140 hypertensive patients, 70 men with mean age of 67.47 years and 70 women with mean age of 67.06 years.

Antropometric values were measured in all the patients. Functional measurements, blood biochemistry and analysis of their medical records were also done. Events of cardiac death were evaluated in the course of a three-year follow-up.

The existence of MS was diagnosed in a high percent, in both males (70%) and females (71.43%).

Arterial hypertension and MS sufferers are more affected by dyslipidemia, angina pectoris and myocardial infarction, and also are at higher risk of lethal outcome, compared to the arterial hypertension sufferers with no MS, regardless of sex.

Key words: metabolic syndrome, arterial hypertension

INTRODUCTION

Noninfectious mass diseases - arterial hypertension, coronary artery disease and diabetes are the leading cause of morbidity and mortality in the world (1).

Half of all annual deaths in Europe are ascribed to cardiovascular disease (2).

For cardiovascular diseases, including arterial hypertension, there is a number of independent risk factors, including: diabetes mellitus, obesity (particularly the central type), dyslipidemia, cigarette smoking, physical inactivity, psychosocial stressors, genetic predisposition, sex, age, excessive alcohol intake (3, 4).

Obese people are frequently diagnosed with insulin resistance, i.e. hyperglycemia. The research showed repetitive entities in subjects with central obesity in association with low HDL cholesterol, insulin resistance, hypertension and hypertriglyceridemia. This clinical state is called metabolic syndrome, and other synonyms are syndrome X, insulin resistance syndrome, postprandial disease, and "death quartet". Metabolic syndrome accounts for 18% of variation in cardiovascular risk (5).

People with the metabolic syndrome are at higher risk of development of type II diabetes and cardiovascular illness.

In the phase when neither type II diabetes nor ischemic heart disease is apparent, people affec-

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ted by the metabolic syndrome suffer a damage or at least a transient endothelial dysfunction resulting from oxidative stress and inflammatory mechanisms, with each postprandial hyperglycemia. This stands for a state that can be called "pre-atherosclerosis" (6-8).

Death rate from cardiovascular disease is 2 to 3 times higher in diabetics, and their life expectancy is 10 to 15 years less than that of the general population.

Frammingham study results have demonstrated a strong connection between hyperglycemia and frequency of cerebral, cardiac and inferior extremities' vascular lesions (9).

Taking into account a highly predictive value of the metabolic syndrome (MS), the aim of the study was to examine its prevalence amongst patients with arterial hypertension of both sexes in the Municipality of Nis.

MATERIAL AND METHODS

The study involved 140 patients with arterial hypertension, followed by the District domiciliary health services, with the basis at the Health Care Centre Nis, through regular home visits.

There were seventy male patients (mean age 67.47 ± 4.17 years), and seventy female patients (mean age 67.06 ± 4.36 years).

All patients were subjected to antropometric measurements, clinical examinations including blood pressure measurement, as well as blood biochemistry, and the analysis of their current medical records was performed.

Antropometric measurement of waist circumference was taken for each subject half way between costal arch and iliac crest on the median axillary line. A ribbon made of non-stretching plastic was used, placed parallel to the base, with a patient in an upright position, with arms by the body. The measurements were recorded in centimeters. Body height was measured with an altimeter. The subjects were barefooted, bareheaded, looking straight ahead, with arms relaxed by their body. The measurements were recorded in meters.

Body weight measurements were made using portable digital scales. Weighing was done in the mornings, before any food or drinks were consumed. Weight was recorded in kilograms. Body mass index (BMI) was calculated according to the BMI formula, by dividing body mass value by body height value squared. The patients with a BMI of over 25 were considered obese.

Blood pressure measurements were done using a mercury manometer, with subjects in a sitting positions, following a five-minute rest, with values recorded in millimeters Hg.

Blood biochemistry involved: total cholesterol, HDL and LDL cholesterol, triglycerides and blood sugar levels. These were being included in order to detect dyslipidemia and glucose intolerance.

The analysis of current medical records was used to verify the presence of dyslipidemia, angina pectoris and myocardial infarction. In the course of the three-year follow-up, events of cardiac death were evaluated.

Diagnostic criteria for metabolic syndrome are fulfilled if at least three of the following five parameters are present:

a) Arterial hypertension with values equalling or higher than 130/85 mm Hg, or under treatment.

b) Fasting hyperglycemia with values equalling or higher than 6.1 mmol/L ($\geqslant$ 110 mg/ dl), or under treatment.

c) Central type obesity with waist circumference values for women higher than 88 cm, and for men higher than 102 cm.

d) Hypertriglyceridemia with values higher than 1.69 mmol/L (>150 mg/dl) or under treatment.

e) Low HDL cholesterol with values equalling or lower than 1.03 mmol/L (<40 mg/ dl) for men and 1.29 mmol/L (<50 mg/dl) for women.

The patients were divided into two groups on the basis of the MS diagnosis presence:

a. Affected group - patients with arterial hypertension and MS;

b. Control group - patients with arterial hypertension, without MS.

Groups were additionally analyzed in relation to sex.

The study results were systematized, and shown in tables and graphs. They were computer-processed, using standard statistical methods, with EXCELL and SPSS computer programs.

RESULTS

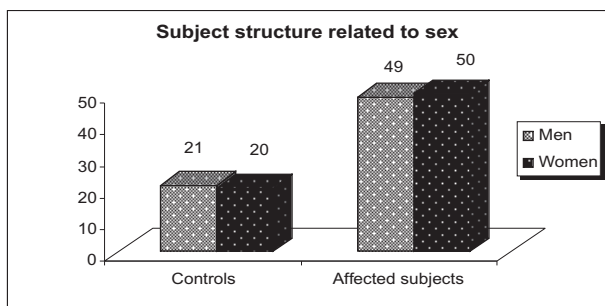In our group of 140 subjects of both sexes, 99 (70.71%) had MS.

Figure 1. Metabolic syndrome prevalence chart in patients with arterial hypertension in relation to sex

In the group of 70 men with arterial hypertension, 49 (70%) were diagnosed with MS. In the

group of 70 women with arterial hypertension, 50 (71.43%) were diagnosed with MS *(Figure 1)*.

There was no statistically important difference with regard to sex and age structure between the affected and control group *(Table 1)*.

The average BMI, waist circumference and biochemical parameters (glycemia, cholesterol and triglycerides) tested in relation to sex between the affected and control group, showed statistically significantly higher values in the affected group, except for the cholesterol values in the female subgroup *(Table 2 and Table 3)*.

No statistically significant difference was found between the prevalence of dyslipidemia in males and females in both the affected and control group *(Table 4)*.

Table 1. Subject structure related to age

Subjects	Mean age of the subjects	
	Males	Females
Control group	68.76±3.73	67.15±4.42
Affected group	66.92±4.26	67.02±4.38
t	1.693	0.110
P	p > 0.05	p > 0.05

Table 2. Average BMI and waist circumference values

Subjects	Average BMI values		Average waist circumference values	
	Males	Females	Males	Females
Control group	26.19±3.20	27.81±5.06	97.60±8.31	91.00±13.82
Affected group	29.20±3.91	31.85±4.72	106.26±11.35	104.04±11.90
t	3.065	3.123	3.108	3.893
p	p < 0.05	p < 0.05	p < 0.05	p < 0.05

Table 3. Average values of glycemia, cholesterol and triglycerides

Subjects	Average values of glycemia		Average values of cholesterol		Average values of triglycerides	
	Males	Females	Males	Females	Males	Females
Control group	5.42±0.72	5.34±0.54	5.63±0.71	5.97±1.04	1.56±0.39	1.40±0.33
Affected group	6.85±2.35	7.35±3.26	6.23±1.07	6.39±1.23	2.44±1.58	2.26±1.06
t	2.695	2.703	2.323	1.327	2.483	3.509
p	p < 0.05	p < 0.05	p < 0.05	p > 0.05	p < 0.05	p < 0.05

Table 4. Prevalence of dyslipidemia

Subjects	Prevalence of dyslipidemia		^{2}
	Males	Females	
Control group	2 (1.43%)	5 (3.57%)	Fisher exact p>0.05
Affected group	28 (20.00%)	29 (20.71%)	

Table 5. Prevalence of obesity

Subjects	Prevalence of obesity		^{2}	OR
	Males	Females		
Control group	11 (7.86%)	14 (10.00%)	0.02 p>0.05	1.07 (0. 93<OR<2.91)
Affected group	33 (23.57%)	45 (32.14%)		

No statistically significant difference was found between the prevalence of obesity in males and females in both the affected and control group *(Table 5)*.
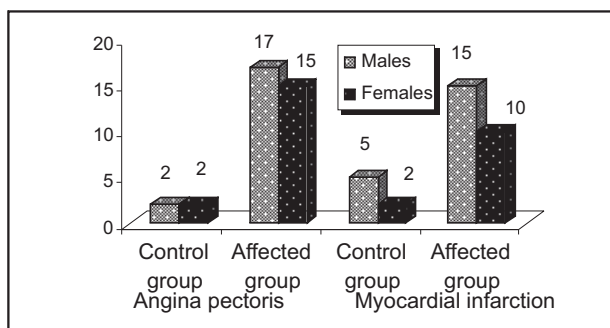

Figure 2. Prevalence of angina pectoris and prevalence of myocardial infarction in the control and affected groups in relation to sex

The prevalence of angina pectoris is higher in the affected group. Amongst the affected males, 17 (12.14%) had angina pectoris, compared to only 2 males (1.43%) in the control group.

patients suffered myocardial infarction, and in the control group 5 (3.57%) males. In the subgroup of affected females, 10 (7.14%) suffered myocardial infarction, and in the control female subgroup there were 2 (1.43%) such subjects. Collectively, 25 (17.85%) patients in the affected group suffered myocardial infarction, compared to 7 (5%) patients in the control group, which is approximately three times less *(Figure 2)*.

In the overview of lethal outcomes, 7 (5%) affected males and 1(0.71%) male in the control group died. Four (2.86%) affected females and 1 (0.71%) female in the control group died. Collectively, 11(7.86%) patients in the affected group died, compared to 2 (1.42%) patients in the control group, which is approximately 5 times less *(Table 6)*.

DISCUSSION

The metabolic syndrome has been ascribed an increasing importance over the last ten years, as a growing number of studies clearly emphasizes a co-

Table 6. Prevalence of lethal outcomes

Subjects	Lethal outcome		^{2}
	Males	Females	
Control group	1 (0.71%)	1 (0.71%)	Fisher exact p>0.05
Affected group	7 (5.00%)	4 (2.86%)	

Amongst the affected females, 15 (10.71%) had angina pectoris, compared to only 2 (1.43%) females in the control group. Collectively, in the affected group angina pectoris was present in 32 (22.85%) subjects, and in the control group it was present in 4 (2.86%) subjects, which is 8 times less *(Figure 2)*.

No important difference was found in the prevalence of myocardial infarction in relation to sex in either the affected group or the control group.

Amongst the affected males, 15 (10.71%)

nnection between the metabolic syndrome and cardiovascular and type II diabetes morbidity. Summarized study results on the MS indicate that a person affected by MS has twice the risk of that in the general population of suffering a cerebrovascular event or a myocardial infarction, regardless of their sex. Each component of the MS separately, independently works as a deterrent to the affected person's health, and their joint effect leads to the multiple risks of cardiovascular disease development phenomenon.

Results of PROCAM (Prospective Cardiovascular Munster) study, performed on a sample of 2754 males aged 40-65 years followed over a four-year period, indicate that patients who had hypertension only or diabetes only, had a 2.5 times increased risk of cardiovascular illness. Patients with a joint diagnosis of diabetes mellitus and hypertensive disease had an eight-fold increase in their risk. There was a twenty- fold increase in the risk of cardiovascular events in patients with diabetes mellitus and coexistent hypertensive disease and associated abdominal lipid profile (10).

Components of the metabolic syndrome, as well as the syndrome in the whole, are presently the objects of extensive research around the world, necessitated by the recent epidemic proportions in obesity prevalence.

In North America, the prevalence of the MS in the population aged 60 to 69 years is 44%, with a minor difference between males and females, while in the general population across all the age groups this figure is 24%, and with equally small sex- related difference (11).

A research done in Havana, Cuba, in 2005, on a population group older than 20 years, showed the MS prevalence of 32% (12).

A research conducted in our neighboring country, Bulgaria, involving people over the age of 14 years, showed the MS prevalence of 26.8%, and only 7.8% of the population had no risk factors (13).

As a part of "Early detection of diabetes campaign in Vojvodina", three clinical indicators of MS were studied (prevalence of the central type obesity, blood pressure readings, glycemia), and they were used as a sole basis for the conclusion on the MS prevalence of 16.9% in the population of Vojvodina aged over 45 years. The subjects did not have serum levels of triglycerides and HDL cholesterol tested, but high frequency of excess body mass (41%), obesity (33.3%) and risk values of waist circumference (80.8%) were found, which nevertheless -although indirectly-indicates that the prevalence of dyslipidemia in the population studied is also high (1). A research done in the Municipality of Nis in 2005 on a population whose mean age was 44.6 years showed the MS prevalence of 43.3% (14).

The Sanct Georgen study, done in Germany on general population in the 18-75 years age group documented the MS prevalence of 26%. This study draws another conclusion: as many as three thirds in the group of obese subjects (BMI > 25) had the MS (15).

A research in Russia, at the Moscow University, done in 2005 on a group of patient that had concurrent hypertensive disease and diabetes mellitus, with mean age of 55. 6 years, found that the MS prevalence in this group was 76.19% (16).

A research from the Health Care Centre Cacak, done in the period 2004 -2005, on a group of subjects who had previously suffered a cerebrovascular accident, found that the MS was present in three quarters of female and a half of male subjects (17).

Our results show the MS prevalence in male patients with arterial hypertension and mean age of 67.47 years, of 70%, and the MS prevalence in female patients with mean age of 67.06 years, of 71.43%, which is concordant with previous research in groups of patient already affected by a morbidity considered to be a complication of MS, with a difference in our study in that a component of MS was already evident across our subject structure (arterial hypertension). As a matter of fact, this represents a target group in a way, since these patients have metabolic changes which had already in a high percent clinically presented at least three times.

Our study shows that the prevalence of dyslipidemia, angina pectoris and myocardial infarction, as well as the lethal outcome, are statistically significantly higher in the affected group compared to the control group, regardless of sex. Female sex in this age group does not have protective role as far as the risk of cardiovascular morbidity is concerned.

MS has a highly predictive value, so doctors should be quite suspicious at routine examinations of the population at risk in an attempt to screen for it.

Taking into account that almost all the components of MS are preventable, and that they mostly respond well to intervention measures by returning into physiologic range, we can say that it is possible to prevent the MS.

CONCLUSION

Results of our study indicate that MS is present in a high percentage in patients who suffer from arterial hypertension, which refers to both males (70%) and females (71.43%).

The prevalence of dyslipidemia, angina pectoris and myocardial infarction, as well as the lethal outcome, is higher in patients with arterial hypertension and MS, compared to patients with arterial hypertension only, regardless of sex.

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PREVALENCA METABOLIČKOG SINDROMA KOD BOLESNIKA SA ARTERIJSKOM HIPERTENZIJOM U ODNOSU NA POL NA TERITORIJI GRADA NIŠA

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SAŽETAK

Metabolički sindrom je skup kliničkih entiteta koji ukazuju na metaboličke promene i povećani rizik za oboljevanje od kardiovaskularnih i šećerne bolesti.

Vodjeni velikim prediktornim značajem metaboličkog sindroma (MS) kod bolesnika sa arterijskom hipertenzijom, cilj studije bio je da se ispita prevalenca MS kod bolesnika sa arterijskom hipertenzijom kod oba pola na teritoriji grada Niša.

Studija je uključila 140 hipertenzivnih bolesnika, 70 muškaraca prosečne starosti 67,47 godina i 70 žena prosečne starosti 67,06 godina.

Svim bolesnicima su vršena antropometrijska merenja, funkcionalna merenja, biohemijski pregled krvi i izvršena je analiza njihove medicinske dokumentacije. Tokom perioda praćenja od 3 godine, evaluirana je pojava srčane smrti.

Postojanje MS dijagnostikovano je u visokom procentu, kako kod muškaraca (70 %) tako i kod žena (71,43 %).

Bolesnici sa arterijskom hipertenzijom i MS su ugroženiji dislipidemijom, anginom pektoris i infarktom miokarda, kao i letalnim ishodom, u odnosu na obolele od arterijske hipertenzije a bez MS, nezavisno od pola.

Ključne reči: **metabolički sindrom, arterijska hipertenzija**