Прилози, Одд. биол. мед. науки, МАНУ, XXIX, 2, с. 227–241 (2008)
Contributions, Sec. Biol. Med. Sci., MASA, XXIX, 2, p. 227–241 (2008)
ISSN 0351–3254
УДК: 616-008-036.22

EPIDEMIOLOGICAL CHARACTERISTICS OF THE METABOLIC SYNDROME IN APPARENTLY HEALTHY PERSONS

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A b s t r a c t: The risk factors that define the metabolic syndrome lead to an accelerated development of atherosclerosis, cardiovascular diseases in apparently healthy persons.

The goal of the research is determining the prevalence of the metabolic syndrome as well as the participation of the risk factors that define this condition in apparently healthy persons.

The metabolic syndrome is defined according to the National Cholesterol Education Program Expert Panel.

The prevalence of the metabolic syndrome in the examined population, aged 53 ± 8, is 62 (39.7%). In the group of subjects that have the metabolic syndrome, the largest number of subjects had 3 risk factors and only 5 subjects had 5 risk factors. With the increase of the number of components of the metabolic syndrome, all the observed parameters of the metabolic syndrome also increase, while the level of HDL decreases. In all the examined groups of subjects, the low level of HDL-H is the most present metabolic risk factor, while in the groups of subjects that have the metabolic syndrome the hypertension is the second most present factor, and the waist circumference is the least present factor.

According to our research, the prevalence of the metabolic syndrome in apparently healthy persons that have a sedentary life style is 39.7%. In all the subjects the low level of HDL-h is the most present, and in the subjects with the metabolic

syndrome compared to subjects that do not have this syndrome the frequency of all the components of the metabolic syndrome is statistically considerably higher.

Key words: metabolic syndrome, hypertension, dyslipidemia, elevated fasting blood glucose, abdominal obesity.

Introduction

Cardiovascular diseases are the main reason for death in most of the developed countries, as well as in many countries in development. More than a third of those who die of CVD belong to the group of persons who are middle-aged. In recent years, the syndrome of multiple metabolic risk factors may be held responsible for the development of cardiovascular disease, and the syndrome consists of abdominal obesity, elevated plasma levels of triglycerides, low plasma levels of high-density lipoprotein cholesterol, insulin resistance with or without intolerance of glucose, and a pro-inflammatory and pro-thrombosis state. The metabolic syndrome was described in 1998 as a special pathological entity among the metabolic diseases and, since the very beginning, it has drawn the attention of many researchers, taking into consideration its wide prevalence as well as the fact that its components, which are leading diseases of modern civilization, lead to an increased development of diabetes and the process of atherosclerosis.

Today it is thought that most frequently visceral obesity, a sedentary life-style, diet and genetic predisposition are in the essence of the metabolic syndrome (MS). Dr. Neil J. Stone and David Saxon follow an approach to treatment of the patient with the metabolic syndrome specifically emphasizing dietary and metabolic life-style interventions. They focus on the syndrome's root causes – an atherogenetic diet, sedentary life-style, and overweight or obesity – and highlight the results of recent studies that demonstrate the effectiveness of therapeutic life-style change in preventing or improving components of the metabolic syndrome. (John P. Foreyt). The prevalence of general and visceral obesity is rapidly increasing. [4] It has been shown that a third of the genes of the visceral adiposities code secrecy bioactive proteins that represent a potential relationship between obesity and the development of insulin resistance, the development of other components of the metabolic syndrome and diabetes on the one hand and the development of atherosclerosis on the other. The prevalence of the metabolic syndrome is high, and it is c.15% of the mature population of Europe, while in the United States it is c. 25% of the population aged > 20, and 45% of the population aged > 50, which is of great importance for public health since it has been shown that persons with the metabolic syndrome have a multiple increased risk of diabetes, cardiovascular morbidity and mortality, as well as overall mortality, even if they have only one or two of these factors.

The metabolic syndrome is defined according to the WHO criteria, while in routine practice the most frequently used are the easily applicable clinical criteria of the National Cholesterol Education Program (NCEAP) adult Treatment Panel III (NCEAP ATP III). It should be emphasized that the level for diagnosis of the metabolic syndrome according to the ATP III criteria is lower and, according to this, a larger number of individuals at risk will be included among persons who have the metabolic syndrome. All this leads to greater success in the primary prevention of cardiovascular diseases.

The goal of our research was to determine the prevalence of the metabolic syndrome, and the presence of the individual risk factors that define this syndrome in the population that is exposed to the risk of development of coronary arterial disease and diabetes.

Methods

The study was conducted as a cross-section study involving 156 subjects employed in public administration in the Ministry of Finance. According to the inclusion criteria, subjects aged 40–80 who had a sedentary life-style were included in the study. The sedentary life-style has been defined as a mainly sedentary position during working hours (8 hours per day). According to the exclusion criteria, subjects who had a coronary arterial disease or diabetes were excluded from the study. The subjects gave oral permission for inclusion in the research.

The subjects were divided into two groups, the target group consisting of subjects who had the metabolic syndrome (62 subjects) and the control group consisting of subjects who did not have the metabolic syndrome (94 subjects). According to the number of components of the metabolic syndrome, the target group was then divided into three smaller subgroups: subgroup 1 with 3 risk factors (42 subjects); subgroup 2 with four risk factors (15 subjects); and subgroup 3 with 5 risk factors (5 subjects).

The past history of all the subjects was taken, and they had a physical examination and laboratory analyses. The following risk factors were examined: age, sex, systolic blood pressure, diastolic blood pressure, fasting blood glucose and triglycerides, low and high density lipoprotein cholesterol, total cholesterol. The level of body weight is represented by the body mass index BMI, which is considered as a relation between the body mass in kilograms and the body height in metres (squared), and the waist circumference measured at the height of the navel. The auscultation method was used for determining blood pressure. By using the standardised laboratory enzymes method the following was determined: concentration of total cholesterol (TC), high density lipoproteins (HDL-C),

and triglycerides. The enzymes 'end point' method was used for determining the total cholesterol. By this method, the cholesterol is determined by means of enzyme hydrolysis and oxidation. The indicating component chinonimin is developed through the reaction between H_2O_2 and aminotriptirin in the presence of fenol and peroxidase. With the GRO-PAP enzyme method that is in fact a colorimetric test, triglycerides were determined by means of enzyme hydrolysis with lipase. An indicator in this reaction is the chinonimin that is formed in peroxide, 4-aminoantipirin and 4-cholrfenyl under the catalytic reaction of peroxidase. The GHOD-PAP method was used for determining the HDL-cholesterol precipitants that are obtained when LDL, VLDL and kilomocrons are precipitated by adding fosfolibdenic acid in the presence of Mg ions. After centrifugation, lipoproteins with high HDL density remain in the supernatant and in this fraction the level of cholesterols in determined. The concentration of lipoproteins of low density (LDL-H) was determined according to the Friedwald formula (Fischbach F). Determining of the vein blood was done by means of the GOD- PAP enzyme method, where in the detection reaction the glucose reacts with glucosedehydrogenesis. The next indicating reaction produces a change of colour whose intensity corresponds with the concentration of glucose in the blood.

The metabolic syndrome is defined according to the Third Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) as the simultaneous existence of three or more risk factors including: visceral obesity (waist circumference males > 102 cm and females > 88cm), hypertriglicerideмics (> = 150 mg/dL and/or 1.69 mmol/L), low values of HDL-H (males < 40mg/dL or 1.04 mmol/L and females < 50 mg/dL or 1.29 mmol/L), arterial hypertension (> = 130/85 mm Hg) and deterioration of glucose tolerance (> = 110 mg/dL or 6.1 mmol/L) [16]. The prevalence of the metabolic syndrome in the research is shown as the participation in percentages of the subjects who met the criteria for the diagnosis of the metabolic syndrome.

In the research, descriptive statistics methods were used as the means of central tendency, more specifically the arithmetic mean, variability (standard deviation), and relative numbers. The methods of analytical statistics used in the research are the methods of identification of empirical organization, (Kolmogorov-Smirnov test), methods for assessment of the importance of difference, including: t-test for independent examples, the Mann-Withney U test, one-factor numerical analysis variations, Kruskal-Wallis analysis variation and × 2 test. The statistical work on data was done by means of SPSS software (version 11.5).

Results

156 subjects were included in the study, 101 (64.7%) female and 55 (35.3%) male. Of the total number of subjects, 94 (60.3%) subjects had fewer

than 3 risk factors needed for determining the metabolic syndrome, while 62 (39.7%) subjects had the metabolic syndrome ($x^2 = 6.5$; $p = 0.01$). Of the total number of subjects 12.2 % did not have one risk factor, 21.8% had 1 risk factor, and 26.3% of the subjects had 2 risk factors. In the group of subjects who had the metabolic syndrome, the largest number of subjects 42 (67.7%) had 3 risk factors, 15 (24.2%) had 4 risk factors, and 5 subjects (8.1%) had 5 risk factors. There was no statistically important difference in the frequency of gender per group (the control group [59 females] vs. the target group [42 females]; $x^2 = 0.4$, $p = 0.5$), while in the target group of subjects there were statistically more females compared to the number of males (42 vs. 20, $x^2 = 7.8$, $p = 0.005$), but without a statistically important difference between the observed subgroups ($x^2 = 0.8$, $p = 0.6$)

The basic characteristics of the numerical marks in the groups of subjects are given in Table 1.

Table 1 – Табела 1

Basic characteristics of numerical marks in groups of subjects
Основни карактеристики на нумеричките обележја на испитаниците во групите

Risk factors	X ± SD				
	Groups				
	< 3FR n = 94	≥ 3FR n = 62	3FR n = 42	4FR n = 15	5FR n = 5
Age (in years)	52.05 ± 6.94	53.34 ± 8.04	53.00 ± 7.77	53.47 ± 8.63	55.80 ± 9.78
Waist (cm)	76.12 ± 13.73	79.73 ± 14.60	75.76 ± 13.80	84.93 ± 12.78	97.40 ± 8.32
Body mass (kg)	73.22 ± 8.61	75.79 ± 8.43	74.00 ± 9.16	80.27 ± 4.61	77.40 ± 6.11
BMI (kg/m2)	26.51 ± 2.78	27.15 ± 2.57	26.88 ± 2.58	27.53 ± 2.69	28.24 ± 2.15
TAs (mmHg)	134.27 ± 18.21	155.97 ± 19.02	153.10 ± 16.71	162.00 ± 24.63	162.00 ± 19.23
	1	2	1	3	3
TAd (mmHg)	82.52 ± 8.02	93.06 ± 10.14	90.60 ± 10.37	97.67 ± 7.76	100.00 ± 7.07
Total cholesterol	5.89 ± 1.33	6.56 ± 1.35	6.50 ± 1.39	6.86 ± 1.34	6.18 ± 1.18
LDL-H	3.89 ± 1.18	4.50 ± 1.24	4.46 ± 1.25	4.78 ± 1.23	4.05 ± 1.28
HDL-H	1.28 ± 0.68	1.06 ± 0.56	1.12 ± 0.66	0.93 ± 0.27	0.99 ± 0.09
Triglycerides	1.65 ± 0.96	2.36 ± 1.37	2.02 ± 0.82	3.29 ± 2.19	2.40 ± 0.57
Glucose	5.31 ± 1.15	7.71 ± 2.99	7.83 ± 3.33	7.50 ± 2.43	7.35 ± 1.04

The average value of the systolic ($p < 0.01$) and diastolic blood pressure ($p < 0.01$), the level of total cholesterol ($p = 0.03$), triglycerides ($p = 0.01$), LDL ($p = 0.002$) and HDL cholesterols ($p < 0.01$) and the level of glucose in the blood ($p < 0.01$) are statistically higher in the groups with three or more risk factors compared to the control group.

Analyzing the between-group differences in the observed marks among the four groups of subjects observed, there is no statistically important difference in the average age values ($p = 0.67$) and BMI ($p = 0.31$) of the subjects.

The subjects in the groups with five ($p = 0.005$) and four ($p = 0.02$) risk factors had a higher waist circumference compared to the control group, which is statistically important, and also compared to the group with three risk factors ($p = 0.007$ vs. $p = 0.021$, respectively). The body weight in the group with four risk factors was statistically higher compared to the control group ($p = 0.03$) and to the group with three risk factors ($p = 0.014$). In the groups with five ($p = 0.007$), four ($p < 0.01$) and three ($p = 0.01$) risk factors there were statistically more average values of systolic pressure compared to the control group ($p < 0.01$). Furthermore, there were statistically fewer average values of diastolic blood pressure in the groups with three compared with the groups with four ($p = 0.014$) and five ($p = 0.038$) risk factors. The level of total cholesterol and LDL cholesterol was statistically higher in the groups with three ($p = 0.016$ and $p = 0.013$, respectively), i.e. four risk factors ($p = 0.010$ and $p = 0.009$, respectively) compared to the same parameters in the control group. The level of triglycerides in the subjects with five ($p = 0.013$), four ($p < 0.01$) and three ($p < 0.01$) risk factors was statistically higher compared to the control group. Furthermore, subjects with four risk factors had a statistically higher level of triglycerides compared to the group with three ($p = 0.001$). The level of HDL-H in the subjects with four ($p = 0.004$) and three ($p = 0.006$) risk factors was statistically lower compared to the level of HDL-H in the control group. The level of blood glucose of the subjects with three ($p < 0.01$), four ($p < 0.01$) and five ($p < 0.01$) risk factors was statistically higher compared to the control group.

Frequency of metabolic risk factors.

In all the groups of subjects examined a low level of HDL-H was the most frequently observed risk factor, while in the groups with the metabolic syndrome arterial hypertension was the second most frequent factor, and waist circumference the least present risk factor (Table 2).

In the control group the most present risk factor is the low level of HDL cholesterol, and after it follows the high level of triglycerides, and then hypertension, then abdominal obesity and last glycaemia.

In the group that has three or more risk factors present the most frequently-occurring risk factor is a low level of HDL cholesterol, and then follows hypertension, a high level of sugar in the blood and triglycerides, and the least present is abdominal obesity.

In the group of subjects with four risk factors present, all the subjects have a low level of HDL cholesterol and hypertension, as well as a high level of triglycerides, then follows glycaemia and at the end abdominal obesity.

Table 2 – Табела 2

Frequency of risk factors that define metabolic syndrome in observed groups of subjects
Зачестеност на јавување на факторите на ризик за метаболен синдром во групите испитаници

Risk factors	Groups				
	< 3FR n = 94	≥ 3FR n = 62	3FR n = 42	4FR n = 15	5FR n = 5
Waist circumference	17 (18.1%)	14 (22.6%)	7 (16.7%)	2 (13.3%)	5 (100%)
Triglycerides	29 (30.9%)	46 (74.2%)	26 (61.9%)	15 (100%)	5 (100%)
HDL-H	38 (40.4%)	54 (87.1%)	34 (81.0%)	15 (100%)	5 (100%)
Glucose	12 (12.8%)	47 (75.8%)	29 (69.0%)	13 (86.7%)	5 (100%)
Hypertension	20 (21.3%)	50 (80.6%)	30 (71.4%)	15 (100%)	5 (100%)

In the group of subjects with three or more risk factors compared to the control group there was a statistically higher frequency of the observed variables of the metabolic syndrome ($p < 0.01$), while there was no difference in the frequency of variables in waist circumference ($p = 0.491$) (Table 3).

Between the subjects of the control group and the subgroup with three, four and five risk factors there was a statistically important difference in the frequency of all the observed variables of the metabolic syndrome ($p < 0.01$) (Table 3).

The frequency of the variables of waist circumference was lower in the group with five risk factors compared with the control group ($p = 0.01$) and the group with three ($p = 0.01$) risk factors, and it was higher compared to the group with four ($p < 0.01$). The frequency of variables HDL-H was higher in the control group compared to the group with three ($p < 0.01$), four ($p < 0.01$) and five ($p = 0.009$) risk factors. Compared to the control group, the frequency of variables in triglycerides was higher in the group with three risk factors ($p < 0.01$), and lower compared to the group with four ($p < 0.01$) and five ($p < 0.02$) components of the metabolic syndrome. Furthermore, the frequency of these variables was lower in the group with four compared to the group with three risk factors ($p < 0.005$). In the groups with 3 and 4 risk factors there was a higher frequency of elevated blood glucose compared to the control group ($p < 0.01$), and the frequency was lower in the groups with four ($p < 0.01$) and five ($p < 0.01$) components of the metabolic syndrome. Furthermore, the frequency of hypertension was lower in the group with four compared to the group with three risk factors ($p = 0.020$).

Table 3 – Табела 3

Frequency of risk factors that define metabolic syndrome among observed groups
Зачестеност на јавување на факторите на ризик за метаболен синдром меѓу групите на испитаници

Risk factors	Groups				
	< 3FR n = 94	≥ 3FR n = 62	3FR n = 42	4FR n = 15	5FR n = 5
Waist circ.	17 (54.8%)	14 (45.2%)	7 (22.6%)	2 (6.5%)	5 (16.1%)
Triglyceride.	29 (38.7%)	46 (61.3%)	26 (34.7%)	15 (20.0%)	5 (6.7%)
HDL-H	38 (41.3%)	54 (58.7%)	34 (37.0%)	15 (16.3%)	5 (5.4%)
Glucose	12 (20.3%)	47 (79.7%)	29 (49.2%)	13 (22.0%)	5 (8.5%)
Hypertens.	20 (28.6%)	50 (71.4%)	30 (42.9%)	15 (21.4%)	5 (7.1%)

Discussion

The frequency of the metabolic syndrome in the population exposed to the risk of developing coronary arterial disease is increasing. The prevalence of the metabolic syndrome is an important indicator of the health status of the population. Determining the prevalence of the metabolic syndrome is a precondition for the suitable application of therapeutic and preventive measures that will affect the prevalence of coronary disease and diabetes, which are increasing. In our examined group of apparently healthy persons over 40 with a sedentary life-style, the prevalence of MS was 39.7%, which is similar to other studies worldwide (San Antonia Heart and Framingham Offspring Studies and Third National Health and Nutrition Examination Survey) in which the group with the metabolic syndrome had a prevalence of c. 40% among people of that age. Gloria Lena Vega and others in the National Health and Nutrition Examination Survey (NHANES III) study in the period 1988–94 found that the prevalence of the metabolic syndrome was 24% of a population of 8814 subjects, Americans aged over 20. According to data from the census in 2000, 47 million adults in America have this problem and need clinical intervention [1]. Our results are partly in agreement with those from the Atherosclerotic Cardiovascular Risk Factors in Danish Children and Adults study, in which 67.3 percent of 414 subjects do not have the metabolic syndrome, and 18.9 percent have the metabolic syndrome. They had a lower percentage of subjects with the metabolic syndrome, which is most likely due to the fact that there was a wider range of age differences, as well as different criteria for defining the metabolic syn-

drome. In this study the definition according to the WHO was used, which is the most rigorous in terms of NCEAP ATP III that was used in this research. [2]

The risk factors that define the metabolic syndrome according to the NCEAP ATP III criteria that were examined in our study are: waist circumference, tension, level of triglycerides, HDL cholesterol and glycaemia. The average values of all the marks of MS were higher in the group with the metabolic syndrome compared to the group of subjects without the MS and they increase with the increase of the number of components of the MS, with the exception of HDL, which decreases. This confirms that the subjects with the MS cannot be observed as a homogeneous unity, i.e. there are differences between the groups. The results of our study are in accordance with the results of the Atherosclerotic Cardiovascular Risk Factors in Danish Children and Adolescents study, according to which there is a difference in the groups that have a larger number of risk factors compared to those that have or do not have three risk factors present. According to the same authors, the increased number of risk factors of MS increases the risk of development of coronary arterial disease or diabetes. In our examined group the subgroup of subjects that had three risk factors present was the largest, and then followed the subgroup with five risk factors. Engstrom *et. al.* have shown in most of their research that hyperglycaemia, insulin resistance, dislipidaemia and hypertension are responsible for the development of the metabolic syndrome, while the increase of inflammation, i.e. dysfunction, is the basis for atherosclerotic changes in coronary arterial disease. [3–4]

The risk factors that are the criteria for diagnosis of the metabolic syndrome participate with a different percentage of participation.

In our group of subjects the most frequent risk factor was the low level of HDL cholesterol. According to Calabresi L. *et. al*. the inverted connection between HDL and the development of the metabolic syndrome, i.e. coronary arterial disease, is due to the protective role of HDL in the development of atherogenesis. They explain the central role of HDL in the reverse transport of cholesterol and its anti-inflammatory role [5]. A few eminent epidemiological studies grouped the low concentration of lipoproteins with a high density among the main independent risk factors for acute coronary cases [6, 7]. The atheroprotective role of HDL cholesterol can be explained by the reverse transport of cholesterol. [8, 9]

Although HDL is between the basic conditions of the anti-inflammatory molecules, in the course of acute and chronic diseases there is a decline in the concentration and changes in the content of the plasma. For instance, there is a connection between the serum amiloid A (SAA) and the ceruloplasmine and loss of part of apoA-I, apoA-II, paraoxonase and PAF-AH, which increase the connection of HDL with the macrophage and directing HDL towards the spot for tissue repair, as well as for neutralization of the effect SAA. The reactant of

the acute phase of the secretory PLA2 group II that is synthesised in vascular GMC, neutofilims, thrombocites in the human liver perform hydrolysis of phospholipids and catabolism of apoliproteins HDL *in vivo*, through which it comes to change the content of HDL molecules, as well as its decreased concentration in the plasma. These modified HDL molecules are less potent than the native in the protection of the oxidation of LDL, but most probably do not affect its anti-inflammatory activities, i.e. the inhibition of the expression of the adhesion molecules.

One of the possible relationships between inflammation of low degree and hypertriglyceridaemia might be IL-6 and TNF-ά that stimulate liposis and the increase of concentration of circulating SMK. But it should not be forgotten that hypertriglyceridaemia is part of the complex metabolic diseases which are connected with insulin resistance, abdominal obesity and low values of HDL-H. There is more and more evidence that low HDL is connected to the development of the dysfunction of endothels, thanks to its anti-inflammatory, anti-oxidative, anti-thromboic, anti-coagulative and pro-fibrinolitic effects [10, 11]. People with atherogenic dyslipidemy characteristic of MS have a higher risk of CVD compared to those with elevated LDL-H [12].

In the group of subjects with MS the second most frequent factor was arterial hypertension. Hypertension is one of the main risk factors for the development of ischemic heart disease, stroke, nephroangiasclerosis, as well as arteriosclerosis of the peripheral blood vessels.

Adipose tissue is a metabolically active endocrine organ. 20% of all the genes of subcutaneous adipose tissue and 30% of the genes of the visceral adiposites code the secretory bioactive proteins (adipocines). Adiposites are an important source of numerous pro-oxidative, pro-inflammatory, pro-coagulative and antifibrinolitic as well as anti-inflammatory substances. There is more and more evidence that adipokines IL-6, TNF-ά resistin can influence the initiation, progression and destabilization of the process of atherosclerosis.

The results of the study show that the high level of TNF-ά in healthy persons is connected to insulin resistance (metabolic syndrome) and endothel dysfunction. TNF-ά locally in autocrine and paracrine adiposities may lead to phospholization of the substrate serine of insulin receptors-1, inhibition of insulin signalization and the condition of insulin resistance among obese persons. However, TNF-ά is the main activator of NF-kB. With the activation of the sfingozine Kinaze, the transcription factor TNF-ά is activated, which later increases transcription of the genes for adhesion molecules ICAM-1 and VCAM-1 in the endothel, as well as the genes for MCP-1 and M-CSF in the endothel and GMC. In this way TNF-ά initiates adhesion, migration and differentiation of monocytes. In the microphages it increases the expression of the genes for inducible (NO), sintetasis, interleucines, super-oxide dismutase, etc. which lead to the activation of macrophages and the progression of atherosclerosis.

The latest studies that have dealt with the study of the endocrine functions of adiposities speak of the importance of the protein resistin in the development of insulin resistance and atherosclerosis. Human recombinative resistin influences the state of dysfunction of the endothelial cells in the culture. In the endothelial cells resistin activates NF-kB, and directly increases the expression of the genes for endothelin-1, VCAM-1, MCP-1 and pentraxin 3 (homologue CRP), and decreases the expression of the genes for the factor-3 connected with the receptor for TNF (TNF receptor-associated factor-3 /TRAF3/), which represents an important inhibitor of the signal way of CD40 liganda.

Moreover, hypoadiponectinemia, together with the increase of TNF-ά, resistin, CPR and PAL-1 in the plasma from adipose tissue can be the basis for atherosclerosis and insulin resistance, i.e. metabolic syndrome and mellitus diabetes.

In the group with the metabolic syndrome abdominal obesity was the least present. We can say that the application of European criteria for abdominal obesity was more suitable in our research than the ATP III classification that applies mostly to Americans, who have a greater value for waist circumference than Europeans.

And that must be the reason why abdominal obesity was least present in the group with the MS in our research.

Obesity and especially the disproportional accumulation of visceral adipose tissue (central obesity) is a pro-inflammatory state and thus it is connected with an increased risk of cardiovascular diseases.

Visceral obesity has frequently been connected with hyperglyceridemia, low values of HDL cholesterol, while the level of LDL cholesterols usually remains in the realm of normal values, it changes a bit in quality dense LDL clots, that are especially keen on oxidation and initiation of inflammation, then on hypertension, disturbance of tolerance of glucose, endothelial disfunction, proinflammatory and a hypercoagulative state. According to ATP III, the simultaneous existence (three or more) of these dysfunctions is defined as the metabolic syndrome. Ram N. Jeiss and others have shown that three factors: obesity and metabolic glucose, the level of dislipidemia and blood pressure explain c. 60% of the total variations in diagnosing the metabolic syndrome, 17% goes to the second factor and 14% to the third factor [13].

Haffner, Taegtmeyer, Reilly and Rader are consistent in the identifycation of insulin resistance as the central pathophysiologic process behind the metabolic syndrome [14]. They identify natural immunity and inflammation as secondary to genetic predisposition, and then modified surroundings as probably the closest reason for the development of insulin resistance. What the theory of the pathogenesis of this syndrome needs to explain is that in the absence of replacement in the genetic configuration, the current epidemics of the

metabolic syndrome have been kindled by exterior factors, immunity and inflammation.

On the basis of the results of clinical studies and experimental research it can be said that the process of inflammation is at the basis of the process of atherosclerosis and insulin resistance, i.e. the metabolic syndrome. The metabolic syndrome can thus be considered as a pro-inflammatory and pro-thromboic state that seems to represent a pathophysiological mechanism of elevated risk of ischemic heart diseases and diabetes in this disease. Furthermore, the increase in the prevalence of the metabolic syndrome and its strong connection with ischemic heart diseases call for an early recognition of these persons and the prompt application of suitable non-pharmacological and/or pharmacological treatment. From the therapeutic point of view, it is important to emphasize that regular physical activity and the reduction of body weight lead to a simultaneous change in the concentration of adipokines, endothel functions and prevention of diabetes.

Conclusion

According to the results of our research the prevalence of the metabolic syndrome in apparently healthy persons who have a sedentary life-style is 39.7%, while with the increase in the number of the components of this syndrome the prevalence decreases. In all the examined persons a low level of HDL-H was the most frequent factor, and the waist circumference the least frequent of the metabolic risk factors. The average values of all the marks of MS were higher in the group that had the metabolic syndrome compared to the group that did not have it, and these increased with the increase in the number of components of MS, with the exception of HDL, which decreased. In persons with the metabolic syndrome compared to persons without it the frequency of all the components of the metabolic syndrome was higher, and this is statistically important.

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Резиме

ЕПИДЕМИОЛОШКИ КАРАКТЕРИСТИКИ НА МЕТАБОЛНИОТ СИНДРОМ КАЈ НАИЗГЛЕД ЗДРАВИ ЛИЦА

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Апстракт: Метаболниот синдром или синдром X, привлекол внимание на голем број истражувачи насекаде во светот. Големиот интерес којшто го предизвикал овој ентитет, се толкува преку влијанието на неговите составни компоненти кои претставуваат водечки болести на современата цивилизација.

Целта на ова истражување ја одредува преваленцата на метаболниот синдром, процентуалното учество на факторите на ризик кои ја дефинираат оваа состојба, нивната корелациска зависност и влијанието на другите фактори на ризик (пушење, алкохол, семејна анамнеза за коронарна артериска болест или дијабет, физичка активност и вид на исхрана) врз појавата на метаболниот синдром, одговорни за создавање на коронарна артериска болест. Кај овие испитаници се утврдува метаболен синдром доколку имаат три или повеќе фактори на ризик од потребните пет. Преваленцата на метаболниот синдром во оваа испитувана популација е 39,7%. Преваленцата на метаболниот синдром кај групата со присутни три фактори на ризик е 26,9%, со четири фактори на ризик е 9,6% и пет фактори на ризик е 3,2%. Факторите на ризик, во групата со метаболен синдром, разгледувана како единечна, се скоро подеднакво застапени, со исклучок на обемот на половината. Зголемениот обем на половината учествува со 6,6% во оваа испитувана група.

Со примена на корелациона анализа на меѓувлијанието (позитивно или негативно) на ризичните фактори внатре во самите групи се утврди дека меѓузависноста е помногубројна во групата со најмал број на фактори на ризик (од 0–2), т.е. групата без МС.

Нашите истражувања потврдуваат дека доколку испитувањата се посеопфатни во однос на сите ризик фактори, полесно се лоцираат индивидуите кои може да страдаат од коронарна артериска болест или дијабет тип 2.

Клучни зборови: метаболен синдром, хипертензија, дислипидемија, хипергликемија, абдоминална дебелина.

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