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Available online at: http://www.iajps.com **Research Article**

PREVALENCE OF METABOLIC SYNDROME IN ADULT POPULATION OF LAHORE

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Abstract:

Aim: *To estimate the prevalence of metabolic syndrome (MetS) and its individual components in the adult population.*

Place and Duration: *In the Medicine Unit II of Jinnah Hospital Lahore for one year duration from March 2019 to March 2020.*

Methods: *A total of 630 people over the age of 18 were randomly selected from the primary healthcare register to represent a representative sample of the population in the Tetovo poviat, adjusted for age and gender. MetS is defined according to the definition of the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATPIII).*

Results: *The prevalence of MetS was 28.25%. It was much higher in women than in men (34.06% vs. 22.26%, p = 0.004). The largest number of people from MetS living in rural areas (31.32% vs. 23.60%, p = 0.002). Of the individual components of MetS, 52.06% of the population had elevated blood pressure, 46.35% lowered high-density lipoprotein cholesterol (HDL-C) and 43.17% abdominal obesity (AA). In the female population, abdominal obesity was more dominant (59.38% and 26.54%, p = 0.000), and men were more dominated by increased blood pressure (53.44% and 50.65%, p = 0.48).*

Conclusion: *The prevalence of MetS is high in our society, especially among women. Rates of hypertension and abdominal obesity are among the highest in the region. Advice on diet and lifestyle changes, in addition to drug therapy in this category, would contribute to the prevention of cardiovascular disease, type II diabetes and complications associated with these diseases.*

Key words: *metabolic syndrome, prevalence, abdominal obesity.*

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INTRODUCTION:

Metabolic syndrome (MS) is a combination of cardiovascular diseases and metabolic and anthropometric abnormalities that increase the risk of type 2 diabetes, which increases the risk of cardiovascular disease, cardiovascular death, myocardial infarction and cerebrovascular insults. - 3 times. It is also associated with a 3.5 to 5-fold increase in the risk of type 2 diabetes. The incidence of this syndrome is high and is increasing in both developed and developing countries. In Pakistan, it is thought to affect 1 in 4 people and 1 in 3 people in the. There are many reports of the prevalence of metabolic syndrome in various populations. It depends on the metabolic syndrome and the definition used to determine the age of the participating population. However, despite the same methodology used in the study, the incidence of MS often presents with different values for different countries. There are racial, ethnic, socio-economic and socio-cultural factors from various communities that influence this change.

In the NHANES study for the American, multiethnic and multiethnic population, prevalence was 31.9% among Mexican Americans, 23.8% among White Americans and 21.6% among African Americans. Even in the CARMELA study for Latin American countries and the DECODE study for different European countries, the differences in metabolic syndrome were clearly noticed. On the other hand, among women (India, Brazil, Mexico, Peru, Iran, Spain, Tunisia, Jordan, and Turkey) than men (France, Pakistan, Germany, Australia, Finland, and Denmark) more frequent occurrence, as well as other cultural differences and different social conditions -economic. In some countries (Bulgaria, Romania and Greece) almost the same results were found for both sexes. Many studies show a growing trend in the prevalence of metabolic syndrome. In the adult American population, the NHANES study has increased by 5% over the past 15 years. Similar data was obtained from the San Antonio Heart Study and some other studies. Due to the emerging size of the epidemic and the obvious impact on the prevalence of social, economic and lifestyle-related factors, MetS is not only a health problem, but also a global socio-economic problem. To date, no studies have been conducted on the prevalence of metabolic syndrome and its components at regional and national levels.

MATERIALS AND METHODS:

This study was held in the Medicine Unit II of Jinnah Hospital Lahore for one year duration from March 2019 to March 2020. This cross-sectional study was conducted among people aged> 18 years (average age 43.81 ± 16.01 years, ± 95% CI: 42.56 to 45.06). Samples were randomly selected from the primary healthcare register. As part of the efforts to achieve the objectives of primary healthcare in the field of preventing cardiovascular disease in men and women over the age of 18, the family doctor periodically randomly invites all important people to the study. It was from this contingent that participants were also recruited for our study. Inclusion criteria were all persons over the age of 18. Pregnant women are excluded from the study. All participants were interviewed by completing the questionnaire in accordance with "WHO STEPS, a chronic disease risk factor monitoring instrument" modified for current conditions. The questionnaire was completed by the GP according to the instructions and initial training on the interview method. Anthropometric measurements were made according to standard techniques and equipment (OBSH international obesity test 1998) for light clothes. Measurements are performed twice and their average is used as the final reading. The waist circumference (WC) of all subjects was measured with a tape measure at the midpoint between the bottom margin of the last palpable rib and the top of the ileum. The measurement was carried out in centimeters (cm), with a margin of about 1 cm. Abdominal obesity is considered a waist circumference ≥102 cm for men and ≥ 88 cm for women. Blood pressure (BP) in all patients was measured using a digital monitor (OMRON T5, Japan). Measurements were taken twice (5 minutes apart) and the average of two measurements was recorded. Hypertension is considered a systolic blood pressure of 130 mmHg or more and a diastolic blood pressure of 85 mmHg or higher, or the use of antihypertensive drugs.

1. Abdominal obesity (waist circumference ≥ 102 cm in men and ≥ 88 cm in women). Venous blood samples for total cholesterol (TC), HDL cholesterol (HDL-C), triglycerides (TG) and glycemia measurements were collected in the morning after 10 hours on an empty stomach. All samples were analyzed on the same day using the Roche Diagnostic COBAS Integra 400 biochemical analyzer. To determine the metabolic syndrome, we used revised criteria according to the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATPIII) 2005. According to this definition, it considers the metabolic syndrome people who had at least three of these 5 factors:
2. Triglycerides ≥ 1.7 mmol / l or specific treatment for this disorder.
3. <1.03 mmol / l in men and <1.29 mmol / l in women or HDL cholesterol or specific treatment for this disorder.
4. Treatment of systolic blood pressure ≥ 130 mmHg and / or diastolic blood pressure ≥ 85 mmHg or hypertension.
5. Fasting glucose ≥ 5.6 mmol / l or previously diagnosed with type 2 diabetes.

Statistical Analysis

The processing of statistical data takes place in the statistical programs STATISTICA 7.1 and SPSS 18.0. The following methods were used:

• In series with numerical variables, were assigned: Descriptive Statistics (Mean ± SD ± 95.00 CI: Minimum Value, Maximum Value)

• In series with categorical variables, differences between analyzed parameters are tested with Pearson Chi- square ($\chi 2$);

• In numerical series with no deviations from a normal distribution, the difference between the two independent samples was tested by t-test for independent samples.

• In numerical series with a deviation from a normal distribution, the difference between the two independent samples was tested by Mann-Whitney U test (U/Z);

• The prognostic role of certain parameters analyzed as independent variables on MetS as a dependent phenomenon is assigned with the application of Logistic Regression (Chi Square, WALD, Exp (B)).

RESULTS:

Of the 630 people who participated in the study, 310 (49.21%) are men and 320 (50.79%) are women. The mean age of the patients ranged between 43.81 ± 16.01 years, ± IC 42.56-55.06, the minimum age was 18 years and the maximum age was 89 years. Descriptive statistics of the parameters analyzed at the sample level are presented in Table 1.

Table 1 Descriptive statistics of the study subjects

Variables	Valid N	Mean	Confidence −95.00%	Confidence +95.00%	Minimum	Maximum	S.D
Glucose	630	5.41	5.27	5.56	3.7	21.8	1.86
TG	630	1.68	1.61	1.76	0.34	8.7	0.99
HDL-C	630	1.25	1.22	1.28	0.37	5.5	0.4
WC	630	93.28	92.28	94.29	58	161	12.82
SBP	630	132.22	130.45	133.99	90	230	22.58
DBP	630	82.17	81.22	83.13	45	140	12.17
Weight	630	78.31	77.33	79.3	42	118	12.59
Height	630	170.06	169.41	170.72	150	195	8.36
BMI	630	27.14	26.79	27.49	16	47.84	4.47

S.D: Standard Deviation; TG: Triglycerides; HDL-C: High Density Lipoprotein Cholesterol; WC: Waist Circumference; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; BMI: Body Mass Index

In our study, 178 people met the criteria for metabolic syndrome. Prevalence rates were 28.25%; 109 (34.06%) are women and 69 (22.26%) are men (Table 2). The incidence of metabolic syndrome in women for p <0.01 (p = 0.004) was significantly higher than in men.

Table 2 Prevalence of metabolic syndrome and its components by sex and age group

Variables	Prevalence %					
	Metabolic Syndrome	Arterial Hypertension	Hyperglycemia	Abdominal Adiposity	Low HDL-C	Hypertriglyceridemia
Total	28.3	52.1	25.2	43.2	46.4	39.1
Male	22.3	50.7	25.8	26.5	44.5	42.3
Women	34.1	53.4	24.7	59.4	48.1	35.9
p value	p=0.004**	p=0.48	p=0.75	p=0.000***	p=0.50	p=0.10
-	-	χ^2=0.49	χ^2=0.10	χ^2=69.57	χ^2=0.444	χ^2=2.64
Age group						
18-29	3.3	18.4	13.1	10.5	32.7	22.9
30-39	22.8	30.2	20.6	32.4	48.5	45.6
40-49	33.9	60.6	21.3	52	40.9	44.9
50-59	40	78	35	63	23	45
60-69	51.6	90.3	41.9	74.2	33.9	38.7
>70	51.9	92.3	44.2	71.2	19.2	44.2
p value*	P=0.000***	P=0.000***	P=0.000**	P=0.000***	P=0.002**	P=0.000***
-	-	χ^2=196.85	χ^2=38.78	χ^2=134.18	χ^2=18.88	χ^2=23.15

χ^2 Test; p<0.05*; p<0.01**; p<0.001***

Most people with MetS lived in the rural area (31.32% vs. 23.60%) (95% CI: 2.7923 - 12.5985, p = 0.002). Tables 3 and 4 show the differences in the analyzed parameters between men and women with metabolic syndrome. Men have triglyceride values (Z = -2.17 and p <0.01), height (Z = -7.87 and p <0.001) and weight (for t = -4.13 and p <0.001) compared to women. Women have HDL-C (Z = –3.33 and p <0.001) and SP (Z = 2.82 and p <0.01) compared to men. Differences in other parameters were not significant.

Table 3 Analyzed parameters, subjects with Met, differences, men and women

Variables	Rank Sum Women	Rank Sum Male	U	Z	p-value	Valid N	Valid N
Glucose	9296	6635	3301	−1.37	0.17	109	69
TG	9029	6902	3034	−2.17	0.03*	109	69
HDL−C	10872	5059	2644	3.33	0.000***	109	69
WC	8797.5	7133.5	2802.5	−2.86	0.00**	109	69
SBP	10700	5231	2816	2.82	0.00**	109	69
DBP	10249.5	5681.5	3266.5	1.47	0.14	109	69
Height	7121	8810	1126	−7.87	0.000***	109	69
Mann-Whitney U Test (U/Z); p<0.05*; p<0.01**; p<0.001***; TG: Triglycerides; HDL-C: High Density Cholesterol; WC: Waist Cicrcumference; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure							

Table 4 Analyzed parameters, subjects with Met differences men and women

Variables	Mean femra	Mean Meshkuj	t-value	df	p	Valid N	Valid N
Weight	82.78	89.824	−4.13	176	0.000***	109	69
BMI	31.11	30.1	1.64	176	0.1	109	69
t-test; p<0.001*** BMI: Body Mass Index							

Figure 1 shows the prevalence rates of people with metabolic syndrome by sex and age. They increase the prevalence rate with age in both sexes. There was no significant difference between the sexes in the distribution of cases with metabolic syndrome by age range 2 = 6.31 and p> 0.05 (p = 0.28).

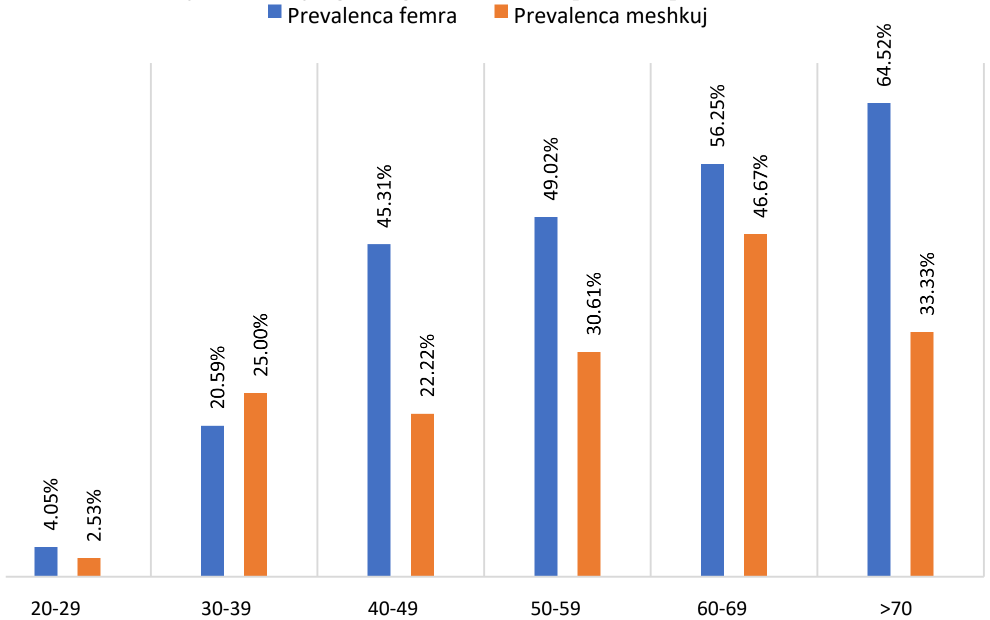

Figure 1 Prevalence of metabolic syndrome/distribution by age and sex

In Figure 2 and Table 2 is shown the prevalence of particular components of the metabolic syndrome in general and by gender to the surveyed subjects (n=630). The most common component was arterial hypertension (52.06%). However, in women, the most common component was abdominal obesity, with a significant difference in relation to men (59.38% vs. 26.54%; p=0.000), whereas decreased HDL-C level was also most common in women, but the difference was not significant (48.13% vs 44.51%, p=0.505). Most common component in men was arterial hypertension, but the difference was not significant (53.44% vs. 50.65%, p=0.48), as well as hyperglycemia and hypertriglyceridemia (25.81% vs. 24.69%; p=0.75 and 42.26% vs. 35.94%; p=0.10) respectively.

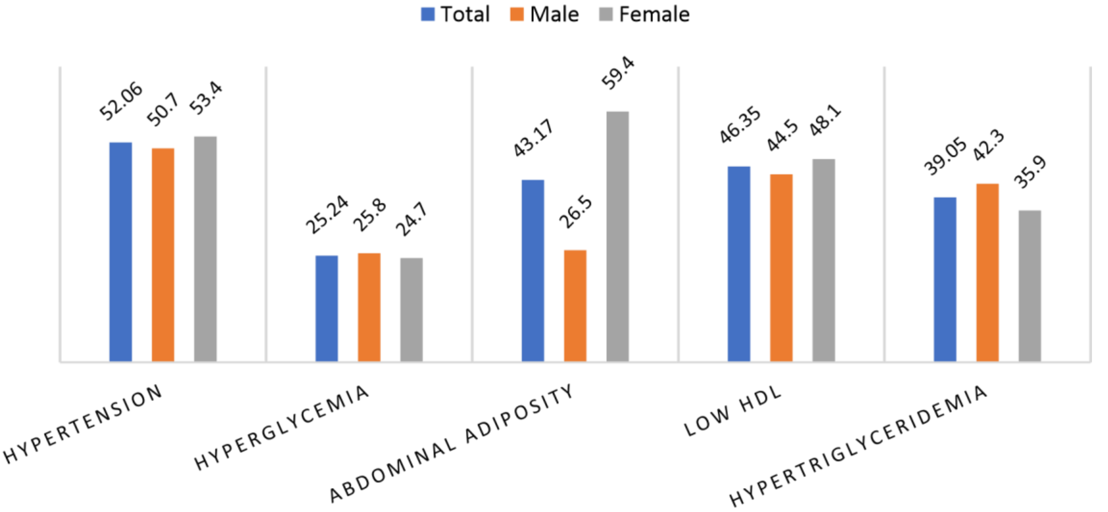

Figure 2 Prevalence of specific components of metabolic syndrome, in total and by sex (N=630)

Table 2 and Fig. 3 show the distribution of prevalence of metabolic syndrome components by age group. In the distribution of patients with respect to hypertension by age (for = 2 = 196.85 and p <0.001), hyperglycemia (for $\chi 2$ = 38.78 and p <0.001), abdominal hydration (for $\chi 2$ = 134.18 and p <0.001) , low HDL - there was a significant difference between C (for $\chi 2$ = 18.8887 and p <0.05) and hypertriglyceridemia (for $\chi 2$ = 23.15 and p <0.001).

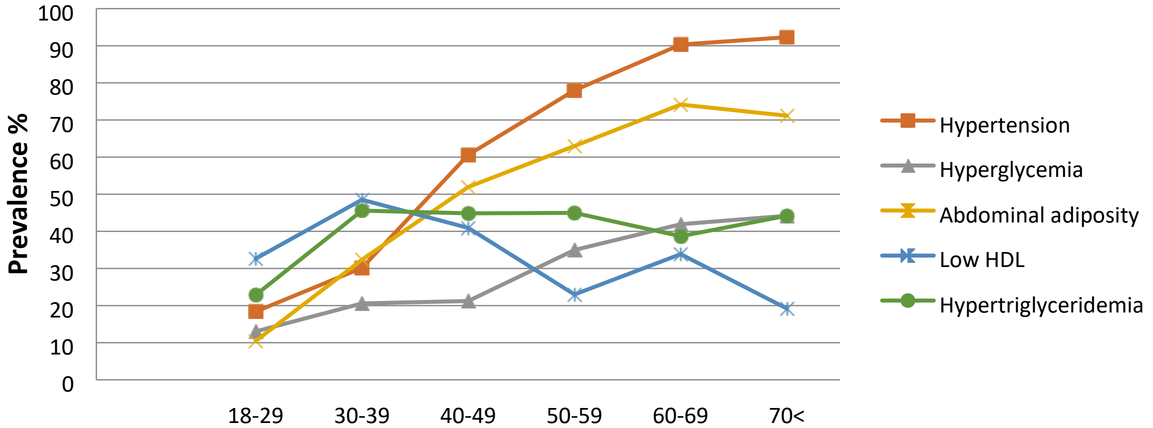

Figure 3 Components of metabolic syndrome/prevalence by age group (N=630)

Table 5 shows the prevalence of specific components of the metabolic syndrome in patients with metabolic syndrome (n = 178). Abdominal adiposity (94.94%) and high blood pressure (85.5%) were the most common components in both sexes, but there was no significant difference between the two sexes (p = 0.73 and p = 0.38). Only the incidence of hypertriglyceridemia showed a significant difference between the sexes (men 82.6 and women 65.1) for dla2 = 6.38 and p <0.05 (p = 0.01).

Table 5 Prevalence of metabolic syndrome components in subjects with metabolic syndrome (n=178)

Variables	Prevalence %				
	Arterial Hypertension	**Hyperglycemia**	**Abdominal Adiposity**	**Low HDL-C**	**Hypertriglyceridemia**
Total	88.2	57.9	94.9	60.01	71.9
Male	85.51	62.32	96.67	62.31	82.61
Women	89.91	55.05	94.5	58.71	65.14
p-value*	p=0.38	p=0.34	p=0.73	p=0.07	p=0.01*
χ2	χ^2=0.79	χ^2=0.92	χ^2=0.12	χ^2=3.23	χ^2=6.38

χ^2 Test; *p<0.05

The distribution of subjects (n = 630) by number of available MetS components is shown in Table 6. Only 16.03% (19.35% men and 12.81% women) of the total number of patients did not have components of the metabolic syndrome. 83.97% (80.64% men and 87.18% women) had at least one MetS component. At least 2 components had more than half of the respondents (51.61% men and 62.8% women). Of the 5 components, there were 2.38% (2.26% men and 2.5% women).

Table 6 The prevalence by number of components of metabolic syndrome by sex

Components	Prevalence %		
	Total (n=630)	Male (n=310)	Women (n=320)
0	16.03	19.35	12.81
>1	83.97	80.64	87.18
>2	57.3	51.61	62.8
>3	28.25	22.26	34.06
>4	13.01	9.36	16.56
5	2.38	2.26	2.5

The predictable role of glucose, triglycerides, HDL-C, waist circumference, systolic blood pressure (SBP), diastolic blood pressure (DBP) and age were analyzed as independent variables in the appearance of the metabolic syndrome. (Table 7).

Table 7 Estimating the predictive role of glucose, triglycerides, HDL-C, abdominal adiposity (WC) systolic blood pressure, diastolic blood pressure and age in Mets

Step 1(a)	B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I. for Exp(B)	
							Lower	Upper
Gl	0.397	0.099	16.076	1	0	1.487	1.225	1.806
TG	0.977	0.16	37.359	1	0	2.655	1.941	3.631
HDL-C	-2.793	0.479	33.929	1	0	0.061	0.024	0.157
WC	0.097	0.022	20.034	1	0	1.102	1.056	1.150
SBP	0.028	0.009	9.452	1	0.002	1.028	1.010	1.047
DBP	0.020	0.018	1.309	1	0.253	1.020	0.986	1.056
Age	0.017	0.008	4.236	1	0.04	1.018	1.001	1.035
Constant	24.978	23.711	1.110	1	0.292	0.7043	-	-
a Variable(s) entered on step 1: Gl, Tr. HDL-C, WC, SBP, DBP, Age Note: Gl: Glucose; TG= Triglycerides; HDL-C: High Density Cholesterol; WC: Waist Circumference; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure								

Triglyceride / WALD = 37.36 (p <0.001) has the greatest impact on the appearance of metabolic syndrome, then HDL-C / WALD = 33.93 (p0.001), waist circumference (WC) / WALD = 20.03 (p <0.001)), glucose / WALD = 16.08 (p <0.001), SBP / WALD = 9.45 (p <0.01) and age / WALD = 4.24 (p0.05). The effect of DBP in the appearance of metabolic syndrome was not significant for P> 0.05. When triglycerides increase by 1 mmol / L, the risk of metabolic syndrome increases by 165.5%, Exp (B) = 2.655. The effect of triglycerides was significant ± CI: 1.94-3.63, p <0.001 (p = 0.000).

When HDL-C increases by 1 mmol / L, the risk of metabolic syndrome decreases by 93.9%, Exp (B) = 0.061, HDL-C effect significantly ± CI: 0.02-0.16, p <0.001 (p = 0.000), metabolic HDL-C It can be said to be protective in the appearance of the syndrome. When the glucose level increases by 1 mmol / L, the risk of metabolic syndrome increases by 48.7%, Exp (B) = 1.49, the glucose effect is significant ± CI: 1.23-1.81, p <0.001 (p = 0.000).

During an increase in abdominal obesity by 1 cm (waist circumference) the risk of metabolic syndrome increases by 10.2%, Exp (B) = 1.102, the effect of abdominal obesity is significant ± CI: 1.06-1.15, p <0.01 (p = 0.002). During the annual increase in age, the risk of metabolic syndrome increases by 1.80%, Exp (B) = 1.02, the age-related effect is significant ± CI: 1.001-1.04, p <0.05 (p = 0.04).

DISCUSSION:

This is the first study of this type devoted to the occurrence of metabolic syndrome in the Republic of Macedonia. In this study, we calculated the incidence of MetS and its individual components by sex and age group. Our research sample, consisting of 630 people selected from basic age and gender adjusted medical records. To compare the prevalence values obtained in our study, we used populations with age groups approximately equal to our study age groups, as well as studies from different countries, using the definition of the same criteria. The incidence of MetS was 28.25%. It was significantly higher in women than in men (34.06% vs. 22.26%). Most people with MetS lived in rural areas (31.32% and 23.60% s). The differences in this matter are explained by social, economic and cultural factors. In our study, the overall incidence of MetS is similar to the incidence in the region. According to multicentre studies, the overall incidence in Greece was slightly lower (24.5%) than in the definition of NCEP-ATP III. The lowest incidence of MetS was conducted in the study (23%) on 575 healthy people in Bulgaria. However, the limit for hyperglycemia in these two studies was 6.1 mmol / L (according to NECPT ATP III, 2001), while in our study it was 5.6 mmol / L (according to NECPT ATP III, 2005). This may be the reason for more frequent occurrence in our study. According to a survey of 2,200 people in Romania, prevalence was 24%. However, while the incidence of MetS in both neighbors in neighboring countries was approximately the same, in our study the incidence of MetS was significantly higher among women (34.06% vs. 22.12%). The reason was the difference in the frequency of moisturizing the abdomen. In our study, women were much more present than men (59.4% vs. 26.5%). In Iran (36.3% and 48.5%, respectively), India (22.9% and 39.9%), China (Shanghai) (28.4% and 35.1%)). In these studies, the difference is attributed to socioeconomic and cultural factors in favor of more women with metabolic syndrome. We believe that these factors also affect differences in our research. Otherwise, many studies have shown that the level of education and family income in developed and developing countries are important socioeconomic determinants at the beginning of the metabolic syndrome and are inversely associated with the occurrence of metabolic syndrome. This is especially evident in the female population.

On the other hand, comparison with Western European countries means that the incidence of Mets is much lower than in our country. In the DECODE study, which included 9 groups of 7 studies in European countries, the prevalence of MetS was 15.7% in men and 14.2% in women. Diabetic patients were excluded in this study, but the population in these studies was older than us (30 to 89 years old). It is believed that this difference in prevalence is attributed to the above-mentioned economic, social and cultural differences. The results of the impact of these factors on our conditions in the study population will be presented in our next study. Several studies have shown an increase in the prevalence of MetS compared to previous studies. In developing countries, a growing trend is observed due to rapid urbanization, better nutrition and the introduction of a Western lifestyle, which leads to an increase in the number of obese people. On the other hand, in some countries, especially in Western Europe, there has been a stagnation or decline in the prevalence of MetS as a result of measures taken to combat certain risk factors as elements of MetS. We have no previous research for our region in the Republic of Macedonia in which we could compare the MetS dissemination trend. The peculiarity of all studies on the prevalence of MetS is the increase in prevalence rates in addition to the increase in age group. Even in our study, the relationship between age ranges and the corresponding MetS prevalence rates for R = 1.0 ($p > 0.05$) showed a maximum positive correlation. In the 30-39 age group the incidence was higher in men (25.5% vs. 20.59%), in the 40-49 age group women were significantly higher (22.22% compared to 45.31%) , and the trend was 50–59, continued for people aged 60–69 and people over 70. In our case, the significant increase in prevalence among women in the age group 40–49 is mainly due to the component of abdominal obesity, which indicates a significant increase in the number of women after 40. When we analyzed the occurrence of specific components, in our example the highest prevalence was high blood pressure, from 52.06%. However, abdominal hydration dominates in women. Over half of the women in our study had abdominal fat, and almost half had high blood pressure and low HDL-C cholesterol. A significant difference between men and women of all ingredients was only abdominal fat. This advantage in moisturizing the abdomen "in favor" of the female population explains the reason for the high incidence of metabolic syndrome in women. The incidence of abdominal obesity and hypertension is highest compared to other studies. In our study, the population with two or more risk factors was 57.3%. This is definitely an important indicator! Although the prevalence of MetS at an early age related to indicators set out in other studies, our study included a large number of young people (20.26% of young people between 20 and 29 years old) who had 1 and 2 MetS components. the addition was dyslipidemia (reduced HDL-C and hypertriglyceridaemia).

CONCLUSION:

The results of this study have shown that the incidence of MetS is high, especially in the female population. The occurrence of high blood pressure and abdominal obesity is one of the highest reported rates. This disturbing data is certainly a challenge for the healthcare industry. As defined by the NCEPT ATP III, defining assets using MetS is very simple and cheap. This can easily be done in a primary (family) clinic based on the results of joint anthropometric and laboratory measurements. In addition to drug treatment in this category, advice on diet and lifestyle changes will contribute to the prevention of cardiovascular diseases, type II diabetes and complications of these diseases.

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