Evaluation of metabolic syndrome prevalence

In semi-rural areas of Central Anatolia, Turkey

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ABSTRACT

الأهداف: تحديد معدلات الانتشار والظهور المكثف للمتلازمة الأيضية (MetS) ومكوناتها في مناطق شبه نائية بوسط الأناضول.

الطريقة: تم إجراء الدراسة خلال الفترة يناير2008 إلى أغسطس 2008، تم اختيار عينة عشوائية من أشخاص بمنطقة أسكي سهير– وسط الأناضول ـ تركيا. تم تشخيص المتلازمة الأيضية في حالة وجود 3 عوامل أو أكثر وفقا لمعاير(NCEP ATP III). تم تحديد الانتشار القياسي للمتلازمة الأيضية حسب العمر، و الانحدار اللوجستي لتحديد عوامل الخطورة المؤثرة في معدل انتشار المتلازمة الأيضية.

النتائج: تألفت مجموعة الدراسة من 2,766 فرد (40.4%) ذكر، و (59.6%) أنثى. قد كان المعدل العام لانتشار المتلازمة عمريا 27.6% مع قيمة بنسبة 19.4% للذكور، و33.2% للإناث. أن انتشار المتلازمة يزداد بتقدم العمر في كلا الجنسين. أظهرت المجموعة التي تشارك في التمارين الجسدية الشاقة والتدخين قابلية منخفضة للإصابة بالمتلازمة الأيضية، بينما تقل خطورة المتلازمة الأيضية لدى الذكور الذين يستهلكون كميات كافية من اللحوم الحمراء والفواكه والخضروات. الإناث في المجموعة المصابة بالمتلازمة الأيضية أكثر عرضة للسمنة الوسطية، بينما الذكور أكثر عرضة لفرط سكر الدم. وفي المجموعة الغير المصابة بالمتلازمة الأيضية الإناث أكثر عرضة للسمنة الوسطية و ارتفاع ضغط الدم، أما الذكور فأكثر عرضة لفرط سكر الدم.

خاتمة: تعتبر المتلازمة الأيضية مشكلة كبيرة في منطقة أسكي سهير. كما أن تغيير نمط المعيشة لدى السكان أمر حتمي من شأنه أن يقلل من عوامل خطورة هذه الحالة.

Objectives: To assess the prevalence and clustering of components of metabolic syndrome (MetS) in semi-rural areas of Central Anatolia, Turkey.

Methods: This study was conducted between January and August 2008 on a randomly selected sample of participants from semi-rural settlement areas of the Eskisehir province, Central Anatolia, Turkey. The MetS was diagnosed as the presence of 3, or more risk factors according to the National Cholesterol Education Program-Expert Panel Adult Treatment Panel III (NCEP ATP III) criteria. The MetS prevalence was standardized according to age, and logistic regression was used to determine the risk factors affecting prevalence.

Results: The study group composed of 2,766 people (40.4% male, 59.6% female). The corrected MetS prevalence according to age was 27.6%, with values of 19.4% in males, and 33.2% in females. The prevalence increased with increasing age in both genders. Groups engaged in heavy physical exercise, and smoking showed decreased odds of having MetS, while MetS risk was lower in men who consumed proper amounts of red meat, fruits, and vegetables. In the MetS group, central obesity risk was higher for women, whereas hypertriglyceridemia risk was higher for men. In the non-MetS group, hypertension, and central obesity risks were higher for women, whereas hypertriglyceridemia risk was higher for men.

Conclusion: It was concluded that MetS is a major problem in the Eskisehir province, and it is imperative that changes in lifestyle be made within this population to reduce the risk factors for the condition.

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Metabolic syndrome (MetS) is characterized by multiple factors, including abnormal fat distribution, dyslipidemia, hypertension, hyperglycemia as a result of insulin resistance, and obesity.[1,2] According to several studies, people with MetS are considered to have high risk of cardiovascular disease (CVD).[3,4] The MetS is based on the concept that the clustering of risk factors is predictive of CVD above and beyond the risk associated with individual components,[5] although the transition from a rural to an urban lifestyle is associated with a deterioration in the CVD risk profile.[6] Assessment of the prevalence and components of MetS in a country can provide important insight into the pathogenesis of MetS, and also assists in health care planning.[7] Since 1998, several definitions and sets of criteria have been used for MetS by the World Health Organization (WHO),[8] the National Cholesterol Education Program Adult Treatment Panel Adult Treatment Panel (NCEP-ATPIII,[9-11] the International Diabetes Federation,[12] and the American Association of Clinical Endocrinologists (AACE).[13] The NCEP-ATPIII criteria that identify people with higher risk is the most commonly used definition due to its ease of use in clinical studies.[9-11] Using the NCEP definition on a representative sample of 8814 men and women from the USA, the age-adjusted prevalence of the MetS was 24% in men, and 23.4% in women.[14] However, in Turkey, there is to date lack of data regarding the prevalence of, and the risk factors for MetS.[15-18] The aim of this study was to assess the prevalence, and to cluster the components of MetS according to the NCEP-ATP III diagnostic criteria in Eskisehir, a region of Central Anatolia, Turkey that contains semi-rural resettlement areas.

Methods. This study was conducted on a sample of people from the semi-rural settlement areas of Eskisehir, which is located in the Central Anatolia Region, Turkey. Eskisehir is one of the most developed provinces in Turkey, but its rural areas are still very much underdeveloped. According to records, the population of Eskisehir was 724,849 in total as of 2007, and the registered population between 20-69 years of age was 402,125 (66.7%).

Population study. According to the Turkish Statistical Institute (TSI), locations where the population is below 5000 are defined as semi-rural regions.[19] The study was conducted at 2 semi-rural areas (Çukurhisar and Muttalip), 20 kms away from Eskisehir. People in these areas earn their living primarily by farming, or working in factories. The population size of people ages 20-69 in Çukurhisar is 2376 and 4681 for Muttalip. At the beginning of the study, the sampling volume for each of the regions was estimated to be 1500 (assuming the use of 95% confidence interval, the detectable difference in the percentage of interest = 2%, and that the frequency of metabolic syndrome estimated = 20%).

The interviewers visited the mapped areas of each semi-rural region, and made a list of the streets in each region. We determined the first house to visit on the street from a random number table, and then reached the targeted number of people for each area by choosing one out of every 3 houses in Muttalip, and one out of every 2 houses in Çukurhisar. While the target number was 1500 for each region, we reached 1415 for Çukurhisar and 1500 for Muttalip. The following day, 1318 (from Çukurhisar [participation rate - 93.1%]), and 1448 (from Muttalip [participation rate - 96.5%]) people responded to the invitation to participate in the survey. There were no differences between those who participated, and those who did not in terms of age, gender, or sociodemographic features. In total, 2766 people were enrolled in the study. The approval of the local committee (certification number: 2007/381), and verbal consent from the participants were received prior to participants' enrollment in the study.

Between January to August 2008, houses in the selected regions were visited, and a survey was carried out addressing sociodemographic features such as age, marital status, educational status, occupation, and household income, as well as cardiovascular risk factors including nutritional habits, smoking, and physical activity. These participants were then invited to 2 sites in the center of the towns so that fasting blood samples, and measurements of blood pressure, weight, height, and waist/hip ratio can be obtained.

Definitions. Physical activity was measured using the short version of the International Physical Activity Questionnaire (IPAQ) with a weekly recall.[20] A physical activity score was calculated by adding the weekly time spent at moderate-intensity activities to twice the weekly time spent at vigorous-intensity activities. The scores were categorized into 4 groups: 0 minutes per week - inactive; one-149 minutes per week - insufficiently active; 150-999 minutes per week - sufficiently active; ≥1000 minutes per week - highly active. The 2 least active groups did not reach current physical activity requirements, which are at least 150 minutes per week of moderate-intensity physical activities.[21]

We defined a smoker, as a person who smokes at least one cigarette a day. In order to determine nutrition habits, inquiries were made into the participants consumption of oil, fresh vegetables, fruits, red meat, and salt. The oil types appraised were vegetable, animal,

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margarine, and mixed. We defined "inappropriate eating of fat" as consumption of animal fats, and margarine. Inappropriate eating habits were defined as follows: eating 3 or more servings of red meat per week, eating vegetables 3 times a day or less, and eating fruits 3 times a day, or less. Extra salt intake was reported if the individual endorsed the use of extra salt during meals.[22,23]

Blood examination. A fasting blood sample was taken for biochemical analysis early in the morning after an overnight fast (10-12 hours). Blood was allowed to clot for 30 minutes (min) at room temperature, and serum was obtained via centrifugation (15 min). The obtained serum was immediately transported to the laboratory in cold boxes filled with ice, and was analyzed at the certified Esogu Medicine Faculty, Clinical Chemistry Laboratory, Turkey on the same day. Total plasma cholesterol, triglyceride, high density lipoprotein (HDL) cholesterol, low density lipoprotein (LDL) cholesterol, and glucose levels were measured using an enzymatic colorimetric method. All measurements were assessed by means of an Roche modular auto-analyzer (F. Hoffmann-La Roche Ltd., Basel, Switzerland).

Other measurements. Body weight, height, waist circumference, and hip circumference of all the participants were measured by standard methods. All participants were weighed with light clothes on, and without shoes. Individuals with a body mass index (BMI) of 30 kg/m^2 and above were assessed to be obese according to the body weight classification.[24]

Following the implementation of the survey, the systolic and diastolic blood pressures of the individual was measured. Individuals with a systolic blood pressure of 130 mm Hg and above, and/or a diastolic blood pressure of 85 mm Hg and above were deemed to be hypertensive. Additionally, those that were previously diagnosed as having hypertension who were currently taking medications were deemed to be hypertensive, regardless of their blood pressure values.[10,11]

Definition of MetS. Based on the criteria suggested by the NCEP-ATP III (with updates in 2004 and 2005),[10,11] MetS was defined as the presence of 3 or more of the following 5 factors: waist circumference - ≥102 cm in men, and ≥88 cm in women; triglyceride - ≥150 mg/dl (1.69 mmol/l); low HDL cholesterol - <40 mg/dl (1.04 mmol/l) in men, and <50 mg/dl (1.29 mmol/l) in women; resting blood pressure - ≥130/85 mm Hg, and/or on treatment for hypertension; fasting glucose - ≥100 mg/ dl (5.6 mmol/l), and/or on treatment for diabetes mellitus.[10,11]

Statistics. All statistical analyses were performed using the Statistical Package for Social Sciences version 13.0 for Windows (SPSS Inc., Chicago, USA). A student's t-test was used to assess the differences between continuous variables, whereas a chi-square test was used for categorical variables. Logistic regression was used to determine the risk factors affecting the prevalence. For categorical independent factors, age-adjusted odds-ratios, and 95% confidence intervals (CI) were calculated. Descriptive bivariate analysis between continuous population characteristics and gender was performed using multiple regression analysis, which included age as a categorical variable. The MetS prevalence was standardized according to age by using Eskisehir's population data according to the Turkish Statistical Institute Regional Statistics 2007. A *p*-value ≤0.05 were considered to be significant.

Results. The study group composed of 2766 people, 1117 of whom were male (40.4%) and 1649 of whom (59.6%) were female. The average age was 42.00 ± 0.25 (range: 20-69). The MetS crude prevalence was 31%. For men, the prevalence was 22.1%, and for women the prevalence was 37%. The MetS prevalence distributions according to age for males and females are shown in **Table 1**. The prevalence increased as the age increased for both genders. The MetS prevalence corrected for age was 27.6%. For males it was 19.4%, while for females it was 33.2%. In the study group, the odds of having MetS was twice as high for women, whereas MetS prevalence increased as the age increased for both genders. When the correlation between socio-demographic features of the study group and MetS was studied, MetS was observed to be lower for high school graduate women, and the odds of having MetS increased 2-fold for housewives (**Table 1**). The group that engaged in heavy physical exercise, and had also reported smoking displayed decreased odds of having MetS, while the risk of MetS was lower for men who consumed appropriate amounts of red meat, fruits, and vegetables (**Table 2**). All metabolic factors in the MetS group for both genders were high, compared to those in the non-MetS group. In both the non-MetS group and the MetS group, men had higher weight, waist circumference, and triglyceride levels than females. In the non-MetS group, women had higher BMIs, total cholesterol, HDL, and glucose. In the MetS group, women had higher BMI, systolic blood pressure, total cholesterol, HDL, and LDL (**Table 3**). The number of risk factors increased as age increased for both genders. For men, the frequency of having 4 or more risk factors for MetS was highest in the age group of 50-59 (p=0.001), the same case was true in women in the age group of 50-59 (p=0.001). In the study group, when MetS and non-MetS groups were compared, the metabolic characteristics was higher in the MetS group for both genders (p=0.000). In the MetS group, central obesity risk was higher in women, whereas hypertriglyceridemia risk was higher in men. In the

Table 1 - Age-adjusted prevalences, odd ratios (OR [95% CI]) *values for the socio-demographic characteristics that affects MetS prevalence by gender.

Variables	Male			Female		
	Prevalence (%)	OR (95% CI)	*P*-value	Prevalence (%)	OR (95% CI)	*P*-value
Age groups						
20-29	(5.5)	1		(8.4)	1	
30-39	(8.3)	1.55 (0.74-3.26)	0.248	(25.1)	3.66 (2.31-5.82)	0.000
40-49	(22.1)	4.87 (2.49-9.55)	0.000	(40.3)	7.36 (4.66-11.6)	0.000
50-59	(44.8)	13.94 (7.18-27.1)	0.000	(57.5)	14.79 (9.24-23.7)	0.000
60-69	(36.4)	9.84 (4.93-19.7)	0.000	(66.2)	21.40 (13.05-35.1)	0.000
Level of education						
Illiterate	(36.9)	1		(55.5)	1	
Primary	(25.4)	1.13 (0.47-2.74)	0.788	(35.1)	0.82 (0.61-1.10)	0.182
Secondary-high	(12.7)	1.10 (0.42-2.91)	0.842	(8.7)	0.34 (0.15-0.72)	0.005
Marital status						
Married	(23.8)	1		(37.3)	1	
Unmarried	(2.3)	0.30 (0.07-1.25)	0.090	(13.5)	0.68 (0.29-1.59)	0.372
Widowed	-	0.00	0.999	(54.5)	0.99 (0.52-1.90)	0.974
Occupation						
Unemployed	(20.0)	1				
Farmer	(14.8)	1.38 (0.65-2.91)	0.926	-		
Worker	(39.2)	1.03 (0.49-2.17)	0.398	(15.0)	1	
Housewife	-	-	-	(38.1)	2.08 (1.08-4.00)	0.029
Household income						
<320 $	(21.0)	1		(38.9)	1	
≥320 $	(22.5)	0.96 (0.68-1.37)	0.837	(35.7)	0.96 (0.76-1.20)	0.704

*Odds-ratio and 95% confidence interval (CI) adjusted by the age groups through logistic regression, MetS - metabolic syndrome

Table 2 - Odds-ratio (OR [95% CI]) values for the physical activity, smoking, and nutrition characteristics that affects MetS prevalence by gender.

Variables	Male			Female		
	Prevalence (%)	OR (95% CI)	*P*-value	Prevalence (%)	OR (95% CI)	*P*-value
Physical activity*						
Never	(34.5)	1		(40.4)	1	
Mild	(20.5)	0.62 (0.44-0.86)	0.004	(33.0)	0.95 (0.75-1.21)	0.696
Vigorous	(7.9)	0.30 (0.18-0.52)	0.000	(9.6)	0.22 (0.08-0.59)	0.003
Cigarette use						
Nonsmoker	(27.8)	1		(38.4)	1	
Smoker	(17.8)	0.56 (0.42-0.75)	0.000	(26.3)	0.57 (0.41-0.80)	0. 001
Extra salt intake						
Absent	(23.2)	1		(37.4)	1	
Present	(19.2)	0.79 (0.57-1.09)	0.152	(35.3)	0.91 (0.71-1.18)	0.488
Inappropriate eating fat						
Absent	(22.2)	1		(37.2)	1	
Present	(20.8)	0.92 (0.52-1.62)	0.770	(34.8)	0.90 (0.62-1.31)	0.585
Inappropriate red meat consumption						
Present	(27.6)	1		(37.3)	1	
Absent	(21.0)	0.43 (0.99-2.04)	0.051	(37.0)	1.01 (0.72-1.42)	0.939
Inappropriate vegetables-fruits						
Present	(24.4)	1		(37.5)	1	
Absent	(18.5)	0.71 (0.52-0.95)	0.022	(36.7)	1.04 (0.84-1.28)	0.743

*Odds-ratio and 95% confidence interval (CI) adjusted by the age groups through logistics regression, MetS - metabolic syndrome

Table 3 - Metabolic characteristics of subjects with MetS and non-MetS by gender.

Metabolic characteristics	Non-MetS Male	Non-MetS Female	MetS Male	MetS Female	Overall
	Mean ± SD				
Weight, kg	72.86 ± 1.22	68.33 ± 12.74*	86.21 ± 11.80	82.15 ± 12.95*	74.40 ± 13.79
BMI, kg/m^2	24.79 ± 3.63	27.53 ± 5.44*	29.63 ± 3.80	33.99 ± 5.00*	28.28 ± 5.78
Waist circumference, cm	88.60 ± 9.82	82.50 ± 1.47*	103.82 ± 9.55	97.80 ± 10.12*	89.69 ± 12.74
Systolic blood pressure, mm Hg	116.26 ± 15.77	115.88 ± 17.23†	134.82 ± 9.55	136.89 ± 22.92§	122.26 ± 20.72
Diastolic blood pressure, mm Hg	73.99 ± 10.64	73.88 ± 11.53 †	85.30 ± 13.55	86.34 ± 14.87 †	77.69 ± 13.49
Biochemical parameters					
Total cholesterol, mg/dL	176.79 ± 40.00	180.44 ± 38.70§	193.72 ± 36.23	201.37 ± 42.53‡	185.10 ± 40.93
HDL-cholesterol, mg/dL	44.91 ± 9.95	53.95 ± 11.47*	37.06 ± 7.17	44.29 ± 9.53*	47.46 ± 11.61
LDL-cholesterol, mg/dL	110.28 ± 34.83	109.25 ± 30.39†	122.60 ± 30.14	129.84 ± 41.57‡	115.31 ± 35.53
Triglycerides, mg/dL	133.40 ± 88.26	103.13 ± 49.38*	234.12 ± 107.72	195.25 ± 95.77*	144.66 ± 91.56
Fasting serum glucose, mg/dL	86.71 ± 21.47	90.28 ± 18.93*	119.42 ± 60.00	116.45 ± 44.66 †	97.53 ± 34.89

MetS - metabolic syndrome, BMI - body mass index, *p=0.000, †p>0.05, ‡p=0.005, §p=0.044

Table 4 - Age-adjusted prevalences, odd ratios, and 95% CI for components of the MetS of subjects with MetS and non-MetS by gender.

Variable	Non- MetS Male	Non- MetS Female	MetS Male	MetS Female
Hypertension				
Prevalence (%)	184 (21.1)	250 (24.1)†	190 (76.9)	469 (76.9)
OR	0.67	1	0.90	1
95% CI	0.53-0.85		0.62-1.29	
Central obesity				
Prevalence%	59 (6.8)	301 (29.0)*	161 (65.2)	542 (88.9) *
OR	0.14	1	0.21	1
95% Cl	0.10-0.19		0.15-0.31	
Hypertriglyceridemia				
Prevalence%	217 (24.9)*	122 (11.7)	216 (87.4)*	415 (68.0)
OR	2.46	1	3.38	1
95% Cl	1.93-3.15		2.23-5.12	
Low HDL cholesterol				
Prevalence%	264 (30.3)	356 (34.3)	184 (74.5)	485 (79.5)
OR	0.88	1	0.80	1
95% Cl	0.73-1.08		0.56-1.14	
Hyperglycemia				
Prevalence %	96 (11.0)	124 (11.9)	147 (59.5)	389 (63.8)
OR	0.86	1	0.76	1
95% Cl	0.50-1.49		0.56-1.04	

*p=0.000, †p=0.001, components of metabolic syndrome (MetS) were defined as follows: central obesity (waist circumference ≥102 cm in men, ≥88 cm in women); hypertension (systolic blood pressure ≥130 mm Hg, or diastolic blood pressure ≥85 mm Hg, or use of oral antihypertensive medication; diabetes (fasting serum glucose ≥100 mg/dl, or previously diagnosed diabetes); total cholesterol ≥200 mg/dl; high-density lipoprotein- cholesterol <40 mg/dl in men, <50 mg/dl in women, triglycerides ≥150 mg/dl,
HDL - high-density lipoprotein

non-MetS group, hypertension, and central obesity risks were higher in women, whereas hypertriglyceridemia risk was higher in men (**Table 4**).

Discussion. In this study, we researched the prevalence of MetS and its components in the Central Anatolian region that features particular socio-demographic features of Turkey, and is located in a semi-rural area. The study region had not fully undergone epidemiologic transformation, however, the risk that it may do so is gradually increasing due to change in behaviors. Working in a factory, as well as engaging in farming and livestock is the means of livelihood for a large majority of the male population, whereas, most women have not yet started to work. The prevalence of the components of MetS, as well as the full clinical syndrome of MetS has not been evaluated before in a society-based study in Eskisehir.

The values reported in Turkey for MetS vary between 26.9-33.9%.[15-18] In some Asian countries, different frequencies are reported such as 16.7% in China, 39.3% in Saudi Arabia, and 9.5% in Taiwan.[25-27] Of interest, the USA has one of the highest rates of MetS in the world.[28,29] The MetS prevalence is also extremely high in Portugal,[30] whereas Italy,[31] UK,[32] and Northern European countries[33,34] have lower prevalence compared to other European countries. The diagnostic criteria used to diagnose the condition play an important role in the significant differences in prevalence values seen in the regions, as do the genetic and environmental characteristics of the regional population.

In a prospective study conducted in Turkey,[35] it was shown that glucose levels ≥100 mg/dl predicted cardiometabolic risk, while NCEP-ATPIII accurately defined MetS. Therefore, a definition including these criteria was taken as the basis for this study. In this study, MetS' prevalence standardized in terms of age was 27.6%, and was found to be higher in women (33.2%) than men (19.4%). The MetS frequency differs according to gender, although the data are somewhat inconsistent on this point. Few studies reported that MetS prevalence is lower for women,[36-38] whereas there are many other studies that report the opposite finding that it is higher in women.[31,39] There are also studies showing that the rate of this condition is similar among men and women.[40,41] As MetS prevalence is found to be different based on gender, in this study we analyzed men and women separately in terms of MetS characteristics. It is known from various studies that the frequency of MetS, and its components increases as age increases.[2,36] In this study, MetS prevalence increased some 10-fold in men in the 60-69 age group, and 21-fold in women. Additionally, the frequency of components increased as the age increased. The age-dependent changes in MetS is maybe the result of the long-term effects of its etiological factors, therefore, age-related corrections were made for odds-ratio values.

It is reported in many studies that social segments with lower socio-economic and education levels show a larger coronary risk factor profile.[42] In the study group, no correlation was found between income level, modified according to age, and MetS. The effect of education level on MetS could be shown for women. The MetS prevalence decreased as the education level increased. This may be related to the fact that housewives may have had insufficient information on health due to their low social interaction, and education levels. Similar results were achieved in a society-based study where MetS and related factors were evaluated.[17] Sedentary lifestyle is a significant and independent risk factor for coronary heart disease, and facilitates the development of other risk factors. As a result of regular physical exercise, weight, LDL, and triglyceride levels decrease, and HDL levels increase. These positive effects decrease the risk of both MetS occurrence and coronary heart disease.[43]

The most significant variable affecting MetS prevalence in men and women was found to be the level of physical exercise. The MetS prevalence was found to be low in the group doing regular physical exercise. There were no places for women in semi-rural areas to do physical exercise other than their homes. Thus, 64% of women lead a sedentary life (in men this rate was 31%). A total of 40% of the people having such a life style (34% for men) had MetS. The MetS frequency risk was high in non-smokers for both genders. This is likely due to obesity, because in our study group, the obesity ratio for smokers was 17%, whereas it was 44.3% for non-smokers (21% for men and 52% for women). A significant group of smokers used smoking as a tool to control weight, which results in increased metabolism, secondary to nicotine effects, and decreased appetite.[44] Consuming foods that are high in calories and carbohydrates, rich in saturated fat, and low in fiber are the most relevant factor that predisposes people to MetS. A diet pattern in which a great deal of red meat is consumed is closely related to the potential to develop MetS.[45] In Turkish society, fruit and vegetable consumption is lower than the ideal level, and instead, mostly animal products are consumed. In this study, the correlation between nutrition characteristics and MetS was observed for men.

Obesity level, which is one MetS' diagnostic components, has reached epidemic levels worldwide, and increasing numbers of studies report a significant correlation between health risks associated with waist circumference and general obesity.[2-4] The BMI and waist circumference is among the anthropometric indicators used in describing obesity.[3] In this study, waist circumference was used in the definition of obesity. The women in our study region were mostly housewives. In addition to their physical activity level, their traditional attitude also increased obesity (general-central), and associated risk factors. Hormonal changes related to menopause, particularly the decrease in estrogen level, may have increased MetS properties. The MetS is a major risk factor for the development of CVD,[3,4] thus the importance of early diagnosis and treatment of MetS increases even more as the number of MetS diagnostic components also increase. The importance of considering the effects of plasma lipids in the identification of CVD risk has been emphasized in epidemiological studies.[46,47] One original outcome of our study is the high frequency of each MetS component. The large decrease is significant, particularly noteworthy for hypertriglycemia and HDL-cholesterol. However, it must be stated that it is necessary to define and evaluate components separately for men and women.

When the diversity of MetS components in Turkish people was analyzed, it was seen that low HDL and hypertension were higher in both genders, whereas central obesity was higher in women. The MetS was not a frequently encountered factor for central obesity as it was not common in men, and hypertriglyceridemia was high, with rates reaching approximately 70%.[48] Accordingly, central obesity was high in women in the MetS group, whereas hypertriglyceridemia was higher in men. Hypertension and central obesity were high in women in the non-MetS group, whereas hypertriglyceridemia was higher in men.

The greatest limitation in our study was the cross-sectional method that we used in order to explore the risk factors.

In conclusion, MetS is a major problem in Eskisehir, thus, engaging this population in making healthy lifestyle changes is imperative in order to reduce MetS-associated risk factors. However, in so doing, men, women, and those without MetS need to be supported with health services separately in a manner that is sensitive to the traditional characteristics of our society.

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