

Kadınlarda Metabolik Sendrom: Bursa Türkiye’de Yapılan Bir Çalışma

[Metabolic Syndrome among Women: A Study from Bursa Turkey]

ÖZET

AMAÇ: Obezite metabolik sendromdaki risk faktörlerinden biridir ve Türkiye’deki prevalansı giderek artmaktadır. Bu çalışmanın amacı 20 yaş ve üzeri kadınlarda metabolik sendrom ve obezite sıklığını araştırmaktır.

YÖNTEM: Kesitsel bir çalışmadır. Bursa’da birinci basamak sağlık hizmeti veren bir kuruluştaki 2008 yılında yapılmıştır. Toplam 807 kadın çalışmaya alınmıştır. Katılımcıların ağırlık, boy, bel çevresi, kan basıncı, toplam ve HDL kolesterol, açlık kan şekeri ve trigliserid düzeyleri ölçülmüştür. Metabolik sendrom tanısı Uluslararası Diabet Federasyonu kriterlerine göre konulmuştur.

BULGULAR: Katılımcıların yaş ortalaması 42,7±13,2’dir. Yüzde 96,4’ü evlidir. Yüzde 50,7’sinin eğitim düzeyi 8 yılın altındadır. Yüzde 93,7’si ev kadınıdır ve %85,3’ünün aylık aile geliri 650\$ veya altındadır. Metabolik sendrom ve abdominal obezite prevalansı sırasıyla %17,5 ve %87,7 olarak bulunmuştur. Diyabeti ve yüksek kan yağlarına sahip olanlarda metabolik sendrom oluşma riski sırasıyla 11,3 ve 4,5 kez daha fazladır. Metabolik sendrom görülme riski yaşla ve vücut kitle indeksinin artmasıyla artmaktadır.

SONUÇ: Çalışmamıza katılan kadınlarda obezite ve abdominal obezitenin yaygın olduğu saptanmıştır. Bel çevresi uzunluğundaki ve vücut kitle indeksindeki artışa rağmen metabolik sendrom prevalansının düşük bir düzeyde oluşu açıklanamamıştır. Trigliserid düzeyindeki düşüklük ve yüksek dansiteli lipoprotein kolesterol düzeyindeki yükseklik konularının daha ileri biçimde araştırılması gerekir. Kesitsel ve tek bir merkezde yapılan bir çalışma olması nedeniyle bu çalışmanın sonuçları genelleştirilmemelidir.

SUMMARY

AIM: Obesity is one of the risk factors of metabolic syndrome (MetS) and its prevalence is rapidly increasing in Turkey. The purpose of this study was to assess the prevalence of MetS and obesity among women aged 20 years and older.

METHOD: This is a cross-sectional study, undergone in a primary health care setting in Bursa /Turkey in the year 2008. A total of 807 women were included in the study. Body weight, height, waist circumference, blood pressure, total and HDL cholesterol, fasting plasma glucose and triglyceride levels were measured. Metabolic Syndrome definition was made according to the International Diabetes Federation (IDF) criteria.

RESULTS: The mean age was 42.7±13.2 years, 96.4% were married, 50.7% had education of less than 8 years, 93.7% were housewives and 85.3% had a monthly family income of \$650 or less. The prevalence of MetS and abdominal obesity were 17.5% and 87.7% respectively. Those with diabetes mellitus and elevated plasma lipids had increased risk of developing MetS 11.3 and 4.5 times more than those without these situations respectively. The risk of MetS increases with age and increasing BMI.

CONCLUSION: In conclusion it can be stated that obesity and central obesity are alarmingly frequent among the adult Turkish women who participated in our study. Despite the high prevalence of elevated waist circumference and body mass index the low prevalence of MetS could not be explained. The low levels of triglycerides and high levels of high density lipoprotein cholesterol should be studied further. Because of its cross-sectional and single center oriented design the results of this study should not be generalized.

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Anahtar Kelimeler:

Metabolik Sendrom, Obezite, Diabet, VKI, Dislipidemi, Uluslararası Diabet Federasyonu Kriterleri.

Key Words:

Metabolic Syndrome (MetS), Obesity, Diabetes Mellitus, BMI, Dyslipidosis International Diabetes Federation Criteria.

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INTRODUCTION

The term “metabolic syndrome (MetS)” describes the clustering of metabolic risk factors including dyslipidemia, impaired carbohydrate metabolism, obesity and high blood pressure (1,2). The World Health Organization (WHO) was the first to propose criteria for the diagnosis of MetS, followed by the European Group for the study of Insulin Resistance (EGIR), the National Cholesterol Education Program (NCEP- ATP III), the American College of Endocrinology (ACE), and the International Diabetes

Federation (IDF) (3-7). Although these organizations proposed to measure the same components, they suggested different combinations and cut-off points. The presence of insulin resistance was a starting point in the WHO and EGIR definitions whereas in the IDF definition abdominal obesity was the most important prerequisite of MetS. Information on consensus of these definitions of MetS is limited, especially as data on the IDF definition has been only recently gathered (8-13).

There have been several studies in Turkey concerned with MetS among adults. Sanisoglu et al

studied 15,468 adults over 30 years of age from different regions of Turkey and found the prevalence of MetS according to the IDF criteria to be 17.91% with the prevalence among female participants found to be higher than male participants (27.33 %) (14). A comparative study using different definitions of MetS found the age and sex adjusted prevalence of MetS among 1,568 Turkish people to be 38% by NCEP, 42% by ACE and IDF, 20% by EGIR and 19% by WHO definition (15). Another study of 4,259 participants from both urban and rural settings used ATP III criteria for the diagnosis of MetS and found prevalence as high as 33.9% with a significantly higher frequency among women (39.6%) (16). A study in a southern province of Turkey found MetS prevalence according to the ATP III criteria to be 39.1% among female and 23.7% among male participants and significantly higher among women in rural areas (17). A recent study of Turkish women found the prevalence of MetS to be 31.9% and increasing age as an important risk factor (18). Studies in Turkey have revealed that Turkish people have high cardiovascular risk factors such as high smoking prevalence, high carbohydrate consumption, high total cholesterol/ high density lipoprotein cholesterol (HDL-C) ratio and low HDL-C levels (19,20).

Obesity is no longer a phenomenon confined to wealthier parts of the world such as Western Europe but is increasingly found in transitional countries of the European Region. According to the WHO Regional Office for Europe, almost 400 million adults (aged 15 years and older) in the WHO European Region are estimated to be overweight and obesity is estimated to affect some 130 million adults (21). The most recent evidence for the burden of obesity on disability and death in the WHO European Region comes from the Global Burden of Disease study which finds that 7.8% of total deaths and disability in the Region are estimated to be attributed to high Body Mass Index (BMI) (22). Overweight and obesity are prevalent in Turkey and a recent study found that 35.8% of the adult Turkish population is obese (14). According to the data of the Turkish Demographic and Health Survey 2008, 34.5% of married women between 15-49 years of age were over-weight and 23.9% were obese (23).

This cross-sectional study aimed to identify the prevalence of MetS and associated factors in women aged 20 years and older.

MATERIAL and METHOD

Study Type

Cross-sectional and descriptive

Place

Primary health care setting named “Emek Family Medicine Clinic”, which is also a training center for the medical students of Uludag University Medical Faculty in Bursa/Turkey. This setting is affiliated to the Department of Family Medicine of the Medical Faculty and serves a population of 55,391.

Study Participants

Approximately 17,045 women aged 20 years or older were registered at this primary health care setting, of whom 807 participated in this study.

Sample Size

We calculated the sample size with the formula:

$$n = N \times t^2 \times p \times q / [d^2 \times (N-1) + t^2 \times p \times q]$$

where:

n= Sample size

N= Population

t= 1.96 (for 95% confidence level)

p= Prevalence of MetS (was accepted as 25% for the Turkish population)

q= 1- p

d= 0.03 (for 95% confidence interval)

$$n = 17,045 \times 1.96^2 \times 0.25 \times 0.75 / [0.03^2 \times (17,045-1) + 1.96^2 \times 0.25 \times 0.75]$$

$$n = 12,272.40 / 16,0596$$

$$n = 765$$

Ethical Issues

Approval for this study was given by Ethics Committee of Uludag University. According to the principles of the Helsinki Declaration, written informed consent was taken from every participant.

Study Period

This study was performed during January- March 2008

Selection of the Participants

Invitations for participation in this study were made by public announcements and distributed

leaflets. After these announcements about 1056 women visited the health care setting over a three-month period. Of these, 63 were pregnant, 57 were younger than 20 years of age and 109 did not want to participate in the study. Finally 827 women who gave written informed consent were included in the study. Women aged 20 years or over, irrespective of disease status (diabetics, hypertensives and dyslipidemic patients were not excluded) were included in the study. The only exclusion criterion was pregnancy.

Study Phases

The study had two phases. In the first phase, socio-demographic data, personal and familial medical history of the participants were collected through structured printed questionnaires completed during face-to face interviews with the authors H.O, G.S and A.O and anthropometric and blood pressure measurements were taken. In the second phase, biochemical measurements were taken. For this purpose an appointment date was determined for every participant at the first phase of the study. Twenty of 827 participants did not participate in the second phase so all analyses were made for 807 participants.

Anthropometry

Height, weight and waist circumference (WC) measurements were obtained in duplicate by the authors H.O and G.S. If the measurements differed by more than 0.5 kg for body weight, 1.0 cm for height and 1.5cm for WC, a third measure was taken by A.O and the closest two were used.

Weight was measured in light clothes. WC was measured with a flexible tape in a standing position, midway between the arcus costalis and processus spina iliaca anterior superior. Central obesity was defined as WC $\geq$ 80 cm. BMI was calculated as weight (kg) divided by height (m²). Overweight was defined as a BMI equal to or higher than 25 kg/m² and obesity as a BMI equal to or higher than 30 kg/m² (24). Blood pressure was measured in a sitting position with a standard mercury sphygmomanometer (ERKA) with an appropriate sized cuff. Systolic (Korotkoff phase I) and diastolic (Korotkoff phase V) blood pressure were measured three times on the left upper arm after five minutes of rest, allowing one minute between measurements and the mean of these measurements was used as the final value. Hypertension was defined as systolic blood pressure of $\geq$ 130 mmHg, diastolic blood pressure of $\geq$ 85

mmHg, or current treatment with antihypertensive drugs in participants with a history of hypertension.

Biochemistry

Venous blood samples were drawn via the antecubital vein, after 12 hours of fasting. Glucose, cholesterol, triglyceride, HDL-cholesterol levels were determined by a semi automatic biochemistry analyzer (Sinnova, BS3000P) at the laboratory of the primary health care setting. Hypertriglyceridemia was defined as TG concentration equal to or more than 150 mg/dl and low serum HDL-C levels (lower than 50 mg/dl) or being under treatment for hyperlipidemia. Diabetes was defined either by a history of previously known diabetes or a fasting plasma glucose of $\geq$ 100 mg/dl.

MetS Criteria

For the assessment of MetS we used the IDF definition, which requires at least three of the following criteria (7): central obesity (WC equal to or more than 80 cm for women) hypertension (defined by blood pressure levels equal to or higher than 130/85 mmHg or previous diagnosis), impaired glucose tolerance (fasting blood glucose equal or higher than 100 mg/dl or previous diagnosis of diabetes type II), hypertriglyceridemia (TG equal to or higher than 150 mg/dl or being under specific treatment), and low serum HDL-C levels (lower than 50 mg/dl for women or being under specific treatment).

Statistical Analysis

The SPSS version 13.5 software (Chicago, IL) was used to carry out statistical analyses. Descriptive analysis which included frequency distribution for the categorical variables and mean $\pm$ standard deviation (SD) for the continuous variables and binary logistic regression analysis were used. Results with $p < 0.05$ were considered significant.

RESULTS

The mean age of the study group was 42.7 years $\pm$ 13.2 (range 20-85years). Most of the participants were married (96.4%) and had 3.6 $\pm$ 2.3(range 0-14) children. Half of them were illiterate or had less than 8 years of education and 93.7% were housewives. Approximately 71.9% of the participants had a monthly family income of \$251-650.

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According to the IDF MetS definition the prevalence of metabolic syndrome was found to be 17.5%.

Table 1 shows the distribution of participants according to the IDF criteria. Among the five criteria, elevated waist circumference was the most common

criteria with a frequency of 87.7% followed by elevated blood pressure (50.2%). In the study group 82 (10.2%) participants met no criteria whereas 295 (36.6%) met one, 289 (35.8%) two, 91 (11.3%) three, 44 (5.5%) four and 6 (0.7%) met five criteria for the diagnosis of MetS.

Table1: Distribution of participants according to the International Diabetes Federation criteria of metabolic syndrome

Criteria for women	Participants with (+) criteria		Participants with (-) criteria	
	N	%	N	%
Central obesity elevated waist circumference ≥ 80 cm	708	87.7	99	12.3
Elevated triglycerides ≥ 150 mg/dl or specific treatment	61	7.6	746	92.4
Reduced HDL-C <50 mg/dl or specific treatment	87	10.8	720	89.2
Elevated blood pressure $\geq 130/85$ mmHg or previous diagnosis	405	50.2	402	49.8
Elevated fasting glucose ≥ 100 mg/dl or previous diagnosis of type II diabetes	91	11.3	716	88.7

HDL-C= High density lipoprotein cholesterol

Table 2: Distribution of participants with and without metabolic syndrome (MetS) according to the criteria of International Diabetes Federation.

IDF Criteria		MetS – (N=666)		MetS + (N=141)	
		N	%	N	%
Central obesity elevated waist circumference ≥ 80 cm	+	567	85.1	141	100.0
	-	99	14.9	0	0
Elevated triglycerides ≥ 150 mg/dl or specific treatment	+	4	0.6	57	40.4
	-	662	99.4	84	59.6
Reduced HDL-C <50 mg/dl or specific treatment	+	13	1.9	74	52.5
	-	653	98.1	67	47.5
Elevated blood pressure $\geq 130/85$ mmHg or previous diagnosis	+	274	41.1	131	92.9
	-	392	58.9	10	7.1
Elevated fasting glucose ≥ 100 mg/dl or previous diagnosis of type II diabetes	+	15	2.3	76	53.9
	-	651	97.7	65	46.1

HDL-C= High density lipoprotein cholesterol

Table 3: Some characteristics of participants with and without metabolic syndrome.

			MetS (-) (N=666)	MetS + (N=141)	Total (N=807)
Age Groups	20-39	N	337	16	353
		%	95.5	4.5	100.0
	40-59	N	278	92	370
		%	75.1	24.9	100.0
	60 and over	N	51	30	84
		%	60.7	39.3	100.0
Marital Status	Single	N	29	0	29
		%	100.0	-	100.0
	Married	N	637	141	778
		%	81.9	18.1	100.0
Education	Illiterate and <8 years	N	314	95	409
		%	76.8	23.2	100.0
	8 years	N	316	46	362
		%	87.3	12.7	100.0
	>8 years	N	36	0	36
		%	100.0	-	100.0
Working Status	Housewife	N	620	136	756
		%	82.0	18.0	100.0
	Working	N	46	5	51
		%	90.2	9.8	100.0
Number of Children	0	N	51	2	53
		%	96.2	3.8	100.0
	1-3	N	341	40	381
		%	89.5	10.5	100.0
	4 and +	N	274	99	373
		%	73.5	26.5	100.0
Monthly Income	250 \$ and less	N	83	25	108
		%	76.9	23.1	100.0
	251- 650 \$	N	486	94	580
		%	83.8	16.2	100.0
	651 \$ and more	N	97	22	119
		%	81.5	18.5	100.0

Table 3: Some characteristics of participants with and without metabolic syndrome (continue).

			MetS (- (N=666)	MetS + (N=141)	Total (N=807)
Nutritional Characteristics					
Meals daily	Two	N	216	68	284
		%	76.1	23.9	100.0
	Three	N	407	64	471
		%	86.4	13.6	100.0
	Four and more	N	43	9	52
		%	82.7	17.3	100.0
Eating between meals	Yes	N	300	63	363
		%	82.6	17.4	100.0
	No	N	366	78	444
		%	82.4	17.6	100.0
Preferred food groups	Bread, pasta, rice	N	261	39	300
		%	87.0	13.0	100.0
	Meat, poultry, egg, dairy	N	61	14	75
		%	81.3	18.7	100.0
	Fruit, vegetables	N	344	88	432
		%	79.6	20.4	100.0
Preferred oil	Margarine	N	19	1	20
		%	95.0	0.5	100.0
	Butter	N	33	2	35
		%	94.3	5.7	100.0
	Liquid vegetable oils	N	614	138	752
		%	81.6	18.4	100.0
Smoking habit	Never	N	578	130	708
		%	81.6	18.4	100.0
	Past or current smoker	N	88	11	99
		%	88.9	11.1	100.0
BMI (kg/m ²)	Normal (18.5-24.9)	N	173	7	180
		%	96.1	3.9	100.0
	Overweight (25.0-29.9)	N	233	36	269
		%	86.6	13.4	100.0
	Obese (≥30.0)	N	260	98	358
		%	72.6	27.4	100.0
Physical activity (daily/minutes)	None	N	508	115	623
		%	81.5	18.5	100.0
	≤30	N	94	13	107
		%	87.9	12.1	100.0
	>30	N	64	13	77
		%	83.1	16.9	100.0

Table 2 shows the distribution of the participants with and without Mets according to the IDF criteria. Elevated waist circumference was 100.0% among participants with MetS whereas this frequency was 85.1% among those without MetS. Elevated blood pressure was found to be 92.9% among MetS diagnosed women whereas among those without MetS it was 41.1%.

Some characteristics of the participants with and without metabolic syndrome are shown in Table 3. More than half of the participants (58.4%) reported that they had daily three meals and 55.0% reported that they did not eat between meals. Fruit and vegetables were the most preferred food groups

followed by pasta, bread and rice. Nearly all the participants reported that they preferred vegetable liquid oils. Physical activity was not common among the participants and only 22.8% mentioned that they performed daily physical activity. Among the participants who reported daily physical activity 58.2% stated that the duration of their activity was 30 minutes or less.

Smoking was not frequent in the study group and 87.7% reported that they had never smoked. However 12.3% of the participants were past or current smokers.

Table 4: Self reported family and personal history of diabetes, hypertension and dyslipidemia among participants with and without metabolic syndrome.

			Mets – (N=666)		Mets + (N=141)	
			N	%	N	%
Personal history	Diabetes	Yes	25	3.8	56	39.7
		No	327	49.1	47	33.3
		Not known	314	47.1	38	27.0
	Hypertension	Yes	145	21.8	89	63.1
		No	338	50.7	36	25.5
		Not known	183	27.5	16	11.4
	Dyslipidemia	Yes	69	10.4	67	47.5
		No	182	27.3	23	16.3
		Not known	415	62.3	51	36.2
Family history	Diabetes	Yes	202	30.3	57	40.4
		No	407	61.1	74	52.5
		Not known	57	8.6	10	7.1
	Hypertension	Yes	395	59.3	84	59.6
		No	236	35.4	45	31.9
		Not known	35	5.3	12	8.5
	Dyslipidemia	Yes	177	26.6	44	31.2
		No	289	43.4	52	36.9
		Not known	200	30.0	45	31.9

Table 5: Anthropometric and biochemical data of participants with and without metabolic syndrome.

	Mets – (N=666)		Mets + (N=141)	
	Mean $\pm$ SD	Range	Mean $\pm$ SD	Range
Height (cm)	157.92 $\pm$ 5.73	134.00-175.00	156.91 $\pm$ 6.01	143.00-176.00
Weight (kg)	71.60 $\pm$ 13.44	42.00-114.00	82.50 $\pm$ 15.95	50.00-135.00
BMI (kg/m²)	28.73 $\pm$ 5.29	17.97-48.59	33.46 $\pm$ 5.97	21.64-52.86
Waist (cm)	93.64 $\pm$ 13.35	62.00-138.00	105.13 $\pm$ 11.43	81.00-155.00
BP(mmHg)				
Systolic	124.39 $\pm$ 23.65	80.00-260.00	148.37 $\pm$ 25.46	110.00-230.00
Diastolic	79.09 $\pm$ 13.80	45.00-140.00	90.89 $\pm$ 12.59	60.00-140.00
TC (mg/dl)	128.06 $\pm$ 22.32	91.00-256.00	184.16 $\pm$ 46.99	102.00-286.00
HDL –C(mg/dl)	65.17 $\pm$ 6.11	39.00-75.00	51.92 $\pm$ 10.24	34.00-70.00
TG (mg/dl)	97.44 $\pm$ 16.16	62.00-164.00	131.29 $\pm$ 30.71	77.00-287.00
FG (mg/dl)	88.09 $\pm$ 13.09	70.00-285.00	124.07 $\pm$ 56.47	76.00-340.00

BMI= Body mass index; BP= Blood pressure; TC= Total cholesterol; HDL-C= High density lipoprotein cholesterol; TG=Triglyceride; FG= Fasting blood glucose

Table 6: Binary logistic regression analysis of participants with and without MetS according to several variables.

Variable	p	Odds ratio	95% CI	
			lower	upper
Age	0.02	1.05	1.00	1.10
Marital status	N.S.	-	-	-
Education	N.S.	-	-	-
Occupation	N.S.	-	-	-
Income	N.S.	-	-	-
Smoking	N.S.	-	-	-
Physical Activity	N.S.	-	-	-
Preferred Food	N.S.	-	-	-
Preferred oil	N.S.	-	-	-
Eating between meals	N.S.	-	-	-
Elevated BP	N.S.	-	-	-
Elevated glucose	0.0001	11.34	4.50	28.60
Elevated TG	0.001	4.59	1.79	11.75
BMI	0.0002	1.18	1.08	1.29
WC	N.S.	-	-	-

Dependent variable: MetS (-)= 0, MetS (+)= 1

N.S.= not significant; BP= Blood pressure; TG= Triglyceride; BMI= Body mass index; WC= Waist circumference

Hosmer Lemeshow goodness of fit test $\chi^2 = 10.33$ df= 8 p=0.243

Self reported family and personal history of diabetes, hypertension and dyslipidemia among participants with and without metabolic syndrome are shown in Table 4. Personal history of diabetes, hypertension and dyslipidemia were reported at higher frequencies among participants with MetS.

Anthropometric and biochemical mean values of participants with and without metabolic syndrome are shown in Table 5. Except height and HDL-C levels, all mean values were higher among participants diagnosed with metabolic syndrome.

Logistic regression analysis was performed to determine the relationship between different variables and MetS. Odds ratios and 95% confidence intervals are presented in Table 6. Participants with elevated glucose levels or previously diagnosed diabetes were found to be at 11.3 times greater risk of MetS. For participants with elevated triglycerides this risk was 4.6 times more. With increasing age and BMI the risk of MetS increased.

DISCUSSION

Metabolic syndrome is a significant burden on healthcare and its prevalence is increasing worldwide (25). The prevalence of MetS varies considerably in different parts of the world and even in the same country. Some of the differences in prevalence might arise from varied definitions of the syndrome. However a wide variation in the prevalence can be observed even when the same diagnostic criteria are used. The worldwide prevalence of MetS among women varies from 7.0% to 56.7% (25, 26).

Several studies have been performed in different regions of Turkey using mostly the NCEP- ATP III diagnostic criteria and found the prevalence of MetS among women to be as high as from 27.3% to 45.2% (14, 16-18). The prevalence of MetS in this study (17.5%) is seen to be lower than that seen in previous studies. This difference could be due to variations in lifestyle and nutritional habits among women in different regions and should be studied further. Sanisoglu et al studied 15,468 adults over 30 years of age from different regions of Turkey and found the MetS prevalence in the Marmara region, where our study was also performed, to be as low as 14.6% (14). In this study there was a tendency for MetS to increase with increasing age. Similar results have been obtained from many other studies worldwide (14,27-31). No relationship was determined between socio-economic status and MetS in this study, although several other studies have found this kind of relationship. Whereas some have revealed MetS to be

more prevalent among those of upper socio-economic status (29), others have shown contrasting results, such as Dallongeville et al who reported that household income had an inverse relation with MetS (32). In this study there was no relationship between educational level and MetS. However, two previous Turkish studies revealed that women with lower education are at greater risk of MetS than those with higher education (14, 33).

Obesity and elevated waist circumference were very common in our study group. According to the WHO definition (24) 33.3% of participants were over-weight, 44.4% obese and central obesity was found to be 87.7%. These numbers are higher than those reported in previous Turkish studies (14, 23). A statistically significant relationship was determined between BMI and MetS and with increasing BMI, the risk of MetS increases. However, such a relationship was not found between WC and MetS. In this study the percentage of participants with elevated TG and reduced HDL-C levels were 7.6% and 10.8% respectively whereas in a previous study of Turkish women these percentages were 16.9% and 80.8%. The discrepancies between these figures highlighted the need for a detailed study on the nutritional habits of Turkish women (14). The Turkish Adult Risk Factor Study which assessed coronary heart disease and risk of metabolic syndrome found the median value of TG levels among women diagnosed with MetS to be 164.2 mg/dl and the mean value of HDL-C levels 39.9 ± 8.4 mg/dl. However, in this study these values for women diagnosed with MetS were 131.29 ± 30.71 mg/dl and 51.92 ± 10.24 mg/dl respectively and this issue needs to be studied further (20).

The prevalence of diabetes at 11.3% in this study conforms to the findings of a nationally representative previous study (34). However, the prevalence of hypertension found in this study was higher than in previous Turkish studies, which had reported prevalence in women of 36.1% and 46.1% (35,36).

There are some limitations to this study because of its cross-sectional design. Despite the high prevalence of elevated WC and BMI, the low prevalence of MetS could not be explained. The low levels of TG and high levels of HDL-C should be studied further. Our study population is not representative of all Turkish adult women and finally, because this study was performed in a single primary health care setting of a geographical region of the country and the results could not be generalized.

In conclusion it can be stated that obesity and central obesity are alarmingly frequent among the adult Turkish women who participated in our study.

Preventive measures such as more information about healthy diet, low saturated fat, and low glycemic index foods should be put into practice, together with encouragement to take more exercise. We believe that these efforts will prevent the development of obesity and thus diseases related to obesity in the Turkish female population in the future.

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TAF Preventive Medicine Bulletin, 2011: 10(4)

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