

# THE PREVALENCE OF METABOLIC SYNDROME AND RELATED FACTORS

Ferda Özyurda, Nazlı Atak

Department of Public Health, School of Medicine, Ankara University, Ankara, Turkey

## ABSTRACT

**Objective:** The aim of this study was to determine the prevalence of metabolic syndrome (MS) and related factors.

**Material and Method:** This is a cross-sectional study which was conducted to ascertain the prevalence of metabolic syndrome and related factors. It included a total of 961 people aged 15 years and over living in 240 households in Cankaya district of Ankara, who were selected by 1/200 systematic sampling method. A questionnaire was administered to the individuals in their households, and blood pressure, height and weight were measured. Fasting blood glucose and total cholesterol, triglyceride, high-density lipoprotein, low-density lipoprotein, very low-density lipoprotein levels were measured after the participants were invited to the laboratory. The definition of metabolic syndrome was made according to The World Health Organization (WHO) 1999 criteria. On this basis, metabolic syndrome is defined as the presence of two or more of the factors including obesity ( $BMI \geq 30 \text{ kg/m}^2$ ), high triglyceride levels ( $>150 \text{ mg/dL}$ ) and/or low HDL

levels ( $<35 \text{ mg/dL}$  in males and  $<39 \text{ mg/dL}$  in females) and high blood pressure (systolic blood pressure  $\geq 140 \text{ mm/Hg}$  and/or diastolic blood pressure  $\geq 90 \text{ mm/Hg}$ ), where the presence of glucose intolerance (Fasting Blood Sugar  $>100 \text{ mg/dL}$ ) is a prerequisite.

**Results:** Metabolic syndrome prevalence was 13.5%. The risk of it was found to be higher in individuals over 45 years of age, in those with low level of education, housewives, unemployed ones, especially women, and in retirees. The risks of metabolic syndrome were 1.6, 3.3 and 2.2 times higher in non-smokers and those with higher systolic and diastolic blood pressures respectively. The risk of metabolic syndrome was found to be higher in ones with hyperlipidemia and with a total cholesterol / HDL ratio of 5 or above.

**Conclusion:** Age, high level of VLDL, and total cholesterol/HDL ratio of 5 or above were found to play a primary role in the development of MS.

**Keywords:** Metabolic syndrome, hypertension, hyperlipidemia, risk factors. Nobel Med 2018; 14(3): 19-24

## METABOLİK SENDROM PREVALANSI VE İLGİLİ FAKTÖRLER

### ÖZET

**Amaç:** Bu çalışmanın metabolik sendrom prevalansı ve etkili faktörlerin saptanmasıdır.

**Materyal ve Metot:** Araştırma, metabolik sendrom (MS) prevalansı ve etkili faktörleri belirlemek üzere gerçekleştirilen kesitsel bir çalışmadır. Ankara İli Çankaya ilçesinde 1:200 oranında sistematik örnekleme yöntemiyle seçilen 240 hanede yaşayan 15 yaş ve üzerindeki 961 kişide yürütülmüştür. Hanelerdekilere anket formu uygulanmış; kan basıncı, boy ve ağırlıkları ölçülmüş; açlık kan şekeri, total kolesterol, trigliserid, yüksek dansiteli lipoprotein, düşük dansiteli lipoprotein, çok düşük dansiteli lipoprotein düzeyleri ölçülmüştür.

MS tanısı Dünya Sağlık Örgütü (DSÖ) 1999 kriterlerine göre yapılmış; glikoz intoleransı ön koşul olmak üzere,

obezite, trigliserid yüksekliği ve/veya HDL düşüklüğü, yüksek kan basıncı gibi faktörlerden iki veya daha fazlasının bulunması MS olarak tanımlanmıştır.

**Bulgular:** MS prevalansı % 13,5'tir. Kırkbeş yaşından büyüklerde, öğrenim düzeyi düşük olanlarda, ev kadını, işsiz ve emeklilerde, çalışmayanlarda özellikle çalışmayan kadınlarda metabolik sendrom riski yüksektir. Sigara içmeyenlerde, sistolik ve diastolik kan basıncı yüksek olanlardaki MS riski sırasıyla 1,6, 3,3, 2,2 kat fazladır. Hiperlipidemi ve total kolesterol-HDL oranı 5 ve üzerinde olanlarda MS riski yüksek bulunmuştur.

**Sonuç:** Sonuç olarak, yaş, VLDL yüksekliği ve total kolesterol-HDL oranının 5 ve üzerinde olmasının MS gelişiminde öncelikli rol oynadığı belirlenmiştir.

**Anahtar kelimeler:** Metabolik sendrom, hipertansiyon, hiperlipidemi, risk faktörleri. **Nobel Med 2018; 14(3): 19-24**

## INTRODUCTION

Metabolic syndrome (MS) is a disorder in which several of cardio-metabolic risk factors co-exist, including insulin resistance, hyperglycemia, obesity, abdominal fat deposition, dyslipidemia and hypertension.

The World Health Organization (WHO) defined the metabolic syndrome in 1998 as having at least two of the components including impaired fasting glucose, impaired glucose tolerance or hypertension (>160/90 mmHg) with insulin resistance, hyperlipidemia, abdominal obesity and microalbuminuria.<sup>1</sup> The increasing popularity of sedentary lifestyles in the world and in Turkey and the global change in eating habits led to an increase in the frequency of the components identified in the metabolic syndrome. For example, in a study conducted in the United States, the prevalence of MS was 33.7% in males and 35.4% in females, whereas 28.8% in males and 41.1% in females in the METSAR study conducted in Turkey in 2004 in a population over 20 years of age.<sup>2,3</sup> Prevention of MS is also important to reduce morbidity and mortality associated with cardiovascular diseases and diabetes and to protect against these diseases.

The purpose of this study was to determine the prevalence of MS and related factors in Çankaya region of Ankara, Turkey.

## MATERIAL AND METHOD

This was a cross-sectional study including a total of 961 people aged 15 years and over living in 240 households in Çankaya district of Ankara Province, who were selected by 1/200 systematic random sampling method. A questionnaire was administered to the individuals in the study sample in their households, and blood pressure, height and weight of these participants were measured. Fasting blood glucose (FBG) and levels of total cholesterol, triglyceride, high-density lipoprotein (HDL), low-density lipoprotein (LDL), very low-density lipoprotein (VLDL) were measured after the participants were invited to the laboratory.

The definition of MS was based on WHO 1999 criteria.<sup>1</sup> On this basis, metabolic syndrome is defined as the presence of two or more of the factors including obesity (BMI≥30 kg/m<sup>2</sup>), high triglyceride levels (>150 mg/dL) and / or low HDL levels (<35 mg/dL in males and<39 mg/dL in females) and high blood pressure (systolic blood pressure≥140 mm/Hg and/or diastolic blood pressure≥90 mm/Hg), where the presence of glucose intolerance (Fasting Blood Glucose >100 mg/dL) is a pre-requisite.

The data were statistically analyzed with SPSS v.11.5 package program. In the analysis of continuous variables, the student's t test was used to determine differences between means, and the chi-square significance test for the assessments of smoking,

alcohol use, and Body Mass Index (BMI), and multiple logistic regression analysis (Backward Wald) was also used to determine risk factors. The differences were considered to be statistically significant at  $p < 0.05$ . The informed written consent was taken from each of the participants, and they were all welcomed for the treatment facility by the university hospital. The approval of ethical committee was attained.

## RESULTS

Of the participants, 64.2% were female, 60.8% had obesity ( $BMI \geq 30$ ), 19.8% had glucose intolerance (Fasting Blood Glucose  $> 100$  mg/dl), 14.7% had hypertriglyceridemia, 7.3% had low HDL levels, 22.9% had higher systolic blood pressure and 26.1% had higher diastolic blood pressure, and the mean age was  $43.9 \pm 15.3$  years. The prevalence of metabolic syndrome was 13.5%. These results, the definition of metabolic syndrome was based on the WHO criteria 1999.

The evaluation of MS prevalence by socio-demographic characteristics revealed no difference in the prevalence of MS according to gender, and family history of type 2 diabetes. However, it was observed that the prevalence increased in parallel with the increase in age over 45 years. The prevalence of MS was significantly lower in single individuals than in married, widowed and divorced. The prevalence of metabolic syndrome was significantly higher in low-educated people, housewives, unemployed and retirees (Table 1).

Considering the prevalence of MS according to the employment status, it was found that 10.2% of employed and 15.0% of unemployed participants had MS, which corresponds to a 1.6 times greater risk in unemployed than employed ones, and the difference was statistically significant ( $p = 0.043$ ; 95% CI = 1.1-2.4) (Table 2).

There was no difference in the prevalence of MS between employed males and females, whereas the prevalence was higher in unemployed females than employed females. In addition, the risk of MS is 4.8 times higher in unemployed females than employed females (Table 3).

Considering the prevalence of MS according to the menopausal status, it was found that 21.4% of women in menopause and 7.5% of women in not menopause had metabolic syndrome, and in those with menopause the risk of MS was 3.4 times higher than women in not menopause (Table 4). The difference was statistically significant.

**Table 1.** Evaluation of prevalence of metabolic syndrome (MS) according to socio-demographic characteristics

	With MS		Without MS		Statistical Analysis
	n	%	n	%	
<b>Gender</b>					$\chi^2 = 0.5, p = 0.487$
Male	43	12.5	301	87.5	
Female	87	14.1	530	85.9	
<b>Age</b>					$\chi^2 = 50.0, p = 0.001$
15-24	3	2.4	120	97.6	
25-34	9	5.7	148	94.3	
35-44	22	9.7	204	90.3	
45-54	38	17.7	176	82.2	
$\geq 55$	58	24.0	183	75.9	
<b>Marital Status</b>					$\chi^2 = 13.0, p = 0.001$
Married	107	14.8	614	85.2	
Single	7	4.6	145	95.4	
Widowed/Divorced	16	18.1	72	81.8	
<b>Level of Education</b>					$\chi^2 = 18.0, p = 0.003$
Not literate	16	22.9	54	77.1	
Literate	6	31.6	13	68.4	
Primary school	50	14.7	290	85.3	
Secondary school	13	11.9	96	88.1	
High school	33	13.4	213	86.6	
College and higher	12	6.8	165	93.2	
<b>Occupation</b>					$\chi^2 = 16.8, p = 0.010$
Housewife/Unemployed	71	15.7	382	84.3	
Driver/Secretary/Officer	12	10.7	100	89.3	
Student	2	2.9	67	97.1	
Retired	26	19.1	110	80.9	
Marketers/Free	14	12.8	95	87.2	
Worker	3	6.2	45	93.8	
Dentist/Physician	2	5.9	32	94.1	
<b>Family History of Diabetes</b>					$\chi^2 = 2.9, p = 0.084$
Yes	55	18.8	238	81.2	
No	96	14.4	572	85.6	

$\chi^2$ : chi-square,  $p$ : p value

The distribution of MS prevalence according to the risk factors is given in Table 5. The prevalence of MS in non-smokers (15.9%) was higher than that of smokers (10.8%), which corresponded to a 1.6 times greater risk in non-smokers than smokers. The evaluation of MS prevalence according to the number of cigarettes smoked during a day and the duration of smoking showed no statistically significant difference ( $p = 0.062$  and  $p = 0.054$ , respectively).

**Table 2.** Evaluation of prevalence of metabolic syndrome (MS) according to the employment status

Employment Status	With MS		Without MS		p value	OR*	95% CI**
	n	%	n	%			
Employed	31	10.2	272	89.8	0.043	1.60	1.01-2.38
Unemployed	99	85.0	559	15.0			

\*: Odds ratio, \*\*: confidence interval

**Table 3.** Distribution of prevalence of metabolic syndrome (MS) according to gender and employment status

Gender	Employment Status	With MS		Without MS		p value	OR*	95% CI**
		n	%	n	%			
Male	Employed	31	10.2	272	89.8	0.043	1.60	1.01-2.38
	Unemployed	99	85.0	559	15.0			
Female	Employed	3	3.7	78	96.3	0.002	4.8	1.5-15.7
	Unemployed	84	15.7	452	84.3			

\*: Odds ratio, \*\*: confidence interval

**Table 4.** Distribution of prevalence of metabolic syndrome (MS) according to the menopausal status

Gender	Menopausal status	With MS		Without MS		p value	OR*	95% CI**
		n	%	n	%			
Female	In menopause	63	21.4	232	78.6	0.001	3.4	2.0-5.6
	In not menopause	24	7.5	298	92.5			

\*: Odds ratio, \*\*: confidence interval

Hypertension was found in 17.7% of the study population. The prevalence of MS was found to be 26.4% in participants with systolic hypertension and 9.7% in those without, and 21.1% in those with diastolic hypertension and 10.8% in ones without. These differences were also statistically significant. The risk of MS was 3.3 fold and 2.2 times higher in ones with systolic and with diastolic hypertension, respectively. Similarly, the prevalence was significantly higher in ones with higher levels total cholesterol, LDL, VLDL than in those without higher levels, with a higher risk ranging from 2.1 to 9.8 times. The prevalence of MS was 30.9% in ones with a total cholesterol / HDL ratio of 5 and above, whereas it was 9.3% in ones with the ratio below 5, which corresponds a 4.3 times higher risk in those with a ratio of 5 and above.

The results of the multiple logistic regression analysis to determine risk factors are shown in Table 6. Accordingly, the risk of MS was 12.4 and 13.9 times higher in those aged 45 to 54 years and older than 55 years, respectively. In addition, the risk was 0.5 times higher in smokers than non-smokers. Moreover, the

risk was 1.9, 1.7, 4.2 and 1.8 times higher in ones with a total cholesterol/HDL ratio of 5 and above, and higher total cholesterol, VLDL and blood pressure levels, respectively.

## DISCUSSION

The prevalence of metabolic syndrome in this study was found to be 13.5%, with a rate of 14.1% in females and 12.5% in males. In the United States, the prevalence over the age of 20 was reported to be 27.3%. The prevalence was 21.8% in males and 23.7% in females in the National Health and Nutrition Survey; it was 15.6% in Carr's study, and it was 35% in the METSAR study; 31.9% in females in a study conducted in Gölbaşı region of Ankara and 30.9% in females in a study conducted in Malatya.<sup>1-6</sup> The differences in these frequencies can be attributed to differences in the criteria used in the definition of MS. Different results were obtained because some studies have been based on the criteria of the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) and the others on the diagnostic criteria of IDF. For example, METSAR study was based on IDF criteria and was conducted on people older than 20 in Turkey. IDF criteria took as base the presence of at least three of the criteria as abdominal obesity, high blood pressure, hypertriglyceridemia, low HDL cholesterol and fasting hyperglycemia. This study was based on the WHO diagnostic criteria and MS prevalence was found to be higher in males than females, but the difference was not statistically significant. In many studies, it has been reported that the prevalence of MS is higher in females.<sup>2,6-11</sup> However, in one study, the prevalence of MS has been found to be comparable in males and females.<sup>12</sup> In the study, the prevalence of MS was found to be significantly higher in those who are 45 years of age or older and in those with a low level of education. This result is similar to the results of many studies.<sup>2,3,10,12-15</sup> This relationship has been found to be associated with an increase in MS components with the increase in age and the changes in lifestyle and nutritional status parallel to the decline in the level of education.

The prevalence of MS was the highest in married participants. This situation was thought to be related to the lifestyle, nutritional status and age, and similar results had been achieved in another study.<sup>5</sup>

The prevalence of MS was higher in retirees, housewives and unemployed, especially women, with a 1.6 times higher than in unemployed

participants than employed ones, and the risk of MS was 4.8 times higher than in unemployed females than employed females. This may be related to age, physical activity and obesity. Similar results were obtained in some studies.<sup>5,9</sup> The risk of MS was 3.4 times higher in menopausal women than non-menopausal women. This relationship, which has been found in many studies, seems to be related to the age of the woman, obesity status and other risk factors.<sup>5,9,16</sup>

The risk of MS was 1.6 times higher in non-smokers than smokers. This may be due to the fact that the frequency of smoking is low in females, as well as that MS is more common in females. Indeed, although there are studies in the literature that establish or do not establish a relationship between smoking and MS, this difference is thought to be due to the different diagnostic criteria.<sup>17-20</sup>

The MS risk was 2.2 and 3.3 times higher in ones with higher systolic and diastolic blood pressures. In terms of hyperlipidemia, the risk of MS was 4.4, 3.1, 6.4 and 4.3 times higher in patients with higher total cholesterol, LDL and VLDL levels, and a total cholesterol / HDL ratio greater than 5, respectively. Studies have shown that the metabolic syndrome also increases the risk of coronary heart diseases (CHD) if hyperglycemia, hypertension, elevated triglyceride levels and obesity are included as a component of metabolic syndrome. However, it is stated that hypertension has the biggest role in the risk of CHD, followed by hyperglycemia, among the components of metabolic syndrome.<sup>3,9,21-24</sup>

Multivariate logistic regression analysis showed that the risk of MS was 1.9, 1.7, 4.2 and 1.8 times higher in ones with a total cholesterol / HDL ratio of 5 or above, and higher total cholesterol, VLDL and blood pressure levels, which support that MS can be a predictor of coronary heart diseases.

In summary, the prevalence of metabolic syndrome was higher in participants over 45 years of age, married, and in low-educated ones, in housewives, retirees, and menopausal women. Considering the biological risk factors, the risk is higher in ones with higher total cholesterol, LDL and VLDL levels, and with a total cholesterol / HDL ratio of 5 or above. The control of the components of the metabolic syndrome, in other words, improving lifestyle

**Table 5.** Distribution of prevalence of metabolic syndrome (MS) according to risk factors

	With MS		Without MS		p value	OR*	95% CI**
	n	%	n	%			
<b>Smoking Status</b>							
Smoker	404	89.2	49	10.8	0.020	1.6	1.1-2.3
Non-smokers	427	84.1	81	15.9			
<b>Systolic Blood Pressure (mm Hg)</b>							
Normal (<140)	669	90.3	72	9.7	0.001	3.3	2.3-4.9
High (≥140)	162	73.6	58	26.4			
<b>Diastolic Blood Pressure (mm Hg)</b>							
Normal (<90)	633	89.2	77	10.8	0.001	2.2	1.5-3.2
High (≥90)	198	78.9	53	21.1			
<b>Total Cholesterol</b>							
≤200 mg / dL	588	92.7	46	7.3	0.001	4.4	2.9-6.5
>200 mg / dL	243	74.3	84	25.7			
<b>LDL</b>							
≤130 mg / dL	613	90.8	62	9.2	0.001	3.1	2.1-4.5
>130 mg / dL	218	76.2	68	23.8			
<b>VLDL</b>							
≤33 mg / dL	755	90.5	79	9.5	0.001	6.4	4.2-9.8
>33 mg / dL	76	59.8	51	40.2			
<b>Total Cholesterol/HDL</b>							
<5	72	9.3	701	90.7	0.001	4.3	2.9-6.4
≥5	58	30.9	130	69.1			

\*: Odds ratio, \*\*: confidence interval

**Table 6.** Results of multiple logistic regression analysis

Related Factors	p value	OR*	95% CI**
Age between 45 to 54 years	0.016	12.4	1.6-95.5
Age ≥55 years	0.011	13.9	1.8-107.1
Smoking	0.005	0.5	0.3-0.8
Total cholesterol / HDL ≥5	0.015	1.9	1.1-3.1
Cholesterol >200 mg / dL	0.042	1.7	1.1-2.8
VLDL >33 mg/dL	0.001	4.2	2.5-6.9
Blood pressure ≥140/90 mm Hg	0.015	1.8	1.1-2.8

\*: Odds ratio, \*\*: confidence interval

behaviors such as changing eating habits and increasing physical activity, will play an important role in preventing both metabolic syndrome and coronary heart diseases.

\*The authors declare that there are no conflicts of interest.



**C** CORRESPONDING AUTHOR: Ferda Üzyurda Ankara Ün. Tıp Fakültesi Halk Sağlığı ABD, Cebeci Tıp Fakültesi, Tıp Fakültesi Cad. 06620, Mamak, Ankara, Türkiye fozyurda@gmail.com  
**✓** DELIVERING DATE: 21 / 08 / 2017 • ACCEPTED DATE: 14 / 02 / 2018



## REFERENCES

1. Grundy SM, Cleeman JI, Daniels SR, et al. Diagnosis and management of the metabolic syndrome. An American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement. *Circulation* 2005; 116: 2785-2826.
2. Türk Kardiyoloji Derneği, METSAR Türkiye metabolik sendrom araştırması, 21. Ulusal Kardiyoloji Kongresi, 2005, 16-20 Kasım, Antalya, Türkiye.
3. Kitiş Y, Bilgili N, Hisar F, et al. Yirmi yaş ve üzeri kadınlarda metabolik sendrom sıklığı ve bunu etkileyen faktörler. *Anadolu Kardiyol Derg*, 2010; 10: 119-129
4. Carr DB, Utzshneider KM, Hull RL, et al. Intra-abdominal fat is a major determinant of the national cholesterol education program adult treatment Panell III criteria for metabolic syndrome. *Diabetes* 2004; 53: 2087-2094.
5. Çetin F, Güneş G, Özer A. Malatya il merkezinde yaşayan kadınlarda metabolik sendrom prevalansı ve öfke ve sosyodemografik özellikler ile ilişkisi. *Enine kesitsel gözlemsel bir araştırma. Anadolu Kardiyol Derg* 2012; 12: 53-59.
6. Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among US adults. *Finding from the Third National Health and Nutrition Examination Survey JAMA* 2002; 287: 356-359.
7. World Health Organization. Definition, diagnosis and classification of diabetes mellitus and its complications: report of a WHO consultation. Part 1: Diagnosis and classification of diabetes mellitus. Geneva, Switzerland: World Health Organization, 1999.
8. Türkiye Endokrinoloji ve Metabolizma Derneği Metabolik Sendrom Kılavuzu 2009.
9. Kutlu R, Çivi S. Aile Hekimliği Polikliniği'ne başvuran yirmi yaş ve üzeri erişkinlerde metabolik sendrom sıklığı ve ilişkili faktörler. *Konuralp Tıp Dergisi* 2014; 6: 47-54
10. Özseven L, Sönmez Y. Prevalence of metabolic syndrome among adults in a family health care center in Turkey. *SDÜ Tıp Fakültesi Dergisi* 2012; 19: 431-461.
11. Ekecik A, Akdeniz Ö, Akyürek AB. 65 yaş ve üzerindeki geriatric hastalarda metabolik sendrom sıklığı. *Sağlık Bilimleri Dergisi* 2009; 18: 154-158.
12. Demirci H, Çınar Y, Bilgel N. Türkiye'de bir aile hekimliği ünitesinde depresyon ve metabolik sendrom ilişkisinin araştırılması. *Klinik Psikofarmakoloji Bülteni* 2011; 21: 49-57.
13. Onat A, Hergenç G, Can G. İki metabolik sendrom tanımının risk öngörüsünün aynı kohortta prospektif yolla değerlendirilmesi ve halkımız için en uygun tanımın seçilmesi. *Anadolu Kardiyoloji Dergisi* 2007; 7: 29-34
14. Mollaoğlu M, Fertelli TK, Tuncay FÖ. Bir sağlık ocağına başvuran erişkinlerde metabolik sendrom risk düzeyleri ve ilişkili faktörler. *İstanbul Üniversitesi Florence Nightingale Hemşirelik Yüksekokulu Dergisi* 2010; 18: 72-79
15. Orhan H, Sadıkoğlu G, Özçakır A, et al. Kadınlarda metabolik sendrom: Bursa Türkiye'de yapılan bir çalışma. *TSK Koruyucu Hekimlik Bülteni* 2011; 10: 421-432
16. Gülcü F, Parmaksız A, Kızır M, et al. Metabolik Sendrom. *Fırat Sağlık Hizmetleri Dergisi* 2006; 1: 23-27
17. Chen-C, Li TC, Chang PC, et al. Association among cigarette smoking, metabolic syndrome, and its individual components: the metabolic syndrome study in Taiwan. *Metabolism* 2008; 57: 544-548.
18. Ister ED, Aslan S, Taşolar H, et al. The metabolic syndrome risk and related factors who admitted to the cardiology outpatient clinic. *Asian Pac J Health Sci* 2016; 3: 163-169.
19. Hou X, Qiu J, Chen P, et al. (China National Diabetes Metabolic Disorders Study Group) Prevalence of newly diagnosed diabetes screened by OGTT than non-smoking in Chinese men with normal weight. *PLoS One* 2016; 11: e0149234.
20. Soysal A, Şimşek H, Doğanay, et al. Prevalence of metabolic syndrome and affecting factors among individuals aged 30 and over in Balçova district of Izmir. *Balkan Medical Journal* 2016; 33: 331-338.
21. Onat A, Toprak S, Ceyhan K, et al. Türk yetişkinlerinde dislipidemik hipertansiyon: yaygınlığı ve koroner riske bindirdiği yük. *Türk Kardiol Dern Arş* 2002; 30: 402-409
22. Nurkalem Z, Orhan AL, Alper AT, et al. Akut koroner sendromlu, diyabetik olmayan hastalarda metabolik sendromla ile TIMI risk skoru arasındaki ilişki. *Türk Kardiol Dern Arş* 2007; 35: 231-236.
23. Isomaa BO, Almgren P, Tuomi T, et al. Cardiovascular morbidity and mortality associated with the metabolic syndrome. *Diabetes Care* 2001; 24: 683-689.
24. Onat A, Ceyhan K, Başar O, et al. Metabolic syndrome: Major impact on coronary risk in a population with low cholesterol levels: A prospective and cross-sectional evaluation. *Atherosclerosis* 2003; 165: 285-292.