# The presence of metabolic syndrome and associated quality of life in Turkish women with cardiovascular disease

Tevfik PINAR [1]*
Gul PINAR [2]
Nevin DOGAN [3]

[1] Kirikkale University Faculty of Medicine, Department of Public Health, Kirikkale, TURKEY.
[2] Yıldırım Beyazıt University, Faculty of Health Sciences, Nursing Department, Ankara, TURKEY.
[3] Baskent University, Faculty of Health Sciences, Nursing Department, Ankara, TURKEY.
* **Corresponding Author:** Assoc. Prof. Tevfik Pinar, MD, Kirikkale University Faculty of Medicine, Department of Public Health, Kirikkale, TURKEY. Phone: +90 533 814 44 23, E-mail: tevfikpinar@gmail.com

## Abstract

***Introduction:*** The prevalence of metabolic syndrome (MetS) is rapidly increasing in Turkey as well as all over the world. Little is known about the association between quality of life (QoL) and the MetS. ***Objective:*** To determine the presence of MetS and its effects on QoL in Turkish women with cardiovascular disease (CVD). ***Methods:*** Given the need for data in Ankara, Turkey, this cross-sectional study was designed to determine the association between demographic, lifestyles, reproductive history and biochemical-antropometric parameters and the MetS among a sample of women (N = 310) in a University Hospital, Cardiology Outpatient Clinic. The MetS was defined according to the revised National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) criteria. ***Results:*** Overall, 55.1% of women met the criteria for MetS with an average age of 57±0.7 years (range 20–80). Women without MetS were younger and had a more favourable triglyceride and glucose profile, and less likely to be physically inactive. Women with MetS who had longer duration of CVD, were significantly obese, had higher blood pressure, lower HDL cholesterol levels. MetS patients showed significant reductions in QoL ($p<0.05$). ***Conclusions:*** These results showed that MetS was a major problem of Turkish women. MetS was a contributing factor for development of low QoL in the Turkish women with CVD.

***Keywords:*** *Metabolic syndrome, Cardiovascular disease, Women, Quality of life, Obesity*

***Received:*** *August 9, 2012;* ***Accepted:*** *September 23, 2012;* ***Published online:*** *October 9, 2012.*



## Introduction

The metabolic syndrome (MetS) was first described by Reaven in 1988. He found a clustering of many symptoms in patients and called this Syndrome X, including "deadly quartet" and the "insulin resistance syndrome" [1]. The syndrome is defined by a constellation of abdominal obesity, impaired fasting glucose, elevated blood pressure, and dyslipidemia. It was suggested that all of these factors could be an important risk factor for cardiovascular disease (CVD) [2, 3]. The MetS has been described as an epidemic, common disease with rapidly increasing prevalence worldwide over the past 20 years. Owing to its increasing prevalence and being not a single disease, MetS is considered to be a major public health challenge. MetS prevalence is not very different for men or women [4–6]. The prevalence of the MetS in the adult Turkish population is very high, especially in women. According to the metabolic syndrome survey (METSAR) study, the prevalence of MetS in Turkey is 39.6% among women and 28% in male population. Among people who are over 70, the prevalence of MetS is 70% in female, 49% in male. Turkish women have more risk factors than men [7]. Risk factor study showed that the obesity of Turkish women is a major problem (46%), and CVD is the leading cause of death [8]. Lack of employment outside of the home and no regular exercise activities may contribute to the higher frequency of obesity and glucose intolerance among Turkish women [9, 10].

As established frankly, MetS a chronic, progressive and multi-complex health problem that can trigger physical, emotional and psychosocial problems. Especially, in post-menopausal women, components of MetS, such as abdominal obesity, hypertension and hyperglycaemia impair quality of life (QoL) which leads functional dependence. Moreover, previous studies demonstrate that subjects with MetS have significantly worse QoL in women [11–15]. Little information have reported an association between the MetS and QoL status in Turkish women [9, 16, 17].

The coordinated work of various health care professionals is essential to achieve high success rates in diagnosis and treatment. Nurses are ideal health care professionals to direct the MetS risk reduction team and to deliver multifactorial risk reduction in hospital settings, outpatient clinics, and community-based facilities [18]. Nursing care focuses in the development of a concise treatment plan based upon patient's education, lifestyle modifications, psychosocial support, collaborative provider/patient partnership, judicious pharmacologic management and close follow-up [19].

The purpose of this study was to determine the frequency of MetS in Turkish women with CVD, and the effect of MetS on the QoL.

## Materials & Methods

### Study Population

A total of 310 women aged 20 years or older who received health examination from a University Hospital Cardiology Outpatient Clinic in Ankara, Turkey, have been enrolled in our study. The study was carried out in accordance with the principles of Declaration of Helsinki and this study was also approved by the Institutional Review Board. Study group was formed among individuals who admitted to the clinic between March 2011 to May 2011. The sampling units were selected through probability-sampling design. Patients with ablility to communicate, mobilized and agreed to paticipate the study formed the body of study. Ultimately, the sample consisted of 310 (92.9%) participants. While conducting the questionnaire, all participants signed an informed consent. The patient identification forms were distributed by the researchers in the clinic setting that were completed within approximately 15 minutes were collected again. A selected sample of participants underwent a health examination form that included anthropometric measurements, blood pressure examination, and blood biochemistry tests.

### Data Collection

**1.The Patient Demographic Form:** A form consisting of 25 questions was used in order to determine the patients' demographical characteristics and features associated with the MetS. Self-reported questionnaires were administered to determine smoking status, alcohol intake, education level, household income, physical exercise level, nutrition style, comorbid disesases, reproductive history, and family history of medical disease. Smoking habits (current, non-smoker or ex-smoker), and alcohol consumption (none, current drinker) were categorized according to the amount and frequency of alcohol and cigarette consumed. Education level was divided into three categories: elementary, high school, and ≥university. Household income was divided according to the mean household income: good, medium, and poor. Physical exercise was categorized into two groups according to the frequency of activity as minimum 20 minutes per week: none, and ≥3 times per week. Residential area was categorized urban and rural area. Age at menarche was categorized into two categories (<12 years, 12–15 years).

**2. MetS Definition Form:** MetS was defined according to the US National Cholesterol Education Program Adult Treatment Panel III (NECP ATP III) guidelines [20], which stipulated at least 3 out of 5 of the criteria listed in the table had to be met (Table 1).

*Clinical Measures:* Body weight and height were measured in all participants for calculation of body mass index (obesity as defined by BMI ≥30 kg/m2). Height was measured without shoes using a stadiometer. Body weight of patients was measured using electronic on a balanced scale. Additionally, waist circumference and waist/hip ratio (WHR) were calculated. Waist circumference was measured at the narrowest circumference between the xiphisternum and umbilicus.

Blood pressure was measured after 10 minutes of rest by a standard sphygmomanometer. Two measurements were taken from all the subjects at 5-minutes intervals, and the average of the two measurements was used. We reviewed medical records for clinical parameters with a specific focus on the components of the MetS among subjects with CVD within 3 months. Patients on medication were presumed to have high triglycerides (TG) and low HDL-C. In the study, participants were divided into two groups as MetS and non-MetS. The QoL levels in MetS group were compared with levels in non-MetS group. Also, the relationship between QoL levels were investigated in each group.

**3. Definiton of World Health Organization (WHO)- 5 QoL Scale:** WHO–5 QoL Scale was used. Respondents indicates their health status using a 0 (worst imaginable health state) to 25 (best imaginable health state) rating scale. Validation and reliability of the Turkish version was made by Eser, 1994. The QoL scale which evaluated the

### Table 1

ATP III Clinical Identification of the Metabolic Syndrome.

| | |
|---|---|
| **Waist circumference (WC)** | ≥ 88 cm (>35 in) |
| **Triglycerides (TG)** | ≥150 mg/dL |
| **HDL cholesterol** | ≤ 50 mg/dL |
| **Blood pressure** | ≥130/≥85 mm Hg |
| **Fasting blood glucose (FBG)** | ≥110 mg/dL‡ |

 

patient's general well-being had 5 questions (e.g., about meaning of life, life satisfaction, physical or emotional health and lack of energy) [21].

## Statistical Analysis

The descriptive statistics were evaluated by percentage, mean ± standard deviation (SD). In order to analyze the relation between the dependent variables and independent variables in analyzing the data, Student *t*-test, Chi-square test, one-way ANOVA test were used. Regression analysis was used to assess the independent contribution of QoL to the presence of the MetS with age, BMI, smoking, alcohol, education level, household income, physical exercise level, residential area, and family history. Pearson correlation was used to analyzethe relationship between QoL scores and the MetS compenenets variables. Odds ratios (OR) were estimated with their 95% confidence internal (CI) and, statistical significance was defined as P value of <0.05. All analyses were made with the SPSS software (SPSS Inc., Chicago, IL; V14.0).

# Results

The demographic characteristics of women with CVD included in the analysis are summarized in Table 2. This study was conducted on 310 women aged between 20–80 years (57.0±14.03). Data from 310 CVD patients was analysed; the overall prevalence of MetS was 55.1%. Of 86.8% people who participated in the study were aged 40 years or older. Majortiy of the participants (61.6%) graduated from elemantary school, 34.8% of the participants graduated from high school or university.

Analysis of data showed that older age was significantly associated with increased risk of MetS, whereas less education and unemployement were associated with increased level in the MetS (p<0.05). MetS risk was also found to be higher in those living in urban rather than rural communities (p>0.05).

The biochemical and antropometric parameters were defined as mean ± SD for the ATP III among MetS group. We observed that BMI score was 32.6±4.5, WC 115.6±11.3, WHR 0.95±0.05, systolic blood pressure (S-BP) 151±14, diastolic blood pressure (D-BP) 104±10, fasting blood glucose (FBG) 147±67.1, TG 184.3±72,4 ve HDL-C 45.1±11.6. Participants with MetS had a significantly greater BMI (p< 0.001) than those without the syndrome. Participants with MetS also had significantly higher levels of S-BP, D-BP, FBG, and TG, and lower level of HDL-C (p< 0.001) (Table 3).

Abdominal obesity, high FBG, and high TG level were 3 significant risk factors for MetS (Table 4). We also obtained results for BMI and WHR. High TG was the most common component (78.3%). Of 69.4% patients were obese, 73.1% of patients had hypertension 68.4% had truncal obesity-WHR and 72.0% of them had abdominal obesity-WC and 74.8% of patients had low HDL-C. There were significant differences among biochemical parameters between the MetS and the non-MetS group. Table 4 displays the prevelance and OR of the risk factors for MetS. Women with MetS had a very high prevalence of the individual components of the syndrome compared with those without MetS (p<0.001 for all).

We found a significant increase in the prevalence of the MetS among the post-menopausal women (Table 5). While the overall prevalence rate in post-menopausal group was 69%, which was significantly higher than that of pre-menopausal group (p<0.05). Age at first birth and polycystic ovary syndrome (PCOS) have been associated with increased risk of MetS in women (p<0.05). MetS was more common among women with gestational diabetes mellitus (GDM), gestational-hypertension (GHT) and breastfed (p<0.05). Age at menarche and use of hormone replacement therapy (HRT) (oral form) were not found significant factor in the presence of the MetS (p>0.05).

This study underlines the positive correlation of regular physical activity and healthy food patern with QoL (Table 6). Most of the participants (58.7%) did not exercise (≥3 times per week; at least 20 minutes) regularly and 28.7 % of them was currently smoking. Majority of the study group (80.6%) consumed chocolate, potatoes, chips and junk food (≥3 times per week), and even 44.5% didn't regularly consume vegetables (≥3 times per week) and 76.5% of the participants had a stressful life.

MetS was present among 43.9% of the smokers and 56.1% of the non-smokers (p<0.05). MetS was predominantly more among people without regular exercise habit (80.7%); only 19.3% of the people doing regular exercises has MetS (p<0.05). Eating habits were also significantly different, 32.2% of the people with regular fresh vegetable and fruit intake had MetS, however 67.8% of the people without such consumption had MetS. People eating junk food had significantly higher MetS (80.7% vs 19.3%) (p<0.05). When we looked for the relationship between MetS and life style, MetS was seen 94.2% among people living stressful life style, whereas 5.8% in stress-free life style (p<0.05). The MetS group had higher rates of comorbid diseases, use of medications, family history and a longer period from initial diagnosis than the non-MetS group (64.3% vs 35.7%, p=0.001; 91.8% vs 8.2%, p=0.002; 88.9% vs 11.1%, p=0.003; 77.1% vs 22.9%, p=0.001, respectively) (Table 7). The correlations between age, BMI, WC, TG, HDL-C, and S-DBP and QoL scores have been presented in Table 8. We found out that MetS risk factors such as, age, glycemic control, obesity, abdominal obesity, elevated S-DBP, low HDL-C, high TG level had detrimental effect on QoL (p<0.05). According

**Table 2**
Socio-demografic characteristics of the two groups.

| Socio-demografic characteristics | MetS (55.1%) | | Non-MetS (44.9%) | | TOTAL (N=310) | | Analysis* | |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | p | $x^2$ |
| **Age (57.0±0.7)** | | | | | | | | |
| 20-39 y | 14 | 8.2 | 27 | 19.4 | 41 | 13.2 | 0.001 | 3.89 |
| ≥ 40 y | 157 | 91.8 | 112 | 79.6 | 169 | 86.8 | | |
| **Educational level** | | | | | | | | |
| Elemantary | 74 | 43.2 | 45 | 32.4 | 119 | 38.4 | 0.050 | 1.67 |
| ≥ High school | 97 | 56.8 | 94 | 67.6 | 191 | 61.6 | | |
| **Employment** | | | | | | | | |
| Unemployed | 120 | 70.2 | 115 | 82.7 | 225 | 72.6 | 0.008 | 1.82 |
| Employed | 51 | 29.8 | 24 | 17.3 | 85 | 27.4 | | |
| **Household income** | | | | | | | | |
| Poor | 133 | 77.8 | 109 | 78.5 | 242 | 78.1 | 0.851 | 0.42 |
| Good | 38 | 22.2 | 30 | 21.5 | 68 | 21.9 | | |
| **Residential area** | | | | | | | | |
| Urban | 137 | 80.1 | 118 | 84.9 | 299 | 96.5 | 0.474 | 0.83 |
| Rural | 34 | 20.9 | 21 | 25.1 | 11 | 3.5 | | |

**Chi-square test*

**Table 3**
The biochemical and antropometric parameters measured in the two groups.

| The biochemical-antropometric parameters | MetS (Mean±SD) | Non-MetS (Mean±SD) | Analysis* F/P |
|---|---|---|---|
| BMI (kg/m2) | 32.6±4.5 | 26.4±2.3 | 21.42 / 0.0001 |
| WC (cm) | 115.6±11.3 | 90.5±9.3 | 31.15 / 0.0001 |
| WHR (cm) | 0,95±0,05 | 0,92±0,06 | 23.46 / 0.0001 |
| SBP (mmHg) | 151±14 | 132±13 | 97.80 / 0.0001 |
| DBP (mmHg) | 104±10 | 89±9.0 | 94.15 / 0.0001 |
| FBG (mg/dl) | 147±67.1 | 132±70,2 | 45.10 / 0.0001 |
| TG (mg/dl) | 184.3±72,4 | 116.8±43.9 | 71.92 / 0.0001 |
| HDL-C (mg/dl) | 45.1±11.6 | 58.3±12.5 | 33.21 / 0.0001 |

**Analysis of variance (ANOVA)*

to variance analysis, significant differences were observed between the two groups in QoL scores. Mets patients had significantly poor QoL (F=81.99, p=0.001).

## Discussion

MetS is one of the most debilitating disorders, especially among patients who are not aware of the disease. This is very important public health issue since it is very common in public. Approximately 25% of the women in USA is afflicted with MetS [4]. The age-adjusted prevalence in American adult population revealed 32.3% incidence between 40–55 years in 1999–2000, age adjusted MetS rate for the Canadian women are 19.1% and up to 36% for Europeans [22]. According to the Turkish Adult Risk Factor and Cardiovascular Disease (TEKHARF) study, 53% of the individuals who improved CVD also have been MetS patients. METSAR study in Turkey showed the indicence of MetS was % 35 in public over 30 years of age (28% of the male, 40% of the female) [7]. The comparison between ABD and Turkey did not show any difference for

 

**Table 4**

Frequencies and age adjusted Odds Ratio (OR) of risk compenents of MetS in the two groups.

| MetS Criteria met | MetS | | Non-MetS | | TOTAL | | Analysis* | | Age-adjusted** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | p | $x^2$ | OR | (95% CI) |
| HDL-C (≤ 50 mg/dl) | 110 | 74.8 | 37 | 25.2 | 147 | 47.4 | 0.0001 | 7.11 | 1.12 | (0.78-1.60) |
| S-DBP (130/85 mm Hg) | 139 | 73.1 | 51 | 26.9 | 190 | 61.3 | 0.0001 | 8.97 | 1.23 | (0.91-1.72) |
| TG (≥150 mg/dl) | 94 | 78.3 | 26 | 21.7 | 120 | 38.7 | 0.0001 | 6.99 | 1.63 | (1.17-2.24) |
| FBG (≥110 mg/dl) | 119 | 77.2 | 35 | 22.8 | 154 | 49.7 | 0.0001 | 8.64 | 2.67 | (1.58-4.60) |
| WC (≥88 cm) | 126 | 72.0 | 49 | 28.0 | 175 | 56.5 | 0.0001 | 7.33 | 1.32 | (0.95-1.92) |
| WHR (≥ 0.8) | 89 | 68.4 | 41 | 31.6 | 130 | 41.9 | 0.0001 | 4.60 | 1.54 | (1.12-2.20) |
| BMI ( ≥30 kg/m2) | 86 | 69.4 | 38 | 30.6 | 124 | 40.0 | 0.0001 | 4.75 | 2.21 | (0.36-3.61) |

**Chi-square test; **Regression analysis*

**Table 5**

Reproductive characteristics of the two groups.

| Reproductive History | MetS | | Non-MetS | | TOTAL | | Analysis* | |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | p | $x^2$ |
| Age at first birth | | | | | | | | |
| <20 y | 122 | 72.6 | 79 | 55.6 | 201 | 64.8 | 0.001 | 38.96 |
| 21-31 y | 49 | 27.4 | 60 | 44.4 | 109 | 35.2 | | |
| Age at menarche | | | | | | | | |
| <12 y | 100 | 59.5 | 69 | 50.0 | 169 | 55.1 | 0.418 | 2.83 |
| 12–15 y | 71 | 40.5 | 70 | 50.0 | 141 | 44.9 | | |
| HRT oral use (≥2 years) | | | | | | | | |
| Yes | 65 | 36.9 | 55 | 40.8 | 120 | 38.7 | 0.478 | 0.50 |
| No | 106 | 63.1 | 84 | 59.2 | 190 | 61.3 | | |
| Breastfeeding (at least 3 months) | | | | | | | | |
| Yes | 94 | 56.0 | 62 | 43.7 | 156 | 50.3 | 0.031 | 4.65 |
| No | 77 | 44.0 | 77 | 56.3 | 154 | 49.7 | | |
| GDM | | | | | | | | |
| Yes | 88 | 51.9 | 46 | 38.7 | 134 | 43.2 | 0.024 | 3.25 |
| No | 83 | 48.1 | 93 | 61.3 | 176 | 56.8 | | |
| GHT | | | | | | | | |
| Yes | 89 | 53.0 | 58 | 40.8 | 147 | 47.4 | 0.033 | 4.54 |
| No | 82 | 47.0 | 81 | 59.2 | 163 | 52.6 | | |
| Menopause | | | | | | | | |
| Yes | 116 | 69.0 | 74 | 52.1 | 190 | 61.3 | 0.002 | 9.30 |
| No | 55 | 31.0 | 65 | 47.9 | 120 | 38.7 | | |
| PCOS | | | | | | | | |
| Yes | 130 | 76.0 | 44 | 31.7 | 174 | 56.1 | 0.001 | 6.45 |
| No | 41 | 24.0 | 95 | 68.3 | 136 | 43.9 | | |

**Chi-square test. (OC: oral contraceptive; HRT: hormone replacement therapy; GDM: gestational diabetes mellitus; GHT: gestational hypertension; PCOS: polycystic ovarian syndrome)*

**Table 6**
Lifestyle habits of participants with and without MetS.

| Life Style Habits | MetS | | Non-MetS | | TOTAL | | Analysis* | |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | p | $x^2$ |
| **Smoking** | | | | | | | | |
| Current smoker | 75 | 43.9 | 14 | 10.0 | 89 | 28.7 | 0.001 | 4.27 |
| Non-smoker | 96 | 56.1 | 125 | 90.0 | 211 | 71.3 | | |
| **Exercise (≥3 times per week; at least 20 minutes)** | | | | | | | | |
| Yes | 33 | 19.3 | 95 | 68.3 | 128 | 41.3 | 0.001 | 10.84 |
| No | 138 | 80.7 | 44 | 31.7 | 182 | 58.7 | | |
| **Fruit-vegetable consumption ( ≥3 times per week)** | | | | | | | | |
| Yes | 55 | 32.2 | 117 | 84.2 | 172 | 55.5 | 0.001 | 10.48 |
| No | 116 | 67.8 | 22 | 15.8 | 138 | 44.5 | | |
| **Junk-food consumption (≥3 times per week)** | | | | | | | | |
| Yes | 138 | 80.7 | 112 | 80.6 | 250 | 80.6 | 0.001 | 11.55 |
| No | 33 | 19.3 | 27 | 19.4 | 60 | 19.4 | | |
| **Stressful life** | | | | | | | | |
| Yes | 161 | 94.2 | 76 | 54.7 | 237 | 76.5 | 0.001 | 5.16 |
| No | 10 | 5.8 | 63 | 45.3 | 73 | 23.5 | | |

**Chi-square test.*

**Table 7**
Medical characteristics of the two groups.

| Medical condition* | MetS | | Non-MetS | | Analysis** | |
|---|---|---|---|---|---|---|
| | n | % | n | % | p | $x^2$ |
| **Period since diagnosed** | | | | | | |
| 1-4 year | 39 | 22.9 | 39 | 28.1 | 0.001 | 4.13 |
| 5 year ≥ | 132 | 77.1 | 100 | 71.9 | | |
| **Comorbid disesases** | | | | | | |
| Yes | 110 | 64.3 | 23 | 16.5 | 0.001 | 9.60 |
| No | 61 | 35.7 | 116 | 83.5 | | |
| **Use of medication** | | | | | | |
| Yes | 157 | 91.8 | 111 | 79.9 | 0.002 | 3.09 |
| No | 14 | 8.2 | 28 | 20.1 | | |
| **Family history** | | | | | | |
| Yes | 152 | 88.9 | 113 | 85.5 | 0.003 | 2.99 |
| No | 19 | 11.1 | 26 | 14.5 | | |

** Comorbid diseases: diabetes, rheumatic diseases, colon diseases, thyroidism, depression; Use of medication: tibolone, anti-HT, anti-diabetic, antianginal, antiplatelet, anti-obesity drugs, anti-psyschotic multivitamins antioxidants, antiacid, H2 blocker; Family history: stroke, kidney diseases, CVD, diabetes, hypertension and myocardial infarction.*
***Chi-square test*

men; however, prevalence among Turkish women was higher than American Women (43%) [7]. In our country, because of low rate of the women participation in work life, technological developments made housewives to work physically less and moreover women did not spare time to exercise. In our study, data from 310 CVD patients was analysed; the overall prevalence rate of MetS was 55.1% (Table 2).

Few studies have evaluated the impact of socio-economic outcomes on the prevalence of MetS [23–29]. Loucks et al. showed that risk factors for MetS were increased in women with low socio-economical status. Socio-economical status has long been known to predict higher rates of many chronic diseases [23]. The association between socio-economical status and MetS within the USA appears to be confounded by race and ethnicity. Among African-American women, higher educational status was associated with reduced risk of MetS compared with lower educational status [4]. European studies did not show any association between the education-socioeconomic status and MetS [15, 22, 25]. Korean women with higher education and income levels had lower risk for MetS [26]. Prospective Urban and Rural Epidemiological Study (PURE) is the another important study which showed a meaningful relationship between MetS and education. In this study, 58.2% of the people who had MetS were from lower educational status [24]. Similarly among Turkish women, there was significant correlation between the prevalence of MetS with education or income levels [10]. In our study, the women with higher educational level and socio-economical status had lower risk for MetS. Education has protective effect on MetS for women ($p<0.05$) (Table 2). It was thought that educated individuals could be more sensitive about healhty life. In addition, urban vs. rural location may play a role in prevalence of MetS in developing countries [10, 24]. Furthermore, women in urban areas of Cameroon had a 7.3-fold greater risk of developing MetS [27]. Similar trends have been observed in China [28]. In our study, the women with urban and rural area had a similar risk for MetS ($p>0.05$) (Table 2).

Ford and colleagues performed The Third National Health and Nutrition Examination Survey-NHANES III on a sample from population between 1988 and 1994 [4]. This study showed that frequency of MetS rised among women from 6.7% to 43.5 % with increasing age from 20-29 to 60-69 years. Results of our study aslo showed increase in frequency of MetS with increasing age. MetS frequency rised from 8.2% to 30.4% and then to 61.4% with ages of 20–39 years to 40–59 years and more than 60 years of ages, respectively (Table 2). So our results and Ford et al. data both indicated MetS increased with age.

The main components of the MetS are abdominal obesity, insulin resistance, hypertension and dyslipidemia [2, 3]. It is estimated that 47 million USA residents have MetS. More than 55% of adults in USA are overweight, one in five is obese, 60.7% of women had abdominal obesity, 61% had diabetes, 26.5% of women had hypertriglyceridemia. Future projections indicated these numbers will be more than double by 2050. WHO data showed 170% increase in prevalence of type 2 DM from 1995 to 2025 [4]. In the same context, the prevalence of hypertension reaches above 30% of the population [20]. In our study, 3 presents the distribution of the components of MetS in women with and without the syndrome. The most prevalent risk factor was 78.3% with dyslipidaemia, 73.1% with hypertension and 72% with abdominal obesity. CVD patients with MetS were significantly older, heavier, and had longer duration of disease, higher blood pressure, higher mean WC, higher TG and lower HDL-C levels ($p<0.05$) (Table 4). These results are parallel with USA studies.

Early onset of menarche (<12 years) was associated with the higer risk of MetS defined according to the NCEP ATP III [20]. The role of menarche in the development of the MetS is not yet clear. It is possible that early menarche only presents a marker for childhood obesity. These associations were only partly mediated by adiposity [29]. The Epic Norfolk cohort study showed that age at menarche below 12 years is associated with higher incidence of CVD (OR: 1.17; CI: 1.07–1.27), incidence coronary artery disease (OR: 1.23; CI: 1.06–1.62) and a higher risk of hypertension (OR: 1.13; CI: 1.02–1.24). Additionally, a study on 794 Finnish women found out that earlier menarche was only a risk marker. Greater childhood BMI contributes to the earlier menarche and hence increase in adult BMI leads to subsequent CVD risk [25]. Results from the KORA F4 Study 1536 women aged 32 to 81 years of the German population were investigated and age at menarche is inversely associated with MetS [30]. On the contrary, a Japanese cohort study with 37,965 postmenopausal women aged 40–79 years showed no association between age of menarche and mortality of CVD [31]. The present study showed that earlier age at menarche was not associated with the development of the MetS ($p>0.05$). (Table 5).

Pregnancy itself creates a milieu that is similar to the syndrome, including the development of insulin insensitivity and increased levels of blood glucose, triglycerides and blood pressure [32]. Some studies showed that this effect is a combination of lifestyle risk factors and/or biological changes associated with earlier age at first birth, which may explain the positive association between parity and increased risk of MetS [31, 33]. Gunderson et al. reported that age at first birth (<20 year) is associated with higher incidence of the MetS among women [34]. A study on Chinese women confirmed these results [28]. In our study, having the first baby at a later age was associated with a decreased risk of MetS (OR, 0.95; 95% CI, 0.90-0.99). In CARDIA study , researchers monitored 704 women with first pregnancy at the age of 18 and 30 years. All women were free of MetS at the beginning of the study. Twenty years later, those women who breastfed longer during the first nine months after birth were significantly less likely to develop MetS [34]. Previous studies have reported much weaker protective association of breastfeeding with MetS in middle-aged and older women [27, 29, 35]. In our study breastfeeding was associated with a lower incidence of the MetS ($p<0.05$) (Table 5).

Dysglycemia is currently the most prevalent metabolic alteration found during pregnancy [3]. Its prevalence during pregnancy may be up to 13% of women [29]. Another recent Kaiser Permanente study by Gunderson et al. showed that women with gestational diabetes were 2.5 times more likely to develop MetS after pregnancy [34]. In another study, women who develop preeclampsia or gestational diabetes have six times more risk of MetS at 3 years after pregnancy. For GHT, the same situation is also true [30]. Women with of high blood pressure problem during pregnancy have ncreased risk of CVD later in life [31]. In our study, GDM and GHT were associated with MetS ($p<0.05$) (Table 5). The insulin resistance and obesity that are frequently found in women with PCOS have been implicated as significant risk factors for MetS. The pathophysiology of the PCOS, like the MetS, is also unclear and highly debated. The ovary, hypothalamic-pituitary axis, and insulin resistance all are thought to have a role in this condition [35]. In our study, PCOS had association with the MetS ($p<0.05$) (Table 5).

Post-menopausal women are known to have higher prevalence of MetS when compared with premenopausal women. However, there are few studies that investigated the effects of reproductive factors on MetS in post-menopausal women [35–37]. A total of 892 postmenopausal women who participated in the 2005 Korean NHANES study that indicated an association between menopause and MetS. The prevalence of MetS increases with menopause and may partially explain the apparent acceleration in CVD after menopause. Decline in sex steroids is likely to contribute the increased prevalence of the MetS in women after menopause [2]. We found significant increase in the prevalence of the MetS among the post-menopausal women ($p<0.05$).

HRT is currently recommended as the gold standard for the management of vasomotor symptoms; however, the benefit of HRT on components of MetS and risk for cardiovascular events is still uncertain. In a study the use of HRT in postmenopausal women has been shown to improve many components of the MetS, such as abdominal obesity, HDL-C, and FBG [35]. In our study, use of HRT (oral form) was not associated with MetS ($p>0.05$) (Table 5). Each component of MetS is responsive to lifestyle changes and predisposing genetic factors must also be identified and addressed. A healthy behaviours pattern for prevention of MetS is necessary [38]. In our study the environmental, genetic factors and individual habits such as increased consumption of high caloric foods, smoking, chronic stress, physical inactivity, and sedentary activity have been positively associated with Mets ($p<0.05$) (Table 6).

QoL assessment has become an important element in health services. In a study by Gonen et al., researchers used the Medical Outcomes Study, Short Form-36 to determine whether individuals with MetS had lower scores on the physical and mental health [16]. Frisman and Kristenson examined the QoL in relation to the MetS in a Swedish middle-aged population. They reported that MetS is a risk factor for poorer QoL independent from age, gender, smoking and alcohol usage [14]. Similarly, Sullivan et al. found that the psychosocial consequences of obesity were greater among women with a BMI greater than 34.0 than among men with a BMI greater than 38.0 [15]. Our study also yielded results supporting the negative relationship between QoL and MetS ($p<0.05$) (Table 8).

## Conclusion

In conclusion, the Turkish women with CVD have a higher risk for MetS (about one in two); risk factors are age, education, socio-economical status, family history, comorbid diseases, some reproductive history, menopause onset, smoking, stress, non-healthy food intake and sedentary habits. Increased TG, low HDL level and hypertension are probably the best predictors of MetS. Women with MetS had significantly lower QoL than those without MetS. Knowledge of the high prevalence of MetS in our population makes it critical to plan prevention with healthcare interventions. Major challenges remain for the integration of the key MetS features into clinical practice in identifying high-risk populations and individuals. It is our opinion that lifestyle modification and weight loss should be at the core of treating or preventing the MetS and its components. Patient management requires an integrated approach with the involvement of various health care providers, i.e., physicians, nurses, dieticians, pharmacists and social workers.

Food patterns and lifestyles were determined by a self-administered questionnaire based participants' memory. Additionally, the participants were sampled from one medical center in the city of Ankara instead of a variety of hospitals. Therefore, this design limits generalization of our findings to all Turkish women.

## Acknowledgement

We thank our subjects for their kind participation, and all members of staff for their invaluable help for interviews and measurements.

## References

[1] Reaven GM. Banting lecture 1988: role of insulin resistance in human disease. Diabetes 1988; 37: 1595–607.

[2] Alexander CM, Landsman PB, Teutsch SM, Haffner SM; Third National Health and Nutrition Examination Survey (NHANES III); National Cholesterol Education Program (NCEP). NCEP-defined metabolic syndrome, diabetes, and prevalence of coronary heart disease among NHANES III participants age 50 years and older. Diabetes 2003; 52: 1210-4.

[3] Alberti KG, Zimmet P, Shaw J. Metabolic syndrome-a new world-wide definition. A Consensus Statement from the International Diabetes Federation. Diabet Med 2006; 23: 469–80.

[4] Ford ES, Giles WH, Dietz WH. Prevalence of metabolic syndrome among US adults: findings from the third National Health and Nutrition Examination Survey. JAMA 2002; 287: 356–9.

 

[5] Boudreau DM, Malone DC, Raebel MA, Fishman PA, Nichols GA, Feldstein AC, *et al.* Health care utilization and costs by metabolic syndrome risk factors. Metab Syndr Relat Disord 2009; 7: 305–14.

[6] Ilanne-Parikka P, Eriksson JG, Lindström J, Hämäläinen H, Keinänen-Kiukaanniemi S, Laakso M, *et al.* Prevalence of the metabolic syndrome and its components: findings from a Finnish general population sample and the Diabetes Prevention Study cohort. Diabetes Care 2004; 27:2135–40.

[7] Onat A, Hergenç G, Can G. Prospective validation in identical Turkish cohort of two metabolic syndrome definitions for predicting cardiometabolic risk and selection of most appropriate definition. Anadolu Kardiyol Derg 2007; 7: 29–34. (Turkish)

[8] Kozan O, Oguz A, Abaci A, Erol C, Ongen Z, Temizhan A, *et al.* Prevalence of the metabolic syndrome among Turkish adults. Eur J Clin Nutr 2007; 61: 548–53.

[9] Erem C, Hacihasanoglu A, Deger O, Topbaş M, Hosver I, Ersoz HO, *et al.* Prevalence of metabolic syndrome and associated risk factors among Turkish adults: Trabzon MetS study. Endocrine 2008; 33: 9–20.

[10] Gemalmaz A, Aydın S, Başak O, Discigil G, Karul A. Prevalance of the Metabolic Syndrome in a rural Turkish population: comparison and concordance of two diagnostic criteria. Turk J Med Sci 2008; 38: 159–65.

[11] Chedraui P, Hidalgo L, Chavez D, Morocho N, Alvarado M, Huc A. Quality of life among postmenopausal Ecuadorian women participating in a metabolic syndrome screening program. Maturitas 2007; 56: 45–53.

[12] Han JH, Park HS, Shin CI, Chang HM, Yun KE, Cho SH, *et al.* Metabolic syndrome and quality of life (QOL) using generalised and obesity-specific QOL scales. Int J Clin Pract 2009; 63: 735–41.

[13] Tung HH, Tseng LH, Wei J, Lin CH, Wang TJ, Liang SY. Food pattern and quality of life in metabolic syndrome patients who underwent coronary artery bypass grafting in Taiwan. Eur J Cardiovasc Nurs 2011; 10: 205–12.

[14] Frisman GH, Kristenson M. Psychosocial status and health related quality of life in relation to the metabolic syndrome in a Swedish middle-aged population. Eur J Cardiovasc Nurs 2009; 8: 207–15.

[15] Sullivan PW, Ghushchyan V, Wyatt HR, Wu EQ, Hill JO. Impact of cardiometabolic risk factor clusters on health-related quality of life in the U.S. Obesity (Silver Spring) 2007; 15: 515–21.

[16] Gönen S, Gungor K, Cilli AS, Kamış U, Akpinar Z, Kısakol G, *et al.* Comprehensive analysis of health related quality of life in patients with diabetes: A study from Konya Turkey. Turk Jem 2007; 11: 81–8.

[17] Demir M, Unsar S. Assessment of quality of life and activities of daily living in Turkish patients with heart failure. Int J of Nurs Pract 2011; 17(6): 607–14.

[18] Berra K, Miller NH, Jennings C. Nurse-based models for cardiovascular disease prevention: from research to clinical practice. J Cardiovasc Nurs. 2011; 26: S46–55.

[19] Wagner JL. When your patient has metabolic syndrome: Find out how to recognize and manage this common and serious cardiovascular condition. Nursing 2008; 38: 6–9.

[20] National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. Circulation 2002; 106: 3143–421.

[21] Eser SY, Fidaner H, Fidaner C, Elbi H, Eser E, Göker E. Yaşam Kalitesinin Ölçülmesi, WHOQOL-100 ve WHOQOOL-BREF. Psikiyatri Psikoloji Psikofarmakoloji (3P) Dergisi 1999; 7: 5–13. (Turkish)

[22] Gerstein HC, Anand S, Yi QL, Vuksan V, Lonn E, Teo K, *et al.* The relationship between dysglycemia and atherosclerosis in South Asian, Chinese, and European individuals in Canada: a randomly sampled cross-sectional study. Diabetes Care 2003; 26(1): 144–9.

[23] Loucks EB, Rehkopf DH, Thurston RC, Kawachi I. Socioeconomic disparities in metabolic syndrome differ by gender: evidence from NHANES III. Ann Epidemiol 2007; 17: 19–26.

[24] Teo K, Chow CK, Vaz M, Rangarajan S, Yusuf S; PURE Investigators-Writing Group. The Prospective Urban Rural Epidemiology (PURE) study: examining the impact of societal influences on chronic noncommunicable diseases in low-, middle-, and high-income countries. Am Heart J 2009; 158: 1–7.

[25] Lakshman R, Forouhi N, Luben R, Bingham S, Khaw K, Wareham N, *et al.* Association between age at menarche and risk of diabetes in adults: results from the EPIC-Norfolk cohort study. Diabetologia 2008; 51: 781–6.

[26] Lim S, Shin H, Song JH, Kwak SH, Kang SM, Won Yoon J, *et al.* Increasing prevalence of metabolic syndrome in Korea: The Korean National Health and Nutrition Examination Survey for 1998-2007. Diabetes Care 2011; 34:1323–8.

[27] Fezeu L, Balkau B, Kengne AP, Sobngwi E, Mbanya JC. Metabolic syndrome in a sub-Saharan African setting: central obesity may be the key determinant. Atherosclerosis 2007; 193: 70–6.

[28] Weng X, Liu Y, Ma J, Wang W, Yang G, Caballero B. An urban-rural comparison of the prevalence of the metabolic syndrome in eastern China. Public Health Nutr 2007; 10: 131–6.

[29] Feng Y, Hong X, Wilker E, Li Z, Zhang W, Jin D, *et al.* Effects of age at menarche, reproductive years, and menopause on metabolic risk factors for cardiovascular diseases. Atherosclerosis 2008; 196: 590–7.

[30] Rathmann W, Strassburger K, Heier M, Holle R, Thorand B, Giani G, *et al.* Incidence of Type 2 diabetes in the elderly German population and the effect of clinical and lifestyle risk factors: KORA S4/F4 cohort study. Diabet Med 2009; 26: 1212–9.

[31] Cui R, Iso H, Toyoshima H, Date C, Yamamoto A, Kikuchi S, *et al.* Relationships of age at menarche and menopause, and reproductive year with mortality from cardiovascular disease in Japanese postmenopausal women: the JACC study. J Epidemiol 2006; 16: 177–84.

[32] Mousavi E, Gharipour M, Tavassoli A, Sadri GH, Sarrafzadegan N. Multiparity and risk of metabolic syndrome: Isfahan Healthy Heart Program. Metab Syndr Relat Disord 2009; 7: 519–24.

[33] Lao XQ, Thomas GN, Jiang CQ, Zhang WS, Yin P, Schooling M, *et al.* Parity and the metabolic syndrome in older Chinese women: the Guangzhou Biobank Cohort Study. Clin Endocrinol (Oxf) 2006; 65: 460–469.

[34] Gunderson EP, Jacobs DR Jr, Chiang V, Lewis CE, Tsai A, Quesenberry CP Jr, *et al.* Childbearing is associated with higher incidence of the metabolic syndrome among women of reproductive age controlling for measurements before pregnancy: the CARDIA study. Am J Obstet Gynecol 2009; 201: 177.e1–177.e9.

[35] Salpeter SR, Walsh JM, Ormiston TM, Greyber E, Buckley NS, Salpeter EE. Meta-analysis: effect of hormone-replacement therapy on components of the metabolic syndrome in postmenopausal women. Diabetes Obes Metab 2006; 8: 538–54.

[36] Cho GJ, Park HT, Shin JH, Kim T, Hur JY, Kim YT, *et al.* The relationship between reproductive factors and metabolic syndrome in Korean postmenopausal women: Korea National Health and Nutrition Survey 2005. Menopause 2009; 16: 998–1003.

[37] Tandon VR, Mahajan A, Sharma S, Sharma A. Prevelance of cardiovascular risk factors in postmenopausal women: A rural study. J Midlife Health 2010; 1: 26–9.

[38] Lakka TA, Laaksonen DE. Physical activity in prevention and treatment of the metabolic syndrome. Appl Physiol Nutr Metab 2007; 32: 76–88.

 