Prevalence of the metabolic syndrome among adults in a family health center in Turkey

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Özet

Türkiye'de bir aile sağlığı merkezindeki erişkin bireylerde metabolik sendrom prevalansı

Amaç: Bu çalışmanın amacı Isparta ili kentsel alanında bulunan aile sağlığı merkezimize kayıtlı erişkin bireylerde metabolik sendrom prevalansını belirlemektir. Materyal ve Metod: Araştırma kesitsel tiptedir. Evren, Kurtuluş Aile Sağlığı Merkezi'ne kayıtlı 20 yaş ve üstü 8038 kişidir. Metabolik sendrom (MetS) prevalansı Ulusal Kolesterol Eğitim Programı (NCEP) Erişkin Tedavi Paneli III (ATP III) ve Uluslararası Diyabet Federasyonu (IDF) tanımlamaları kullanılarak belirlenmiştir. Bulgular: ATP III ve IDF tanımlamalarına göre MetS prevalansı sırasıyla % 29.9 ve % 35.3 olarak bulunmuştur. Her iki tanımlamayla da prevalans kadınlarda erkeklere oranla daha yüksektir. ATP III için bu oranlar % 32.6'ya % 26.7 iken, IDF için % 37.9'a % 32.3 düzeylerindedir. Prevalans, her iki tanımlamayla da yaşla birlikte artış göstererek 60-69 yaş grubunda en yüksek düzeye ulaşmıştır. En yüksek oranda saptanan MetS kriteri, ATP III tanımlamasıyla düşük HDL-C (% 52.1) iken IDF tanımlaması ile abdominal obezite (% 72.1) olmuştur. Sonuç: Kentsel alandaki bu toplumda MetS prevalansı yüksek bulunmuştur. Sonuçlarımız değerlendirildiğinde incelenen toplumun yaklaşık üçte biri diyabet ve kardiyovasküler hastalıkların gelişimi açısından risk altındadır. Bu bulgular aile sağlığı merkezimizdeki bireylerde sağlıklı yaşam tarzı davranışlarının teşvik edilmesi ve desteklenmesi ihtiyacını ortaya koymaktadır.

Anahtar kelimeler: Metabolik sendrom, prevalans, aile sağlığı merkezi

Abstract

Objective: The purpose of this study was to determine the prevalence of the metabolic syndrome (MetS) in an urban population enrolled at a family health center in the city of Isparta. Material and Method: It was a cross-sectional study. The study population consisted of 8038 individuals aged 20 and over enrolled at Kurtuluş Family Health Center. The MetS was diagnosed using the National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III) and the International Diabetes Federation (IDF) criteria. Results: According to ATP III and IDF definitions, the overall prevalence of the MetS was 29.9% and 35.3%, respectively. By both definitions, the prevalence was higher in women than men. For ATP III, it was 32.6% versus 26.7%; while it was 37.9% versus 32.3% for IDF. The prevalence increased significantly by age for both definitions reaching peak levels in the sixth decade. The most common component was low HDL-C (52.1%) for ATP III, however it was abdominal obesity (72.1%) for IDF. Conclusion: There is a high prevalence of MetS in this urban population. Considering our results, it is noteworthy that one third of our population has the risk of developing diabetes and cardiovascular disease. These findings indicate the need for support and promotion of healthy lifestyle behaviors among individuals of our family health center.

Keywords: Metabolic syndrome, prevalence, family health center

Introduction

The name of the metabolic syndrome (MetS) has been considered for the clustering of some cardiovascular risk factors including abdominal obesity, elevated blood pressure, hyperglycemia, and atherogenic dyslipidemia (1).

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Studies suggest an association between the MetS, diabetes and cardiovascular disease (2-5). Patients with the metabolic syndrome are also at increased risk for developing myocardial infarction or stroke compared to people without MetS (6). To introduce the MetS into clinical practice, several organizations have formulated simple criteria for its diagnosis. The World Health Organization (WHO) proposed a definition of the MetS in 1999 (7) and the European Group for the Study of Insulin Resistance (EGIR) revised a modified version of the WHO definition to be used in non-diabetic subjects (8). The National Cholesterol Education Program Expert Panel and Adult Treatment Panel III (NCEP ATP III) published a definition in 2001 (9) and The International Diabetes Federation (IDF) Consensus group has come out with another definition in 2005 (10).

The definition suggested by NCEP ATP III is relatively simple, and hence most widely used (9). The IDF definition is a global definition focusing on central obesity, and allowing for differences in waist circumference (WC) cut off points between populations of different ethnicity. Unfortunately, there is no internationally agreed definition for the MetS and, hence, the prevalence of this syndrome vary substantially across populations depending on the criteria used and reported as about 20–40 % in western countries and 10–20 % among Asian adults (11). The prevalence of obesity and the MetS is rapidly increasing, leading to increased morbidity and mortality (12).

Family Medicine model is implemented currently in the primary care health service program in Turkey. In this presentation of health services, family physicians are primary health care providers responsible to address general health concerns and present the preventive and diagnostic treatment procedures to the society. It is essential to assess the risk profiles of patients to reduce the morbidity and mortality rates.

The aim of the present study was to evaluate the prevalence of the MetS in an urban Turkish population at a family health center using the NCEP ATP III and IDF definitions.

Methods

The study design

This study was a cross-sectional study conducted in a family health center in the central province of Isparta city located in the western Mediterranean region of Turkey. It was carried out from September to November of 2011. The study was approved by the Ethical Committee of Süleyman Demirel University. A total of 8038 individuals aged 20 and over enrolled at Kurtuluş Family Health Center were stratified into six age groups of 10 year intervals. The sample size was then calculated based on a MetS prevalence of 33 % with a deviation ±2.5 % (precision 30.5-35.5%) at a confidence level of 95 %. Finally, 5 % more was added to compensate for non-response and this resulted in a total sample size of 1220 subjects. Then systematic sampling is applied within each stratum proportional to the sizes in the total population to select the subjects that met the eligibility criteria which were: absence of any physical handicap that could interfere with the anthropometric evaluation, not to be pregnant or breastfeeding. A total of 1014 subjects participated in the study, giving a response rate of 83.1 %. All the subjects received oral information concerning the study and gave their written consent.

Definition of MetS

The NCEP ATP III (ATP III) definition of the MetS requires the presence of 3 or more of the following: 1. Abdominal obesity: WC >102 cm in men and >88 cm in women; 2. High triglyceride (TG) level: ≥150 mg/dL (1.69 mmol/L); 3. Low HDL cholesterol (HDL-C) level: <40 mg/dL (1.03 mmol/L) for men and <50 mg/dL (1.29 mmol/L]) for women; 4. High blood pressure (BP): systolic ≥130 or diastolic ≥85 mmHg or using antihypertensive treatment; and 5. High fasting plasma glucose (FPG) concentration: ≥110 mg/dL (6.1 mmol/L) or the presence of diabetes mellitus (9).

According to the IDF definition, for a person to be defined as having the MetS they must have central obesity defined as WC ≥ 94 cm for Europid (European origin) men and ≥ 80 cm for Europid women, plus any two of the following four factors (there are ethnic specific values of WC for other groups like Asian or Japanese): 1. Raised TG level: ≥150 mg/dL (1.69 mmol/L), or specific treatment for this lipid abnormality; 2. Reduced HDL-C: < 40 mg/dL (1.03 mmol/L) in males and < 50 mg/dL (1.29 mmol/L) in females, or specific treatment for this lipid abnormality; 3. Raised BP: systolic ≥ 130 or diastolic ≥ 85 mmHg, or treatment of previously diagnosed hypertension; 4. Raised FPG: ≥ 100 mg/dL (5.6 mmol/L), or previously diagnosed type 2 diabetes (10).

Anthropometric measurements

Anthropometric measurements, including height, weight and WC were performed while subjects were wearing light clothing and no shoes. Weight was measured to the nearest 0.1 kg using a digital weight recorder. Height was measured to the nearest 0.1 cm using a wall fixed stadiometer. WC was measured at a level midway between the lowest rib margin and the iliac crest in a horizontal plane using a flexible measuring tape at the end of a normal expiration.

BP measurements

A standard aneroid sphygmomanometer (Erka, Germany) was used to measure the BP of each subject in the sitting position after a 10-minute rest period. Systolic (Korotkoff phase I) and diastolic (Korotkoff phase V) BP was measured twice and the average of each measurement was used for data analysis.

Blood Assays

Blood samples were taken in the morning after a 12-hour, overnight fasting period. Samples were subsequently transported to a central, certified laboratory to be analyzed. Plasma glucose, TG, and HDL-C levels were measured by an autoanalyzer (Roche/Hitachi Cobas 6000).

Statistical analysis

All data were analyzed by the Statistical Package for Social Sciences for Windows, version 15.0 (SPSS Inc. Chicago, IL). Chi-square test was used to compare proportions between two or more groups. Significance was considered to be $p < 0.05$.

Results

The prevalence of the MetS in men and women by age and gender is shown in Table 1. Of the 1014 subjects participating in the study, there were 465 (45.9 %) men and 549 (54.1 %) women. The mean age (± SD) was 45 ± 16 years (range 20–93 years, median 43.0 years). The prevalence of the MetS calculated by using the ATP III and IDF definitions was 29.9 % and 35.3 %, respectively. The prevalence was greater in women than men using both definitions. For ATP III, it was 32.6 % versus 26.7 %; while it was 37.9 % versus 32.3 % for IDF (Table 1). The results were statistically significant for ATP III ($p = 0.040$) but not for IDF ($p = 0.062$).

Table 1. Prevalence of the metabolic syndrome based on NCEP ATP III and IDF criteria by age group and gender

	Total population		Men		Women	
	n	MetS n (%)	n	MetS n (%)	n	MetS n (%)
NCEP ATP III						
20-29	218	17 (7.8)	99	8 (8.1)	119	9 (7.6)
30-39	217	34 (15.7)	103	15 (14.6)	114	19 (16.7)
40-49	194	60 (30.9)	90	23 (25.6)	104	37 (35.6)
50-59	190	91 (47.9)	88	41 (46.6)	102	50 (49.0)
60-69	108	58 (53.7)	46	22 (47.8)	62	36 (58.1)
70 ≤	87	43 (49.4)	39	15 (38.5)	48	28 (58.3)
Total	1014	303 (29.9)	465	124 (26.7)	549	179 (32.6)
IDF						
20-29	218	20 (9.2)	99	9 (9.1)	119	11 (9.2)
30-39	217	44 (20.3)	103	20 (19.4)	114	24 (21.1)
40-49	194	70 (36.1)	90	27 (30.0)	104	43 (41.3)
50-59	190	106 (55.8)	88	48 (54.5)	102	58 (56.9)
60-69	108	68 (63.0)	46	27 (58.7)	62	41 (66.1)
70 ≤	87	50 (57.5)	39	19 (48.7)	48	31 (64.6)
Total	1014	358 (35.3)	465	150 (32.3)	549	208 (37.9)

The prevalence of the MetS increased from 7.8 % for ATP III and 9.2 for IDF within the 20–29 year-old group to 53.7 % and 63.0 % in the group of 60-69 years of age, respectively. These results were statistically significant ($p < 0.001$).

Table 2 shows the overall and gender-specific frequencies of the five individual MetS components. Of the 1014 subjects, the most common component was low HDL-C (52.1 %) for ATP III, however it was abdominal obesity (72.1 %) for IDF. The frequencies of increased WC ($p<0.0001$) and low HDL-C ($p= 0.016$) were significantly higher in women than men for both definitions. Men had significantly higher frequency of hypertriglyceridemia (39.8 %, $p= 0.018$) than women for each definition.

Table 2. Frequencies of the metabolic syndrome components by gender

	Total[1] n(%)	Men[2] n(%)	Women[3] n(%)	P (men vs. women)
NCEP ATP III				
Increased waist circumference	473 (46.6)	158 (34.0)	315 (57.4)	<0.0001
High blood pressure	269 (26.5)	126 (27.1)	143 (26.0)	0.706
Hypertriglyceridemia	364 (35.9)	185 (39.8)	179 (32.6)	0.018
Low HDL cholesterol	528 (52.1)	223 (48.0)	305 (55.6)	0.016
High fasting plasma glucose	132 (13.0)	65 (14)	67 (12.2)	0.403
IDF				
Increased waist circumference	731 (72.1)	296 (63.7)	435 (79.2)	<0.0001
Blood pressure	269 (26.5)	126 (27.1)	143 (26.0)	0.706
Hypertriglyceridemia	364 (35.9)	185 (39.8)	179 (32.6)	0.018
Low HDL cholesterol	528 (52.1)	223 (48.0)	305 (55.6)	0.016
High fasting plasma glucose	222 (21.9)	102 (21.9)	120 (21.9)	0.976

[1]n=1014, [2]n=465, [3]n=549

Discussion

In the present study, the prevalence of the MetS using the IDF definition is considerably higher than that observed using the ATP III definition. The structure of the ATP III definition is a simple scoring system with no single dominant component. In contrast, the IDF definition has abdominal obesity as a core component, with different waist circumference cut-off points depending on ethnicity. Consistent with the results of our study, there are studies that have assessed the prevalence of the MetS following the ATP III and IDF criteria. With the NHANES (1999–2002) database, Ford reported the prevalence of MetS in 3,601 American adults to be 34.5 % and 39.0 % based on the ATP III and IDF criteria, respectively (13). Similarly, in a study done in South Australia (14), the prevalence of MetS was higher using the IDF criteria (22.8 %) as compared to ATP III criteria (15 %). A study done by Can et al. concluded that the prevalence was 42 % by IDF and 38 % by ATP III in Turkish adults (15). Similar results were also found by Harzallah et al. (16) in a study in Tunisia with an Arab population (45.5 % by IDF vs. 24.3 % by ATP III). The increase in the prevalence by the IDF criteria is simply due to a reduction in the definition of central obesity with WC from 102 cm for men and 88 cm for women (ATP III criteria) to 94 cm and 80 cm, respectively (IDF criteria for Europids).

The prevalence of the MetS increased significantly with age in men and women by both definitions, reaching peak levels especially in the sixth decade in our study. This is probably due to age-related changes in body size and fat distribution and associated with increases in visceral adipose tissue, which is important in the pathogenesis of insulin resistance (17). This finding was in concordance with the study conducted by Kanjlal et al. (18), who reported maximum prevalence in age group of 50-59 years and Reddy et al. (19) who reported maximum prevalence among age group > 60 years in a multi-centric population of India. Similar trends were also reported by a study done by Taylor et al. (20) in African-American population, who studied the prevalence in age group 21-94 years and maximum prevalence was seen in 65-74 year age group and lowest was seen among 21-34 year age group. Another study done by Hildrum et al. (21) in Norwegian population also found the similar trends in prevalence according to age.

In the present study, women had a much higher prevalence of the MetS than did men for each definition, however the results were statistically significant for ATP III ($p < 0.05$) but not for IDF. This difference might be due to the higher prevalence of abdominal obesity and low HDL-C in women compared with men, since we used different cut-offs for men and women to define these two components. Nevertheless, there are many studies reporting marked differences by gender. A prevalence of 42 % in women and 24 % in men was found for the Iranians in the Tehran Lipid and Glucose Study (22). Similarly, the prevalence reported in the Indian study was 46.5 % in women and 36.4 % in men (23). A survey in Turkey (24) reported a prevalence of 33.9 % for the MetS, with a higher prevalence in women (39.6 %) than in men (28 %). Another study in Turkey reported a prevalence of 10.09 % and 27.33 % for the MetS in men and women, respectively (25). In another study, Özsahin et al. (26) found that the prevalence of the MetS in a Turkish adult population of 1,637 individuals was 33.4 % (39.1 for women and 23.7 % for men) in Adana, a southern province of Turkey. Erem et al. (27), in a study performed in a northern city of Turkey, reported a higher prevalence of MetS among women than men (31.3 vs. 21.7 %). In our study, low HDL-C was the most common metabolic disorder in men, whereas, in women, it was abdominal obesity by the ATP III definition. However, the most common component of the MetS by the IDF definition was abdominal obesity followed by HDL-C for both genders (Table 2). In the study done by Harzallah et al. (16) in Tunisia, the two most common components were central obesity and low HDL-C. In a population in Northern Jordan (28), the prevalence of the MetS (by ATP III) was reported to be 36.3 %, with a significantly higher prevalence in women than in men and the most common abnormality for this population was low HDL-C in men (62.7 %) and abdominal obesity in women (69.1 %). The prevalence of the MetS (by ATP III) was reported to be 21.0 % in the city of Nizwa in Oman, with low HDL-C (75.4 %) and abdominal obesity as the two most common components (29). In conclusion, among this population based sample, the prevalence of the MetS is shown to be high, regardless of which definition is used. As with many parts of the world, both diabetes and obesity are significant problems in Turkey (30,31). It is therefore not surprising that the prevalence of the MetS among this study population is high. Prevention, early identification and treatment of this syndrome represent

a major challenge for physicians. Support and promotion of healthy lifestyle behaviors like weight management and appropriate physical activity procedures for individuals with and at risk of MetS are key aspects of prevention.

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