Frequency of abdominal obesity and metabolic syndrome in healthcare workers and their awareness levels about these entities

Sağlık çalışanlarında abdominal obezite ve metabolik sendrom sıklığı ve bu durumlar hakkında farkındalık düzeyleri

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Objectives: We investigated the frequency of metabolic syndrome (MetS) and abdominal obesity and evaluated the level of awareness about these two conditions in healthcare workers.

Study design: A total of 723 healthcare workers (372 physicians, 247 nurses, 104 other healthcare staff; mean age 32.8±8.2 years) from four centers were included. Demographic, anthropometric, and biochemical data were recorded, lifestyle features were inquired, and the levels of awareness about abdominal obesity and MetS were surveyed. The criteria recommended by the Adult Treatment Panel (ATP) III were used for the diagnosis of abdominal obesity and MetS. The presence of MetS was evaluated in 178 subjects. Univariate and multivariate analyses were performed to evaluate the association between lifestyle features and abdominal obesity.

Results: The frequency of abdominal obesity was 13.8% and it was significantly higher in males than in females (19.1% *vs* 10.6%; p=0.002). Metabolic syndrome was diagnosed in 14 participants (7.9%), and there was no significant difference between men and women in this respect (p>0.05). The cut-off values for abdominal obesity and at least three criteria of MetS were correctly listed by 47 participants (6.5%) and 240 participants (33.2%), respectively, with physicians showing significantly higher awareness levels (p=0.001). In multivariate analysis, age ≥40 years and male gender were significantly associated with abdominal obesity.

Conclusion: Our results demonstrate that only a minority of healthcare workers are cognizant of MetS as a clinical syndrome and the definition of abdominal obesity.

Key words: Abdominal fat; adult; age factors; awareness; health personnel; metabolic syndrome X/epidemiology; obesity/epidemiology; prevalence.

Amaç: Bu çalışmada sağlık çalışanlarında metabolik sendrom (MetS) ve abdominal obezite sıklığı araştırıldı ve bu iki durum ile ilgili tanı ölçütlerinin farkındalık düzeyleri değerlendirildi.

Çalışma planı: Çalışmaya dört merkezden toplam 723 sağlık çalışanı (372 hekim, 247 hemşire, 104 yardımcı sağlık personeli; ort. yaş 32.8±8.2) alındı. Katılımcıların demografik, antropometrik ve biyokimyasal verileri kaydedildi; yaşam tarzı özellikleri sorgulandı ve abdominal obezite ve MetS konusunda farkındalık düzeyleri araştırıldı. Abdominal obezite ve MetS tanıları için Üçüncü Erişkin Tedavi Paneli'nce (ATP III) önerilen tanımlama kullanıldı. Metabolik sendrom varlığı 178 katılımcıda değerlendirildi. Yaşam tarzı özellikleri ile abdominal obezite arasındaki ilişki tekdeğişkenli ve çokdeğişkenli analizlerle araştırıldı.

Bulgular: Abdominal obezite sıklığı tüm sağlık çalışanları için %13.8 bulundu; bu oran erkeklerde kadınlara göre daha yüksekti (%19.1 ve %10.6; p=0.002). Metabolik sendrom 14 sağlık çalışanında (%7.9) saptandı ve bu açıdan erkek ve kadınlar arasında fark yoktu (p>0.05). Abdominal obezite için sınır değerlerinin ve MetS tanısı için en az üç ölçütün doğru olarak bildirildiği katılımcı sayısı sırasıyla 47 (%6.5) ve 240 (%33.2) idi. Her iki açıdan da, hekimlerin diğer iki gruba göre doğru yanıt yüzdeleri anlamlı derecede yüksekti (p=0.001). Çokdeğişkenli analizde ≥40 yaşın ve erkek cinsiyetin abdominal obezite ile anlamlı ilişki içinde olduğu saptandı.

Sonuç: Bulgularımız, sağlık çalışanlarının çok az bir kısmının bir klinik sendrom olarak MetS'i tanıdığını ve abdominal obezite tanımını bildiğini gösterdi.

Anahtar sözcükler: Abdominal yağ; erişkin; yaş faktörü; farkındalık; sağlık personeli; metabolik sendrom X/epidemiyoloji; şişmanlık/epidemiyoloji; prevalans.

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Metabolic syndrome (MetS) is a clustering of cardiovascular risk factors consisting of abdominal obesity, hypertension, atherogenic dyslipidemia, hyperglycemia, and prothrombotic and proinflammatory conditions. Furthermore, this syndrome is a major risk factor for the development of type 2 diabetes and atherosclerotic cardiovascular diseases.[1,2] Physical inactivity and poor nutrition intake associated with modern lifestyle are thought to make a major contribution to the development of the syndrome, and the main pathogenetic factors responsible for the condition include abdominal obesity and insulin resistance, in addition to genetic tendency.[3] In Turkey, similar to Western societies, the prevalences of abdominal obesity and MetS are high and on the increase.[4-6] Despite these observations, low levels of awareness about abdominal obesity and MetS have been reported for the general population.[7,8] Thus, determining the level of awareness about MetS and obesity among healthcare workers is important to improve the awareness levels in general.

In the present study, our objective was to evaluate the frequency of MetS and abdominal obesity together with related lifestyle features in a sample of Turkish healthcare workers, and to determine the level of awareness about the criteria for the diagnosis of these two entities.

PATIENTS AND METHODS

Study population. The study included 723 healthcare workers (278 males, 445 females; mean age 32.8±8.2 years) working at outpatient clinics, wards, and laboratories of the following four centers: Göztepe Training and Research Hospital, Süreyyapaşa Chest Disease and Thoracic Surgery Training and Research Hospital, Siyami Ersek Thoracic and Cardiovascular Surgery Training and Research Hospital, and Kocaeli University Medical Faculty Hospital. Of all the participants, 372 were physicians (157 females, 215 males), 247 were nurses (all female), and 104 were other healthcare staff (41 females, 63 males). The study protocol was approved by local ethics committee (approval date and no: 01.09.2005/25) and conducted in accordance with the Declaration of Helsinki.

Study design. Demographic and anthropometric data were collected and biochemical parameters were assessed. A 14-item questionnaire was used to evaluate the level of awareness about abdominal obesity and MetS and to characterize lifestyle parameters which included diet and exercise, cigarette smoking, alcohol consumption, automobile driving, and duration of computer use or TV watching. A total of 178 subjects (115 females, 63 males) were evaluated for MetS frequency.

Diagnosis of MetS. The presence of at least three of the following criteria proposed by Adult Treatment Panel (ATP) III was required for the diagnosis of MetS: waist circumference >102 cm for men and >88 cm for women, blood pressure ≥130/85 mmHg (or use of antihypertensive medication), fasting plasma glucose ≥100 mg/dl (or use of antidiabetic medication), fasting triglycerides ≥150 mg/dl, and high density lipoprotein (HDL) cholesterol <40 mg/dl for men and <50 mg/dl for women.[9]

Evaluation of the awareness about MetS and abdominal obesity. The level of awareness about abdominal obesity was sought using the following question: *What are the cut-off values for waist circumference to diagnose abdominal obesity?* A response giving recommended cut-off values by the ATP III system was considered correct. The level of awareness about MetS was sought using the following questions: *Have you ever heard of a disease entity called metabolic syndrome? What are the criteria for its diagnosis?* A response was considered correct if the answer to the first question was 'yes', followed by listing at least three of the ATP III criteria.

Anthropometric and biochemical measurements. Sitting blood pressure was measured in both arms with an appropriate mercury sphygmomanometer using the phase I and phase V Korotkoff sounds after at least 10 minutes of resting. At least three minutes after the first measurement, a second measurement was made in the arm in which a higher value had been recorded. The means of the two measurements were used for systolic and diastolic blood pressures. Body mass index was calculated by using Quetelet index (weight in kilograms divided by height in meters squared).[10] Waist circumference was measured at the plane between the anterior superior iliac spine and lower costal margin at the narrowest part of the waistline while the patient was standing and during slight expiration.

Biochemical components of MetS (triglycerides, HDL-cholesterol, and fasting blood glucose) were derived, if available, from previous laboratory investigations made within the past three months.

Statistical analyses. All data were analyzed using SPSS for Windows 10.0 software. In addition to descriptive statistics (mean, standard deviation), one-way ANOVA test was used for comparison of age and waist circumference, Tukey HSD test was used for post hoc analysis, and chi-square test was used

Table 1. Demographic and clinical characteristics of the participants

	Total (n=723)			Female (n=445)			Male (n=278)			
	n	%	Mean±SD	n	%	Mean±SD	n	%	Mean±SD	*p*
Age (years)			32.8±8.2			32.6±8.2			33.3±8.2	N S
Waist circumference (cm)			82.0±12.8			75.2±9.6			92.7±9.6	0.001
Body mass index (kg/m²)			23.9±3.7			22.7±3.6			25.8±3.2	0.001
Smoking	312	43.2		181	40.7		131	47.1		N S
Alcohol use	180	24.9		73	16.4		107	38.5		0.001
Abdominal obesity	100	13.8		47	10.6		53	19.1		0.002
Metabolic syndrome (n=178) (115 females, 63 males)	14	7.9		6	5.2		8	12.7		N.S

NS: Not significant.

for comparison of frequencies. Univariate and multivariate analyses with backward stepwise logistic regression were performed to evaluate the association of age, gender, and lifestyle factors with abdominal obesity. The results were evaluated at a significance level of 0.05 with 95% confidence intervals.

RESULTS

Demographic and clinical characteristics of the participants are shown in Table 1. Male and female participants were comparable with respect to age (p>0.05), whereas body mass index and waist circumference were higher in males (p=0.001). Alcohol consumption was more frequent among male subjects (p=0.001), while cigarette smoking was similar (p>0.05). The frequency of abdominal obesity was 13.8% and it was significantly higher in men than in women (19.1% *vs* 10.6%; p=0.002). The frequency of MetS was 7.9% among the 178 cases for whom a complete evaluation according to the ATP III criteria was performed. There was no significant difference between men and women with regard to MetS frequency (12.7% *vs* 5.2%; p>0.05).

Analysis by occupation. Demographic and clinical characteristics of the participants by occupation are given in Table 2. The mean age of other healthcare staff was higher compared to physicians and nurses (p=0.001). Alcohol consumption was higher in physicians (p=0.001). The frequencies of smoking, regular diet, regular exercise, abdominal obesity, and MetS did not differ significantly between the three groups (p>0.05).

The cut-off values for abdominal obesity were correctly given by 47 participants (6.5%), including 44 physicians (11.8%, p=0.001) and three nurses (1.2%).

Table 2. Distribution of clinical characteristics by occupation

	Physicians (n=372)			Nurses (n=247)			Other healthcare staff (n=104)			
	n	%	Mean±SD	n	%	Mean±SD	n	%	Mean±SD	*p*
Age (years)			33.0±8.7			31.6±7.2			35.2±8.0	0.001
Waist circumference (cm)			84.9±13.2			75.3±9.2			86.9±12.2	0.001
Body mass index (kg/m²)			24.4±3.7			22.9±3.7			24.6±3.4	0.001
Smoking	144	38.7		116	47.0		52	50.0		N.S
Alcohol use	126	33.9		32	13.0		22	21.2		0.001
Abdominal obesity	54	14.5		27	10.9		19	18.3		N S
Metabolic syndrome (n=178) (91 physicians, 61 nurses, 26 other)	7	7.7		4	6.6		3	11.5		N S
Regular diet	75	20.2		53	21.5		17	16.4		N S
Regular exercise	100	26.9		61	24.7		27	26.0		N S
Awareness about abdominal obesity	44	11.8		3	1.2		0	0.0		0.001
Awareness about metabolic syndrome	214	57.5		24	9.7		2	1.9		0.001
High blood pressure	25	6.7		11	4.5		11	10.6		N S
High blood glucose level (n=190) (93 physicians, 70 nurses, 27 other)	23	24.7		14	20.0		8	29.6		N.S
High triglyceride level (n=124) (61 physicians, 40 nurses, 23 other)	18	29.5		9	22.5		7	30.4		N S
Low HDL-cholesterol level (n=126) (74 physicians, 32 nurses, 20 other)	17	23.0		10	31.3		7	35.0		N S

NS: Not significant.

Table 3. Waist circumference values according to age and gender

	Waist circumference (cm) in age groups (Mean±SD)			
	20-29 years	30-39 years	40-49 years	≥50 years
Males				
Physicians (n=215)	90.3±9.4	93.7±9.2	95.9±11.1	100.6±9.5
Other healthcare staff (n=63)	90.2±8.3	90.7±7.7	98.9±8.0	–
Total (n=278)	90.3±9.2	92.6±8.8	96.8±10.1	100.6±9.5
Females				
Physicians (n=157)	70.8±6.9	76.0±10.0	75.4±8.3	83.4±15.1
Nurses (n=247)	72.4±7.8	75.8±8.7	83.3±10.3	83.5±5.7
Other healthcare staff (n=41)	70.8±6.8	79.1±11.7	80.7±12.9	92.0±9.1
Total (n=445)	71.8±7.4	76.2±9.5	80.4±10.5	85.9±12.0

At least three criteria of MetS were correctly listed by 240 participants (33.2%), including 214 physicians (57.5%, p=0.001), 24 nurses (9.7%), and two other healthcare staff (1.9%).

The three groups did not differ significantly with regard to the incidences of high blood pressure, high fasting blood glucose, high triglyceride, and low HDL-cholesterol levels (p>0.05).

Waist circumference values according to age and gender, the degree of awareness about MetS according to occupation and gender, and the presence of MetS components according to occupation are presented in tables 3, 4, and 5.

Univariate and multivariate analyses. In univariate analysis, abdominal obesity was significantly associated with age groups 40 to 49 years and ≥50 years, male gender, regular diet, driving, computer use for more than two hours a day, and combination of the parameters including driving, television watching and/or computer use for more than two hours a day (Table 6). In multivariate analysis, age 40 to 49 years (OR: 3.782, 95% CI: 1.520-9.413), age ≥50 years (OR: 5.196, 95% CI: 1.365-19.78), and male gender (OR: 3.205, 95% CI: 1.577-6.512) were significantly associated with abdominal obesity (Table 7).

DISCUSSION

The results of our study demonstrated low levels of awareness about MetS and abdominal obesity among healthcare workers. Plausibly, healthcare staff other than physicians and nurses may not be expected to have gained a high level of knowledge about MetS due to inadequate education in health sciences and due to the absence of a straightforward connection between their occupation and diagnosis and treatment of diseases. However, considerably low level of awareness among physicians and nurses is noteworthy.

Metabolic syndrome is a global public health problem.[11] On the other hand, studies evaluating the levels of awareness about MetS and its control in the general population are scarce. Athyros et al.,[7] in their

Table 4. The degree of awareness about metabolic syndrome according to occupation and gender

	Awareness about metabolic syndrome						
	≥3 critera		<3 criteria		No response		
	n	%	n	%	n	%	*p*
Males							
Physicians (n=215)	119	55.4	17	7.9	79	36.7	0.001
Other healthcare staff (n=63)	1	1.6	1	1.6	61	96.8	
Total (n=278)	120	43.2	18	6.5	140	50.4	
Females							
Physicians (n=157)	95	60.5	13	8.3	49	31.2	0.001
Nurses (n=247)	24	9.7	18	7.3	205	83.0	
Other healthcare staff (n=41)	1	2.4	7	17.1	33	80.5	
Total (n=445)	120	27.0	38	8.5	287	64.5	
Total							
Physicians (n=372)	214	57.5	30	8.1	128	34.4	0.001
Nurses (n=247)	24	9.7	18	7.3	205	83.0	
Other healthcare staff (n=104)	2	1.9	8	7.7	94	90.4	
Total (n=723)	240	33.2	56	7.8	427	59.1	

Table 5. The presence of metabolic syndrome components according to occupation

	Physicians (n=96)		Nurses (n=49)		Other healthcare staff (n=33)		
	n	%	n	%	n	%	*p*
1 criterion (n=122, 68.5%)	71	74.0	33	67.4	18	54.6	0.175
2 criterion (n=42, 23.6%)	20	20.8	11	22.5	11	33.3	0.071
3 criterion (n=9, 5.1%)	4	4.2	2	4.1	3	9.1	0.254
4 criterion (n=4, 2.3%)	1	1.0	2	4.1	1	3.0	0.561
5 criterion (n=1, 0.6%)	–		1	2.0	0	0	–
Total	96		49		33		0.046

cross-sectional analysis of a large sample of 9,669 adults (age 46±18 years), found that the prevalence of MetS was 24.5%, and that only one-third of the subjects were aware of the components of MetS and only 5% were cognizant of MetS as a disease entity. In this study, a low level of awareness about MetS was observed among nurses and healthcare staff. Arguably, it is not surprising to observe a low level of awareness about MetS parameters in the general population and in healthcare workers, since MetS is a recently defined disorder with varying diagnostic criteria used by individual organizations.[9,12-15]

The absence of universally accepted diagnostic criteria and the ongoing debate regarding the actual existence of this syndrome[16] may be partially responsible for low levels of awareness among healthcare workers. Nevertheless, MetS has been receiving growing interest worldwide, resulting in a consistence increase in the annual number of publications, searched by the keyword "metabolic syndrome", from 1,144 to 21,577 between 2000 and 2007. Therefore, higher levels of awareness could be expected for a diagnostic entity defined by similar criteria by important organizations such as ATP III and International Diabetes Federation (IDF).[9,13]

A growing body of evidence shows that excess abdominal (visceral) fat is one of the most important predictors of cardiometabolic risk.[17,18] The upper limits of waist circumference were initially defined by ATP III as 102 cm and 88 cm for males and females, respectively.[9] Subsequently, the use of individual waist circumference values for diverse ethnic groups by IDF[13] demonstrated the need for defining specific waist circumference limits for a particular society. In Turkish adults (mean age 40.9±14.9 years), the average waist circumferences reported by Kozan et al.[6] were 90.1±14.8 cm and 91.7±12.2 cm for females and males, respectively. Onat et al.[19] reported the mean waist

Table 6. Univariate analysis of parameters associated with abdominal obesity

	Abdominal obesity				
	Absent		Present		
	n	%	n	%	*p*
Age groups (years)					
<30 (n=353)	25	7.1	328	92.9	
30-39 (n=213)	26	12.2	187	87.8	
40-49 (n=120)	36	30.0	84	70.0	0.001
≥50 (n=37)	13	35.1	24	64.9	0.001
Sex					
Female (n=445)	47	10.6	398	89.4	
Male (n=278)	53	19.1	225	80.9	0.001
Smoking (n=312)	39	12.5	273	87.5	N.S
Alcohol use (n=180)	25	13.9	155	86.1	N.S
Regular diet (n=145)	32	22.1	113	77.9	0.001
Regular exercise (n=188)	30	16.0	158	84.0	N.S
Driving (n=347)	60	17.3	287	82.7	0.011
Watching television ≥2 hours (n=388)	58	15.0	330	85.1	N.S
Using computer ≥2 hours (n=240)	40	16.7	200	83.3	0.040
Driving + watching television and/or using computer ≥2 hours (n=372)	40	10.8	332	89.3	0.016

NS: Not significant.

Table 7. Multivariate analysis of parameters associated with abdominal obesity

	p	Odds ratio	95% confidence interval
Age groups (years)			
<30	N S	–	
30-39	N S	1.635	0.728 - 3.671
40-49	0.004	3.782	1.520 - 9.413
≥50	0.016	5.196	1.365 - 19.78
Sex (male)	0.001	3.205	1.577 - 6.512
Smoking	N S	0.826	0.209 - 3.266
Alcohol use	N S	0.692	0.327 - 1.467
Regular diet	N S	0.502	0.232 - 1.082
Regular exercise	N S	0.756	0.440 - 1.299
Driving	N S	0.954	0.468 - 1.946
Watching television ≥2 hours	N S	0.630	0.294 - 1.348
Using computer ≥2 hours	N S	0.592	0.301 - 1.164
Driving + watching television and/or using computer ≥2 hours	N S	0.896	0.550 - 1.461

NS: Not significant.

circumferences as 88.6±13 cm for females and 93±12 cm for males. The corresponding figures in the present study were 75.2±9.6 cm for females and 92.7±9.6 cm for males. Although the values reported for our population are comparable to those reported in other studies, interestingly, the average waist circumference of women was lower in the present study. Probably the main reason for this difference is the lower average age of the female participants (32.8±8.2 years). The higher frequency of obesity among housewives may be explained by the lower level of physical activity and a common high-calorie diet based on diary and desert products served during social meetings.

Metabolic syndrome and abdominal obesity occur in a very high proportion of Turkish adults.[5,6] Kozan et al.[6] reported the prevalence rates of MetS and abdominal obesity as 33.9% (39.6% in females, 28.0% in males) and 36.2% (54.8% in females, 17.2% in males), respectively. In that study, the prevalence of MetS was 10.7% in the age group of 20 to 29 years, and increased in subsequent age groups. A relatively lower frequency of MetS and abdominal obesity among healthcare workers may have resulted from a number of factors including younger age, higher level of physical activity due to working conditions, and awareness about healthy lifestyle habits. Abbate et al.[20] found that 13.6% and 13.3% of male and female healthcare workers were obese, respectively. The mean body mass index of 51,529 health professionals in the US Health Professionals Follow-Up Study was 25 kg/m^2.[21] Higher education levels are known to be associated with a lower frequency of obesity.[20] A higher frequency of obesity among other healthcare staff compared to physicians and nurses supports this observation.

Cigarette smoking is an independent risk factor for coronary heart disease.[22] The frequency of smoking among male and female subjects in studies by Onat et al.[23] and Kozan et al.[6] were 45.8% and 17.6%, and 58.7% and 20.8%, respectively. In our study, 47.1% of male and 40.7% of female healthcare workers were current smokers, showing that cigarette smoking is alarmingly high among healthcare workers, despite a higher level of awareness about a healthy lifestyle. In another study,[24] it was found that 32.5% of male and 3.6% of female Turkish adults consumed alcohol regularly. Alcohol consumption was five times more prevalent among the female participants in our study compared to the general Turkish population, with approximately one-third of physicians and one-fifth of other healthcare staff (other than physicians and nurses) consuming alcohol.

In addition to the role of genetic factors, environmental factors are thought to play a major role in the increasing frequency of abdominal obesity.[25] Excessive or unbalanced intake of food and technological advances limiting physical activity are partly responsible for the obesity epidemic.[26] Univariate analysis in our study showed significant associations between abdominal obesity and regular diet, automobile driving, computer use for more than two hours a day, and driving and television watching and/or using computer for more than two hours a day, in addition to age- and gender-related factors. In multivariate analysis, male gender and age over 40 years, which are factors not related with lifestyle, were associated with abdominal obesity. The higher prevalence of abdominal obesity among males may be associated with genetic factors.

The rates of high fasting blood glucose levels were considerably higher compared to prevalence ratios reported in another study (TURDEP study) from Turkey.[27] However, these data are probably associated with a high disposition to bias, since fasting blood glucose, triglyceride, and HDL-cholesterol measurements were performed in only a proportion of the study subjects, and the measurements were self-reported and were not based on formal request by the investigators.

As mentioned above, a major limitation of our study is the use of the available previous laboratory test results in only 24.6% of the participants for the evaluation of MetS.

In conclusion, our study shows low levels of awareness about abdominal obesity and MetS in a sample of Turkish healthcare workers. Attempts to increase awareness about these conditions among healthcare workers is a rational way that would contribute to improve the general awareness and prevent cardiovascular diseases and type 2 diabetes in the society.

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