DOI: 10.5350/KPB-BCP201121108

Metabolic Syndrome and Depressive Symptoms in a Primary Health Care Setting in Turkey

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ÖZET:

Türkiye'de bir aile hekimliği ünitesinde depresyon ve metabolik sendrom ilişkisinin araştırılması

Giriş: Depresif semptomlar ve metabolik sendrom (MetS) arasındaki muhtemel ilişki son dönemde önemli bir tartışma konusudur. Bu ilişkinin varlığı konusunda sınırlı veri vardır. Bu çalışmanın amacı depresyon ve MetS arasındaki ilişkiyi incelemektir.

Yöntem: Bu çalışma toplum kökenli kesitsel bir çalışmadır. Çalışma 3600 kişiden sorumlu kentsel bir aile hekimliği biriminde yürütülmüştür. Çalışmaya katılanlar bu aile hekimliği ünitesine başvuran 18 yaş ve üzeri 250 kişiden oluşmuştur. MetS (MetS) sınıflaması NCEP-ATPIII kriterleri kullanılarak yapılmıştır. Beck Depresyon Ölçeği depresyon değerlendirmesi için tüm katılımcılar tarafından doldurulmuştur.

Bulgular: MetS prevalansı her iki cinsiyet için benzerdi (%48.8 erkek ve %48.1 bayan) ve yaş ilerledikçe artmaktaydı. İlkokul mezunları yüksekokul mezunlarına göre 2.2 kez daha fazla MetS riskine sahipti. Depresif şikayet prevalansı kadınlarda (%31) erkeklere (%9.9) oranla daha fazlaydı. İstatistik analizlerle MetS ve depresif semptomlar arasında anlamlı bir ilişki tespit edilemedi.

Sonuç: MetS prevalansı her iki cinsiyet içinde yüksek bulundu. Depresif semptomlar açısından kadınlar erkeklere kıyasla 3.8 kat daha fazla risk altındaydı. Depresyon semptomları ile hem MetS hemde MetS kriterleri arasında ilişki bulamadık.

Anahtar sözcükler: Metabolik sendrom, adult popülasyon, depresif semptomlar, aile hekimliği, Türkiye

Klinik Psikofarmakoloji Bülteni 2011;21:49-57

ABSTRACT:

Metabolic syndrome and depressive symptoms in a primary health care setting in Turkey

Background: The possible association between depressive symptoms and metabolic syndrome (MetS) has recently become an important topic of discussion. There is some limited and inconsistent evidence in the literature concerning whether or not depression and metabolic syndrome are associated. The aim of this study was to examine the association between depressive symptoms and metabolic syndrome.

Methods: This is a cross-sectional community-based study. The setting is a family practice unit in an urban area which serves about 3,600 people. The participants were 250 individuals aged 18 and over, selected randomly from all enrolled patients in this family practice unit. National Cholesterol Education Program (NCEP- ATP-III) criteria were used for the classification of metabolic myndrome (MetS). The Beck Depression Inventory was filled out by the participants for the evaluation of depressive symptoms.

Results: The prevalence of MetS was similar for men (48.8%) and women (48.1%) and increased with age in both sexes. Participants with only primary education were found to be 2.2 times more at risk of developing MetS than participants with a higher education. The prevalence of depressive symptoms was higher among women (31.0%) than men (9.9%). Statistical analyses revealed no statistically significant association between MetS and depressive symptoms.

Conclusion: The prevalence of MetS was found to be high in both sexes. Women had a 3.8 times higher risk of developing depressive symptoms than men. We found no association of depressive symptoms with MetS or with any of the MetS criteria.

Key words: Metabolic syndrome, adult population, depressive symptoms, family practice, Turkey

Bulletin of Clinical Psychopharmacology 2011;21:49-57

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Kabul tarihi / Date of acceptance: 18 Aralık 2010 / December 18, 2010

Bağıntı beyanı:
H.D., Y.C., N.B.: Yazarlar bu makale ile ilgili olarak herhangi bir çıkar çatışması bildirmemişlerdir.

Declaration of interest:
H.D., Y.C., N.B.: The authors reported no conflict of interest related to this article.

INTRODUCTION

The association between metabolic syndrome (MetS) and depression and whether a causal relationship exists between them has been studied with increasing interest during recent years. Several studies have supported an association of MetS with depression but variations in study design, psychological measures, and definitions of MetS have led to inconsistent results. Some of the previous studies concerning the link between MetS and depression are shown in Table 1.

Although multiple cross-sectional and prospective

Table 1: Studies of depression and metabolic syndrome

	N	Gender	Age	Depression measure	MetS definition	Result
Herva et al. (1)	5,698	Men & women	31 (mean)	HSCL-25	ATP III	No clear association
Kinder et al. (2)	6,189	Men & women	17-39	SCID	ATP III	Association with MetS and depression only in women. Association with high blood pressure and triglycerides
McCaffery et al. (3)	346	Men	45 and +	CES-D	Metabolic factors	Small association
Miller et al. (4)	100	Men & Women	18-45	HAM-D; BDI	Metabolic factors	Evidence linking depressive symptoms with inflammatory process
Raikkonen et al. (5)	425	Women	42-50	BDI	ATP III	Association with MetS and depression
Raikkonen et al. (6)	432	Women	Middle aged	BDI	ATP III, WHO, IDF	Association with MetS and depression
Vogelzangs et al. (7)	867	Men & Women	65 and +	CES-D	ATP III	Synergistic relationship
Skilton et al. (8)	1,598	Men & Women	30-80	HADS-D	ATP III, IDF	Association with MetS and depression
Dunbar et al. (9)	1,345	Men & Women	25-84	HADS-A , HADS-D, K10	ATP III, IDF	Association with MetS and depression
Miettola et al(10)	416	Men & Women	50.4 (mean)	BDI	ATP III	Elevated plasma glucose in men and central obesity in women are associated with depression
Hildrum et al. (11)	9,571	Men & Women	20-89	HADS-D	IDF	No association
Akbaraly et al. (12)	5,232	Men & Women	41-61	GHQ	ATP III	Obesity and dyslipidemia components are associated with depression
Takeuchi et al. (13)	956	Men	42.7 (mean)	DSM-IV	IDF	Association with MetS and depression
Almeida et al. (14)	12,216	Men	65-84	ICD-10	Waist circumference and self reported history of dyslipidemia, diabetes and hypertension	No clear association. Obesity is associated with an increase risk of incident depression among older men.
Ahola et al. (15)	1,226	Men & Women with type I diabetes	45 (mean)	BDI	IDF	MetS is frequently found among depressed patients with type I diabetes

BDI= Beck Depression Inventory; CES-D=Centre for Epidemiological Studies-Depression Scale; DSM-IV= Diagnostic and Statistical Manual of Mental Disorders; GHQ= General Health Questionnaire; HADS= Hospital Depression Anxiety Scale; HAM-D= Hamilton Rating Scale for Depression; HSCL-25=Hopkins Symptom Checklist;
ICD= International Classification of Diseases; K10= Kessler 10 Measure; SCID= Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders.

studies have revealed an association between MetS and depressive symptoms, the overall relationship has remained unclear (1-15). This result may be attributable to confounding variables in these studies (16).

Studies concerning the association between the components of metabolic syndrome and depressive symptoms have found some significant relationships. Some of this literature has revealed an increased prevalence of depression among hypertensive patients (17-19). Others studies have shown that depressive symptoms are frequently seen in patients with diabetes (20-23). Coexistence of depressive symptoms and dyslipidemia has been found in several studies (24, 25) and it has been claimed that depression and obesity have a reciprocal relation (26).

Several studies have been carried out in Turkey concerning MetS among adults. Sanisoglu et al. studied 15,468 adults over 30 years of age from different regions of Turkey and found the prevalence of MetS according to the IDF criteria to be 17.91%, with the prevalence among female participants being higher than male participants (27.33 %) (27). A comparative study using different definitions of MetS found the age and sex adjusted prevalence of MetS among 1,568 Turkish people to be 38% by National Cholesterol Education Program (NCEP-ATP-III), 42% by American College of Endocrinology (ACE) and the International Diabetes Federation (IDF), 20% by European Group for the Study of Insulin Resistance (EGIR) and 19% by World Health Organization (WHO) definitions (28). Another study of 4,259 participants from both urban and rural settings used National Cholesterol Education Program (NCEP- ATP-III)criteria for the diagnosis of MetS and found the prevalence to be as high as 33.9%, with a significantly higher frequency among women (39.6%) (29) A study in a southern province of Turkey found MetS prevalence according to the ATP III criteria to be 39.1% among female and 23.7% among male participants and significantly higher among women in rural areas (30). Studies in Turkey have revealed that Turkish people have significant cardiovascular risk factors such as high smoking prevalence, high carbohydrate consumption, high total cholesterol/ high density lipoprotein cholesterol (HDL-C) ratio and low HDL-C levels (31,32). There are insufficient data regarding the prevalence of depressive disorders in Turkey, but according to the "National Burden of Disease and Cost Effectiveness Project" the first cause of YLD (years lost with disability) in Turkey at a national level for both sexes is unipolar depressive disorders (8.7%) (33).Some studies have shown a high prevalence of depressive disorders among primary health care patients. In a study conducted in ten different cities, the frequency of depressive disorders in primary care patients was found to be 23.2% and higher among those with chronic illnesses (34).

The aim of this study was to examine the prevalence of MetS and its association with depressive symptoms in a population based sample.

METHODS

Study Design and Participants

This cross-sectional study was conducted in a family practice unit located at the city of Bursa/Turkey. This family practice unit serves as a primary health care setting to a population of 3,600 individuals, 2,476 of whom are adults. All of the individuals of this population are registered to this family practice unit and their physical and laboratory examinations and socio-demographic data are computerized. We calculated the minimum sample size with the formula:

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

n= Sample size

N= Population (only adults were taken into consideration)

t= 1.96 (for 95% confidence level)

p= Prevalence of MetS (was accepted as 20%)

q= 1- p

d= 0.05

$n= 2,476 \times 1.96^2 \times 0.20 \times 0.80 / [(0.05)^2 \times (2,476-1) + (1.96)^2 \times 0.20 \times 0.80]$

n=1522 / 6.8

n= 224

Among the 2,476 registered adults, those who had undergone laboratory examinations during the last six months for fasting blood glucose, cholesterol and triglycerides and who were not diagnosed with any psychiatric disorder, were recruited as possible study participants. Among the possible study participants, 250 individuals were selected by simple random sampling. Selected participants were invited to the family practice unit and informed about the study. Those who agreed and gave their written informed consent were recruited as

study participants. For those who did not want to participate in the study (only five), new individuals were selected. Approval to conduct the study was obtained from the Ethics Committee of Uludag University.

Study Instruments

MetS was diagnosed according to modified criteria of the National Cholesterol Education Program (NCEP) (35), based on the presence of three or more of the following: Fasting plasma glucose levels ≥110 mg/dl or use of diabetes medications; fasting serum triglycerides ≥150 mg/dl or use of dyslipidemia medications; low fasting serum high-density lipoprotein (HDL) cholesterol (<40 mg/dl in men, <50 mg/dl in women); systolic blood pressure ≥130 mmHg, diastolic blood pressure ≥85 mmHg or use of hypertension medications, and abdominal obesity (waist circumference >102 cm for men and >88 cm for women).

Physical examination, height, weight, waist circumference, and blood pressure measurements were performed by the corresponding physician of the family practice unit. Weight was taken in light clothing and height was measured in a standing position. Body mass Index (BMI) was calculated from the formula: weight/ height2. Waist circumference was measured at the midpoint between the lowest rib and the iliac crest, and blood pressure was taken in a sitting position at five-minute intervals after 10 minutes of rest. For the statistical analysis, we calculated the mean of three measurements.

Biochemical measures were obtained from the previously registered data of each participant. If there was more than one laboratory result for the last six months, the latest one was taken used.

Depressive symptoms were evaluated by using the Turkish version of the Beck Depression Inventory (BDI) which was translated and validated by Hisli (36). All of the participants filled out the BDI. For those who could not read, the inventory was read out loud and the answers were recorded by the corresponding physician. The BDI total score was the sum of the scores of the 21 separate BDI items which contain four statements each, reflecting the intensity of a particular item of mood. The participants selected the most appropriate statement of each BDI item. For the statistical analysis, these statements were given numerical values (0=no symptoms, 1= mild symptoms, 2= moderate symptoms, 3= severe symptoms). The BDI items are: mood, pessimism, sense of failure, lack of satisfaction, guilty feelings, sense of punishment, self-hate, self-accusation, self-punitive wishes, crying spells, irritability, social withdrawal, indecisiveness, body image, work inhibition, sleep disturbances, fatigability, loss of appetite, weight loss, somatic preoccupation and loss of libido. We used a cut-off point of 16/17 to categorize the participants as depressive (total score 17 or higher) or non-depressive (total score 16 or lower) (36).

Statistical Analysis

SPSS 13.0 for Windows statistical software (SPSS Inc., Chicago, IL) was used with a p-value of less than 0.05 for statistically significant differences. For descriptive statistics, frequency distributions and mean values were used. We performed a chi square test to compare the absence or presence of depression among the participants with and without MetS. Furthermore with binary logistic regression analyses we studied:

1. The associations of MetS criteria with depression status (absent vs. present)
2. The associations of demographic characteristics with depression status (absent vs. present)
3. The associations of demographic characteristics with MetS (absent vs. present).

RESULTS

MetS prevalence was 48.8% in men and 48.1% in women. Table 2 summarizes the basic characteristics of the study participants.

The mean age of the participants with MetS was significantly higher than that of the participants without MetS (52.9 vs. 47.9 years) Furthermore, the participants with MetS had a significantly lower education level than the participants without MetS. We found no statistically significant difference between participants with and without MetS in terms of depressive symptoms (Table 3.)

Table 4 shows the mean values of systolic/diastolic blood pressure, BMI, waist circumference, HDL-cholesterol, triglyceride, and fasting plasma glucose levels of participants with and without depressive symptoms.

In a logistic regression analysis using a BDI cut-off point of 16/17 no significant association was found between depression and any of the MetS criteria (Table 5).

Table 2: Basic characteristics of the participants

	MetS absent		MetS present		Total		p-value *
	N	%	N	%	N	N	
Age Groups							
18-29	17	13.2	2	1.7	19	7.6	0.0001
30-39	14	10.9	9	7.4	23	9.2	
40-49	30	23.3	22	18.2	52	20.8	
50-59	51	39.5	52	43.0	103	41.2	
60-69	17	13.2	36	29.8	53	21.2	
Gender							
Men	62	48.1	59	48.8	121	48.4	0.912
Women	67	51.9	62	51.2	129	51.6	
Marital Status							
Single	23	17.8	20	16.5	43	17.2	0.785
Married	106	82.2	101	83.5	207	82.8	
Education							
Primary	59	45.7	83	68.6	142	56.8	0.001
Secondary	40	31.0	19	15.7	59	23.6	
Higher Education	30	23.3	19	15.7	49	19.6	
Monthly Income (TL)							
100-500	10	7.8	6	5.0	16	6.4	0.559
501-1000	41	31.8	49	40.5	90	36.0	
1001-2000	54	41.9	49	40.5	103	41.2	
2001-3000	18	14.0	12	9.9	30	12.0	
≥3001	6	4.7	5	4.1	11	4.4	
Cigarette smoking							
Never	103	79.8	98	81.0	201	80.4	0.819
Previous or current smoker	26	20.2	23	19.0	49	19.6	

* Chi Square test was performed

Table 3: MetS and depression

	Depression (-) BDI score ≤ 16		Depression (+) BDI score ≥17		Total	
	N	%	N	%	N	%
MetS (-)	105	53.0	24	46.2	129	51.6
MetS (+)	93	47.0	28	53.8	121	48.4
	198	100.0	52	100.0	250	100.0

$\chi 2$ =0.377, df=1, p= 0.433

Table 4: The mean (mean±SD) values of MetS criteria in participants with and without depression

Criteria	Depression (-)	Depression (+)	p-value*
Systolic blood pressure (mmHg)	127.89±21.75	122.40±22.97	0.110
Diastolic blood pressure (mmHg)	80.29±12.03	78.11±10.56	0.234
Waist circumference (cm)	98.16±11.93	100.36±12.22	0.240
HDL-cholesterol (mg/dl)	43.85±10.44	45.86±10.71	0.220
Triglyceride (mg/dl)	161.64±98.14	143.42±58.43	0.202
Fasting plasma glucose (mg/dl)	116.34±47.78	116.23±46.91	0.989
BMI (kg/m^2)	28.34±4.68	29.75±5.73	0.066

*t test for independent samples was performed

Associations between depression and demographic characteristics are shown in Table 6. We found that women had a 3.8 times higher risk of developing depressive symptoms. Other demographic characteristics such as age, education level, marital status, and income level were not statistically significant.

The mean values of systolic/diastolic blood pressure, BMI, waist circumference, HDL-cholesterol, triglyceride,

Table 5: Binary logistic analysis for MetS components and depressive symptoms

Variable	OR (95% CI)	p-value
Waist circumference (Continuous)	1.012 (0.964; 1.062)	0.639
Systolic blood pressure (Continuous)	0.982 (0.961; 1.003)	0.090
Diastolic blood pressure(Continuous)	0.988 (0.950; 1.027)	0.539
HDL-cholesterol (mg/dl) (Continuous)	1.023 (0.991; 1.056)	0.157
Triglyceride (mg/dl) (Continuous)	0.997 (0.992; 1.001)	0.169
Glucose (mg/dl) (Continuous)	1.003 (0.996; 1.011)	0.345
BMI (kg/m^2) (Continuous)	1.087 (0.974; 1.213)	0.136

Dependent variable: BDI total score (cut-off point of 16/17); ≤16= depression absent (0);
≥17 = depression present (1)

Table 6: Binary logistic analysis for demographic variables and depressive symptoms

Variable	OR (95% CI)	p-value
Gender (reference= men)	3.817 (1.813; 8.038)	0.000
Age (Continuous)	0.977 (0.949;1.005)	0.106
Income (Continuous)	1.000 (0.999; 1.000)	0.107
Education level *(refererence= higher education)*		0.680
Primary education	1.129 (0.395; 3.227)	0.821
Secondary education	1.285 (0.550; 3.002)	0.563
Marital Status (reference=married)	1.169 (0.520; 2.629)	0.706

Dependent variable: BDI total score (cut-off point of 16/17); ≤16= depression absent (0);
≥17 = depression present (1)

Table 7: Mean values of MetS criteria among participants with and without MetS (Mean ± SD)

Criteria	MetS (-)	MetS (+)
Systolic blood pressure(mmHg)	116.51±18.73	137.67±20.10
Diastolic blood pressure (mmHg)	75.36±10.45	84.61±11.18
Waist circumference (cm)	93.00±11.20	104.60±9.76
HDL-cholesterol (mg/dl)	46.96±11.10	41.39±9.03
Triglyceride (mg/dl)	121.90±62.91	196.17±101.41
Fasting plasma glucose (mg/dl)	98.41±18.45	135.41±60.07
BMI (kg/m^2)	26.60±4.44	30.80±4.50

Table 8: Binary logistic analysis for demographic variables and MetS (Mean ± SD)

Variable	OR (95% CI)	p-value
Gender (reference= men)	0.754 (0.433; 1.316)	0.321
Age (Continuous)	1.047 (1.021;1.075)	0.000
Income (Continuous)	1.000 (1.000; 1.000)	0.789
Education level *(refererence= higher education)*		0.005
Primary education	2.284 (1.044; 4.995)	0.039
Secondary education	0.785 (0.337; 1.828)	0.575
Marital Status (reference=married)	1.286 (0.602; 2.747)	0.516

Dependent variable: MetS MetS absent=0 ; MetS present=1

and fasting plasma glucose levels of participants with and without MetS are presented in Table 7.

Associations between MetS and demographic characteristics are shown in Table 8.

We found that the risk of developing MetS was associated with increasing age and participants with a primary education level were 2.2 times more likely to develop MetS than participants with a university education level. The associations between other demographic characteristics and MetS were not statistically significant.

DISCUSSION

We found the prevalence of metabolic syndrome to be as high as 48.0% in our study group and this result is consistent with the findings of previous studies in Turkey (28-30,32). Although these previous studies found the prevalence of metabolic syndrome to be significantly higher among women than men, we did not observe such a difference. According to our findings, metabolic syndrome was correlated with age and this result is also consistent with the findings in former studies (27-30, 32). We also observed a relationship between educational level and metabolic syndrome, whereby those with a lower education level had a higher risk of developing metabolic syndrome than those with a higher level of education. Similar findings have been shown in some other studies (10,12). The prevalence of depressive symptoms in our study group was as high as 20.8% and this result is in line with previous Turkish studies (33,34).

In the present study, we found no association of depressive symptoms with metabolic syndrome. This result is consistent with the results of some previous studies (1,11,37,38). Herva and colleagues reported a non-significant, association between MetS and depression, which remained non-significant and negatively confounded with the addition of covariates (1). In another analysis of 9571 participants aged 20 to 89 years, the association of interest did not hold up after the inclusion of education, physical activity, smoking, and pulse rate (11). A recent study analyzed the data of 1126 participants and found that MetS or its components are not correlated with depression severity (37) and another community-based study found no association between life-time history of major depression and the presence of metabolic syndrome (38).

The inconclusive findings in previous population based studies have included a weak or moderate association between depressive symptoms and metabolic syndrome in elderly people (7,14,26,39), in younger women but not in men (2), in middle aged women (5,6), in a heterogeneous sample of 1,690 individuals (9) and in diabetic patients (20-23).

We did not find a statistically significant association between any of the components of MetS and depressive symptoms. Some of the previous studies found a positive association between abdominal obesity and depression (1,7,8,11,12,15,40) but not all (2,13,14,39). Some studies revealed an inverse association between depression and blood pressure (1,11) whereas other studies found no association (7,10,12,13,15,39). A positive association of depression with elevated triglycerides was found in some studies (11,12,15,40,41), whereas some others mentioned no association (1,2,13,39). An association between low HDL-cholesterol levels and depression was revealed in several studies (9,11,12,15,41), but not in others (1,2,10,37,39,40). The lack of association between fasting plasma glucose and depression is shown in many previous studies (1,7,9,11,37,39,40). We were not able to make comparisons with previous Turkish studies concerning the association between metabolic syndrome and depression because we could not find published studies about this matter in the Turkish medical literature (42-46). We found only one study which was performed on 39 patients with metabolic syndrome and in this study the impact of co-morbid psychiatric disorders on quality of life in metabolic syndrome was assessed (42). In this study 30.7% of patients were diagnosed with at least one co-morbid psychiatric disorder. The most common psychiatric disorder was panic disorder (12.8%), followed by major depressive disorder (7.6%) and obsessive-compulsive disorder (7.6%) (42).

Our study has several limitations that deserve attention. First our sample was small, and if effect size (or proportion of significant findings) is negatively associated with sample size, there might be a risk of bias. Second, the number of depressive symptoms and MetS or its components may change over time, which may be better captured by a longitudinal rather than cross-sectional analysis. Third, the evaluation of depressive symptoms was carried out with a self reporting BDI measurement and this might have caused underreporting or recall bias.

In spite of these limitations we think that our study is important and could help future researchers in studying the role of time and the nature of the association between MetS and depression.

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