RESEARCH ARTICLE

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How Does Metabolic Syndrome Affect Sexual Function in Obese Women?

ABSTRACT

Objective: Metabolic syndrome (MetS) is significant public health concern with a rising prevalence. MetS leads to diseases such as diabetes mellitus, arterial hypertension (HTN) and atherosclerotic heart disease, as well as female sexual dysfunction (FSD). However, the relationship of MetS to female sexual function in obese woman is unclear. In our study, obese women and obese women with MetS were compared. We aimed to determine whether there was a difference between the two groups in terms of FSD.

Method: The study included 114 patients, aged 21-51, who visited the obesity outpatient clinic of our center from January to April 2022. Patients who met the study criteria answered the sociodemographic data questionnaire, Female Sexual Function Index (FSFI), and the Beck Depression Inventory (BDI). Anthropometric measurements and blood pressure assessments were conducted during the visit, and blood tests were recorded.

Results: Seventy-three (64%) patients were only obese, and 41 (36%) had a diagnosis of MetS with obesity. There was no significant difference between the two groups in terms of demographic data, clinical features, BDI scores, and FSFI total score. Lubrication, one of the FSFI subparameters, was found to be low in the group with MetS (p=0.028), while there was no difference in other subparameters.

Conclusion: In this study, we showed that lubrication as a sign of arousal problem is affected by MetS. Patients with risk factors for FSD such as MetS, obesity, HTN, diabetes mellitus should not be ignored. Thus, it will be possible to prevent the effects of FSD on general health.

Keywords: Bioelectrical Impedance, Female Sexual Dysfunction, Metabolic Syndrome, Obesity.

Metabolik Sendrom Obez Kadınlarda Cinsel İşlevi Nasıl Etkiler?

ÖZET

Amaç: Metabolik sendrom (MetS), gitgide yaygınlaşan önemli bir halk sağlığı sorunudur. MetS; diabetes mellitus, arteriyel hipertansiyon ve aterosklerotik kalp hastalığı gibi hastalıklara ve kadın cinsel işlev bozukluğuna (FSD) yol açar. Ancak obez bireylerde MetS'un kadın cinsel işleviyle ilişkisi belirsizdir. Çalışmamızda obez kadınlar ve MetS'li obez kadınlar karşılaştırıldı. Her iki grup arasında cinsel işlev bozukluğu açısından fark olup olmadığını saptamayı amaçladık.

Yöntem: Çalışmaya Ocak-Nisan 2022 tarihleri arasında merkezimizin obezite polikliniğine başvuran 21-51 yaş aralığındaki 114 hasta dahil edildi. Çalışma kriterlerini karşılayan hastalar sosyodemografik veri anketi, Kadın Cinsel İşlev İndeksi (FSFI) ve Beck Depresyon Envanteri'ni (BDI) yanıtladılar. Ziyaret sırasında antropometrik ölçümler ile kan basıncı ölçümleri yapıldı ve laboratuvar sonuçları kaydedildi.

Bulgular: Hastaların 73'ü (%64) sadece obez iken 41'i (%36) obezite ile birlikte MetS tanısı almıştı. İki grup arasında demografik veriler, klinik özellikler, BDI puanları ve FSFI toplam puanı açısından anlamlı fark saptanmadı. FSFI alt parametrelerinden biri olan lubrikasyon MetS'li grupta düşük bulunurken (p=0,028), diğer alt parametrelerde fark görülmedi.

Sonuç: Bu çalışmada, uyarılma sorununun bir işareti olan lubrikasyonun MetS'dan etkilendiğini gösterdik. MetS, obezite, arteriyel hipertansiyon, diabetes mellitus gibi FSD için risk faktörleri olan hastalar göz ardı edilmemelidir. Böylece FSD'nin genel sağlık üzerine olası etkilerinin önüne geçmek mümkün olacaktır.

Anahtar Kelimeler: Biyoelektrik Empedans, Kadın Cinsel İşlev Bozukluğu, Metabolik Sendrom, Obezite.

INTRODUCTION

Female sexual dysfunction (FSD) is a health issue influenced by various factors, including psychological, biological, and interpersonal components. It is affected by many factors such as age, ethnicity, sociocultural level, general health (1). According to the definition made by the World Health Organization (WHO), sexuality; it consists of a combination of effects that enrich personality, communication and emotions in physical, psychological and social aspects. The female sexual response cycle is a multifaceted process influenced by various factors, such as vasculogenic, neurogenic, hormonal, and psychogenic elements (1). The disturbance of any of these factors may lead to sexual dysfunction. It is known that nearly half of women in the United States of America (USA) face at least one sexual health problem (2).

Obesity is characterized by the accumulation of excess fat in the body. It is a chronic disease that affects all systems, especially the cardiac and endocrine systems. Obesity, recognized as a complex and multifactorial disease that adversely impacts health, is the second leading cause of preventable deaths after smoking (3). According to WHO 2016 data, the estimated number of obese adults worldwide is 650 million and the number of overweight people is 1.9 billion. Among the adult population, 13.1% are classified as obese, while 39% are considered overweight (4). Metabolic syndrome (MetS) is an endocrinological disease in which diseases such as hyperglycemia, obesity, insulin resistance, arterial hypertension (HTN), hyperlipidemia, and coronary artery disease coexist (5). The most widely used definitions for MetS have been established by WHO, European Group for the Study of Insulin Resistance, and National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) (6). Adult Treatment Panel III (ATP III) diagnostic criteria are as follows; abdominal obesity; waist circumference >88 cm in women, >102 cm in men, triglyceride (TG) ≥150 mg/dl, high-density lipoprotein (HDL) level <40 mg/dl in men, <50 mg/dl in women, fasting plasma glucose >100 mg/dl, arterial blood pressure ≥ 130/85 mm Hg. Three of the five criteria are sufficient for the diagnosis of MetS (6).

MetS, defined as a pandemic by Grundy, is increasing globally in many countries and affects 20-30% of the adult population (7,8). MetS leads to diseases such as diabetes mellitus, HTN and atherosclerotic heart disease, as well as FSD. However, the relationship of MetS to female sexual function in obese woman is unclear. Consequently, this study aims to explore the potential association between the presence of MetS and sexual dysfunction among women of reproductive age who are being monitored at an obesity outpatient clinic. Another aim was to analyze the relationship between depression and FSD in this selected patient group.

MATERIALS AND METHODS

After the approval of the Ethics Committee of University (Approval No: 2021/0622, Date: 8/12/2021), the patients who were followed up and treated in the obesity outpatient clinic were prospectively enrolled in the study. Patients were screened according to the study criteria and first interview was made with 160 of 2488 patients who applied to the outpatient clinic between January 2022 and April 2022. The use of drugs causing sexual dysfunction was an exclusion criterion. Being in menopause, having urinary tract infection or genital infection in the last one month, having a history of pelvic surgery were determined as exclusion criteria. Thirty-four of the interviewed patients were excluded from the study due to their personal problems with their spouses and irregular relationship. Three patients were excluded from the study because they were previously diagnosed with vaginismus or had previously been treated for this reason. Seven patients were excluded from the study due to their social and mental status affecting their sexual life; three patients had recently lost a first-degree relative, four patients were in active patient care. Study was completed with 114 patients remaining after exclusion criteria.

Female Sexual Function Index (FSFI) and Beck Depression Inventory (BDI) were used. FSFI was developed in 2000 by Rosen et al (9). In 2005, a validation study was conducted for the Turkish population, and the Turkish version of FSFI is reliable and valid (10). It is a questionnaire consisting of 19 questions about the woman's sexual life in the last four weeks. The total score range of the scale is 2 – 36. Scale's structure includes 6 main subparameters: sexual desire, arousal, lubrication, orgasm, satisfaction, and pain. Six subparameters are defined as: *sexual desire* to measure the degree of sexual desire and interest of the patient; *arousal* to ensure the state of arousal, to measure the frequency and level of arousal; *orgasm* to measure difficulty in reaching orgasm, satisfaction at that moment and its frequency; *lubrication* to measure the frequency of lubrication, the frequency of maintaining this condition in the relationship, and the difficulty; *satisfaction* to measure the rate of intimacy with her partner, satisfaction with sexual and general life and *pain* during vaginal penetration, to measure the feeling of discomfort afterwards. The cut-off value of the FSFI total score for sexual dysfunction was accepted as 26.55 (11).

The psychological aspect of sexual dysfunction is significant and cannot be overlooked; therefore, depressive symptoms were also evaluated. BDI is a 21-item questionnaire that measures emotional, somatic, cognitive and motivational symptoms related to depression. Turkish validation was published by Hisli et al (12). The score ranges for minimal, mild, moderate, and severe depression are 0-9, 10-16, 17-29, and 30-63,

respectively. In our study, these questionnaires were read and filled by the physician in a separate room where the patients could talk comfortably.

Bioelectrical impedance analysis (BIA) is based on the difference in electrical permeability of lean tissue mass and fat. It is effective with its ease of measurement and low cost. Tanita MC 780 was used for BIA. Body weight, fat and muscle ratio measurements were made with the device. Then the patients were divided into two groups as obese with MetS and obese only.

Statistical Analysis: The data were analyzed using SPSS version 18 (IBM, NY, USA). Conformity of continuous variables to normal distribution was examined by Kolmogorov Smirnov test. Categorical variables in the study were presented with frequency (n) and percentage (%), and continuous variables with mean deviation to standard (mean±SD) and median (IQR: 25th-75th percentile) values. For the analysis of categorical variables, Pearson's Chi-square, Yates correction, Fisher Freeman Halton Exact Test were used in comparison of the two groups mean. Independent Samples T test was used when parametric test assumptions were met, and Mann Whitney U test was used when not. The statistical significance level was accepted as 0,05 in the study.

RESULTS

The mean age of the 114 participants included in the study was 38.99±7.23 years, and the mean age of onset of obesity was calculated as 25.21±7.73 years. The comorbidities of the patients and the drugs they used were examined; 56 patients (49.1%) had no comorbid disease. The most common comorbid disease was prediabetes (41.2%). Nine patients had HTN (7.8%) and three patients (2.6%) had hyperlipidemia. Patients with a total score of less than 26.55 on the FSFI scale were diagnosed with sexual dysfunction. According to the analyses conducted, sexual dysfunction was identified in 46 of the participants, which accounts for 40% of the study population.

Patients were found to be statistically similar in terms of age, age of onset of obesity, and employment status. Smoking status shows a significant difference among the groups (p=0.035). While 6.8% of obese patients were actively smoking, this rate was found to be significantly higher (24.4%) in obese patients with MetS (Table 1).

Table 1. Demographic characteristics, anthropometric measurements, laboratory findings, bioelectrical impedance measurements, FSFI scores and Beck depression scale scores by study groups

Variables (n=114)	Groups: Obese (n=73)	Obese+MetS (n=41)	p value
Demographic features			
Age (years), *Median(IQR)*	40(33-44)	40(35-46)	0.732
Age at diagnosis of obesity (years), *Median(IQR)*	24(20-30)	24(20-28)	0.290
Working status (n, %)			
Not working	54(74)	32(78)	0.796
Working	19(26)	9(22)	
Smoking (n, %)			
Never	63(86.3)[a]	29(70.7)[b]	**0.035**
Ex smoker	5(6.8)[a]	2(4.9)[a]	
Active smoker	5(6.8)[a]	10(24.4)[b]	
Anthropometric measurements			
Body mass index (kg/m^2), *Mean±SD*	34.63±4.74	35.91±4.82	0.170
Waist circumference (cm), *Mean±SD*	102.78±10.32	107.1±10.21	**0.034**
Hip circumference (cm), *Mean±SD*	119.88±10.19	122.9±10.16	0.131
Laboratory findings			
HbA1c (%), *Median(IQR)*	5.6(5.3-5.8)	5.9(5.6-6)	**0.002**
Fasting plasma glucose (mg/dl), *Median(IQR)*	91(87-98)	100(91-106)	**0.001**
HDL (mg/dl), *Median(IQR)*	56(49-67)	45(39-50)	**<0.001**
LDL (mg/dl), *Median(IQR)*	117(86-133)	109(95-136)	0.920
Triglyceride (mg/dl), *Median(IQR)*	90(71-120)	182(142-219)	**<0.001**
Bioelectrical impedance measurements			
TANITA fat (%), *Median(IQR)*	38.4(33.4-40.1)	37.9(35.4-42)	0.186
TANITA fat (kg), *Mean±SD*	33.47±8.34	37.32±10.17	**0.031**
Body, fat (kg), *Mean±D*	14.06±4.13	15.92±4.89	**0.033**
FSFI scores			
Desire, *Median(IQR)*	3(3-3.6)	3(2.4-3.6)	0.860
Arousal, *Mean±SD*	3.84±1.16	3.73±1.11	0.631
Lubrication, *Median(IQR)*	5.4(4.2-6)	4.8(4.2-5.4)	**0.028**
Orgasm, *Median(IQR)*	4.4(4-5.2)	4.4(3.6-5.2)	0.907
Satisfaction, *Median(IQR)*	5.2(4.4-6)	4.8(4-5.6)	0.139
Pain/discomfort, *Median(IQR)*	5.6(4.8-6)	5.6(4-6)	0.509
Total score, *Median(IQR)*	27.5(24.2-30.3)	26.7(23.1-29.4)	0.336
Beck depression scale scores			
Minimal depression, 0-9, (n, %)	33(45.2)	20(48.8)	0.827
Mild depression, 10-16, (n, %)	29(39.7)	13(31.7)	
Moderate depression, 17-29, (n, %)	9(12.3)	7(17.1)	
Severe depression, 30-63, (n, %)	2(2.7)	1(2.4)	

FSFI: Female Sexual Function Index, MetS: Metabolic syndrome, HDL: High-density lipoprotein, LDL: Low-density lipoprotein; Mann Whitney U test, Independent samples T test, Pearson's chi-squared test, Fisher Exact test, Yates' correction. a,b: Differences between groups are shown in lower case letters.

Anthropometric measurements were analyzed according to the study groups and the results of the analysis were shown. Waist circumference (cm) (102.78 vs 107.1; p=0.034) was found to be significantly higher in obese patients with MetS than in patients with only obesity. HbA1c (%) (5.6 and 5.9; p=0.002), fasting plasma glucose (mg/dl) (91 and 100; p=0.001), triglyceride (mg/dl) (90 and 182; p<0.001)), body fat weight (kg) (14.06±4.13 and 15.92±4.89; p=0.033) was significantly higher in obese patients with MetS than in patients who were only obese; HDL (mg/dl) was found to be significantly lower (56 and 45; p<0.001). TANITA fat weight was 33.47±8.34 kg in obese patients and 37.32±10.17 kg in obese patients with MetS, and this difference was statistically significant (p=0.031). TANITA fat percentage was similar in both groups (p=0.0186). When the scores of the patients from the FSFI scale were analyzed, it was determined that the lubrication score was 5.4 (4.2-6) in obese patients and 4.8 (4.2-5.4) in obese patients with MetS, and this difference was statistically significant (p=0.028). There was no significant difference found between the groups in terms of the total score and scores obtained from other subparameters. Sexual dysfunction was observed in 38.4% of obese patients and 43.9% of obese patients with MetS, but this difference was not statistically significant (p=0.562). The median score obtained from the BDI was determined as 10 for both groups (p=0.981). When the relationships between the presence of sexual dysfunction and other independent variables are examined; there was a difference between the two groups in terms of the scores obtained from the BDI and the scale classification (Table 2). The mean scores of the patients from the BDI were calculated as 11.53±6.58. According to the analysis, minimal depression was found in 53 patients (46.5%), mild depression in 42 patients (36.8%), moderate depression in 16 patients (14%), and severe depression in 3 patients (2.6%)

Table 2. Beck depression scale scores and scale classification according to sexual dysfunction

	Sexual dysfunction, *n(%)*		
Variables (n=114)	**No (n=68)**	**Yes (n=46)**	**p value**
Beck depression scale score, *Median(IQR)*	9(7-12)	14(9-19)	**<0.001**
Beck depression scale scores			
Minimal depression (0-9)	40(58.8)[a]	13(28.3)[b]	**<0.001**
Mild depression (10-16)	24(35.3)[a]	18(39.1)[a]	
Moderate depression (17-29)	4(5.9)[a]	12(26.1)[b]	
Severe depression (30-63)	0(0)[a]	3(6.5)[b]	

Mann Whitney U test, Pearson's chi-squared test, Fisher Exact test.
a, b: Differences between groups are shown in lower case letters

DISCUSSION

Epidemiological data are needed to determine the etiology of diseases, to define risk factors, and to evaluate their prevalence in the population. Oksuz et al. detected FSD in 48.3% of 518 women and reported age, smoking, diet, menopause and marital status as risk factor (13). In another study conducted with 2467 participants, the FSD rate was found to be 46.9% and it was reported that female sexual function was affected by age, low education level, unemployment status, chronic disease, multiparity and menopause (14). Other studies have shown that it is affected by many factors such as chronic diseases, neurotransmitters, sex hormones, age, marital status, income level and mood disorders (15) (16) (17). In our study, it was shown that the group with FSD had a more depressive mood, but no difference was found between the two groups in terms of sociodemographic characteristics defined in the literature. This situation may have been caused by the evaluation of only the patients in the reproductive period in our study.

In a study conducted by Kirchengast et al. in 1990 with 171 postmenopausal female patients without a control group, it was shown that the increase in body mass index (BMI) and subcutaneous fat ratio was significantly associated with sexual reluctance, independent of the hormonal effect (18). On the other hand, Adolfsson et al. did not find a relationship between BMI and FSD in their study. This study was based on a Swedish population of 840 women aged 18-49 (18% overweight, 6% obese) and 426 women aged 50-74 (32% overweight and 11% obese). There was no difference in satisfaction with sexual life between obese and normal weight women in both groups, but a trend was detected in the younger group towards a decrease in sexual satisfaction and sexual desire as weight increased (19). In a study conducted with 5535 women in France, no difference was found between those with normal BMI and those who were obese or overweight in terms of sexual dysfunction. However, sexual desire was observed to be lower in patients with high BMI (p=0.01) (20). Esposito et al. showed that BMI and FSFI score were significantly correlated when they compared 52 women with an FSFI score <23 to 66 women with a score of >23. It has been shown that sexual desire and pain are not correlated with BMI, but arousal, vaginal dryness, orgasm and sexual satisfaction are correlated with BMI (21). In

our study, which focused exclusively on women in the reproductive period, no significant differences in anthropometric measurements were observed between the groups with and without sexual dysfunction. We think that the main reason for this result is that we evaluated only obese patients.

In study by Esposito et al., 120 female patients with MetS and 80 without MetS with similar BMIs were evaluated with the FSFI score. Total FSFI score was found to be significantly lower ($p<0.001$) in the group with MetS. It has been shown that orgasm, arousal and lubrication scores, which are subparameters, are low in women with MetS (21). In their study published in 2010, Kadioglu et al. detected FSD in 32 (50%) of obese patients and 11 (41%) of 27 control cases among patients with similar sociodemographic characteristics, age, and menopausal status. When all subparameters were compared, no difference was found between obese patients and healthy controls. It was shown that all FSFI subparameter scores except lubrication were similar between patients with MetS and patients without MetS, but the median score of the lubrication parameter was found to be significantly lower in patients with MetS ($p=0.04$) (22). Female genital arousal response is a neurovascular event involving genital engorgement, swelling, and lubrication. Vaginal lubrication occurs as a result of increased clitoral, vaginal and labial blood flow. Women with sexual arousal disorder experience problems such as delayed arousal, decreased vaginal/clitoral sensation, difficulty in orgasm, and decreased lubrication. It is thought that these problems may result from insufficiency in the ilio-hypogastric arterial bed (23). We can attribute the reason for the significantly lower lubrication score in the MetS group in our study to the higher incidence of atherosclerotic events. Clitoral and vaginal vascular insufficiency due to atherosclerosis may have led to decreased genital blood flow, decreased muscle relaxation, and decreased response of the genital organs to sexual stimulation.

HTN is one of the main MetS components that cause FSD. In the literature, the FSFI score of patients diagnosed with HTN was found to be significantly lower than those without (24). In our study, 9 of 114 patients were diagnosed with HTN, and we detected FSD (77%) in 7 of these 9 patients. Among the drugs, the main agents causing sexual dysfunction are selective serotonin reuptake inhibitors, they cause orgasmic disorders in female patients (25). Since it is known that antihypertensive drugs such as thiazide diuretics, irbesertan, felodipine, and metoprolol may also cause sexual dysfunction, patients using these drugs were not included in our study (26).

In our study, we wanted to touch on female sexuality, which is quite complex, and its relationship with MetS. From a pathophysiological perspective, MetS would be expected to have an impact on arousal function or pain. We should consider that our sample size may have been insufficient to show the effect of MetS on FSD. This may have caused the relationships between variables to be statistically insignificant. Another limitation of our study is that it was conducted in a single center and it was not a randomized study. Patients with serious comorbidities were not included in the study, so our patient group may not have well reflected those with MetS and obesity in the society. Sexual dysfunctions in the partners of the participants could not be questioned, which is one of the limitations of our study. When comparing the findings of our study with studies in the literature, we should not forget the cultural and social differences between the study populations.

CONCLUSION

In our study, there was no difference in FSFI total scores between obese participants with MetS and only obese participants. No significant difference was found in the other FSFI subparameters except lubrication. We showed that lubrication as a sign of arousal problem is affected by MetS. It was also revealed that patients with sexual dysfunction were in a more depressed mood. Patients with risk factors for FSD such as MetS, obesity, HTN, diabetes mellitus should not be ignored. Thus, it will be possible to prevent the possible effects of FSD on general health.

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