

EFFECTS OF OBESITY DEGREES AND THE PRESENCE OF METABOLIC SYNDROME ON THE SEXUAL LIFE OF WOMEN AND MEN

OBEZİTENİN DERESESİ VE METABOLİK SENDROM VARLIĞININ KADIN VE ERKEK CİNSEL YAŞAMINA ETKİLERİ

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ABSTRACT

Objective: This study evaluated the sexual functions of women and men with different degrees of obesity and/or metabolic syndrome (MetSynd).

Material and Methods: Participants were divided into subgroups according to their degree of obesity and presence of MetSend, and their sexual functions were evaluated using the Female Sexual Function Index (FSFI) for women and the International Index of Erectile Function (IIEF) for men. The results were compared with a healthy control group.

Result: Two hundred and thirteen (213) patients (females/males:119/94) were included. The mean age was 39.72±6.64 and 37.84±6.83 years, and the BMI was 38.34±9.77 and 38.48±10.58 kg/m², respectively, for females and males. Metabolic syndrome was diagnosed in 61.7% of females and 67.9% of males. In women, the BMI of those with severe sexual dysfunction (SD) was higher than those with moderate SD (p>0.05), and their age was found to be older (p=0.033). Sexual satisfaction was found to be higher in those with high BMI (p<0.001). The probability of having erectile dysfunction (ED) in men with obesity and MetSend is higher than in those without (p>0.05). While SD was detected

ÖZET

Amaç: Bu çalışmada farklı derecelerde obeziteli ve/veya metabolik sendrom (MetSend) tanılı kadın ve erkeklerin cinsel işlevlerinin değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntem: Katılımcılar obezite derecelerine ve MetSend varlığına göre alt gruplara ayrılmış, cinsel fonksiyonları Kadın Cinsel Fonksiyonu İndeksi (FSFI) ve Uluslararası Erektile Fonksiyon Endeksi (IIEF) kullanılarak değerlendirilmiştir. Sonuçlar sağlıklı kontrol grubuyla karşılaştırılmıştır.

Bulgular: Çalışmaya 213 hasta (kadın/erkek:119/94) dahil edilmiştir. Kadın ve erkekleri cinsiyetle yaş 39,72±6,64/37,84±6,83 yılı; beden kitle indeksi (BKİ) 38,34±9,77/38,48±10,58 kg/m² saptanmıştır. Kadınların %61'ine, erkeklerin ise %67,9'una MetSend tanısı konmuştur. Kadınlarda seksüel disfonksiyonu (SD) ciddi olanların ortalama BKİ (p>0,05) ve yaşları (p=0,033) orta derecede SD bulunanlardan daha yüksek bulunmuştur. Cinsel tatmin ise yüksek BKİ'li bireylerde daha yüksek bulunmuştur (p<0,001). Obeziteli ve MetSend bulunan erkeklerde erektil disfonksiyon (ED) varlığı, bulunmayanlara göre daha yüksektir (p>0,05). Tüm kadınlarda SD tespit edilirken (%83,2'sinde kötü-SD, %16,8'inde orta-SD), erkeklerde ED %15 oranında

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in all women (severe-SD in 83.2%, moderate-SD in 16.8%), erectile dysfunction was found in only 15% of men. In women, SD (moderate/severe) was associated with age (OR: 1.087, 95% CI: 1.008-1.172; $p=0.030$) and the presence of MetSend (OR: 4.257, 95% CI: 1.291-14.038; $p=0.017$), however no statistically significant relation was found in men.

Conclusion: Metabolic syndrome and obesity are closely associated with sexual dysfunction in both men and women, and it worsens as the severity of obesity increases. Contrary to expectations, sexual satisfaction in women is inversely proportional to the severity of obesity. Expectations regarding sexual satisfaction in obese individuals can be expected to be lower than in individuals of normal weight because social stigma may cause obese individuals to impose restrictions on enjoying sexual interaction. The fact that all women have SD and only 15% of men have ED calls into question the reliability of participant statements. This can be explained by the fact that sexuality is a male-dominated taboo in our country and similar Eastern cultures. Therefore, new studies with similar designs and more participants are needed to eliminate uncertainties.

Keywords: Obesity, metabolic syndrome, impotence, erectile dysfunction, female sexual dysfunction, sexual satisfaction

bulunmuştur. Kadınlarda orta/kötü SD'nun yaş (OR: 1,087, 95% CI: 1,008–1,172; $p=0,030$) ve MetSend varlığı (OR: 4,257; %95 CI: 1,291–14,038; $p=0,017$) ile ilişkili olduğu gözlenirken, erkeklerde bu parametreler arasında anlamlı ilişki bulunmamıştır.

Sonuç: Metabolik sendrom ve obezite varlığı hem kadın hem de erkeklerde SD ile ilişkili olup, obezite şiddeti arttıkça SD daha da kötüleşmektedir. Kadınlarda cinsel doyum beklenenin aksine obezite şiddetiyle ters orantılıdır. Obeziteli bireylerde cinsel doyum için beklentilerin, normal kilolulardan daha düşük olması beklenebilir. Çünkü toplumsal stigmatizasyon obeziteli bireylerin cinsel ilişkiden keyif almamak konusunda bazı kısıtlamalar uygulamasına neden olabilir. Kadınların tamamında SD olup erkeklerin sadece %15'inde ED saptanması katılımcı beyanlarının güvenilirliğini sorgulamaktadır. Bu durum bizde ve benzer doğu kültürlerinde cinselliğin erkek egemen bir tabu olması ile açıklanabilir. Bu nedenle belirsizlikleri ortadan kaldırmak için benzer tasarımda ve daha fazla katılımcıyla yapılacak yeni çalışmalara ihtiyaç duyulmaktadır.

Anahtar Kelimeler: Obezite, metabolik sendrom, impotans, erektil disfonksiyon, kadın cinsel disfonksiyonu, cinsel tatmin

INTRODUCTION

Obesity negatively affects both physical and emotional well-being and psychosocial functions. According to Satman et al.'s 2010 prevalence study, obesity in the population aged ≥ 20 years in Türkiye was 32% (1). When compared to TURDEP-I study conducted in 1997-98, the proportion of normal-weight individuals decreased from 41% to 26%, and the ratio of overweight individuals increased from 35% to 37%; class-I obesity (BMI: 30-34.9 kg/m²) from 16% to 24%, class-II obesity (BMI:35-39.9 kg/m²) from 5% to 8.8%, class-III obesity (BMI:35-39.9 kg/m²) (BMI ≥ 40 kg/m²) rate increased from 1% to 3.1% (1, 2). Between the two studies, obesity increased by 34% in women and 107% in men. According to the World Obesity Atlas published in 2023, the estimated increase rate of obesity in adults in our country is 2.3%/year, and it is predicted that the prevalence of obesity will reach 55% in 2035 (3).

Metabolic syndrome (MetSynd) is a condition in which several comorbidities coexist, including central obesity, insulin resistance or impaired glucose metabolism, dyslipidemia, and arterial hypertension (4). In Türkiye, one (1) in every four men and one (1) in every three women have MetSynd (5). High body fat mass (FM) in men with obesity is responsible for increased aromatase activity and changes in the testosterone/estradiol ratio (6). In these men, sexual dysfunction (SD), especially erectile dysfunction (ED), increased 1.3 times (7).

Some drugs used in the treatment of hypertension and endothelial dysfunction resulting from defects in smooth

muscle contraction may explain the development of ED (6, 8). Although it has been suggested that female sexual dysfunction (FSD) is more complex and more closely related to psychosocial factors, successful control of hypertension also reduces FSD (8). Other problems include age, partner-related problems, low socio-economic status, low education level, and chronic diseases (9). It has been found that women with MetSynd have less satisfactory sexual lives and experience SD more frequently (9).

Research results on the relationship between obesity and female sexuality are conflicting. In a study evaluating the prevalence of FSD in our country, FSD was detected in 86% of women with obesity and 83% of women with normal weight (10). In another study, FSD was detected in 50% of obese women and 41% of normal-weight women; no significant difference was found (11). The general prevalence of FSD in Türkiye is 29.3%-86%, and it is reported that 3/4 of women with Class-I obesity and approximately half of those with Class II, -III, and above obesity have FSD and suggested that body image affects sexual health in women rather than BMI (12, 13).

It has been reported that ED is related to BMI, and the prevalence is 53.1% (14). Another study stated that the frequency of ED increased 1.5 times in overweight men and three times in obese men (15). In Türkiye, the age-adjusted prevalence of ED was found to be 69.2% (mild: 33.2%, moderate: 27.5%, severe: 8.5%), and the severity of ED increased with age (16). Erectile dysfunction is up to three times more common in men with MetSynd. It is reported that a total of 79-96% of people with MetSynd apply due to ED, and 29-66% of people with ED have

MetSynd (17). The presence of MetSynd is associated with an increased risk of ED, even in men with BMI <25 kg/m² (18).

In light of all these studies, it appears that obesity negatively affects sexual function in men, but shows contradictory results in women. We did not find any study in the literature in which men and women were evaluated together in a single center. This study assessed the factors affecting the sexual function (SF) of men and women diagnosed with MetSynd and different degrees of obesity who are followed up by the same team at the same center.

MATERIALS and METHODS

Patients who were followed up due to MetSynd and/or obesity at Istanbul University, Istanbul Faculty of Medicine, Department of Endocrinology and Metabolism, Outpatient Clinic between January 2016 and January 2019, were included in the study. The study was approved by the Istanbul Faculty of Medicine Clinical Research Ethics Committee (Date: 14.08.2015, No: 13) and was conducted by the Declaration of Helsinki Principles. Written informed consent was obtained from each participant.

Study population

One hundred and sixty-three subjects with MetSynd and obesity between 18-50 years old were included in the patient group and 50 healthy subjects with non-obese consisted of the control group. All participants were married or had sexual partners, and had sexual intercourse at least once a month. Postmenopausal women and sexually inactive women were excluded from the study.

The patient's demographic characteristics and bioimpedance analyses (Tanita, TBF-300, Japan) were collected through interviews with a research doctor or nurse. The participants were given 15 minutes for the surveys. By calculating BMI (kg/m²) values, patients were divided into subgroups as normal weight (18.5-24.9 kg/m²), overweight (25.0-29.9 kg/m²), class-I (moderate) obesity (30.0-34.9 kg/m²), class-II (severe) obesity (35.00-39.9 kg/m²), class-III (morbid) obesity (40.0-49.9 kg/m²), and super obesity (≥50.0 kg/m²) (19). The criteria of the National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III)-2001 were used as Metabolic Syndrome Diagnostic Criteria (20).

Questionnaires

Beck Depression Inventory

The 'Beck Depression Inventory (BDI)', a self-report scale, was used to examine the depression status of the participants. This scale consists of 21 questions; each item is scored 0-3. The total score for the scale is between 0-63. According to the Turkish validity and reli-

ability study conducted by Hisli et al., the higher the test score, the higher the severity of depression (21,22). In our study, those who scored ≥17 (moderate and severe) were considered to have depression.

SF-36 Item Short Form Survey

The Short Form Survey (SF-36) consists of eight multi-item scales (36 items in total) that assess patients' health status and impact on their lives (physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, mental health). Scores on each scale range from 0 (worst) to 100 (best). Higher scores indicate higher quality of life (23). A Turkish validity and reliability study was conducted (24).

Female Sexual Function Index

Sexual function was assessed by completing the FSFI, a validated 19-item self-report measure of female SF (25). Nineteen items analyze six distinct domains of female SF: desire disorder, arousal disorder, orgasmic disorder, sexual pain disorder, lubrication, and sexual satisfaction. Each domain is scored on a scale of zero or 1-6; A higher score indicates better function. The total score range is 2-36, and a score of ≤26.55 is defined as SD (26). Turkish validity-reliability study of the scale was conducted (27).

International Index of Erectile Function questionnaire

This study used the International Index of Erectile Function (IIEF) to question various sexual function (28). In this study, participants were asked 15 questions to determine erectile function, orgasm function, sexual desire, sexual intercourse satisfaction, and general satisfaction. Accordingly, ED is divided into five categories according to severity: no ED (between 26-30 points), mild (between 22-25 points), mild-moderate (between 17-21 points), moderate (between 11-16 points) and severe (between 6 and 10 points). The IIEF was adapted into Turkish by the Andrology Association (16).

Statistical analysis

Statistical analyses were performed using the SPSS-21 package program (SPSS Corp., Armonk, NY, USA). Normality control was performed by Shapiro Wilk or a single-sample Kolmogorov-Smirnov test where appropriate. Data was presented as mean and SD or frequency and percentage. In comparing the two groups, the variables showing normal distribution were compared with the student t-test and the Mann-Whitney U test was used in the others. Categorical variables were compared with Yates' corrected chi-square and Fisher's exact probability tests. Where appropriate, possible correlations between the variables were tested with Pearson's, Spearman's, and partial correlation tests. We used logistic regression analyses to assess independent factors associated with FSD and ED. Statistical significance was accepted at two-sided p<0.05.

RESULTS

Findings of female participants

The demographic characteristics: The average age of 119 females was 39.72 ± 6.64 (24.00-50.00) years, weight was 99.25 ± 25.62 (52.70-179.80) kg, BMI was 38.34 ± 9.77 (19.40-63.70) kg/m², FM was 42.80 ± 18.79 (10.30-89.32) kg. According to the participants BMI categories, 8.4% were normal weight, 15.1% were overweight, and 76.5% were obese (of them 9.2% were super obese; 33.6% were class III-morbidly obese, 16.8% were class II-severely obese, 16.8% were class I-obese). The demographic characteristics of the participants are presented in Table 1.

Results of BDI: According to the BDI score, moderate and severe depression was detected in 25% of women. There is no significant difference between the FSFI scores of those who were depressed and those who were not.

Results of SF-36 assessment: Subparameter scores of SF-36 were found to be below the norm values determined for Turkish women (29). In addition, the subparameter scores decreased as the degree of obesity increased. Correlations between SF-36 and FSFI domains are presented in Table 2.

Findings of smoker women: The rate of smokers was 25.6% and does not create a substantial difference in FSD.

FSFI and its domain findings: Arousal (3.70 ± 1.44 vs. 2.76 ± 1.69 ; $p=0.003$), orgasm (17.86 ± 5.61 vs. 15.56 ± 6.63 ; $p=0.040$), and the total FSFI scores of 59 working women were found to be significantly higher than those of unemployed women. The average total FSFI score of the participants was 16.70 ± 6.23 (3.00-26.30), and all of them had SD since the cut-off score of the scale was less than 26.55. The FSFI cut-off <23 was classified as "SF-poor," 23-29 as "SF-moderate," and ≥ 30 as "SF-good," while 83.2% of the participants had "SF-poor," and 16.8% had "SF-moderate."

All female patients had SD. The mean BMI (38.49 ± 10.14 vs 37.68 ± 8.06 kg/m²) and FM (43.52 ± 19.68 vs 39.51 ± 14.05 kg) of those with poor SF were found to be higher than those with moderate SF ($p=0.477$; $p=0.804$), and their ages were significantly older (40.41 ± 6.39 vs. 36.55 ± 7.02 years; $p=0.033$). Of those with SF-poor, 75.8% were obese, 15.2% were overweight, and 9.1% were normal weight.

Effects of obesity on female participants: The total FSFI scores were lower in those with obesity than those without ($p=0.476$). The FSFI domains were also found to be lower in those with obesity than those without obesity, including arousal ($p=0.021$), lubrication ($p=0.016$), and pain ($p=0.001$) scores. However, satisfaction scores were higher in women with obesity ($p<0.001$) (Table 2).

Satisfaction disorders were found in 52.5% and 90.9% of those with and without obesity, respectively ($p=0.021$); Pain disorder was 72% and 34.6% ($p=0.003$). It was observed that obesity did not create a statistically significant difference in the evaluation of the other FSFI domains. When the average scores of BMI categories and the FSFI domains were analyzed, the arousal ($p=0.011$), lubrication ($p=0.015$), and pain scores ($p<0.0001$) decreased significantly as BMI increased, while satisfaction scores ($p<0.0001$) increased significantly (Table 3).

A weak negative correlation was observed between both BMI and obesity severity and arousal ($p=0.010$, $r=-0.239$ and $p=0.042$, $r=-0.190$), lubrication ($p=0.023$, $r=-0.211$ and $p=0.047$, $r=-0.136$), and pain ($p=0.000$, $r=-0.334$ and $p=0.002$, $r=-0.278$). Figure 1 shows the average scores of FSFI domains in normal, overweight, and obese women. A weak negative correlation was found between the FM and FSFI scores: arousal ($p=0.003$, $r=-0.276$), lubrication ($p=0.020$, $r=-0.217$), orgasm ($p=0.046$, $r=-0.172$), and pain ($p=0.003$, $r=-0.273$).

Sexual satisfaction showed a weak positive correlation with BMI and FM and a moderate positive correlation with the severity of obesity ($p<0.001$, $r=0.380$; $p<0.001$, $r=0.513$ and $p=0.011$, $r=0.280$).

Effects of MetSynd on female participants: MetSynd was present in $n=58$ participants. Sexual desire ($p=0.017$), arousal ($p=0.047$), pain ($p=0.016$), and total FSFI score ($p=0.042$) were found to be lower in women without MetSynd than in women with. Additionally, 91.8% of those with MetSynd had a total FSFI score of <23 and were considered SF-poor.

In logistic regression analysis, it was observed that age alone (OR: 1.087, 95% CI: 1.008–1.172; $p=0.030$) and the presence of MetSynd alone (OR: 4.257, 95% CI: 1.291–14.038; $p=0.017$) had significant relationships with moderate or poor impairment of SF.

Findings of male participants

The demographic characteristics: The average age of the 94 males was 37.84 ± 6.83 (23-50) years, weight 118.88 ± 34.91 (60.20-217.80) kg, FM 41.58 ± 25.46 (4.40-118.14) kg and BMI 38.48 ± 10.58 (20.00-63.10) kg/m².

According to the participants' BMI categories, 76.5% were obese (13.6% super obese, 27.2% class III-morbidly obese; 13.6% class II-severely obese, 23.5% class I-obese), 14.8% overweight and 8.6% normal weight. The demographic characteristics of the participants are presented in Table 1.

BDI assessment findings in men: According to the BDI score, moderate and severe depression was detected in 16% of men. The sexual desire scores of these patients

Table 1: Demographic characteristics of participating women and men by body mass index categories

	Normal		Overweight		Class I (Moderate) obesity		Class II (Severe) obesity		Class III (Morbid) obesity		Super obesity	
	Women (n=10)	Men (n=10)	Women (n=18)	Men (n=12)	Women (n=20)	Men (n=21)	Women (n=20)	Men (n=14)	Women (n=40)	Men (n=26)	Women (n=11)	Men (n=11)
Age (year)	35.30 ±8.32	35.57 ±6.50	41.76 ±5.73	37.27 ±8.10	40.33 ±7.83	38.23 ±7.11	39.52 ±4.96	38.20 ±5.34	40.11 ±6.75	38.10 ±6.17	39.50 ±5.60	38.50 ±9.00
Weight (kg)	60.24 ±4.71	74.50 ±8.93	73.81 ±9.48	85.19 ±8.96	84.19 ±6.50	98.73 ±8.60	96.92 ±4.10	114.01 ±11.04	114.04 ±11.33	140.34 ±15.12	146.12 ±13.94	180.30 ±28.01
Fat mass (kg)	14.59 ±3.62	12.89 ±4.75	27.16 ±6.06	21.11 ±4.90	31.97 ±5.81	27.06 ±3.35	38.79 ±6.24	70.41 ±105.73	52.67 ±8.89	59.58 ±14.75	79.85 ±6.02	78.48 ±28.58
BMI (kg/m²)	22.64 ±1.72	22.74 ±1.39	28.06 ±1.49	28.23 ±1.99	32.52 ±1.37	32.07 ±1.25	37.61 ±1.34	37.62 ±1.42	44.31 ±3.04	45.56 ±2.82	56.20 ±3.71	57.97 ±3.59
Married (%)	80.0	71.4	92.3	72.7	86.7	70.6	100.0	60.0	82.9	20.0	90.0	12.5
Employed (%)	90.0	71.4	61.5	90.9	40.0	100.0	29.4	100.0	60.0	95.5	50.0	100.0
Education level (%)												
Primary school	N/A	28.6	23.1	9.1	26.7	5.9	5.9	20.0	22.9	NA	10.0	N/A
Secondary high school	N/A	14.3	23.1	45.5	40.0	35.3	76.5	70.0	45.7	60.0	80.0	62.5
University	100.0	57.1	53.8	45.5	33.3	58.8	17.6	10.0	31.4	40.0	10.0	37.5
Smoker (%)	20.0	28.6	16.7	54.5	33.3	23.5	11.1	60.0	30	40.0	25.0	50.0
Moderate- severe depression (%)	10.0	14.3	25.0	9.1	N/A	17.6	33.3	20.0	42.9	15.0	N/A	12.5
MetSynd (%)	N/A	N/A	53.8	45.5	60.0	52.9	29.4	70.0	62.9	95.0	60.0	87.5

BMI: Body Mass Index, MetSynd: Metabolic Syndrome, N/A: Not Available

Table 2: Correlations between 36-Item Short Form Survey (SF-36) domains and Female Sexual Function Index (FSFI) and International Index of Erectile Function (IIEF) domains

SF-36 domains	Female Sexual Function Index (FSFI) domains				International Index of Erectile Function (IIEF) domains						
	Desire	Arousal	Lubrication	Orgasm	Satisfaction	Pain	Erectile function	Orgasmic function	Sexual desire	Intercourse satisfaction	Overall satisfaction
Physical functioning	p=0.031 r=0.260	p=0.003 r=0.363			p=0.000 r=-0.632	p=0.000 r=0.454					
Role limitation due to physical problems		p=0.011 r=0.303			p=0.000 r=-0.546	p=0.003 r=0.354					
Role limitation due to emotional problems	p=0.046 r=0.240	p=0.027 r=0.266			p=0.000 r=-0.501	p=0.004 r=0.341	p=0.042 r=0.255	p=0.036 r=0.263	p=0.044 r=0.232	p=0.022 r=0.295	
Energy and vitality		p=0.024 r=0.274			p=0.000 r=-0.674	p=0.000 r=0.483					
Mental health		p=0.005 r=0.334			p=0.000 r=-0.673	p=0.000 r=0.557					
Social functioning		p=0.000 r=0.414		p=0.012 r=0.301	p=0.000 r=-0.695	p=0.000 r=0.558					
Bodily pain		p=0.001 r=0.385			p=0.000 r=-0.689	p=0.000 r=0.593					
General perception of health		p=0.011 r=0.311			p=0.000 r=-0.615	p=0.001 r=0.388					

Table 3: Female Sexual Function Index and 36-Item Short Form Survey Field Scores in women classified based on body mass index categories

FSFI domains	Min-Max Scores	Non obese	Class I (Moderate) obesity	Class II (Severe) obesity	Class III (Morbid) obesity	Super obesity
Desire	1.2-6.0	3.51±1.07	3.33±1.22	2.91±1.56	3.00±1.28	3.00±1.22
Arousal	0-6.0	3.80±1.58	3.50±1.65	3.12±1.77	3.09±1.51	2.12±1.49
Lubrication	0-6.0	3.38±1.49	3.39±1.37	2.77±1.43	3.00±1.16	2.26±1.65
Orgasm	0-6.0	3.51±1.50	3.41±1.46	2.75±1.70	3.26±1.26	2.36±1.61
Satisfaction	0.8-6.0	3.36±1.33	2.20±2.62	3.60±1.98	3.91±1.51	2.65±1.96
Pain	0-6.0	3.30±1.47	3.10±1.75	1.93±1.66	2.01±1.36	1.89±1.77
Total score	2.0-36.0	17.18±5.50	17.32±5.22	15.81±7.70	17.16±6.11	14.30±7.44
SF-36 domains	Country (Türkiye) specific scores	Non obese	Class I (Moderate) obesity	Class II (Severe) obesity	Class III (Morbid) obesity	Super obesity
Physical functioning	80.6±21.7	74.95±22.19	43.18±17.90	28.85±21.03	27.60±19.53	14.33±2.30
Role limitation due to physical problems	82.9±28.6	64.22±45.94	33.16±41.39	10.06±18.15	21.85±35.17	4.00±0.00
Role limitation due to emotional problems	89.0±22.5	70.01±43.00	20.77±38.16	10.66±24.79	15.26±27.71	4.66±1.15
Energy and vitality	63.4±13.7	53.27±21.91	33.25±14.02	19.53±11.98	22.68±20.23	13.66±3.78
Mental health	70.1±11.4	65.31±21.00	55.16±23.56	29.46±22.68	29.10±26.61	21.00±2.00
Social functioning	90.1±12.9	69.86±29.53	60.79±37.65	18.06±29.01	26.42±37.09	6.00±1.00
Bodily pain	81.0±20.2	66.06±30.78	44.04±30.40	15.00±22.08	22.77±32.98	7.33±1.52
General perception of health	69.1±16.9	56.40±22.71	40.90±21.50	23.53±16.60	23.00±16.95	16.00±1.00

FSFI: Female Sexual Function Index, SF-36: 36-Item Short Form Survey. Scores are given as mean±SD

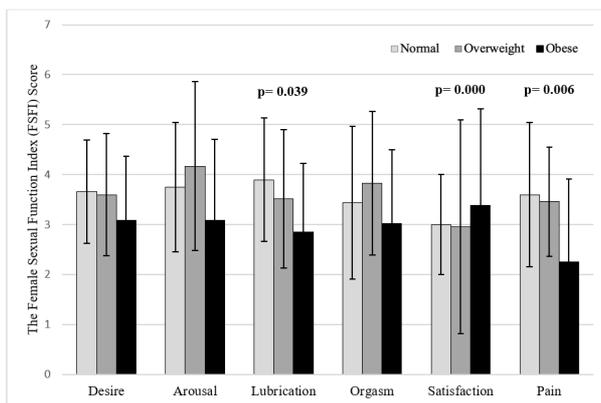


Figure 1: Individual domains of female sexual function in women according to categories of body mass index

were found to be higher than those without depression ($p=0.008$). Depression and orgasmic function ($p=0.032$, $r=-0.221$), sexual desire ($p=0.032$, $r=-0.238$), sexual satisfaction ($p=0.033$, $r=-0.221$), and general satisfaction ($p=0.027$, $r=-0.234$) had weak negative scores; A weak positive correlation ($p=0.045$, $r=0.208$) was detected between ED.

SF-36 assessment findings in men: Subparameter scores of SF-36 were below the norm values determined for Turkish men with MetSynd (29). In addition, the scores determined for each domain decreased as the degree of obesity increased. Correlations between SF-36 and IIEF domains are presented in Table 2.

Findings of smoker men: The rate of smokers was 39.5%, and there was no significant difference in terms of ED. However, smokers' sexual satisfaction scores were found to be lower than non-smokers ($p=0.047$).

IIEF and its domain findings in men: According to the participants' IIEF scores, the rate of men with moderate-severe ED (score <21) was 15.5%, while the rate of men without ED (score ≥ 21) was 84.5%. When looking at the IIEF domains, orgasmic function scores of 2.8% of the participants, sexual desire scores of 23.6%, sexual satisfaction scores of 5.6%, and general satisfaction scores of 5.6% were below the average.

Effects of obesity on male participants: Although not statistically significant, the probability of having ED was

higher in men with obesity than in those without ED (10.5% vs. 16.4%; $p=0.417$). According to the IIEF survey, no significant difference existed between the age, weight, and BMI of men with moderate-severe ED (score <21) and those without. A significant difference was found between the FM of men with and without moderate-severe ED ($p=0.042$). No relationship could be detected between the FM and IIEF domains in men.

Orgasmic function, sexual satisfaction, and general satisfaction scores were below the average in all men with obesity, and sexual desire scores were below the average in 24.1% of men with obesity.

The IIEF domains, orgasmic function scores were less than the average scores in 3.8% of the obese participants, sexual desire in 24.1%, sexual satisfaction in 7.5%, and general satisfaction scores in 13%. The IIEF domain scores according to BMI and obesity severity are presented in Table 4.

It was determined that the incidence of ED increased with increasing BMI ($p=0.004$, $r=0.316$) (Figure 2). The incidence of ED increased as the severity of obesity increased (I, II, III.degree and super-obesity 8.3%, 8.3%, 16.7%, and 50%,

respectively; $p=0.032$). However, no relationship was found between them in the logistic regression analysis. When the average scores of the BMI categories and IIEF domains were analyzed, only the ED scores decreased significantly as the BMI increased ($p=0.046$).

Effects of MetSynd on male participants: The rate of patients with MetSynd is 67.9% and 83.3% of participants with MetSynd had ED ($p=0.175$). There was a negative relationship between the presence of MetSynd and the general satisfaction scores from IIEF domains; that is, they had lower general satisfaction scores ($p=0.035$, $r=-0.234$). We found that the probability of ED in those diagnosed with MetSynd was higher than in those without (18.5% vs. 7.7%; $p=0.176$). Looking at the IIEF domains of the participants, orgasmic function scores were below average at 4.4%, sexual desire at 23.9%, sexual satisfaction at 8.9%, and general satisfaction scores at 15%.

DISCUSSION

The most important finding of this study, which supports the literature, is that SF in women and men are negatively affected by the presence of MetSynd and obesity. Sexual function worsens as the severity of obesity increases in

Table 4: Male Sexual Function Index and 36-Item Short Form Survey Field Scores in women classified based on body mass index categories

IIEF domains	Min-Max scores	Non obese	Class I (Moderate) obesity	Class II (Severe) obesity	Class III (Morbid) obesity	Super obesity
Erectile function	0-30	26.00±3.36	26.00±3.92	26.09±3.36	24.27±3.71	22.63±3.57
Orgasmic function	0-10	9.00±1.45	9.38±1.03	9.18±1.47	9.63±0.92	8.04±2.01
Sexual desire	2-10	7.44±1.85	7.73±1.19	8.27±1.42	7.36±1.80	7.31±1.83
Intercourse satisfaction	0-15	11.61±1.46	11.27±2.51	11.90±2.30	12.00±2.56	11.27±2.41
Overall satisfaction	2-10	8.05±1.79	8.52±1.50	9.09±0.94	8.18±1.60	7.45±2.34
SF-36 domains	Country (Türkiye) specific scores	Non obese	Class I (Moderate) obesity	Class II (Severe) obesity	Class III (Morbid) obesity	Super obesity
Physical functioning	87.2±17.1	79.88±23.87	83.93±20.73	56.12±23.27	35.38±29.80	24.33±9.81
Role limitation due to physical problems	89.8±19.3	74.93±36.37	68.42±45.58	61.37±47.23	27.84±41.15	29.00±39.88
Role limitation due to emotional problems	92.8±15.1	55.75±38.87	80.40±40.59	59.83±40.41	14.17±27.03	25.88±35.31
Energy and vitality	65.7±11.9	58.88±23.49	61.81±25.03	41.62±21.49	25.42±17.84	35.00±34.87
Mental health	71.0±10.6	73.60±19.98	64.75±21.91	54.62±32.80	25.69±18.35	42.00±39.84
Social functioning	91.7±12.8	68.34±26.40	78.43±28.53	61.00±38.96	22.00±30.79	28.66±40.12
Bodily pain	85.1±16.4	72.73±31.63	79.18±27.74	52.87±37.87	22.61±34.73	23.66±35.79
General perception of health	73.6±14.9	60.56±23.59	60.62±20.88	43.37±31.25	20.58±15.12	32.66±32.34

IIEF: International Index of Erectile Function Questionnaire, SF-36: 36-Item Short Form Survey. Scores are given as mean±SD

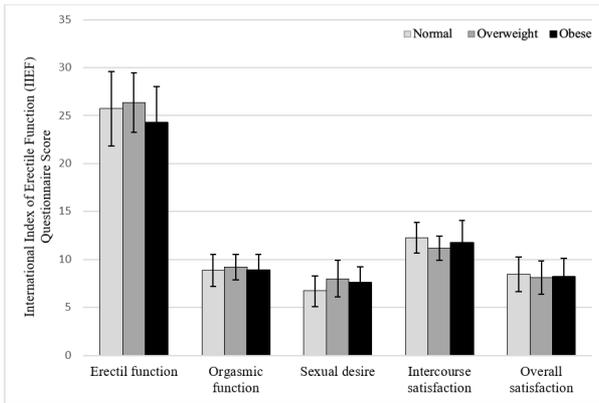


Figure 2: Individual domains of male sexual function in men with different categories of body mass index

women, and the incidence of ED increases in men, but there is no significant change in evaluation scores. On the other hand, sexual satisfaction in women is inversely proportional to the severity of obesity, contrary to expectations. In addition, while SF worsens in women with increasing age, men do not change.

MetSynd is closely associated with both ED and FSD. Esposito et al. showed that the prevalence of ED in men with MetSynd was 96% and that the FSFI score and the number of components of MetSynd were inversely related in women (30). In our study, the prevalence of ED was 83.3%, and the prevalence of poor-SF in women was 4.24 times higher than in healthy women. Other factors associated with FSD are age and BMI (26,34). In men, age is a less important factor than the severity of obesity in ED (15). In the study of Skrypnik et al., the risk of SD is 1.5 times higher in patients with BMI 25-30 kg/m² and three times higher in patients with BMI >30 kg/m², and the severity of obesity is an independent risk factor for ED (15).

However, no relationship was found between the FSFI scores and BMI in women (10). It is interesting that in our study a significant negative relationship was found between BMI and all domains except in women's sexual satisfaction scores. The sexual satisfaction scores were even higher in women with 2nd and 3rd-degree obesity. While sexual arousal and lubrication were negatively affected by both physical and emotional factors, sexual satisfaction was not. As a matter of fact, research showed there are uncertainties in the relationship between obesity and sexual satisfaction in women. While some studies showed that women of normal weight may be more sexually active, others discovered that women with obesity may also be sexually active (10). This situation makes us think that sexual satisfaction, especially in women, does not show a linear relationship with the presence and degree of obesity. Similarly, we saw that there is a close relationship between emotional negativities and ED, orgasmic function, sexual desire, and general satisfaction in men. Litwin MS et al., reached similar results

in their study and therefore emphasized that doctors should consider the emotional impact when evaluating sexual performance in men (31). Another issue they drew attention to is the low correlation coefficients between SD and SF-36 domains, as we observed in our study. The authors note that general health-related quality-of-life measures alone do not adequately reflect disease-specific impairments in patients' quality of life.

Studies conducted in different countries emphasize that the prevalence of sexual desire, arousal, and orgasm disorders varies from country to country, indicating the potential for significant intercultural differences (10). Studies conducted in different provinces of Türkiye have yielded very different results as well. The possible reason for this is our cities' cultural and traditional differences. It can be challenging to predict personal difficulties and their impact on survey results, especially when it comes to questioning and declaring individual behaviors regarding sexuality, which is taboo in our society.

Adolfsson et al. found no significant difference between weight groups in terms of sexual life satisfaction in both men and women. At this point, researchers have touched on the variability of personal expectations regarding what is required for satisfaction (32). That is, overweight and obese people have lower expectations about what is needed for sexual satisfaction than people of normal weight. Social stigma applied consciously or unconsciously to obese individuals may cause these individuals to internalize these negative messages and restrict themselves from enjoying sexual intercourse.

In our study, we found that sexual desire in men was least affected by obesity and MetSynd (24). In contrast, orgasm function and sexual satisfaction scores were 1.5 times lower on average, and general satisfaction scores were 2.5 times lower on average. Corona G et al., found hypoactive sexual desire in 40% of men with MetSynd. They emphasized the importance of not only penile perfusion disorder but also somatized anxiety among the causes of SD (33).

The strength of our study is that men and women were evaluated together at the same center and with the same team. The number of studies with this design is quite limited. The limitations of our study are the small number of participants in the normal BMI group and the fact that the participants' hormonal levels and body images were not evaluated. Therefore, regardless of the factors considered in this study, the effects of male and female SD, obesity-related hormonal imbalance, body image disturbance, and low self-perception could not be evaluated.

CONCLUSION

As a result, the relationship between FSD and obesity with and without MetSynd has been investigated less

in the literature than ED, and the results are contradictory. The hypothesis that FSD increases with increasing obesity severity is compatible with our study. In men, the presence of obesity±MetSynd obesity with and without MetSynd has been associated with ED primarily on physiological grounds and, in some studies, on psychological foundations. Our analysis supports this finding. In our study, while FSD was present in all women, ED was detected in only 15% of men, which calls into question the applicability of research in this field and the reliability of the participants' statements (12). Because sexuality is seen as a taboo and a male-dominated activity in our culture, new studies with similar designs and more participants are needed to eliminate uncertainties in our country and in other similar cultures.

Ethics Committee Approval: This study was approved by Istanbul Faculty of Medicine Clinical Research Ethics Committee (Date: 14.08.2015, No: 13).

Informed Consent: Written informed consent was obtained from each participant.

Peer Review: Externally peer-reviewed.

Author Contributions: Conception/Design of Study- B.Y., C.İ., S.Ç., S.S., A.K.Ü.; Data Acquisition- B.Y., C.İ., S.Ç., S.S., A.K.Ü.; Data Analysis/Interpretation- B.F.Ç., S.S., A.K.Ü., İ.S.; Drafting Manuscript- B.F.Ç., S.S., A.K.Ü., İ.S.; Critical Revision of Manuscript- B.F.Ç., H.H., İ.S.; Final Approval and Accountability- B.F.Ç., İ.S.

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