



# Body mass index, waist/hip ratio and sexual dysfunction

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## ABSTRACT

**Objectives:** Sexual functions are the result of multifactorial and complex processes. While the negative effects of weight gain in men are clearly known, this is not clearly known in women and also there are few studies on the subject. This study aims to determine the effects of body mass index (BMI) on sexual functions.

**Materials and Methods:** This study was designed as a cross-sectional and prospective research. Participants were divided into three groups according to their BMI data. The distribution of the participants to the groups is as follows: 80 normal weight (41.2%), 59 overweight (30.4%), and 55 obese (28.4%) participants. Female sexual function index (FSFI) was used to evaluate sexual dysfunctions.

**Results:** It was determined that 40.7% of the participants had sexual dysfunction. It was observed that there was no significant difference between BMI groups in terms of sexual dysfunction ( $p=0.336$ ). However, as a result of the evaluation of FSFI scores according to its domains, a statistically significant decrease was found in orgasm ( $r=-0.151$ ,  $p=0.036$ ) and FSFI total ( $r=-0.158$ ,  $p=0.028$ ) scores as WHR increased, and in orgasm ( $r=-0.205$ ,  $p=0.004$ ) scores as BMI increased.

**Conclusion:** It was observed that obesity is particularly associated with orgasm in women. The increase in the waist/hip ratio appears to be associated with sexual dysfunction.

**Keywords:** BMI; WHR; obesity; sexual dysfunction

## INTRODUCTION

Female sexuality has a multifactorial and complex nature. Many individual, social, and cultural factors effect sexuality. Female sexual dysfunctions (FSD) are classified as desire and arousal

disorders, dyspareunia, inhibited orgasm, and satisfaction.<sup>1</sup> FSD is a very common health problem that effects 22-93% of women and varies according to age.<sup>2,3</sup> Obesity and metabolic syndrome have now become a public health crisis and their prevalence continues to increase rapidly worldwide. Obesity is a risk factor

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for chronic diseases, particularly diabetes and cardiovascular diseases.<sup>4</sup> The effects of weight gain and obesity on overall health have been given more attention in the literature. However, it is seen that there are few studies evaluating the effects of weight gain and obesity on sexuality. The distinction between the terms overweight and obese is determined by using a formula called body mass index (BMI). BMI is calculated according to the person's weight and height.<sup>5</sup> When the literature is reviewed, it is seen that the effects of BMI on sexual functions are quite variable. Some studies suggest that an increase in BMI makes sex less satisfying due to negative body image perception, while others state that obesity does not lead to any sexual dysfunction.<sup>6,7</sup> This study was conducted to contribute to the literature on the subject by evaluating the effects of BMI and additionally waist/hip ratio on sexual functions.

## MATERIALS AND METHODS

This study was conducted as a prospective, cross-sectional research. The patient sample was selected from among the women who visited the obstetrics and gynecology outpatient clinic of our hospital between November 2021 and April 2022. Ethics committee approval was obtained from the Clinical Research Ethics Committee of Yozgat Bozok University Hospital before starting the study (2017-KAEK-189\_2022.12.29\_11). In addition, signed consent was obtained from all participants.

In this study, the National Heart, Lung, and Blood Institute's terminology was used with the categories of normal weight (BMI 18.5-<25), overweight (BMI 25-<30), and obesity (BMI ≥30). A total of 128 patients were included in the study. Women between the ages of 18-50, who had a regular heterosexual relationship for the last 6 months and had regular menstrual periods, participated in the study. Women with the following conditions were not included in the study: Pregnant or in the first 8 weeks postpartum, diabetes mellitus (fasting blood glucose >126 mg/dL) or impaired glucose tolerance (glucose levels 140-200 mg/dL after 2 hours from 75 g oral glucose load), uremia, multiple sclerosis, chronic alcoholism (≥500g/week intake), neoplasm, current moderate or severe depression, current or previous psychosis or dissociative symptoms, current substance abuse or dependency, bipolar disorder, cardiovascular disease, gynecological surgery, lower urinary tract symptoms, pelvic trauma, polycystic ovarian syndrome, abnormal thyroid function, and taking any medication.

Demographic characteristics of the participants including age, BMI, waist-hip ratio (WHR), parity, delivery method of the pregnancy, cigarettes and alcohol use, and economic level were recorded.

Body weight was measured with patients minimally clothed using a digital scale (Seca 707, Hanover, Md., USA) and rounded to the nearest 100 grams. Similarly, height was measured without shoes using a tape measure with shoulders in normal alignment. BMI was calculated by dividing weight in kilograms (kg) by the square of height (m<sup>2</sup>). Waist circumference was measured at the narrowest level between the costal margin and the iliac crest during normal breathing while the hip circumference was measured at the widest level on the hips. WHR was calculated.

The sexual function of women was assessed using Turkish version of female sexual function index (FSFI), which has been previously validated in Turkish by Turkish Society of Andrology.<sup>3,8</sup> FSFI has six domains including, (1<sup>th</sup>) Desire (questions 1 and 2); (2<sup>nd</sup>) Arousal (questions 3, 4, 5 and 6); (3<sup>rd</sup>) Lubrication (questions 7, 8, 9 and 10); (4<sup>th</sup>) Orgasm (questions 11, 12 and 13); (5<sup>th</sup>) Satisfaction (questions 14, 15 and 16); (6<sup>th</sup>) Pain (questions 17, 18 and 19). The total-scale score range was between 2 to 36. The cut-off value was 26.55. A value equal to or below this point was assumed as sexual dysfunction.

All blood samples were obtained in the morning between 8 AM and 9 AM, after overnight fasting and during the early follicular phase of a spontaneous or progesterone-induced menstrual cycle. Endocrine profile (including pituitary hormones, ovarian and adrenal steroids), serum lipids, fasting glucose and insulin levels were measured. Serum follicle-stimulating hormone, luteinizing hormone, estradiol, prolactin, insulin, and thyroid-stimulating hormone (0.38-5.33 mIU/mL), FT4, FT3, levels were determined by the chemiluminescent method. Fasting glucose, total cholesterol, high-density lipoprotein cholesterol and triglyceride levels were measured spectrophotometrically using an enzymatic colorimetric assay (Roche Integrated system, Mannheim, Germany). Low-density lipoprotein cholesterol was calculated using the Friedewald formula. Hematological parameters were measured in a standard complete blood count device. Insulin resistance was calculated using the homeostatic model assessment insulin resistance index (HOMA-IR). HOMA-IR formula: fasting plasma glucose (mg/dL) × fasting serum insulin (mU/mL)/405.

## Statistical Analysis

Statistical package program SPSS 20 (IBM Corp. released 2011. IBM SPSS Statistics for Windows, version 20.0, Armonk, NY: IBM Corp.) was used to evaluate the data. Data was expressed as mean ± standard deviation and in percentages. Continuous variables were investigated using analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk's test) to determine whether or not they are normally distributed. If the numerical data was non-parametric, the Kruskal-Wallis test was conducted, if it was parametric,

a One-Way ANOVA test was carried out and Bonferroni correction was used for the post-hoc assessment. For double comparison, The Mann-Whitney U test was utilized for the non-parametric numerical data while the Student t-test was adopted for the parametric numerical data. Relationships between categorical variables were analyzed by chi-square test. Bivariate correlations were investigated by Spearman's correlation analysis and  $p < 0.05$  was accepted as statistically significant.

## RESULTS

A total of 194 participants who met the inclusion criteria were included in the study. Participants were divided into three groups according to their BMI data (BMI 18.5-<25= normal weight, BMI 25-<30=, overweight, and BMI  $\geq 30$ = obesity). The distribution of the participants to the groups is as follows: 80 normal weight (41.2%), 59 overweight (30.4%), and 55 obese (28.4%) participants.

The demographic characteristics of the participants are shown in Table 1. The mean age of the participants is  $27.6 \pm 6.0$ , the mean BMI is  $26.8 \pm 5.4$ , the mean WHR is  $0.7 \pm 0.1$ , the mean gravidity is  $0.8 \pm 0.9$ . There was no significant difference between the groups in these values ( $p > 0.05$ ). In addition, no significant difference was found between the economic levels of the participants and the rates of smoking and alcohol use ( $p > 0.05$ ). In terms of the education levels of the participants, it was found that there was a statistically significant increase in the education level as the

BMI decreased ( $p = 0.005$ ). However, in terms of the relationship between education level and FSFI domains, no statistically significant relationship was found between education level and any of the FSFI domains ( $p > 0.05$ ) (data not shown). And also there was no statistically significant relationship between the groups in terms of the laboratory characteristics of the participants (Table 2).

Table 3 shows FSFI scores by BMI groups. It was found that 40.7% of the participants had sexual dysfunction. The rate of sexual dysfunction was found to be 45.8% in women with a BMI between 25-30 and 32.7% in women with a BMI of  $>30$ . There was no significant difference between the groups in terms of sexual dysfunction ( $p = 0.336$ ). In terms of FSFI sub-scores, a statistically significant difference was found between the groups, with the FSFI orgasm domain being  $4.7 \pm 0.8$  in the normal group,  $4.2 \pm 0.8$  in the overweight group, and  $4.2 \pm 0.9$  in the obese group ( $p = 0.002$ ). On the other hand, no statistically significant difference was found between the groups formed according to BMI in other domains of FSFI ( $p > 0.05$ ).

As shown in Table 4, FSFI parameters and both WHR and BMI values were evaluated by correlation analysis. Accordingly, it was seen that there was a statistically significant decrease both in orgasm ( $r = -0.151$ ,  $p = 0.036$ ) and FSFI total scores ( $r = -0.158$ ,  $p = 0.028$ ) as WHR increased, and a statistically significant decrease in orgasm score ( $r = -0.205$ ,  $p = 0.004$ ) as BMI increased.

**Table 1. Demographic features**

		BMI group			p
		<25	25-30	>30	
Age (years)		26.7 $\pm$ 5.0	28.8 $\pm$ 6.5	27.5 $\pm$ 6.8	0.225
BMI (kg/m <sup>2</sup> )		22.6 $\pm$ 1.7	26.7 $\pm$ 2.1	33.1 $\pm$ 5.2	0.000
WHR		0.7 $\pm$ 0.1	0.7 $\pm$ 0.1	0.7 $\pm$ 0.1	0.032
Parity		0.5 $\pm$ 0.8	1 $\pm$ 1	0.8 $\pm$ 0.9	0.015
Type of birth	Nulliparity	51 (63.8%)	25 (42.4%)	30 (54.5%)	0.153
	Vaginal labor	4 (5.0%)	5 (8.5%)	5 (9.1%)	
	Cesarean section	25 (31.3%)	29 (49.2%)	20 (36.4%)	
Monthly income	0-3000 TL	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.468
	3000-5000 TL	22 (27.5%)	22 (37.3%)	17 (30.9%)	
	>5000 TL	58 (72.5%)	37 (62.7%)	38 (69.1%)	
Level of education	Primary school	0 (0.0%)	9 (15.3%)	6 (10.9%)	0.005
	Secondary school	34 (42.5%)	23 (39.0%)	28 (50.9%)	
	High school	46 (57.5%)	27 (45.8%)	21 (38.2%)	
Smoking	No	50 (62.5%)	29 (49.2%)	36 (65.5%)	0.156
	Yes	30 (37.5%)	30 (50.8%)	19 (34.5%)	
Alcohol use	No	77 (96.3%)	57 (96.6%)	55 (100.0%)	0.359
	Yes	3 (3.8%)	2 (3.4%)	0 (0.0%)	

BMI: Body mass index; WHR: Waist-hip ratio; TL: Turkish liras

**Table 2. Comparison of endocrine, biochemical, and metabolic characteristics among BMI groups**

	BMI group			p
	<25	25-30	>30	
HOMA-IR	2.2±1.2	2.4±1.5	2.2±1.3	0.758
Fasting glucose (mg/dL)	88.9±9.1	89±8	89.8±9.6	0.850
Insulin (µIU/mL)	9.8±5.2	10.9±6.4	9.7±5.3	0.715
FSH (mIU/mL)	8±17.5	6.8±7.5	12.4±29.5	0.854
LH (mIU/mL)	9.5±9.6	6.8±3.4	8.8±10.5	0.167
Estradiol (mIU/mL)	50.3±37.3	48±16.2	44.1±15.2	0.368
Progesterone (mIU/mL)	9.9±5.7	10.3±4.7	10.6±4.9	0.608
Prolaktin (mIU/mL)	13.2±8.6	14.5±8.8	15.7±9.8	0.175
TSH (mIU/mL)	2.1±1	2±0.8	2.2±1	0.344
T3 (mIU/mL)	0.3±0.2	0.5±0.7	0.4±0.3	0.586
T4 (mIU/mL)	1.3±0.2	1.2±0.2	1.3±0.2	0.105
HDL (mg/dL)	52.7±11.2	51.4±12.4	52.6±12.4	0.526
LDL (mg/dL)	93.5±23.4	88.2±27	96.5±26.8	0.378
HB (mg/dL)	13.3±0.9	13.3±1	13.3±0.9	0.924
WBC (K/mL)	7.2±2.1	7.6±2.5	7±2	0.395

BMI: Body mass index; HOMA-IR: Homeostatic model assessment insulin resistance index; HDL-C: HDL cholesterol; LDL-C: LDL cholesterol; FSH: Follicle-stimulating hormone; LH: Luteinizing hormone; TSH: Thyroid stimulating hormone

**Table 3. FSFI scores in all patients**

	BMI group			p
	<25	25-30	>30	
Desire	4.2±1	3.8±0.8	3.9±0.9	0.051
Arousal	4.3±0.8	4.1±0.6	4.4±0.6	0.315
Lubrication	4.9±0.8	4.8±0.7	4.8±0.7	0.567
Orgasm	4.7±0.8	4.2±0.8	4.2±0.9	0.002
Satisfaction	5.3±0.9	4.9±0.8	5.1±0.7	0.120
Pain	4.7±1.4	4.6±1.1	4.6±1.1	0.679
Total FSFI score	28.1±3.4	26.6±2.2	27±2.1	0.058
Sexual dysfunction	34 (42.5%)	27 (45.8%)	18 (32.7%)	0.336

BMI: Body mass index; FSFI: Female sexual function index

**Table 4. Correlation analysis between BMI and WHR and FSFI scores**

	BMI		WHR	
	r	p	r	p
Desire	-0.101	0.161	-0.029	0.692
Arousal	0.082	0.254	-0.018	0.806
Lubrication	-0.062	0.390	-0.064	0.375
Orgasm	-0.205	0.004	-0.151	0.036
Satisfaction	-0.059	0.413	-0.138	0.056
Pain	0.030	0.682	-0.124	0.085
Total FSFI score	-0.021	0.769	-0.158	0.028

BMI: Body mass index; WHR: Waist-hip ratio; FSFI: Female sexual function index

## DISCUSSION

It was found that 40.7% of the participants in the study had sexual dysfunction. It was determined that 45.8% of the overweight women and 32.7% of the obese women had sexual dysfunction. These results suggest that the increase in BMI is not associated with sexual dysfunction. On the other hand, as a result of the evaluation made according to FSFI domains, it is seen that increased BMI is associated with orgasmic disorder. A similar relationship is also seen in the increase in WHR. However, it was determined that the FSFI total scores decreased with the increase in WHR.

Rates of sexual dysfunction in women vary by years and countries. In 2017, this rate was found to be quite high as 91.5% by Rabiepoor et al.<sup>5</sup> likewise the results of the study of Martins e Silva et al.<sup>9</sup> from Brazil. On the other hand, in a study conducted in Iran, sexual dysfunction was found in 27.3% of women of reproductive age.<sup>10</sup> In another study conducted with 1749 women between the ages of 18-59 in the USA, this rate was found to be 43%. In a study from our country, this rate was found to be 53%.<sup>11,12</sup> Although it varies from society to society, it is seen that this rate is between 17-55% in the general evaluation and it was determined as 40.7% in this study.

In the evaluation of sexual dysfunction rates in obese and overweight women, Rabiepoor et al.<sup>5</sup> found high rates such as 91.3% and 91.8%. Similarly, Yaylali et al.<sup>13</sup> reported a rate of 86%, which is quite high. On the other hand, in a few studies in which normal weight women were also evaluated, as in this study, no statistically significant difference was found between sexual dysfunction and BMI.<sup>14,15</sup> However, weight gain and obesity seem to cause some sexual problems. While Kolocin draws attention to low sexual desire and sexual interest disorders<sup>16</sup>, Larsen et al.<sup>17</sup> state that obese individuals experience difficulty in orgasm and have satisfaction problems.<sup>16</sup> Sexuality is a multifactorial experience; thus it is very difficult to evaluate the effects of obesity alone. Assimakopoulos et al.<sup>18</sup> explain the effect of obesity with 3 possible mechanisms: (a) insulin resistance and related hormonal changes; (b) dyslipidemia and related drugs; and (c) psychological problems. However, there are insufficient data to verify these possible effects. When clinical studies were examined, Esposito et al.<sup>19</sup> stated that total fat amount was more important than fat distribution in the evaluation of sexual dysfunction according to WHR and BMI values, and they did not find a relationship with WHR. According to Esposito's study, BMI has a positive but non-significant relationship with sexual desire and does not effect pain, but effects arousal, lubrication, satisfaction, and orgasm. In our study, we found a relationship between increased WHR and difficulty in orgasm. As Esposito stated, some biochemical processes related to the total amount of fat can cause events that will effect sexual functions. However, as seen in our study, the variability in fat distribution can create problems related to different processes. The fact that the increase in waist circumference creates metabolic and cardiac problems indicates that fat distribution may be related to many processes. Of course, it's not just about fat distribution. Sexual activity is also closely related to WHR.

Studies show that the male population prefers women with narrow waists and wide hips. Although men's lust for a woman varies according to ethnic and cultural factors, the "hourglass" appearance is a feature that is accepted and especially

emphasized in Latin culture. WHR =0.8 is generally considered the most attractive appearance.<sup>20</sup> In addition to all these, increase in WHR and short height are stated as causes of sexual dysfunction, particularly in studies from Brazil.<sup>18</sup> The review of studies evaluating the effects of obesity on sexual functions with psychological scales reveals different dimensions of the issue. It is seen that comorbid conditions in obese individuals cause anxiety and depression, and also cause problems with self-esteem and body image.<sup>21,22</sup> These problems and negative perception of obesity cause lower sexual satisfaction in obese women.<sup>7</sup> Arguete et al.<sup>23</sup> define this condition as "the presence of a silhouette that is assumed to be ideal for sufficient sexual attractiveness". Despite all these negative results, there are also studies in the literature stating that overweight and obese women enjoy excessive pleasure. Individuals may not be satisfied with their body image perceptions, however the interaction and relationship dynamics of the couples cause variable results.

### Study Limitations

The fact that there are few studies on the subject is a clear indication of the importance of our study. However, the most important limitation of this study is that the pathophysiological processes that can define the current results and the sexual functions of the partner could not be evaluated.

### CONCLUSION

The effects of obesity in sexuality are complex. Our results reveal that obesity specifically refers to problems with orgasm. Excessive fat distribution in the waist causes sexual dysfunction. However, randomized controlled studies with different designs are needed to explain the effects.

### ETHICS

**Ethics Committee Approval:** Ethics committee approval was obtained from the Clinical Research Ethics Committee of Yozgat Bozok University Hospital before starting the study (2017-KAEK-189\_2022.12.29\_11).

**Informed Consent:** Signed consent was obtained from all participants.

### Contributions

Concept: D.A.K. A.C.K.; Design: E.B.; Data Collection or Processing: E.B., N.S.Ş., D.A.K.; Analysis or Interpretation: E.B.; Literature Search: A.C.K., D.A.K.; Writing: D.A.K., E.B.

### DISCLOSURES

**Conflict of Interest:** No conflict of interest was declared by the authors.

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