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# Eating Attitudes and Sexual Functions in Patients Who Underwent Bariatric Surgery: A 1-Year Follow-up Study

## *Bariatrik Cerrahi Uygulanan Hastalarda Yeme Tutumları ve Cinsel İşlevler: Bir Yıllık İzlem Çalışması*

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**ABSTRACT**

**Objective:** In this study, we aimed to examine the effects of bariatric surgery before and after the surgery by comparing eating attitudes and sexual functions in patients who underwent bariatric surgery.

**Methods:** The study included 57 patients consecutively admitted to the General Surgery Outpatient Clinic of Recep Tayyip Erdogan University, Training and Research Hospital, for bariatric surgery. All psychiatric evaluations and psychometric measurements performed before bariatric surgery and in the first year after the surgery were recorded by retrospectively examining the medical files of the patients. All the patients were evaluated using the Sociodemographic Data Form, Eating Attitude Test-40, and Arizona Sexual Experiences Scale before and in the first year after bariatric surgery.

**Results:** Of the 57 patients included in the study, 41 (71.9%) were women and 16 (28.1%) were men. There was no statistically significant difference between the mean scores of Eating Attitude Test-40 before and after bariatric surgery. The mean Arizona Sexual Experiences Scale total scores before and after bariatric surgery were compared, and a statistically significant difference was found. After bariatric surgery, the Arizona Sexual Experiences Scale scores were significantly decreased in both women and men ($P < .001$). Although there was no significant relationship between body mass index and Eating Attitude Test-40 and Arizona Sexual Experiences Scale after bariatric surgery, a significant relationship was found between the current body weight.

**Conclusion:** Sexual functions before and after bariatric surgery were compared in our study, and the statistically significant difference observed in both sexes shows that bariatric surgery has positive effects on sexual functions.

**Keywords:** Bariatric surgery, eating attitude, obesity, sexual function

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## ÖZ

**Amaç:** Bu çalışmada bariatrik cerrahi (BC) uygulanan hastalarda ameliyat öncesi ve sonrası yeme tutumları ile cinsel işlevler karşılaştırılarak BC'nin etkilerinin incelenmesi amaçlanmıştır.

**Yöntemler:** Çalışmaya Recep Tayyip Erdoğan Üniversitesi Eğitim ve Araştırma Hastanesi Genel Cerrahi Polikliniğine BC için ardışık sıra ile başvuran 57 olgu dâhil edilmiştir. BC öncesi ve birinci yılda yapılan tüm psikiyatrik değerlendirmeler ve psikometrik ölçümler kayıt alına alınmış olup, çalışma hastaların tıbbi dosyaları geriye dönük incelenerek gerçekleştirilmiştir. Tüm olgular BC öncesinde ve BC sonrası birinci yılda Sosyodemografik Veri Formu, Yeme Tutumu Testi (YTT-40) ve Arizona Cinsel Yaşantılar Ölçeği (ACYÖ) kullanılarak değerlendirilmiştir.

**Bulgular:** Çalışmaya dahil edilen 57 hastanın 41'i (%71,9) kadın, 16'sı (%28,1) erkek idi. Olguların BC öncesi ve sonrası YTT-40 toplam puan ortalamaları arasında istatistiksel olarak anlamlı bir fark saptanmamıştır. BC öncesi ve sonrası ACYÖ toplam puan ortalamaları karşılaştırıldığında ise istatistiksel olarak anlamlı bir fark bulunmuştur. BC sonrası kadın ve erkeklerde ACYÖ puanları anlamlı olarak azalmıştır ($P < ,001$). BC sonrası beden kitle indeksi (BKİ) ile YTT-40 ve ACYÖ arasında anlamlı bir ilişki görülmezken, mevcut beden ağırlığı arasında anlamlı bir ilişki saptanmıştır.

**Sonuç:** Çalışmamızda BC öncesi ve sonrası cinsel işlevler karşılaştırıldığında her iki cinsiyette istatistiksel olarak anlamlı farkın elde edilmiş olması, BC'nin cinsel işlevler üzerine olumlu etkilerinin olduğunu göstermektedir.


**Anahtar Kelimeler:** Bariatrik cerrahi, cinsel işlev, obezite, yeme tutumu

## INTRODUCTION

Obesity is a multifactorial disease that is increasingly common in our country and worldwide and can cause serious health problems. Obesity could be a result of both genetic and environmental conditions.[1] In the 24 788 people who were included in the Turkey-I Diabetes and Hypertension Epidemiology (TURDEP-I) study between 1997 and 1998, the prevalence of obesity in our country was found to be 22.3%. The frequency of obesity according to sex was reported as 29.9% in women and 12.9% in men.[2] In the TURDEP-II study conducted 12 years after the TURDEP-I study, the rate of obesity in the general population was determined to be 35% (women 44% and men 27%).[3] When the results of this study were compared with the first TURDEP-I study, it was observed that the prevalence of obesity increased from 22.3% to 31.2% in our country and increased by 34% in women and 107% in men.[3]

Obesity causes a wide variety of medical and psychosocial comorbidities.[4,5] If obesity cannot be treated and progressively increases, it can lead to serious harm in terms of individual and public health.[6] The aim of obesity treatment is to reduce the morbidity and mortality risks related to obesity and to increase the quality of life by giving an individual an adequate and balanced diet. Lifestyle changes, diet, physical exercise, and pharmacological approaches are frequently preferred in traditional methods in the treatment of mild and moderate obesity.[7] However, the serious increase in obesity rates and the low success of traditional methods have led to the search for new treatments.

In recent years, bariatric surgery (BS) has been widely used in the treatment of patients with morbid obesity. Bariatric surgery is an effective treatment method for rapid weight loss and improvement of physical comorbidity in patients with a body mass index (BMI) of 40 kg/m$^2$ and above.[8,9] Laparoscopic Roux-en-Y gastric bypass, sleeve gastrectomy (tube stomach operation), and gastric balloon (intra-gastric balloon application) are the most commonly used BS methods.[10] In addition to detailed medical and psychiatric evaluation of patients who apply for surgery before BS, it is also important to follow up with the patients after BS.[9,10] However, there is no globally accepted guideline regarding pre-BS evaluations and follow-up of patients after BS. Therefore, different results are obtained in studies comparing results before and after BS.[11] It is stated that rapid weight loss expected after BS may cause possible negative psychological problems, along with positive effects.[10,12,13]

Appearance and obesity can negatively affect sexual life. Sexuality in patients with obesity is one of the areas where individuals feel uncomfortable with their partner when nude and because of the impairment of sexual function related to weight.[12] Studies conducted till date show that BS leads to improvement in sexual functions.[14-19] However, the persistence of this improvement is not known as the studies are limited to small samples and short follow-up. Improvement in weight loss, body image, and physical diseases after BS may contribute to positive improvement in sexual functions.[20] Parallel to this, positive developments in marital satisfaction have also been reported.[21-26] However, there are also studies reporting the negative effects of BS on sexual functions.[27]

Another issue to be followed after BS is eating and nutritional habits. Changes in gastrointestinal anatomy that occur during BS may cause differences in eating attitudes with their effects on gut hormones, bile acids, and microbiota. Therefore, it is important to learn eating attitudes in the follow-up of patients applying for BS.[28-30] After BS, patients are asked to eat small portions; chew foods slowly and excessively; avoid alcoholic, high-calorie, and carbonated drinks, high-fat, high-sugar, and poorly tolerated foods. Patients should increase their water intake and avoid overeating and snacking.[31-34] Although patients after BS sometimes report that they avoid consuming high-fat and high-sugar and prefer healthier foods, some of them prefer chocolates, sweets, and fried foods.[35,36] It is important for clinicians to understand the possible difficulties in the eating habits of patients pre-BS and their expectations regarding how eating and hunger might be affected post-BS.[37]

There are only a few studies comparing eating attitudes and sexual functions before and after BS. Therefore, there is a need for studies examining the effects of BS on eating attitudes and sexual functions. In this study, we aimed to compare the effects of BS on eating attitudes and sexual functions in a 1-year follow-up period.

## METHODS

### Subjects

Fifty-seven patients who applied for BS to the Recep Tayyip Erdogan University Training and Research Hospital general surgery polyclinic between February 01, 2016 and December 31, 2018, and who were deemed suitable for surgery by the obesity council were included in the study. All psychiatric evaluations and psychometric measurements performed before BS and in the first year were recorded, and the study was carried out retrospectively by examining the medical files of the patients. Those who were illiterate, younger than 18 years or older than 65 years, mentally retarded, and/or had severe psychotic or organic mental disorders were excluded from the study. The necessary approval was obtained from the ethics committee of the Recep Tayyip Erdogan University, Faculty of Medicine on February 06, 2020 (2020/14). The study was conducted in accordance with the ethical standards of the institutional and/or national research committee and the 1964 Helsinki Declaration and its subsequent revisions or comparable ethical standards.

### Measures

***Sociodemographic and Clinical Features Data Form:*** In this form developed by the authors, sociodemographic information such as age, marital status, place of residence, education level and clinical characteristics such as body weight, height, and past psychiatric disorders were included.

***Arizona Sexual Experiences Scale:*** This scale consisted of 5 questions designed by McGahuey et al[38] to evaluate the changes and disorders in sexual functions. It is used to assess the basic parts of sexual function in both men and women. The validity and reliability study of the Turkish version of the scale was conducted by Soykan,[39] and the Cronbach's alpha internal consistency coefficient was found to be 0.90.

***Eating Attitude Test:*** This is a Likert-type self-report scale developed by Garner and Garfinkel[40] to measure the symptoms of anorexia nervosa. Eating attitude test's (EAT-40) reliability and validity study was conducted by Savasir and Erol[41] in Turkey. The reliability coefficient of the test is 0.65, and internal consistency calculated with Cronbach's alpha was reported as 0.70. In this study, according to the evaluation scale of EAT-40, people whose score was 30 were described as "susceptible to eating behavior disorder."

### Statistical Analysis

The Statistical Package for Social Sciences (IBM SPSS Corp., Armonk, NY, USA) version 22.0 was used for the analysis of the results obtained from our study. In analyzing descriptive data, mean and standard deviation were used for quantitative data, and numbers and percentages were used for qualitative data. To evaluate the differences between multiple groups, continuous variables from analysis of variance dual clinical and demographic variables were evaluated using the dependent sample *t*-test, and categorical variables were evaluated using the chi-squared test. The Kolmogorov–Smirnov test was used to compare the study data suitable for normal distribution. The significance level was accepted as $P < .05$.

## RESULTS

Of the 57 cases included in the study (age range, 21-61 years), 71.9% (n = 41) were women and 28.1% (n = 16) were men. The sociodemographic characteristics of the study group are given in Table 1.

Health problems were stated by 71.8% (n = 41) of the patients as the reason for BS application. Sleeve gastrectomy (tube stomach operation) was performed in 55 (96.5%) patients as the BS method.

Examining the patients' own statements and hospital records identified 29 (50.9%) patients with a history of psychiatric disorders. The diagnoses made in these patients were depression, generalized anxiety disorder, dissociative disorder, panic disorder, and eating disorder. There were 23 (40.4%) patients with a family history of psychiatric illness.

The mean height of the patients was 163.63 ± 8.53 cm, the mean body weight before BS was 133.10 ± 26.92 kg, and the mean BMI was 50.76 ± 8.04 kg/m$^2$. After BS, the mean body weight was 84.64 ± 17.17 kg, and the mean BMI was 32.99 ± 6.70 kg/m$^2$. A statistically significant difference was observed between the body weight and BMI averages of the patients before and after BS ($P < .001$). When the mean EAT-40 total scores before and after BS were compared, no statistically significant difference was found ($P = .391$). However, a statistically significant difference was found between the mean ASEX total scores before and after BS ($P < .001$). The mean ASEX score for female patients before BS was 20.05 ± 6.0 and after BS was 15.93 ± 5.0, the mean ASEX score for male patients before BS was 15.31 ± 4.84, and after BS was found to be 10.56 ± 3.42. A statistically significant difference was found between ASEX scores before and after BS for both sexes ($P < .001$). A comparison of the anthropometric measurements of the patients and EAT-40 and ASEX mean scores before and after BS is given in Table 2.

In the regression analysis performed with variables such as sex, age, education level, and past psychiatric history, it was concluded that education level had an effect on BMI values before ($P = .007$) and

**Table 1. Sociodemographic Characteristics of the Patients**

| Sociodemographic Characteristics | |
|---|---|
| Age (mean ± SD) (years) | 40.5 ± 12.54 |
| **Sex, n (%)** | |
| Female | 41 (71.9) |
| Male | 16 (28.1) |
| **Education level, n (%)** | |
| Elementary | 26 (45.6) |
| High School | 15 (26.3) |
| University | 16 (28.1) |
| **Marital status, n (%)** | |
| Married | 40 (70.2) |
| Single | 15 (26.3) |
| Divorced | 2 (3.6) |
| **Occupation status, n (%)** | |
| Employment | 25 (43.9) |
| Unemployment | 32 (56.1) |
| **Living place, n (%)** | |
| Urban areas | 25 (45.6) |
| Rural areas | 31 (54.4) |

n, number of patients, SD, standard deviation.

**Table 2. Comparison of the Anthropometric Measurements of the Patients and EAT-40 and ASEX Mean Scores Before and After BS**

| | Before BS | After BS | *t* | *P* |
|---|---|---|---|---|
| Height (cm), mean ± SD | 163.63 ± 8.53 | | | |
| Body weight (kg), mean ± SD[a] | 133.10 ± 26.92 | 84.64 ± 17.17 | | **<.001*** |
| BMI (kg/m$^2$), mean ± SD[a] | 50.76 ± 8.04 | 32.99 ± 6.70 | | **<.001*** |
| EAT-40 total mean ± SD[a] | 27.28 ± 12.89 | 25.82 ± 14.15 | 0.87 | .391 |
| ASEX total mean ± SD[a] | 18.72 ± 6.09 | 14.42 ± 5.25 | 6.22 | **<.001*** |
| ASEX women mean ± SD[a] | 20.05 ± 6.06 | 15.93 ± 5.09 | 4.84 | **<.001*** |
| ASEX men mean ± SD[a] | 15.31 ± 4.84 | 10.56 ± 3.42 | 4.05 | **≤.001*** |

[a]*t* test; **P* < .001.
SD, standard deviation; BMI, body mass index; EAT-40, eating attitude test; ASEX, Arizona sexual experiences scale; BS, bariatric surgery.

after (*P* = .003) BS. Higher education levels had a positive effect on BMI. It was determined that other variables did not predict BMI before and after BS.

No significant relationship was found between BMI and EAT-40 and ASEX scores before BS by correlation analysis. After BS, there was no significant relationship between BMI and EAT-40 and ASEX scores, whereas there was a significant positive correlation between body weight and EAT-40 and ASEX scores ($r = 0.830$, $P < .001$).

## DISCUSSION

In this study, which was carried out by examining the medical records of 57 patients who underwent BS, it was found that there was no significant change in the eating attitudes after BS; however, there were positive changes in sexual functions. The changes in lifestyle and eating habits with advancements in technology cause an increase in obesity.[42] It has been pointed out that obesity is increasingly seen in individuals living in rural areas, married, 30 years and over, and women.[43-45] In our study, 71.9% of the applicants for BS were women. This situation supports the results of other studies. Similar rates of obesity in women were also reported in TURDEP-I and Turkey Obesity and Hypertension Survey (TOHTS) studies.[2,46] There is strong evidence that a higher education level is associated with lower obesity, particularly in women.[47,48] In our study, it was found that there is a significant relationship between higher education level and BMI values before and after BS. This situation is compatible with the results of studies investigating obesity and education level. It has been reported that unemployment and the region of residence are risk factors for obesity.[43,49] In our study, 52.6% of the patients included did not work, and 45.6% had an education level of 8 years or less, which is consistent with the results of previous studies. In 2 separate studies conducted in our country, low socioeconomic status and living in rural areas were reported to increase the frequency of obesity.[50,51] In our study, 54.4% of the patients reported living in a rural area.

Bariatric surgery is highly effective in the recovery of physical diseases caused by obesity.[52] Bariatric surgery is recommended in patients who cannot achieve permanent body weight loss, considering comorbid conditions. Sleeve gastrectomy, which has been reported to have very good results in weight loss around the world and in our country, with a morbidity and mortality rate of 1%, is one of the most preferred BS methods.[53,54] In our study, sleeve gastrectomy was applied to 96.5% of the cases.

It is known that there is a higher rate of psychiatric disorders in patients diagnosed with morbid obesity. The most common diagnoses in psychiatric evaluation before BS were anxiety disorders, mood disorders, binge eating disorder, and personality disorders.[55,56] In a study conducted with patients who were BS candidates, it was reported that approximately 66% of them had at least 1 Axis I diagnosis during their lifetime, 38% still had an Axis I diagnosis, and 29% had an Axis II diagnosis.[57] Depression is the most common mood disorder; although the presence of depression is explained by the stigmatization of patients with morbid obesity, some studies also show that depression and obesity affect each other mutually.[58,59] In accordance with these findings, we found that 50.9% of the patients before BS had a history of psychiatric disorders in the past according to the hospital records, and they were treated for the diagnoses of depression, generalized anxiety disorder, dissociative disorder, panic disorder, and eating disorder.

Bariatric surgery is an effective method to treat comorbid conditions with a decrease in weight loss and BMI in patients with morbid obesity.[60] Studies have reported rapid weight loss and lower BMIs in the post-BS period.[61,62] In our study, the fact that a statistically significant difference was obtained in the comparison of body weight and BMI averages before and after BS supports these results. However, there are also studies reporting that the incidence of achieving body weight before BS as a result of regaining weight from the lowest weight in the first year after BS varied between 46% and 63%.[63,64] This situation will result in a significant recurrence in physical diseases associated with obesity and will cause deterioration in the quality of life. Owing to the risks associated with insufficient body weight loss or weight gain, it is recommended that the patients be followed up in the long term after BS.[65] After BS, the lifestyle and eating attitudes of the patients change, and new eating habits develop. However, the relationship between eating behavior before and after BS and body weight loss has not been adequately studied.[66] In recent studies, attention has been drawn to binge eating disorder and grazing-type eating habits in patients after BS.[67,68] In a study comparing eating behaviors before and after BS in patients in the first year after BS, it was reported that new methods should be developed to define and evaluate positive and negative eating behaviors associated with weight loss.[69] In another study, eating attitudes and lifestyles of patients with Roux-en-Y gastric bypass and sleeve gastrectomy type BS were evaluated and compared. Although the patients developed healthy eating habits after BS, it was reported that smoking and physical activity levels did not change.[70] In our study, eating attitudes observed before and in the first year after BS were evaluated, and no statistically significant difference was found. This situation can be explained by the fact that the cases after BS were evaluated in a short period, and some eating behaviors (such as grazing) that may occur after BS could not be detected with EAT-40.

In a study conducted in our country, patients were evaluated in the first 4 years to investigate the relationship between changes in BMI and weight gain with eating attitudes and behaviors after a sleeve gastrectomy, and a significant difference was found between the EAT-26 scores by years. In the same study, it was reported that the

most important difference was in the first and second years; unlike other studies in the literature, there was no significant decrease in EAT-26 scores in the third and fourth years. The authors attributed this situation to the frequent follow-up of patients by psychiatrists and dieticians in the first year, the smaller stomach volume in the first period after BS compared with the progressive stages, and the positive effects of significant postoperative body weight loss on the process of adaptation to diet.[42]

Sexual functions contribute significantly to health-related quality of life, which may be impaired owing to obesity.[71] In many studies, it has been stated that high BMI or being overweight may cause various problems with sexual functions or sexual life quality.[72-78] There are studies reporting that weight loss after BS positively affects sexual functions.[19,79-82] Similarly, in our study, it was found that sexual functions were positively affected when compared before and in the first year after BS and that there was a significant relationship between body weight after BS and EAT-40 and ASEX scores. In addition, a statistically significant difference was found in the ASEX score comparisons for both sexes before and in the first year after BS in our study. Although there are studies reporting the positive effects of BS on sexual functions in men and women in the literature, there are also studies reporting that sexual functions were affected negatively after BS, especially in men.[27,83-86] The findings obtained from these studies, with mostly small samples and from patient statements without using any measurement tools in a short period after BS, are contradictory. In addition, the permanence of the improvement reported in these studies limited to a short follow-up period is also controversial. Therefore, we believe that the effect of weight loss with BS on sexual functions in both sexes has not been adequately studied. Apart from weight loss after BS, improvement in body image, related physical diseases, mental disorders, and improvement in reproductive hormones can also positively affect sexual functions.

This study had some limitations. First, the results of our study could not be generalized because the sample was small, and the patients were selected from a single center. Psychological symptoms and disorders that may affect sexual function and the fact that reproductive hormones have not been examined are other limitations. Despite these limitations, the fact that the study was performed with the same number of samples before and after BS, sexual function and eating attitudes were evaluated together, and measurement tools were used is the strength of our study.

In conclusion, in our study, it was found that sexual functions were positively affected in both sexes after BS and that there was a significant relationship between weight loss after BS and sexual function and eating attitudes. In addition to a detailed psychosocial evaluation of patients before BS, monitoring after BS may prevent complications that may occur after BS. Therefore, follow-up of patients after BS with a team including a psychiatrist and a dietitian will increase their quality of life. Long-term studies examining the effects of BS on eating attitudes and sexual function in large samples according to the diet, lifestyle changes, exercise habits, reproductive hormones, and BS methods are needed.

**Ethics Committee Approval:** Ethics committee approval was received for this study from the ethics committee of Recep Tayyip Erdoğan University (Date: February 6, 2020, No: 2020/14).

**Informed Consent:** Written informed consent was obtained from patients who participated in this study.

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## REFERENCES

1. World Health Organization (WHO). Obesity preventing and managing the global epidemic: report of a WHO consultation on obesity. *WHO/NUT/NCD1998*. Geneva: World Health Organization; 1998.
2. Satman I, Yilmaz T, Sengül A, et al. Population-based study of diabetes and risk characteristics in Turkey: results of the Turkish diabetes epidemiology study (TURDEP). *Diabetes Care*. 2002;25(9):1551-1556. [CrossRef]
3. Satman I, Omer B, Tutuncu Y, et al. Twelve-year trends in the prevalence and risk factors of diabetes and prediabetes in Turkish adults. *Eur J Epidemiol*. 2013;28(2):169-180. [CrossRef]
4. Clark NG, Fox KM, Grandy S, SHIELD Study Group. Symptoms of diabetes and their association with the risk and presence of diabetes: findings from the study to help improve early evaluation and management of risk factors leading to diabetes (SHIELD). *Diabetes Care*. 2007;30(11):2868-2873. [CrossRef]
5. Dong JY, Zhang YH, Qin LQ. Erectile dysfunction and risk of cardiovascular disease: meta-analysis of prospective cohort studies. *J Am Coll Cardiol*. 2011;58(13):1378-1385. [CrossRef]
6. Jarolimova J, Tagoni J, Stern TA. Obesity: its epidemiology, comorbidities, and management. *Prim Care Companion CNS Disord*. 2013;15(5):PCC.12f01475. [CrossRef]
7. Yamaoka K, Tango T. Efficacy of lifestyle education to prevent type 2 diabetes: a meta-analysis of randomized controlled trials. *Diabetes Care*. 2005;28(11):2780-2786. [CrossRef]
8. Allied Health Sciences Section Ad Hoc Nutrition Committee, Aills L, Blankenship J, Buffington C, Furtado M, Parrott J. ASMBS allied health nutritional guidelines for the surgical weight loss patient. *Surg Obes Relat Dis*. 2008;4(suppl 5):S73-S108. [CrossRef]
9. Colquitt JL, Pickett K, Loveman E, Frampton GK. Surgery for weight loss in adults. *Cochrane Database Syst Rev*. 2014;8(8):CD003641. [CrossRef]

10. Picot J, Jones J, Colquitt JL, et al. The clinical effectiveness and cost-effectiveness of bariatric (weight loss) surgery for obesity: a systematic review and economic evaluation. *Health Technol Assess*. 2009;13(41):190-215. [CrossRef]
11. Lanyon RI, Maxwell BM. Predictors of outcome after gastric bypass surgery. *Obes Surg*. 2007;17(3):321-328. [CrossRef]
12. Rizvi SJ, Kennedy SH, Ravindran LN, et al. The relationship between testosterone and sexual function in depressed and healthy men. *J Sex Med*. 2010;7(2 Pt 1):816-825. [CrossRef]
13. Freire CC, Zanella MT, Segal A, Arasaki CH, Matos MIR, Carneiro G. Associations between binge eating, depressive symptoms and anxiety and weight regain after Roux-en-Y gastric bypass surgery. *Eat Weight Disord*. 2021;26(1):191-199. [CrossRef]
14. Dallal RM, Chernoff A, O'Leary MP, Smith JA, Braverman JD, Quebbemann BB. Sexual dysfunction is common in the morbidly obese male and improves after gastric bypass surgery. *J Am Coll Surg*. 2008;207(6):859-864. [CrossRef]
15. Hammoud A, Gibson M, Hunt SC, et al. Effect of Roux-en-Y gastric bypass surgery on the sex steroids and quality of life in obese men. *J Clin Endocrinol Metab*. 2009;94(4):1329-1332. [CrossRef]
16. Reis LO, Favaro WJ, Barreiro GC, et al. Erectile dysfunction and hormonal imbalance in morbidly obese male is reversed after gastric bypass surgery: a prospective randomized controlled trial. *Int J Androl*. 2010 ;33(5):736-744. [CrossRef]
17. Mora M, Aranda GB, de Hollanda A, Flores L, Puig-Domingo M, Vidal J. Weight loss is a major contributor to improved sexual function after bariatric surgery. *Surg Endosc*. 2013;27(9):3197-3204. [CrossRef]
18. Efthymiou V, Hyphantis T, Karaivazoglou K, et al. The effect of bariatric surgery on patient HRQOL and sexual health during a 1-year postoperative period. *Obes Surg*. 2015;25(2):310-318. [CrossRef]
19. Sarwer DB, Spitzer JC, Wadden TA, et al. Sexual functioning and sex hormones in men who underwent bariatric surgery. *Surg Obes Relat Dis*. 2015;11(3):643-651. [CrossRef]
20. Camps MA, Zervos E, Goode S, Rosemurgy AS. Impact of bariatric surgery on body image perception and sexuality in morbidly obese patients and their partners. *Obes Surg*. 1996;6(4):356-360. [CrossRef]
21. Steffen KJ, King WC, White GE, et al. Sexual functioning of men and women with severe obesity before bariatric surgery. *Surg Obes Relat Dis*. 2017;13(2):334-343. [CrossRef]
22. Ferrer-Márquez M, Pomares-Callejón MÁ, Fernández-Agis I, Belda-Lozano R, Vidaña-Márquez E, Soriano-Maldonado A. Sexual satisfaction following bariatric surgery: a prospective exploratory study. *Cir Esp*. 2017;95(9):521-528. [CrossRef]
23. Oliveira CFA, Dos Santos PO, de Oliveira RA, et al. Changes in sexual function and positions in women with severe obesity after bariatric surgery. *Sex Med*. 2019;7(1):80-85. [CrossRef]
24. Pichlerova D, Bob P, Zmolikova J, et al. Sexual dysfunctions in obese women before and after bariatric surgery. *Med Sci Monit*. 2019;25:3108-3114. [CrossRef]
25. Kinzl JF, Trefalt E, Fiala M, Hotter A, Biebl W, Aigner F. Partnership, sexuality, and sexual disorders in morbidly obese women: consequences of weight loss after gastric banding. *Obes Surg*. 2001;11(4):455-458. [CrossRef]
26. Hafner RJ, Watts JM, Rogers J. Quality of life after gastric bypass for morbid obesity. *Int J Obes*. 1991;15(8):555-560.
27. di Frega AS, Dale B, Di Matteo L, Wilding M. Secondary male factor infertility after Roux-en-Y gastric bypass for morbid obesity: case report. *Hum Reprod*. 2005;20(4):997-998. [CrossRef]
28. Al-Najim W, Docherty NG, le Roux CW. Food intake and eating behavior after bariatric surgery. *Physiol Rev*. 2018;98(3):1113-1141. [CrossRef]
29. Opolski M, Chur-Hansen A, Wittert G. The eating-related behaviours, disorders and expectations of candidates for bariatric surgery. *Clin Obes*. 2015;5(4):165-197. [CrossRef]
30. Adler S, Fowler N, Robinson AH, et al. Correlates of dietary adherence and maladaptive eating patterns following Roux-en-Y bariatric surgery. *Obes Surg*. 2018;28(4):1130-1135. [CrossRef]
31. Elkins G, Whitfield P, Marcus J, Symmonds R, Rodriguez J, Cook T. Noncompliance with behavioral recommendations following bariatric surgery. *Obes Surg*. 2005;15(4):546-551. [CrossRef]
32. Parkes E. Nutritional management of patients after bariatric surgery. *Am J Med Sci*. 2006;331(4):207-213. [CrossRef]
33. Rusch MD, Andris D. Maladaptive eating patterns after weight-loss surgery. *Nutr Clin Pract*. 2007;22(1):41-49. [CrossRef]
34. Sandoval D. Bariatric surgeries: beyond restriction and malabsorption. *Int J Obes*. 2011;35(suppl 3):S45-S49. [CrossRef]
35. Nogué M, Nogué E, Molinari N, Macioce V, Avignon A, Sultan A. Intuitive eating is associated with weight loss after bariatric surgery in women. *Am J Clin Nutr*. 2019;110(1):10-15. [CrossRef]
36. Koball AM, Clark MM, Collazo-Clavell M, et al. The relationship among food addiction, negative mood, and eating-disordered behaviors in patients seeking to have bariatric surgery. *Surg Obes Relat Dis*. 2016;12(1):165-170. [CrossRef]
37. Sarwer DB, Wadden TA, Moore RH, et al. Preoperative eating behavior, postoperative dietary adherence, and weight loss after gastric bypass surgery. *Surg Obes Relat Dis*. 2008;4(5):640-646. [CrossRef]
38. McGahuey CA, Gelenberg AJ, Laukes CA, et al. The Arizona Sexual Experience Scale (ASEX): reliability and validity. *J Sex Marital Ther*. 2000;26(1):25-40. [CrossRef]
39. Soykan A. The reliability and validity of Arizona Sexual Experiences Scale in Turkish ESRD patients undergoing hemodialysis. *Int J Impot Res*. 2004;16(6):531-534. [CrossRef]
40. Garner DM, Garfinkel PE. The Eating Attitudes Test: an index of the symptoms of anorexia nervosa. *Psychol Med*. 1979;9(2):273-279. [CrossRef]
41. Savaşır I, Erol N. Yeme Tutum Testi: anoreksi nervoza belirtileri indeksi (Turkish). *Psikhol Derg*. 1989;7:19-25.
42. Yıldız Ş, Alphan E, Batar N. Sleeve Gastrektomi operasyonu geçirmiş hastaların yeme tutum ve davranışlarını ile beden kütle indeksi değişiminin değerlendirilmesi. *Kafkas J Med Sci*. 2020;10(2):136-144. [CrossRef]
43. Dinsa GD, Goryakin Y, Fumagalli E, Suhrcke M. Obesity and socioeconomic status in developing countries: a systematic review. *Obes Rev*. 2012;13(11):1067-1079. [CrossRef]
44. Newton S, Braithwaite D, Akinyemiju TF. Socio-economic status over the life course and obesity: systematic review and meta-analysis. *PLoS One*. 2017;12(5):e0177151. [CrossRef]
45. Wang Y, Pan L, Wan SP, et al. Association between socioeconomic status and overweight/obesity in Yi people, Sichuan Province. *Zhonghua Liu Xing Bing Xue Za Zhi*. 2020;41(3):315-319. [CrossRef]
46. Yumuk VD. Prevalence of obesity in Turkey. *Obes Rev*. 2005;6(1):9-10. [CrossRef]
47. Greve J, Weatherall CD. The Impact of higher education on body weight. *Nordic J Health Econ*. 2019;7(1):31-46. [CrossRef]
48. Devaux M, Sassi F, Church J, et al. Exploring the relationship between education and obesity. *OECD J Econ Stud*. 2011;2011(1):1-40. [CrossRef]
49. Özkahraman Ş, Kişioğlu AN, Öztürk M. Bir sağlık ocağı bölgesindeki 15-49 yaş evli kadınlarda obezite prevalansı ve yapılan eğitimin obezite ile ilgili bilgi, tutum, davranış ve prevalansa etkisi (Turkish). *8. Ulus Halk Sağlığı Kongresi Kongre Kitabı*. 2002:738-740.
50. Doğan N, Toprak D, Demİr S. Prevalence of obesity and associated risk factors in Afyonkarahisar-Turkey (Turkish). *Turkiye Klinikleri J Med Sci*. 2011;31(1):122-132. [CrossRef]
51. Emre N, Öner M. Kırsal yaşayan kadınlarda obezite, yaşam kalitesi ve ruhsal durum ilişkisi (Turkish). *Turk Aile Hekimliği Derg*. 2018;22(4):176-184. [CrossRef]
52. Atila K. Morbid obezitenin cerrahi tedavisi (Turkish). *Arch Clin Toxicol*. 2014;1:23-27.
53. Sağlam F, Güven H. Obezite cerrahi tedavisi (Turkish). *Okmeydanı Tıp Derg*. 2014;30(suppl 1):60-65. [CrossRef]
54. Lin HY, Huang CK, Tai CM, et al. Psychiatric disorders of patients seeking obesity treatment. *BMC Psychiatry*. 2013;13(1):1. [CrossRef]
55. Wadden TA, Sarwer DB, Womble LG, Foster GD, McGuckin BG, Schimmel A. Psychosocial aspects of obesity and obesity surgery. *Surg Clin North Am*. 2001;81(5):1001-1024. [CrossRef]
56. Deveci A, Demet MM, Özmen B, Hekimsoy Z. Psychopathology, alexithymia, and self-esteem in obese patients. *Anatol J Psychiatry*. 2005;6:84-91.
57. Kalarchian MA, Marcus MD, Levine MD, et al. Psychiatric disorders among bariatric surgery candidates: relationship to obesity and functional health status. *Am J Psychiatry*. 2007;164(2):328-334; quiz 374. [CrossRef]
58. Chen Y, Jiang Y, Mao Y. Association between obesity and depression in Canadians. *J Womens Health*. 2009;18(10):1687-1692. [CrossRef]
59. Luppino FS, de Wit LM, Bouvy PF, et al. Overweight, obesity, and depression: a systematic review and meta-analysis of longitudinal studies. *Arch Gen Psychiatry*. 2010;67(3):220-229. [CrossRef]
60. Castanha CR, Tcbc-Pe ÁABF, Castanha AR, et al. Evaluation of quality of life, weight loss and comorbidities of patients undergoing bariatric surgery. *Rev Col Bras Cirur*. 2018;45(3):e1864. [CrossRef]
61. Wolfe BM, Kvach E, Eckel RH. Treatment of obesity: weight loss and bariatric surgery. *Circ Res*. 2016;118(11):1844-1855. [CrossRef]

62. O'Brien PE, Hindle A, Brennan L, et al. Long-term outcomes after bariatric surgery: a systematic review and meta-analysis of weight loss at 10 or more years for all bariatric procedures and a single-centre review of 20-year outcomes after adjustable gastric banding. *Obes Surg*. 2019;29(1):3-14. [CrossRef]
63. Freire RH, Borges MC, Alvarez-Leite JI, Correia MITD. Food quality, physical activity, and nutritional follow-up as determinant of weight regain after Roux-en-Y gastric bypass. *Nutrition*. 2012;28(1):53-58. [CrossRef]
64. Shantavasinkul PC, Omotosho P, Corsino L, Portenier D, Torquati A. Predictors of weight regain in patients who underwent Roux-en-Y gastric bypass surgery. *Surg Obes Relat Dis*. 2016;12(9):1640-1645. [CrossRef]
65. Concors SJ, Ecker BL, Maduka R, et al. Complications and surveillance after bariatric surgery. *Curr Treat Options Neurol*. 2016;18(1):5. [CrossRef]
66. Burgmer R, Grigutsch K, Zipfel S, et al. The influence of eating behavior and eating pathology on weight loss after gastric restriction operations. *Obes Surg*. 2005;15(5):684-691. [CrossRef]
67. Conceição EM, Mitchell JE, Engel SG, Machado PP, Lancaster K, Wonderlich SA. What is "grazing"? Reviewing its definition, frequency, clinical characteristics, and impact on bariatric surgery outcomes, and proposing a standardized definition. *Surg Obes Relat Dis*. 2014;10(5):973-982. [CrossRef]
68. Pizato N, Botelho PB, Gonçalves VSS, Dutra ES, de Carvalho KMB. Effect of grazing behavior on weight regain post-bariatric surgery: a systematic review. *Nutrients*. 2017;9(12):1322. [CrossRef]
69. Colles SL, Dixon JB, O'Brien PE. Grazing and loss of control related to eating: two high-risk factors following bariatric surgery. *Obesity*. 2008;16(3):615-622. [CrossRef]
70. Cena H, De Giuseppe R, Biino G, et al. Evaluation of eating habits and lifestyle in patients with obesity before and after bariatric surgery: a single Italian center experience. *Springerplus*. 2016;5(1):1467. [CrossRef]
71. Sarwer DB, Lavery M, Spitzer JC. A review of the relationships between extreme obesity, quality of life, and sexual function. *Obes Surg*. 2012;22(4):668-676. [CrossRef]
72. Kolotkin RL, Crosby RD, Williams GR. Health-related quality of life varies among obese subgroups. *Obes Res*. 2002;10(8):748-756. [CrossRef]
73. Kolotkin RL, Binks M, Crosby RD, Østbye T, Gress RE, Adams TD. Obesity and sexual quality of life. *Obesity*. 2006;14(3):472-479. [CrossRef]
74. Kolotkin RL, Zunker C, Østbye T. Sexual functioning and obesity: a review. *Obesity*. 2012;20(12):2325-2333. [CrossRef]
75. Assimakopoulos K, Panayiotopoulos S, Iconomou G, et al. Assessing sexual function in obese women preparing for bariatric surgery. *Obes Surg*. 2006;16(8):1087-1091. [CrossRef]
76. Veronelli A, Mauri C, Zecchini B, et al. Sexual dysfunction is frequent in premenopausal women with diabetes, obesity, and hypothyroidism, and correlates with markers of increased cardiovascular risk. a preliminary report. *J Sex Med*. 2009;6(6):1561-1568. [CrossRef]
77. Moore RH, Sarwer DB, Lavenberg JA, et al. Relationship between sexual function and quality of life in obese persons seeking weight reduction. *Obesity*. 2013;21(10):1966-1974. [CrossRef]
78. Sarwer DB, Spitzer JC, Wadden TA, et al. Sexual functioning and sex hormones in persons with extreme obesity and seeking surgical and nonsurgical weight loss. *Surg Obes Relat Dis*. 2013;9(6):997-1007. [CrossRef]
79. Bond DS, Wing RR, Vithiananthan S, et al. Significant resolution of female sexual dysfunction after bariatric surgery. *Surg Obes Relat Dis*. 2011;7(1):1-7. [CrossRef]
80. Reis LO, Zani EL, Saad RD, Chaim EA, de Oliveira LC, Fregonesi A. Bariatric surgery does not interfere with sperm quality: a preliminary long-term study. *Reprod Sci*. 2012;19(10):1057-1062. [CrossRef]
81. Goitein D, Zendel A, Segev L, Feigin A, Zippel D. Bariatric surgery improves sexual function in obese patients. *Isr Med Assoc J*. 2015;17(10):616-619.
82. Kun L, Pin Z, Jianzhong D, et al. Significant improvement of erectile function after Roux-en-Y gastric bypass surgery in obese Chinese men with erectile dysfunction. *Obes Surg*. 2015;25(5):838-844. [CrossRef]
83. Aygin D, Acar K. Does bariatric surgery affect sexuality? A systematic review. *J Contemp Med*. 2017;7:284-297.
84. Calderón B, Huerta L, Galindo J, et al. Lack of improvement of sperm characteristics in obese males after obesity surgery despite the beneficial changes observed in reproductive hormones. *Obes Surg*. 2019;29(7):2045-2050. [CrossRef]
85. Steffen KJ, King WC, White GE, et al. Changes in sexual functioning in women and men in the 5 years after bariatric surgery. *JAMA Surg*. 2019;154(6):487-498. [CrossRef]
86. Wood GJA, Tiseo BC, Paluello DV, et al. Bariatric surgery impact on reproductive hormones, semen analysis, and sperm DNA fragmentation in men with severe obesity: prospective study. *Obes Surg*. 2020;30(12):4840-4851. [CrossRef]