

Psychiatric and Sexual Experience Outcomes of Bariatric Surgery Patients: A One-Year Follow-up Study

Bariatrik Cerrahi Hastalarının Psikiyatrik ve Cinsel Deneyim Sonuçları: Bir Yıllık Takip Çalışması Kohort Çalışma

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ABSTRACT Objective: Obesity, a growing pandemic of this era by affecting approximately 13% of the global population, is associated with various medical comorbidities including Type 2 diabetes, hypertension and atherosclerosis along with psychiatric conditions such as depression and anxiety. In this study our aim is to assess and compare the effect of bariatric surgery on depression, anxiety disorder and sexual experience status of patients by assessment at preoperative period and postoperative 1st year. To assess the psychiatric and sexual experience outcomes prior to and after surgery. A prospective observational cohort study. **Material and Methods:** Three major inventories, namely Beck Depression Inventory, Beck Anxiety Inventory and Arizona Sexual Experience Scale, have been utilized in order to assess the effect of bariatric surgery on participants in terms of depression, anxiety disorder and sexual experience status. **Results:** We have included 174 patients operated at the same bariatric surgery department with identical surgical procedure. Our results indicate statistically significant improvement in depression, anxiety and sexual experience at post-operative year 1 compared to pre-operative period. **Conclusion:** Psychiatric comorbidities of bariatric surgery candidates should not be overlooked and may potentially be included in bariatric surgery indications along with other medical comorbidities, nevertheless, further studies are required in this field.

Keywords: Obesity; bariatric surgery; anxiety; depression; sexual experience

ÖZET Amaç: Dünya nüfusunun yaklaşık %13'ünü etkileyen ve çağımızın büyüyen bir pandemisi olan obezite, tip 2 diyabet, hipertansiyon ve ateroskleroz gibi çeşitli tıbbi komorbiditeler ile depresyon ve anksiyete gibi psikiyatrik durumlar ile ilişkilidir. Bu çalışmanın amacı, obezite cerrahisinin hastaların depresyon, anksiyete ve cinsel deneyim durumlarına etkisini preoperatif dönemde ve postoperatif 1. yılda değerlendirmek ve karşılaştırmaktır. Prospektif gözlemsel kohort çalışması. **Gereç ve Yöntemler:** Obezite cerrahisinin katılımcılar üzerindeki etkisini depresyon, anksiyete bozukluğu, cinsel deneyim açısından değerlendirmek için Beck Depresyon Envanteri, Beck Anksiyete Envanteri ve Arizona Cinsel Deneyim Ölçeği olmak üzere 3 ana envanter kullanılmıştır. **Bulgular:** Aynı obezite cerrahisi bölümünde aynı cerrahi prosedürle ameliyat edilen 174 hastanın verileri değerlendirilmiştir. Sonuçlar, ameliyat sonrası 1. yılda depresyon, anksiyete ve cinsel deneyimde belirgin bir iyileşme olduğunu göstermiştir. **Sonuç:** Obezite cerrahisi adaylarının psikiyatrik komorbiditeleri göz ardı edilmemeli ve potansiyel olarak diğer tıbbi komorbiditelerle birlikte obezite cerrahisi endikasyonlarına eklenmesi potansiyel olarak düşünülmelidir. Ancak bu alanda daha fazla çalışmaya ihtiyaç vardır.

Anahtar Kelimeler: Obezite; obezite cerrahisi; anksiyete; depresyon; cinsel deneyim

As of 2019, 40% of the global population is overweight, defined as body-mass index (BMI) over 25 kg/m², while almost 1/3 of them are classified as obese, defined as BMI over 30 kg/m².¹ High BMI

leads more than 70 million disability-adjusted life years and more than 2.5 million deaths annually.² Most common comorbidities are hypertension, cardiovascular diseases, Type 2 diabetes mellitus,

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atherosclerosis, obstructive sleep apnea, dyslipidemia, non-alcoholic steatohepatitis, certain malignancies and psychiatric disorders mainly including depression and anxiety disorder.³ Exact pathophysiology leading to high prevalence of psychiatric disorders in patients with obesity remains unclear, whereas, most commonly adopted mechanisms include alterations at hypothalamic–pituitary–adrenal axis, immune-inflammation and neuroendocrine alterations especially at leptin and insulin.⁴ Treatment options for obesity includes lifestyle modifications, pharmacotherapy and surgery. Pharmacotherapeutic approaches approved by the Food and Drug Administration are limited to orlistat, lorcaserin, phentermine-topiramate, naltrexone-bupropion and liraglutide, therefore, bariatric surgeries such as laparoscopic sleeve gastrectomy and Roux-en-Y gastric bypass constitute significant proportion of the treatment process.⁵

Large scale meta-analysis studies revealed that most common psychiatric comorbidities for patients seeking bariatric surgery are depression (19%) and binge eating disorder (17%), whereas, only depressive symptoms improve following the operation.⁶ A cohort study involving a total of eleven female patient at age 25-34 undergoing bariatric surgery has illustrated significant improvement in depression, anxiety and sexual experience scores at post-operative month 18 compared to pre-operative period.⁷ Another study involving a total of 53 female patient undergoing laparoscopic sleeve gastrectomy procedure has demonstrated statistically significant improvement in sexual experience scores.⁸ Another study demonstrated significant improvement in anxiety and depressive symptoms in patients over age 60 following bariatric surgery, nevertheless, studies investigating the psychiatric consequences of bariatric surgery demonstrated inconsistent results.⁹⁻¹¹ A meta-analysis study assessing the effects of bariatric surgery on sexual functions reported that statistically significant improvement in erectile function, sexual intercourse satisfaction, sexual desire and total satisfaction, however, this study is primarily limited since it only includes 12 studies with the total of 420 participants.¹² In this study our aim is to assess and compare depression, anxiety disorder and sexual

experience status of patients undergoing bariatric surgery at preoperative period and postoperative 1st year. We hypothesize to demonstrate statistically significant increase in sexual experience scores and decline in anxiety and depression scores at post-operative year 1 compared to pre-operative period.

MATERIAL AND METHODS

A total of 174 participants, 111 females and 63 males, have been included in this study in which “Relational Screening Model” developed by Karasar et al. in 2005 is used. Patients undergoing any type of bariatric surgery at a single tertiary center in-between 2019 and 2020 were included in this study. Patients with prior psychiatric comorbidities or utilizing any psychiatric medication (ie. selective serotonin reuptake inhibitors, serotonin and norepinephrine reuptake inhibitors, monoamine oxidase inhibitors) were excluded from this study. All participants have undergone standardized psychological evaluation both prior and at post-operative 1st year including Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI) and Arizona Sexual Experience Scale (ASES) by an expert psychologist. A psychiatric interview has not been conducted with the patients, which constitutes a limitation of the study. Demographic parameters including age and gender, medical history including comorbidities and medication use, physical parameters including height, weight and body-mass index have been recorded. Informed consent of all the participants had obtained prior to application of any questionnaire or inventory. Ethical approval was obtained from the relevant department of the medical center. The inventories utilized in this study include BDI, BAI and ASES. (date: April 8, 2022, no: 2022/894)

BDI is an inventory composed of 21 3-point Likert scale questions to assess the features of depression in a certain population. It was developed in 1961 and validated for Turkish population in 2005.¹³⁻¹⁴ A BDI score given after the application of the inventory may reveal no depression ($BDI < 10$), mild depression ($10 \leq BDI \leq 15$), moderate depression ($16 \leq BDI \leq 20$) and severe depression ($BDI > 23$). BDI has a re-test reliability of 0.82 ($r=0.82$) and internal consistency of 0.86 ($\alpha=0.86$).

An inventory composed of 21 3-point Likert scale questions to assess features of generalized anxiety in certain populations which was developed in 1988 and validated for Turkish population in 1998 is referred as BAI.¹⁵⁻¹⁶ A BDI score given after the application of the inventory may reveal no anxiety (BAI15), minimal anxiety (16BAI22), moderate anxiety (23BAI42) and severe anxiety (BAI>42). BAI has an internal consistency of 0.94 (alpha=0.94).

ASES which was developed in 2000 by McGahuey et al. is composed of five items different for males and females which assess sexual drive, vaginal lubrication/penile erection, arousal, orgasm and satisfaction from orgasm.¹⁷ ASES has an internal consistency of 0.90 (alpha=0.90).

Data are analyzed using SPSS version 22.0 software. Statistical and parametric tests utilized in the analysis include t-test, independent samples, paired samples, analysis of variance and Bonferroni were applied as parametric tests since data demonstrate normal distribution according to the Tabachnic and Fidel (2013) skewness. This study was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

A total of 174 participants, aged between 20 and 63, have been included in this study. A total of 174 subjects, 111 females (63.8%) and 63 males (36.2%), ages varying between 20 and 63 are included in this study. All participants have BMI over 30 kg/m². Age, gender, and BMI distribution of participants are shown at Table 1.

At pre-operative period only 36.2% of the participants have no signs of anxiety in contrast to 83.9% at post-operative year 1 and 20.7% of the participants have no signs of depression in contrast to 71.8% at post-operative year 1. Similar pattern of improvement has been observed as decline in the percentile of the participants with severe or moderate depression or severe or moderate anxiety (Table 2). Similarly, deterioration rates at ASES score have declined to 24.1% at post-operative year from 89.7% at pre-operative period (Table 2). Analysis of BAI, BDI and ASES scores revealed significant improvement in depression, anxiety, and sexual experience at post-operative year 1 compared to

TABLE 1: Demographic characteristics of the participants

Variables	Features	n	%
Gender	Female	111	63.8
	Male	63	36.2
Age range	20-30	54	31.0
	31-41	61	35.1
	42-52	36	20.7
	53-63	23	13.2
BMI	30-34.99	38	21.8
	35-39.99	64	36.8
	>39.99	72	41.4
Total		174	100

BMI: Body mass index

TABLE 2: BDI, BAI and ASES scores and distribution of participants at pre-operative period and post-operative year one

Variables	Pre-op	Period	Post-op	Year 1	R ²
	n	%	n	%	
BAI score					
0-15	63	36.2	146	83.9	0.38
16-22	62	35.6	24	13.8	
23-42	44	25.3	4	2.3	
43-63	5	2.9	-	-	
BDI score					
0-9	36	20.7	125	71.8	0.51
10-15	61	35.1	36	20.7	
16-23	39	22.4	12	6.9	
24-63	38	21.8	1	0.6	
ASES score					
0-10	18	10.3	132	75.9	0.37
>10	156	89.7	42	24.1	
Total	174	100	174	100	

BDI: Beck depression inventory; BAI: Beck anxiety inventory; ASES: Arizona sexual experience scale; n: Number

pre-operative period (p value <0.05). Linear regression analysis (R²) demonstrated that bariatric surgery contributes to 38% of the improvement in anxiety, 51% of the improvement in depression and 37% of the improvement in sexual experience.

Our analysis demonstrated statistically significant difference at BAI scores at preoperative period in accordance with gender variable (p<0.05), whereas no statistically significant variation is detected at post-operative period across genders. Additionally, gender has no statistically significant influence over pre-operative or post-operative BDI and ASES scores (Table 3). Participants with ages between 53-63

TABLE 3: Mean and standard deviation values of BAI, BDI and ASES of participants at pre-operative period and post-operative year one in relation to gender, age, and BMI

Variables	Groups	Pre-operative period				Post-operative year 1			
		\bar{X}	SD	F	p value	\bar{X}	SD	F	p value
Gender									
Anxiety		1.94	0.85	5.67	0.01*	1.18	0.44	2.68	0.10
	F	2.06	0.85			1.22	0.49		
	M	1.74	0.82			1.11	0.31		
Depression		2.45	1.05	1.23	0.26	1.36	0.63	0.40	0.84
	F	2.38	1.07			1.36	0.69		
	M	2.57	1.01			1.34	0.51		
Sexual Exp.		1.89	0.30	0.58	0.44	1.24	0.42	1.39	0.24
	F	1.90	0.28			1.24	0.44		
	M	1.87	0.33			1.27	0.39		
Age									
Anxiety		1.94	0.85	0.41	0.74	1.18	0.44	1.99	0.11
	20-30	2.03	0.93			1.22	0.46		
	31-41	1.93	0.77			1.24	0.53		
	42-52	1.83	0.91			1.13	0.35		
	53-63	1.95	0.82			1.00	0.02		
Depression		2.45	1.05	0.35	0.78	1.36	0.63	1.00	0.39
	20-30	2.35	1.18			1.40	0.68		
	31-41	2.54	1.04			1.32	0.62		
	42-52	2.50	0.91			1.25	0.43		
	53-63	2.39	0.98			1.52	0.79		
Sexual Exp.		1.89	0.30	2.16	0.09	1.24	0.42	42.7	0.00*
	20-30	1.83	0.37			1.09	0.29		
	31-41	1.93	0.24			1.16	0.37		
	42-52	1.86	0.35			1.13	0.35		
	53-63	2.00	0.09			1.95	0.20		<0.00*
BMI									
Anxiety		1.94	0.85	2.08	0.12	1.18	0.44	0.80	0.44
	30-34.9	2.05	0.86			1.26	0.55		
	35-39.9	2.06	0.85			1.17	0.45		
	40+	1.79	0.83			1.15	0.36		
Depression		2.45	1.05	1.29	0.27	1.36	0.63	2.44	0.09
	30-34.9	2.68	1.16			1.44	0.64		
	35-39.9	2.43	1.05			1.45	0.79		
	40+	2.34	0.98			1.23	0.42		
Sexual Exp.		1.89	0.30	8.98	0.00*	1.24	0.42	0.94	0.39
	30-34.9	1.76	0.43			1.18	0.39		
	35-39.9	1.85	0.35			1.29	0.46		
	40+	2.00	0.01		<0.00*	1.22	0.41		

*The mean difference is significant <0.05. SD: Standard deviation; F: Female; M: Male; BMI: Body mass index

have statistically significant improvement at post-operative sexual experience score compared to other age ranges (p value<0.05), whereas no effect of age range has been detected on any other pre-operative or post-operative score (Table 3). Patients with BMI

over 40 have poor ASES score at pre-operative period at statistically significant manner (p value<0.05) compared to other BMI ranges while BMI range no significant effect on any other parameter at pre-operative or post-operative period (Table 3).

DISCUSSION

Our study demonstrated significant improvement in depression, anxiety and sexual experiences in patients undergoing bariatric surgery at postoperative year 1 compared to pre-operative period while certain improvements are associated with independent variables such as gender and age in statistically significant manner. Our study group has high rates of depression and anxiety, assessed via BDI and BAI, at baseline in accordance with the literature. Rates of depression have been reported as high as 65% in bariatric surgery candidates while rates of anxiety disorder have been reported as high as 45%.¹⁸⁻²⁰ The higher rates observed in our study group may be attributable to higher BMI averages, cultural differences, and higher rates of stigmatization towards obese individuals in Türkiye. Studies investigating sexual experience of bariatric surgery candidates are limited.²¹ However, studies in obese and overweight individuals revealed higher rates of erectile dysfunction and sexual aversion, lower rates of sexual desire and orgasms and difficulties in sexual arousal which are in accordance with our findings.²²

Studies investigating the effects of bariatric surgery on depression and anxiety disorders mostly demonstrate beneficial effects, however, only very few of them assess such psychiatric conditions as their primary outcome which is the primary limitation.²³⁻²⁸ Similarly, we reported higher rates of decline in depression to 28.2% from 79.3% and decline in anxiety to 16.1% from 63.8% both of which may be attributable to high social stigmatization towards obese individuals in Türkiye. Another important aspect of bariatric surgery on psychiatric outcomes is that the improvement may have been lost in 24-36 months of follow-up as reported in certain studies.^{11,29} Lack of longer follow-up period to assess such relapse is one of the main limitations of our study, whereas assessment of psychiatric outcomes as primary outcome variables is the main strength. We have reported statistically significant improvement in sexual experience score at postoperative period which is more evident in patient between ages 53-63. Our study is significant by being one of the few studies assessing the sexual experience in patients from both

genders undergoing bariatric surgery and by being the very few studies focusing on psychiatric perspective of sexual experience while most studies assessed the improvement in erectile dysfunction.³⁰⁻³⁵

We acknowledged that our study has some limitations including a follow-up period limited to 12 months which may prevent the observation of relapse of psychiatric comorbidities. Another important limitation is the lack of clinical interviews to assess the psychiatric status of the participants which may lead to misinterpretation of certain individuals despite the fact that BAI, BDI and ASES are all highly utilized tools to assess those conditions and have high internal validity. Lastly, we have not assessed the comorbid medical conditions in our study group which may have improved following bariatric surgery and have an additional positive impact on psychiatric outcome, or vice versa.

Although further and more comprehensive studies are needed for definitive judgement regarding the beneficial effects of bariatric surgery on psychiatric studies of the patients, psychiatric outcomes of bariatric surgeries should not be overlooked. Additionally, having a psychiatrist on bariatric surgery team may have positive impact on the treatment decision process and postoperative psychiatric follow-up of the patients. We believe that having a psychiatrist in the treatment team, conducting clinical consultations before and after the surgical procedure, as well as extending the follow-up period to better understand whether recovery is sustained over a longer time, and conducting larger studies separately for different age groups in both women and men, would contribute significantly to the literature. This study is important as an example for those who will work in this field.

CONCLUSION

This study found positive effects of bariatric surgery on depression, anxiety and sexual experience. Psychiatric comorbidities of bariatric surgery candidates should not be overlooked and may potentially be included in bariatric surgery indications along with other medical comorbidities, nevertheless, further studies are required in this field.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Mazlum Çöpür, Nilüfer Saatcioğlu Tınkır, Sidar Çöpür, Ali Durmuş; **Design:** Mazlum Çöpür, Nilüfer Saatcioğlu Tınkır, Sidar Çöpür, Ali Durmuş; **Control/Supervision:** Mazlum Çöpür, Nilüfer Saatcioğlu Tınkır; **Data Collection and/or Processing:** Nilüfer Saatcioğlu Tınkır, Sidar Çöpür, Ali Durmuş; **Analysis and/or Interpretation:** Mazlum Çöpür, Nilüfer Saatcioğlu Tınkır; **Literature Review:** Mazlum Çöpür, Sidar Çöpür; **Writing the Article:** Mazlum Çöpür, Sidar Çöpür; **Critical Review:** Mazlum Çöpür, Ali Durmuş; **References and Findings:** Mazlum Çöpür, Ali Durmuş, Nilüfer Saatcioğlu Tınkır; **Materials:** Ali Durmuş, Nilüfer Saatcioğlu Tınkır.

REFERENCES

1. Hruby A, Hu FB. The epidemiology of obesity: a big picture. *Pharmacoeconomics*. 2015;33(7):673-89. PMID: 25471927; PMCID: PMC4859313.
2. Dai H, Alsalhe TA, Chalghaf N, Riccò M, Bragazzi NL, Wu J. The global burden of disease attributable to high body mass index in 195 countries and territories, 1990-2017: An analysis of the Global Burden of Disease Study. *PLoS Med*. 2020;17(7):e1003198. PMID: 32722671; PMCID: PMC7386577.
3. Apovian CM. Obesity: definition, comorbidities, causes, and burden. *Am J Manag Care*. 2016;22(7 Suppl):s176-85. PMID: 27356115.
4. Milaneschi Y, Simmons WK, van Rossum EFC, Penninx BW. Depression and obesity: evidence of shared biological mechanisms. *Mol Psychiatry*. 2019;24(1):18-33. PMID: 29453413.
5. Gadde KM, Apolzan JW, Berthoud HR. Pharmacotherapy for Patients with Obesity. *Clin Chem*. 2018;64(1):118-29. PMID: 29054924; PMCID: PMC7379842.
6. Dawes AJ, Maggard-Gibbons M, Maher AR, Booth MJ, Miake-Lye I, Beroes JM, et al. Mental health conditions among patients seeking and undergoing bariatric surgery: a meta-analysis. *JAMA*. 2016;315(2):150-63. PMID: 26757464.
7. Nilsson-Condori E, Järholm S, Thurin-Kjellberg A, Hedenbro J, Friberg B. A new beginning: young women's experiences and sexual function 18 months after bariatric surgery. *Sex Med*. 2020;8(4):730-9. PMID: 32980296; PMCID: PMC7691881.
8. Akan S, Uruc F, Aydin MT, Verit A. The effect of sleeve gastrectomy technique on women's sexual function: a prospective study. *Rev Int Androl*. 2018;16(4):167-73. Erratum in: *Rev Int Androl*. 2019;17(2):78. PMID: 30286871.
9. Taylor CJ, Layani L. Laparoscopic adjustable gastric banding in patients > or =60 years old: is it worthwhile? *Obes Surg*. 2006;16(12):1579-83. PMID: 17217633.
10. Gill H, Kang S, Lee Y, Rosenblat JD, Brietzke E, Zuckerman H, et al. The long-term effect of bariatric surgery on depression and anxiety. *J Affect Disord*. 2019;246:886-94. PMID: 30795495.
11. Ribeiro GANA, Giapietro HB, Belardino LB, Salgado-Junior W. Depression, anxiety, and binge eating before and after bariatric surgery: problems that remain. *Arq Bras Cir Dig*. 2018;31(1):e1356. PMID: 29947690; PMCID: PMC6050001.
12. Xu J, Wu Q, Zhang Y, Pei C. Effect of bariatric surgery on male sexual function: a meta-analysis and systematic review. *Sex Med*. 2019;7(3):270-81. PMID: 31302076; PMCID: PMC6728768.
13. Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. *Arch Gen Psychiatry*. 1961;4:561-71. PMID: 13688369.
14. Aktürk Z, Dağdeviren HN, Türe M, Tuğlu C. The reliability and validity analysis of the Turkish version of beck depression inventory for primary care. *Turk J Fam Pract*. 2005;9(3):117-22. <https://turkjfampract.org/article/view/208/207>
15. Beck AT, Epstein N, Brown G, Steer RA. An inventory for measuring clinical anxiety: psychometric properties. *J Consult Clin Psychol*. 1988;56(6):893-7. PMID: 3204199.
16. Ulusoy M, Sahin NH, Erkmen H. Turkish Version of the Beck Anxiety Inventory: Psychometric Properties. *J Cogn Psychother*. 1998;12(2):163-72. https://www.researchgate.net/profile/Nesrin-Hisli-Sahin/publication/233792003_Turkish_Version_of_the_Beck_Anxiety_Inventory_Psychometric_Properties/links/0912f50b89f36c598c000000/Turkish-Version-of-the-Beck-Anxiety-Inventory-Psychometric-Properties.pdf
17. McGahuey CA, Gelenberg AJ, Laukes CA, Moreno FA, Delgado PL, McKnight KM, et al. The Arizona Sexual Experience Scale (ASEX): reliability and validity. *J Sex Marital Ther*. 2000;26(1):25-40. PMID: 10693114.
18. Duarte-Guerra LS, Coêlho BM, Santo MA, Wang YP. Psychiatric disorders among obese patients seeking bariatric surgery: results of structured clinical interviews. *Obes Surg*. 2015;25(5):830-7. PMID: 25358821.
19. Rajan TM, Menon V. Psychiatric disorders and obesity: A review of association studies. *J Postgrad Med*. 2017;63(3):182-90. PMID: 28695871; PMCID: PMC5525483.
20. Salma S, Trabulsi N, Zagzoog M, Mortada H, Altowaireb A, Hemdi A, et al. Prevalence of depression and anxiety disorders among bariatric surgery patients. *Journal of Surgery and Medicine*. 2019;3(8):574-8. doi: 10.28982/josam.604856
21. Öncel HF, Salar R, Özbay E, Elkan H. Changes in the sexual functions of male patients and their partners after obesity surgery. *Andrologia*. 2021;53(1):e13873. PMID: 33108823.
22. Esfahani SB, Pal S. Obesity, mental health, and sexual dysfunction: A critical review. *Health Psychol Open*. 2018;5(2):2055102918786867. PMID: 30023076; PMCID: PMC6047250.
23. Järholm K, Karlsson J, Olbers T, Peltonen M, Marcus C, Dahlgren J, et al. Two-year trends in psychological outcomes after gastric bypass in adolescents with severe obesity. *Obesity (Silver Spring)*. 2015;23(10):1966-72. PMID: 26227556.

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24. Strain GW, Kolotkin RL, Dakin GF, Gagner M, Inabnet WB, Christos P, et al. The effects of weight loss after bariatric surgery on health-related quality of life and depression. *Nutr Diabetes*. 2014;4(9):e132. PMID: 25177912; PMCID: PMC4183970.
 25. Karlsson J, Sjöström L, Sullivan M. Swedish obese subjects (SOS)--an intervention study of obesity. Two-year follow-up of health-related quality of life (HRQL) and eating behavior after gastric surgery for severe obesity. *Int J Obes Relat Metab Disord*. 1998;22(2):113-26. PMID: 9504319.
 26. Thonney B, Pataky Z, Badel S, Bobbioni-Harsch E, Golay A. The relationship between weight loss and psychosocial functioning among bariatric surgery patients. *Am J Surg*. 2010;199(2):183-8. PMID: 19362287.
 27. de Zwaan M, Enderle J, Wagner S, Mühlhans B, Ditzel B, Gefeller O, et al. Anxiety and depression in bariatric surgery patients: a prospective, follow-up study using structured clinical interviews. *J Affect Disord*. 2011;133(1-2):61-8. PMID: 21501874.
 28. Booth H, Khan O, Prevost AT, Reddy M, Charlton J, Gulliford MC; King's Bariatric Surgery Study Group. Impact of bariatric surgery on clinical depression. Interrupted time series study with matched controls. *J Affect Disord*. 2015;174:644-9. PMID: 25577158.
 29. Susmallian S, Nikiforova I, Azoulai S, Barnea R. Outcomes of bariatric surgery in patients with depression disorders. *PLoS One*. 2019;14(8):e0221576. PMID: 31454382; PMCID: PMC6711535.
 30. Reis LO, Favaro WJ, Barreiro GC, de Oliveira LC, Chaim EA, Fregonesi A, 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):736-44. PMID: 20039972.
 31. Ranasinghe WK, Wright T, Attia J, McElduff P, Doyle T, Bartholomew M, et al. Effects of bariatric surgery on urinary and sexual function. *BJU Int*. 2011;107(1):88-94. PMID: 20707800.
 32. 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):3197-204. PMID: 23612762.
 33. Kun L, Pin Z, Jianzhong D, Xiaodong H, Haoyong Y, Yuqian B, 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):838-44. PMID: 25361762.
 34. El-Tholoth HS, Bedaiwi AK, Binjawhar A, Almulhem AA, Bedaiwi KK, Alshurafa H, et al. Male sexual function after weight-loss surgeries in a group of Saudi population. *Urol Ann*. 2021;13(2):125-9. PMID: 34194137; PMCID: PMC8210719.
 35. Aleid M, Muneer A, Renshaw S, George J, Jenkinson AD, Adamo M, et al. Early effect of bariatric surgery on urogenital function in morbidly obese men. *J Sex Med*. 2017;14(2):205-14. PMID: 28087357.

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