

The comparison of severity and prevalence of major depressive disorder, general anxiety disorder and eating disorders before and after bariatric surgery

Diana Matini¹, Atefeh Ghanbari Jolfaei², Abdolreza Pazouki³
Mohadeseh Pishgahroudsari⁴, Mehdi Ehtesham⁵

Received: 24 May 2013

Accepted: 15 March 2014

Published: 8 October 2014

Abstract

Background: Severe obesity is highly co-morbid with psychiatric disorders and may have effect on the quality of life. This study aimed to compare severity and prevalence rate of depression, anxiety and eating disorders and quality of life in severe obese patients before and 6 months after the gastric bypass surgery.

Methods: This was a prospective observational study which conducted at Hazarat Rasool-Akram Hospital in Tehran, 2012. Questionnaires included demographic questions, eating disorder Inventory (EDI), The Short Form Health Survey (SF-36) for quality of life, Structured Clinical Interview for DSM-IV Axis I disorders (SCID-I) and Hamilton Rating Scale for Depression (HRSD) and anxiety (HRSA). Participants were interviewed two times, before surgery and six months after, to determine changes of the disorders. Patients with the history of bariatric surgery, individuals younger than 18 year old and those who disagreed to join the study were excluded.

Results: In assessing the eating disorder inventory-3rd version (EDI-3), Significant reduction in drive for thinness (DT) ($p=0.010$), bulimia (B) ($p<0.0001$) and body dissatisfaction mean (BD) (0.038) was observed at the 6-month follow-up. At this period, the mean for physical component summary of SF36, significantly decreased ($p<0.0001$), however mental component summary did not significantly differ ($p=0.368$); Also differences in severity of anxiety ($p=0.852$), and depression in HRSD ($p=0.311$), prevalence of depression ($p=0.189$) and prevalence of general anxiety disorder according to SCID ($p=0.167$) did not differ significantly, at this period.

Conclusion: Although weight loss after bariatric surgery improved the physical component of quality of life, this improvement did not affect the mental aspect of life, depression and anxiety and it seems that these psychopathologies need attention and treatment in addition to weight loss treatments in patients with obesity.

Keywords: Bariatric surgery, Psychiatric disorders, Obesity.

Cite this article as: Matini D, Ghanbari Jolfaei A, Pazouki A, Pishgahroudsari M, Ehtesham M. The comparison of severity and prevalence of major depressive disorder, general anxiety disorder and eating disorders before and after bariatric surgery. *Med J Islam Repub Iran* 2014 (8 October). Vol. 28:109.

Introduction

According to the World Health Organization (WHO) report, obesity is one of the main public health problems (1); National studies showed that the prevalence of obesity is increasing all around the world, in developed as well as in developing countries (1,2). It is estimated that in developed countries around one-third of adults are suf-

fer from obesity and it is predicted that by the year 2020 more than 20% of world's population will suffer from obesity (1). Worldwide, there are more than one billion individual suffering from obesity. It was also mentioned that morbid obesity would increase the risk of morbidity and mortality and it is connected with severe medical conditions. Morbid obesity may also lead to

1. MD, Minimally Invasive Surgery Research Center, Iran University of Medical Sciences, Tehran, Iran. diana.matini@gmail.com

2. **(Corresponding author)** Assistant Professor of Psychiatry, Minimally Invasive Surgery Research Center, Iran University of Medical Sciences, Tehran, Iran. draghj@yahoo.com

3. Assistant Professor of Surgery, Minimally Invasive surgery Research Center, Iran University of Medical Sciences, Tehran, Iran. apazouki@yahoo.com

4. BS, Minimally Invasive Surgery Research Center, Iran University of Medical Sciences, Tehran, Iran. mo.pishgah@gmail.com

5. Epidemiologist, Shaheed Rajaei Cardiovascular center. mehdi.e@yahoo.com

psychiatric disorders and poor quality of life (1-3).

Overweight and obesity were the reasons of death of around 2.8 million people each year (1).

The side-effects of obesity include cardiovascular disease, diabetes, hypertension, some kinds of cancers, liver diseases, skeletal and joint diseases (2). Not only physical health, but also that the mental and social health of patients may also be affected; several studies have shown that obesity may be associated with mental disorders and this relationship could be two-way. For example social isolation of these people could lead to more inactivity and would make them more susceptible to mental disorders and weight gain (4).

In patients with BMI more than 35, bariatric surgery has been recommended as the most effective treatment (5).

Several studies have shown that compared to diet the success rate of maintenance of weight loss after surgery when is 80% vs. 5% (6). According to Balsiger and Kennedy, surgical treatments of obesity are divided into two categories: restrictive surgery and malabsorptive surgery (7).

The candidates for surgery are individuals who have severe obesity (BMI > 40) or BMI > 35 with obstructive sleep apnea syndrome or coronary artery disease or hypertension or type 2 diabetes (8).

There have been extensive discussions about psychological causes of obesity; according to the previous findings and researchers the main psychological causes of obesity are:

1. Eating as a way of coping with intolerable problems in personal life.
2. Bulimia as a symptom of depression.
3. Overeating as an addiction to food.
4. Agitation in the face of food or its smell.
5. Stress and subsequent overeating (9).

Anxiety and depression are the most common mental disorders associated with overeating.

Obese women with better socio-economic status are at more risk for depression in

comparison with those of the lower status. It can also influence the quality of self-esteem (10).

The association between obesity and depression can be explained as: first, overweight patients have greater risk of depression due to the community attitude towards them and its stigma; in this context, fashion and media advertisements play important roles. As a result some people lose their confidence and self-esteem because of their body shape. Hence they are inactive and may adopt a sedentary life-style and in turn gain more weight (10).

Although there are proofed medical benefits in bariatric surgery, but patients often mention psychosocial factors including social isolation, depression, discrimination and quality of life, as primary reasons for deciding to have surgery and they believe these problems will improve after surgery (11,12). Some studies showed that the psycho-social function of patients with obesity improved after bariatric surgery and psychopathologies, especially depression significantly improved post-operatively (13-15). In contrast Kuldau and Rand found that 45% of their 68 patients had no change in psychopathology post-operatively, 31% improved and 24% deteriorated. According to such controversial results, this study was designed to compare severity and rate of depression, anxiety and eating disorders as well as quality of life in severe obese patients before and 6 months after the gastric bypass surgery (16).

Methods

This study was a prospective observational study conducted at Hazarat Rasool-Akram hospital in Tehran from May 2012 to May 2013. Gathering data through instruments were done by two psychiatrists.

Participants

Sixty seven candidates of bariatric surgery were enrolled to the study by convenient sampling. The exclusion criteria were inaccessibility of follow-up, educational level under fifth grade, age under 18 and

the second bariatric surgery.

Eleven patients refused to participate in the study and 3 withdrew the follow-up. Age and gender of these patients were not significantly different compare to other participants.

Patients signed the informed consent forms approved by ethical committee of minimally invasive surgery research center and at the beginning, the researchers ensured participates that all their personal information would be saved at safe place with no access to their data. They were also ensured that their decision, whether conduct or not, would not influence their medical care and joining this research was not mandatory.

Measures

Questionnaire included demographic questions, Eating Disorder Inventory-3 (EDI-3), the short form health survey (SF-36) for quality of life, the Persian version of structured clinical interview for DSM-IV Axis I Disorders (SCID-I); and Hamilton rating scale for depression and anxiety.

The Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) is a diagnostic exam used to determine DSM-IV Axis I disorders (major mental disorders). This exam was used for diagnosis of major depressive disorder and general anxiety disorder in this study. The instrument was designed to be administered by a clinician or trained mental health professional. It's Persian version has been shown to have acceptable reliability and validity on a large sample of Iranian patients (17).

The EDI-3 is a diagnostic tool designed for use in a clinical setting to assess the presence of eating disorders. The validity and reliability were determined to be satisfactory and sensitivity and specificity shown excellent results. It consists of the 91 Questions with three subscales measuring eating disorder symptoms, i.e., DT, bulimia (B) and body dissatisfaction (BD) (16). The HRAS and HDRS are useful instruments to measure the severity of the depression and anxiety (19- 21).

The Hamilton Depression Rating Scale

(HAM-D) has proven useful for many years to determine a patient's level of depression. It should be administered by a clinician experienced in working with psychiatric patients.

It generally takes 15-20 minutes to complete and have 17 items filled. Eight items scored on a 5-point scale, ranging from 0 = not present to 4 severe. Nine scored from 0-2. A score of 0-7 considered to be normal. The Hamilton Anxiety Rating Scale (HAM-A), is a questionnaire used by clinicians to rate the severity of a patient's anxiety. It contains 14 questions, in which these items consist of a severity rating, from not present (scored as 0) to very severe (scored as 4) (19- 21).

Sf-36 is a standard tool for quality of life. Reliability and validity of Persian version was acceptable (22, 23).

Data analysis

Statistical analyses were performed by SPSS 13.5 for windows. Mean and standard deviation for quantitative scales and frequency (percent) for qualitative scales were calculated. A paired-sample t-test was conducted comparing anxiety in Hamilton, depression, eating disorder and quality of life by participants before and after bariatric surgery; however for comparing anxiety and depression scale in SCID at the 6-month follow-up, MacNemar test was used the relation between weight loss and these psychiatric disorders was assessed using the Pearson correlation. Less than 0.05 was accepted as indicating statistical significance.

Results

In this study 67 morbid obese patients with mean age of 36.8 ± 8.5 years and mean BMI of 48.8 ± 4.7 kg/m² were included. Of 63 (94%) female patients 55 (82.1%) were married. Regarding education statues, 12 (17.9%) of patients were under diploma, 37 (55.2%) diploma, and 15 (22.4%) with academic education. At 6-month post-surgery, the mean weight loss was 29.3 ± 7.7 kg, and the mean BMI decreased to 35.7 ± 3.9 ($p <$

Table 1. The comparison of depression, anxiety, quality of life and eating disorders before and 6 months after surgery

Psychiatric Disorders	Before surgery	After surgery	p
General anxiety disorder(SCID)	17(25.4%)	24(35.8%)	0.167
Major Depressive disorder(SCID)	16(23.9%)	10(14.9%)	0.189
Hamilton Anxiety	7.1±0.9	5.8±0.7	0.852
Hamilton depression	5.9±0.7	6.3±0.8	0.311

Table 2. The comparison of eating disorders before and 6 months after surgery in morbid obese patients

EDI-3 CS Tests	Before surgery	After surgery	p
Drive for Thinness (DT)	15.7±7.4	12.8±5.5	0.010
Bulimia(B)	11.5±6.1	7.9±5.2	<0.0001
Body Dissatisfaction (BD)	13.6±4.6	12.1±4	0.038

Table 3. The comparison of quality - SF36 of life before and 6 months after surgery in morbid obese patients

Quality of life- SF36	Before Surgery	After surgery	p
The physical component summary scale(PCS)	38.6±9.4	52.1±10.1	<0.0001
mental summary component scale (MCS)	39.5±10.8	41.2±13.9	0.368

00001 for both of them).

General anxiety and major depressive disorder based on the SCID and severity of anxiety and depression in Hamilton scale:

At pre-surgery prevalence of general anxiety disorder and major depressive disorder according to SCID in the patients were 17 (25.4%) and 16 (23.9%), respectively. Six patients with anxiety and 7 with depression were under treatment (mostly Fluoxetine and Alprazolam) and others referred for alternative treatment except for one, who did not accept because symptoms caused by obesity and distress of the belief that her. The medication was not changed through the six months for majority of cases other than three cases, one withdrew taking medication and two increased the dose. As shown in Table 1, in comparison with the pre surgery, the prevalence of depression ($p=0.189$) and anxiety ($p=0.167$) did not differ significantly (Table 1).

Data showed that, patients with depression or anxiety (SCID) had a higher BMI than those without, (49.13 ± 3.99 vs. $48.71\pm5.01\text{kg/m}^2$ and 48.30 ± 4.10 vs. $49.06\pm4.97\text{kg/m}^2$, respectively) whereas the observed differences were not significant ($p>0.05$ for both of them)(table 1) Regarding the severity of anxiety and depression in Hamilton scale, at this period, the result did not show significant differences in severity of anxiety (7.1 ± 0.9 vs. 5.8 ± 0.7 , $p=0.852$) and depression base on

Hamilton scale (5.9 ± 0.7 vs. 6.3 ± 0.8 , $p=0.311$) (Table 1).

In addition, at 6 month post-surgery, Pearson correlation coefficients did not demonstrate significant correlation between weight loss and change in the scales of depression ($r=0.119$, $p=0.345$) and anxiety ($r=0.085$, $p=0.499$) in Hamilton scale.

Eating disorders

The mean of drive for thinness (DT), bulimia (B) and body dissatisfaction (BD) at pre-surgery and 6 months after surgery are presented in Table 2. At this period, the analysis of eating disorder inventory-3rd version (EDI-3), significant reduction in DT ($p=0.010$), B ($p<0.0001$) and BD (0.038). Whereas there was not significant correlation between weight loss and DT ($r=0.049$, $p=0.700$), B ($r=0.090$, $p=0.477$) and BD ($r=0.022$, $p=0.700$) at 6 month after surgery.

Quality of life SF36: Table 3 gives mean of quality of life SF36 components. In our study, physical components summary of SF36 at 6 month after operation were significantly higher than pre surgery ($p=0.000$), but mental component summary did not significantly differ after surgery ($p=0.368$). The Pearson correlation coefficients didn't show significant correlation between weight loss and physical component summary ($r=0.091$, $p=0.469$) and mental component summary ($r=-0.047$, $p=$

0.710) at 6 months post-surgery.

Discussion

The mean of weight loss was about 30 kilograms which was impressive. Previous studies proved that bariatric surgery could decrease BMI and it is categorized as one of the most effective interventions to reduce BMI for patients with severe obesity. (7, 24) The rate of depression was higher than normal population in Iran which previously reported as 3.5% (25). Hsu et al. also suggested that compare to the general population the prevalence of psychiatric disorders such as depression and anxiety and eating disturbances are significantly higher in patients with obesity (26).

Onyike et al. study on 40,000 individuals showed that obese patients ($BMI \geq 30$ kg/m²) had 1.8 times more risk of major depression in comparison to those women with normal weight (BMI between 18.5 and 25). They also added, patients with $BMI \geq 40$ kg/m² were five times more likely to have major depression when compared to individuals with average weight (27).

Lee et al. also found that anxiety and depression were more common among patients with obesity who are seeking clinical treatment (28).

Some studies demonstrated that eating disorder had correlation with obesity and over one-third of patients seeking treatment for obesity suffered from eating disorders (29- 31).

In this study BMI had association with depression, anxiety, eating disorder inventory scores and quality of life. Kalarchian et al. conducted a study in Pittsburgh, also found relationship between BMI and rate of psychiatric disorders (32).

This study has illustrated that the scores of eating disorder inventory declined significantly six months after Bariatric surgery. Consistent with this finding, other studies showed improvement in eating habits and decrease in eating disturbances in general and after bariatric surgery (33, 34). On the other hand some experts believe that eating disturbances could be a counter-

indication for bariatric surgery, because it could increase the chance of weight gain after surgery. Some studies also confirmed the association of failed outcome for bariatric surgery and eating disorders (35, 36).

Saunders stated that, "As time goes by, patients may be able to eat more. Some patients report a feeling of loss of control over eating as early as six months postoperatively, when grazing can become a common behavior, and may develop eating disorders" (37).

According to these controversial findings it is difficult to make comments about the importance of treatment of eating disturbances before bariatric surgery and the extent to which surgery actually results in a normalization of eating patterns. But it seems that although the assessment and management of eating disturbances before bariatric surgery is essential, these disturbances could decrease after surgery and they are not counter- indication for bariatric surgery.

In this study severity of anxiety and depression and the scores of mental component of SF-36 did not differ after surgery. On the other hand weight loss due to bariatric surgery did not improve mental health. Van Hout et al. claimed that the effect of bariatric surgery on psychopathologies would take six to 24 months. Our participants were followed only six months and this might be the cause of the insignificant results (38).

In contrast to this study decreases in depression and anxiety have been commonly reported in previous studies, but the instruments and duration of follow up were different from this study. The majority of previous studies used self-report instruments such as hospital anxiety and depression scale (HADS) or Beck depression inventory and the duration of follow up was at least 1 year (39-44). Although concurring with this study Bull et al. also did not find decreases in depression severity after surgery (45).

As it was expected and in concordance with previous studies physical component

of SF-36 was improved (46).

It is important to mention that due to the large number of questions, other variables such as medical condition or socioeconomic status was not included. The small number of sample size and the short duration of the follow-up were other limitations in this study.

Conclusion

Although weight loss after bariatric surgery improved the physical component of quality of life, but it did not affect mental component of quality of life, depression and anxiety and it seems that these psychopathologies need attention and treatment in addition to weight loss treatments in patients with obesity.

References

1. Health G. 2009. who.intOnline. Available at: URL:http://www.who.int/nmh/publications/ncd_report_chapter1.pdf. Accessed OCT 1, 2013
2. Berrington de Gonzalez A, Hartge P, Cerhan JR, Flint AJ, Hannan L, MacInnis RJ, et al. Body-mass index and mortality among 1.46 million white adults. *N Engl J Med* 2010 Dec;363(23): 2211-2219
3. Flegal KM, Graubard BI, Williamson DF, Gail MH. Excess deaths associated with underweight, overweight, and obesity. *JAMA*. 2005 Apr; 293(15): 1861-7.
4. Gallagher D, Heymsfield SB, Heo M, Jebb SA, Murgatroyd PR, Sakamoto Y. Healthy percentage body fat ranges: an approach for developing guidelines based on body mass index. *Am J Clin Nutr*. 2000 Sep; 72(3):694-701
5. Cigaina V Gastric pacing as therapy for morbid obesity: preliminary results. *Obes Surg*. 2002 Apr; 12 (Suppl 1):12S-16S
6. Bays HE. Current and investigational antiobesity agents and obesity therapeutic treatment targets. *Obes Res*. 2004 Aug;12(8):1197-211
7. Balsiger BM, Kennedy FP, Abu-Lebdeh HS, Collazo-Clavell M, Jensen MD, O'Brien T, et al. Prospective evaluation of Roux-en-Y gastric bypass as primary operation for medically complicated obesity. *Mayo Clin Proc*. 2000 Jul;75(7):673-80.
8. Kriplani AK, Mukherjee AJ. Laparoscopic surgery for morbid obesity. *Apollo Medicine* 2006 June; 3(2):175-188
9. Pulgarón ER. Childhood obesity: a review of increased risk for physical and psychological comorbidities. *Clin Ther*. 2013 Jan;35(1):A18-32.
10. van Hout G, van Heck G. Bariatric Psychology, Psychological Aspects of Weight Loss Surgery. *Obes Facts* 2009;2(1):10-5
11. Hall JC, Horne K, O'Brien PE, Watts JM. Patient well-being after gastric bypass surgery for morbid obesity. *Aust NZ J Surg* 1983;53(4):321- 4.
12. Harris MB, Green D. Psychosocial effects of gastric reduction surgery for obesity. *Int J Obes* 1982;6(6):527-39.
13. Schowalter M, Benecke A, Lager C, Heimbucher J, Bueter M, Thalheimer A, et al. Changes in depression following gastric banding: a 5- to 7-year prospective study. *Obes Surg* 2008 Mar;18(3):314-20.
14. 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 Feb; 199(2):183-8.
15. Brancatisano A, Wahlroos S, Brancatisano R. Improvement in comorbid illness after placement of the Swedish Adjustable Gastric Band. *Surg Obes Relat Dis* 2008 May-Jun; 4(3 Suppl):S39-46.
16. Kulda JM, Rand CS. Jejunoileal bypass for obesity: general and psychiatric outcome after one year. *Psychosomatics* 1980 Jul;21(7):534-9.
17. Sharifi V, Assadi SM, Mohammadi MR, Amini HA, Kaviani H, Semnani Y, et al. Structured clinical interview for DSM-IV (SCID): Persian translation and cultural adaptation. *Iran J Psychiatry* 2007; 2(1): 46-48
18. David M, Marion P. Development and validation of a multidimensional eating disorder inventory for anorexia nervosa and bulimia. *Int J Eat Disord* 1983 spring; 2(2):15-34
19. Trajković G, Starčević V, Latas M, Leštarević M, Ille T. Reliability of the Hamilton Rating Scale for Depression: A meta-analysis over a period of 49 years. *Psychiatry Res* 2011 Aug 30;189(1):1-9.
20. Maier W, Buller R, Philipp M, Heuser I. The Hamilton Anxiety Scale: reliability, validity and sensitivity to change in anxiety and depressive disorders. *J Affect Disord* 1988 Jan-Feb;14(1):61-8.
21. Hamilton M. The assessment of anxiety states by rating. *Br J Med Psychol* 1959 March; 32(1):50-55.
22. Motamed N, Ayatollahi AR, Zare N, Sadeghi-Hassanabadi A. Validity and reliability of the Persian translation of the SF-36 version 2 questionnaire. *East Mediterr Health J* 2005 May;11(3):349-57.
23. Montazeri A, Goshtasebi A, Vahdanini a M, Gandek B. The Short form health survey (SF-36): translation and validation study of the Iranian version. *Qual Life Res* 2005 Apr;14(3):875-82.
24. Superman HJ. Summary: Consensus conference on surgery for severe obesity. *Surgery for Obesity and Related Diseases* 2005 May-June;1(3): 369-370
25. Mohammadi MR, Ghanizadeh H, Noorbala AA, Davidian H, Malek Afzali AA, Naghavi HR. Prevalence of mood disorders in Iran. *Iran J Psychi-*

atry 2006; 1:59-64.

26. Hsu LK, Benotti PN, Dwyer J, Roberts SB, Saltzman E, Shikora S, et al. Nonsurgical factors that influence the outcome of bariatric surgery: a review. *Psychosom Med* 1998 May-Jun; 60(3): 338-46.

27. Onyike CU, Crum RM, Lee HB, Lyketsos CG, Eaton WW. Is obesity associated with major depression? Results from the Third National Health and Nutrition Examination Survey. *Am J Epidemiol* 2003 Dec 15;158(12):1139-47.

28. Lee ES, Kim YH, Beck SH, Lee S, Oh SW. Depressive mood and abdominal fat distribution in overweight premenopausal women. *Obes Res* 2005 Feb;13(2):320-5.

29. Segal A, Libanori HT, Azevedo A. Bariatric surgery in a patient with possible psychiatric contraindications. *Obes Surg* 2002 Aug;12(4):598-601.

30. Adami GF, Gandolfo P, Bauer B, Scopinaro N. Binge eating in massively obese patients undergoing bariatric surgery. *Int J Eat Disord* 1995 Jan; 17(1):45-50.

31. Adami GF, Meneghelli A, Bressani A, Scopinaro N. Body image in obese patients before and after stable weight reduction following bariatric surgery. *J Psychosom Res* 1999;46:275-81.

32. Kalarchian MA, Marcus MD, Levine MD, Courcoulas AP, Pilkonis PA, Ringham RM, et al. Psychiatric disorders among bariatric surgery candidates: relationship to obesity and functional health status. *Am J Psychiatry* 2007 Feb;164(2):328-34;

33. Mills MJ, Stunkard AJ. Behavioral changes following surgery for obesity. *Am J Psychiatry* 1976 May;133(5):527-31.

34. Powers PS, Perez A, Boyd F, Rosemurgy A. Eating pathology before and after bariatric surgery: a prospective study. *Int J Eat Disord* 1999 Apr;25(3): 293-300.

35. Sugerman HJ, Kellum JM, Engle KM, Wolfe L, Starkey JV, Birkenhauer R, et al. Gastric bypass for treating severe obesity. *Am J Clin Nutr* 1992; 55(2): 560-6.

36. Pekkarinen T, Koskela K, Huikuri K, Musta-

joki P. Long-term results of gastroplasty for morbid obesity: Binge-eating as a predictor of poor outcome. *Obes Surg* 1994 Aug; 4(3):248-255.

37. Saunders R. Grazing: a high-risk behavior. *Obes Surg* 2004 Jan;14(1):98-102.

38. Van Hout GC, Fortuin FA, Pelle AJ, van Heck GL. Psychosocial functioning, personality, and body image following vertical banded gastroplasty. *Obes Surg* 2008 Jan;18(1):115-20.

39. La Manna A, Ricci GB, Giorgi I I, Gossemburg M, La Manna L, Catona A. Psychological effects of vertical banded gastroplasty on pathologically obese patients. *Obes Surg* 1992 Aug;2(3):239-243.

40. Rand CS, MacGregor AM, Hankins G. Gastric bypass surgery for obesity: weight loss, psychosocial outcome and morbidity one and three years later. *South Med J* 1986 Dec;79(12):1511-4.

41. Hafner RJ, Rogers J, Watts JM. Psychological status before and after gastric restriction as predictors of weight loss in the morbidly obese. *J Psychosom Res* 1990;34:295-302.

42. Bull RH, Engels WD, Engelsmann F, Bloom L. Behavioural changes following gastric surgery for morbid obesity: A prospective, controlled study. *J Psychosom Res* 1983;27(6):457-67.

43. Chandarana PC, Conlon P, Holliday RL, Deslippe T, Field VA. A prospective study of the psychosocial aspects of gastric stapling surgery. *Psychiatr J Univ Ott* 1990 Mar;15(1):32-5. 5.

44. Delin CR, Watts J, Bassett DL. An exploration of the outcomes of gastric bypass surgery for morbid obesity: patient characteristics and indices of success. *Obes Surg*. 1995 May;5(2):159-170.

45. Bull RH, Engels WD, Engelman F, Bloom L. Behavioral changes following gastric bypass surgery for morbid obesity: a prospective, controlled study. *J Psychosom Res*. 1983;27(6):457-67.

46. Isacson A, Frederiksen SG, Nilsson P, Hedenbro JL. Quality of life after gastroplasty is normal: a controlled study. *Eur J Surg*. 1997 Mar; 163(3):181-6.