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A Clinical Report on the Impact of Gastric Bypass Surgery on Obesity-Related Complaints and Comorbidities Six Months after the Surgery

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ABSTRACT

Introduction: Gastric bypass surgery is an intervention used to treat class III obesity and its complications. Evidence is scarce regarding its benefits among the Iranian population, especially its role in resolving obesity-related complaints and comorbidities. The present study aimed to investigate the impact of gastric bypass surgery on the improvement of obesity-related complaints and comorbidities in morbid obesity.

Methods: This study was conducted on 35 morbidly obese patients who volunteered to undergo gastric bypass surgery. Anthropometric data, comorbidity status, and dietary habits were collected at baseline and six months postoperatively. Data analysis was performed in SPSS version 16.0.

Results: The majority of the patients were female (80%). A significant difference was observed in the frequency distribution of normal dietary habits (five regular meals per day) before and after surgery ($P = 0.01$). In comparison, the distribution was not significant for snacking and three large meals per day ($P > 0.05$). All complaints of eating disorders according to self-reports (e.g., overeating and night eating syndrome) significantly improved ($P < 0.05$). Moreover, the dose of the medications prescribed for the comorbidities associated with obesity reduced significantly ($P = 0.001$). The frequency of several obesity-related complaints (e.g., knee pain, hirsutism, acanthosis nigricans, and sleep apnea) also decreased significantly ($P < 0.05$). However, no significant improvement was observed in hair loss, brittle nails, and menstrual dysfunction ($P > 0.05$).

Conclusion: Accordingly, gastric bypass surgery could improve obesity-related complaints six months postoperatively. Also, according to the patients' self -declaration, patients' adherence to "normal eating habits" increased during this period, and their eating disorders like night eating syndrome (NES) and overeating behaviors decreased compared to before the surgery.

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Introduction

Obesity is a major cause of non-communicable diseases, such as cancer and cardiovascular, musculoskeletal, and neurodegenerative disorders, which account for more than 80% of mortalities worldwide (1). Evidence suggests that sustained weight loss could reduce adverse obesity-related complications, especially when they are accompanied by metabolic disorders (2). Non-surgical and surgical interventions are commonly used for the treatment of obesity and its complications (3).

It has been suggested that dietary, behavioral, and pharmacological interventions often have no permanent impact on the morbid outcomes in obese patients (4). Therefore, surgical interventions are advocated as a practical approach for treating class III obesity and its comorbidities (5).

Several studies have indicated that the surgical treatments of obesity could diminish medication use and often completely resolve comorbid conditions (6, 7). According to the report of the American Society of Metabolic and Bariatric Surgery (ASMBS) in 2016, the Roux-en-Y gastric bypass (RYGB) surgery is the second most popular weight loss surgery (8), and it is believed that 61.6% of obesity-related comorbidities can be diminished within two years after this surgical operation (7).

Evidence attests to the presence of psychological disorders in patients with class III obesity (9). The prevalence of depression is particularly high in this population due to the loss of eating control, binge eating, and body image dissatisfaction (10). Although the gastric volume restriction and malabsorption induced by gastric bypass surgery have been considered as the main causes of weight loss after this procedure, several studies have elaborated on the effects of non-surgical factors (e.g., existing psychological disorders and postoperative changes in dietary habits) on weight loss (11-13). Therefore, preoperative and postoperative psychological disorders in patients undergoing bariatric surgery could also lead to specific treatment outcomes (14).

Nutritional follow-up is essential to the surgical procedures for obesity, such as preoperative and postoperative comprehensive anthropometric measurements (15). Furthermore, comprehensive psychological and nutritional counseling before and during the treatment process can enhance the positive effects of bariatric surgery on weight loss, thereby improving obesity-associated comorbidities.

Few studies have examined the diet and frequency of meals of patients after gastric bypass surgery. Although the number of bariatric surgical procedures has dramatically increased since 1991, only preliminary research has been conducted on this clinical procedure and its health benefits among Iranians (17). This study aimed to investigate the effects of gastric bypass surgery on dietary habits, eating disorders, and obesity-related complaints and comorbidities six months postoperatively in the Iranian obese population.

Methods

Study population

This retrospective observational study was conducted on 35 morbidly obese patients, in a nutrition and dietetic clinic being managed by one of the researchers, to investigate the obesity-related comorbidities and complaints, medication history, dietary habits, eating disorders, and anthropometric data.

All 35 surgeries were performed by the same surgeon, and the study protocol was approved by the Ethics Committee of the local university of medical sciences. Before the study, written informed consent was obtained from all the participants.

Assessments and follow-up

Data were collected regarding the status of comorbidities and obesity-related complaints, medication history, dietary habits, and eating disorders using a self-administrated form at baseline and six months after the surgery. The method of measuring anthropometric data, selecting inclusion and exclusion criteria, and determining the sample size according to the protocol is described in our previous article (18).

According to the ASMBS recommendations (19), the patients participated in group classes before the surgery and were informed of clinical and postoperative medical and nutritional care. Afterward, they had the opportunity to join a Telegram channel (a popular social networking application), where they made connections with the other individuals undergoing the same surgery to share their experiences.

The postoperative diet was initiated based on a standard protocol (20). The data on the patients' dietary habits, lifestyle, and postoperative satisfaction were collected and investigated on a bimonthly basis.

Definitions

Since obese patients have various eating disorders, in this study, three items were evaluated by Self-reports of patients' food intake: Normal

Overeating. These variables were considered based on patients' self-expression. To measure the daily consumption frequency of foods, meals, and snacks, we used the term "normal eating habits," which means diet five times a day. Five meals a day equals breakfast, lunch, dinner, and two snacks.

In 1990, the NES was described as nocturnal awakenings (more than once a night), with complete consciousness and often followed by consuming snacks for three months and with the absence of bulimia nervosa and overeating disorder (16). Overeating means the consumption of food in excessive amounts that are more than the body needs (21).

Statistical analysis

Data analysis was performed in SPSS version 16 using the nonparametric one-sample Kolmogorov-Smirnov test to assess the normality of the study variables. The quantitative variables were also expressed as mean, standard deviation, range, and minimum/maximum. The qualitative variables were represented as frequency and percentage. The quantitative variables were shown as the percentage of the variation between the baseline and final value based on the following formula:

(Postoperative Values - Preoperative Value) ÷ Preoperative Value × 100

The McNamara test was applied for the binary variables to compare their frequency distribution before and after the surgery. The Kappa measure of agreement was used for the categorical multilevel variables. In all the statistical analyses, a P-value of less than 0.05 was considered significant.

Results

In total, 35 patients with the mean age of 39.42±11.76 years were enrolled in the study (age range: 19-64 years). The mean weight of the patients was 127.56±25.50 kilograms (range: 94.9-200 kg), and their mean body mass index (BMI) was 47.06±6.79 kg/m2 (range: 38.2-69.6 kg/m2). Among the patients, 80% were female, and 20% were male. Table 1 shows the baseline characteristics of the participants by gender-patients was 127.56±25.50 kilograms (range: 94.9-200 kg), and their mean body mass index (BMI) was 47.06±6.79 kg/m2 (range: 38.2-69.6 kg/m2). Among the patients, 80% were female, and 20% were male. Table 1 shows the baseline characteristics of the participants by gender.

Table 1. Baseline characteristics of the 35 participants (27 (80%) women, 8 (20%) men)

		Minimum	Maximum	Mean	Std.Deviation
Female	Age (year)	19.00	64.00	39.60	12.37
	Weight (kg)	94.90	153.50	118.48	16.67
	BMI (kg/m2)	38.20	61.50	46.15	5.69
Male	Age (year)	20.00	50.00	38.71	9.72
	Weight (kg)	124.90	200.00	163.88	22.60
	BMI (kg/m2)	40.30	69.60	50.70	9.82

Data are described as number

Six months after the surgery, 28.44% of the patients experienced reduced mean weight (range: 21.2-67.9 kg), while the mean BMI decreased by 28.19% (range: 8.5-20.2 kg/m2), and 43.94% of the patients had reduced mean fat mass (range: 16.8-43.8 kg).

In addition, the mean fat-free mass was reduced in 13.2% of the patients (range: 1.9-24.9 kg), and the mean waist circumference decreased in 22.1% of the sample population (range: 8-91.4 cm) compared to the baseline values (P<0.001). Table 2 shows the comparison of the frequency distribution of dietary habits before and six months after the surgery. According to the patients' self-report before the surgery, only 5.7% of the participants had normal dietary habits (five regular meals per day). In contrast, six months postoperatively, 34.3% of the subjects had normal dietary habits (P<0.013). Furthermore, data on eating disorders were collected before and six months after the surgery and compared after the surgery.

Based on the findings, the NES was completely resolved six months after the surgery, and all the patients with this disorder had no medical complaints six months postoperatively.

Table2. Comparison of the frequency distribution of dietary habits before (row) and six months after (column) gastric bypass surgery

Normal eating		**Normal eating (5 regular meal /day) six months after surgery**			**p****
(5 regular meal /day) before surgery		No	Yes	Total	0.013
	No	21 (60)	12 (34.3)	33 (94.3)	
	Yes	2 (5.7)	0 (0.0)	2 (5.7)	
	Total	23 (65.7)	12 (34.3)	35 (100)	
Large meal eating before surgery		**Large meal eating (3 meal /day) six months after surgery**			0.267
		No	Yes	Total	
	No	19 (54.3)	4 (11.4)	23 (65.7)	
	Yes	9 (25.7)	3 (8.6)	12 (34.3)	
	Total	28 (80)	7 (20)	35 (100)	
Snacking before surgery		**Snacking six months after surgery**			0.332
		No	Yes	Total	
	No	8 (22.9)	6 (17.1)	14 (40)	
	Yes	11 (31.4)	28 (6)	21 (60)	
	Total	19 (54.3)	16 (45.7)	35 (100)	

*Data are described as frequency (percent).

** The McNamara distribution test is used. Bold values are statistically significant.

According to the information in Table 3, overeating was prevalent in 80% of the patients before the surgery, which reduced to 42.9% six months postoperatively (P<0.001).

In addition, 40% of the patients with a history of overeating claimed to have not suffered from this disorder six months after the surgery.

Based on the findings, the NES was completely resolved six months after the surgery, and all the patients with this disorder had no medical complaints six months postoperatively.

Table 3. Comparison of the frequency distribution of eating disorders before (row) and six months after (column) gastric bypass surgery

Bulimia nervosa Before surgery		**Bulimia nervosa six months after surgery**			**p*****
		No	Yes	Total	0.001
	No	6 (17.1)	1 (2.9)	7 (20)	
	Yes	14 (40)	14 (40)	28 (80)	
	Total	20 (57.1)	15 (42.9)	35 (100)	
Night eating syndrome before surgery		**Night eating syndrome six months**			
		No	Yes	Total	
	No	28 (80)	0 (0.0)	28 (80)	
	Yes	7 (20)	0 (0.0)	7 (20)	
	Total	35 (100)	0 (0.0)	35 (100)	

* Data are described as frequency (percent).

**The McNamara distribution test is used. Bold values are statistically significant.

Table 4 shows the comparison of obesity-related complaints before and after the surgery. At the baseline, 57.1% of the subjects had complaints of knee pain, while six months postoperatively, only 22.9% had complaints of this condition (P<0.001). However, the prevalence of postoperative hair loss, brittle nails, and menstrual dysfunction were not considered statistically significant (P=0.05).

Table 4. Frequency distribution of obesity-related complaints before (row) and six months after (column) surgery*

Knee pain before surgery		**Knee pain six months after surgery**			
		No	Yes	Total	
	No	15 (42.9)	0 (0.0)	15 (42.9)	< 0.001
	Yes	12 (34.3)	8 (22.9)	20 (57.1)	
	Total	27 (77.1)	8 (22.9)	35 (100)	
Hair loss before surgery		**Hair loss six months after surgery**			
		No	Yes	Total	
	No	2 (5.7)	10 (28.6)	12 (34.3)	0.092
	Yes	3 (8.6)	20 (57.1)	23 (65.7)	
	Total	5 (14.3)	30 (85.7)	35 (100)	
Brittle nails before surgery		**Brittle nails six months after surgery**			
		No	Yes	Total	
	No	11 (31.4)	10 (28.6)	21 (60)	0.815
	Yes	8 (22.9)	6 (17.1)	14 (40)	
	Total	19 (54.3)	16 (45.7)	35 (100)	
Hirsutism before surgery		**Hirsutism six months after surgery**			
		No	Yes	Total	
	No	13 (37.1)	0 (0.0)	13 (37.1)	0.002
	Yes	10 (28.6)	5 (14.3)	15 (42.9)	
	Total	23 (65.7)	5 (14.3)	28 (80)	
Acanthosis Nigricans before surgery		**Acanthosis Nigricans six months after surgery**			
		No	Yes	Total	
	No	17 (48.6)	0 (0.0)	17 (48.6)	< 0.001
	Yes	15 (42.9)	3 (8.6)	18 (51.4)	
	Total	32 (91.4)	3 (8.6)	35 (100)	
Sleep apnea before surgery		**Sleep apnea six months after surgery**			
		No	Yes	Total	
	No	18 (51.4)	0 (0.0)	18 (51.4)	
	Yes	17 (48.6)	0 (0.0)	17 (48.6)	
	Total	35 (100)	0 (0.0)	35 (100)	
Menstrual dysfunction before surgery		**Menstrual Dysfunction six months after surgery**			
		No	Yes	Total	
	No	8 (22.9)	5 (14.3)	13 (37.2)	0.48
	Yes	3 (8.6)	5 (14.3)	8 (22.9)	
	Total	11 (31.4)	10 (28.6)	21 (60)	

* Data are described as frequency (percent).
**The McNamara distribution test is used. Bold values are statistically significant.

According to the current research findings, hirsutism was prevalent in 42.9% of the female patients of reproductive age preoperatively. Six months after the surgery, only 14.3% of the patients presented with this obesity-related complication (P=0.023).

Furthermore, acanthosis nigricans was detected in 51.4% of the patients preoperatively, while six months after the surgery, the prevalence rate reduced to 8.6% (P<0.001).

On the other hand, 48.6% of the patients had sleep apnea, while there was no such complaint six months postoperatively.

Before the surgery, 17.1% of the patients used medications to control the comorbidities associated with obesity, and the medications included anticoagulants (2.9%), lipid-lowering agents (5.7%), anti-diabetic agents (5.7%), and insulin (2.9%).

Six months after the surgery, only the consumers of anti-diabetic agents (5.7%) used these medica-

tions. According to the Kappa measure of agreement test, the medication requirements to control possible comorbidities significantly reduced six months postoperatively (P=0.001) (Table 5).

Table 5. Comparison of frequency distribution of participants' drug history before (row) and after (column) surgery

Participants drug history before surgery	Participants drug history after surgery		Total
	No	Yes	
No need medication controlling comorbidities	29 (82.9)	0 (0.0)	29 (82.9)
Anticoagulants & Lipid-lowering agents	1 (2.9)	0 (0.0)	1 (2.9)
Anticoagulants & Lipid- lowering Agents & Anti-diabetic drug	2 (5.7)	1 (2.9)	3 (2.9)
All of above & Insulin	1 (2.9)	1 (2.9)	2 (5.7)
Total	33 (94.3)	2 (5.7)	35 (100)

Data are described as frequency (percent).

Kappa agreement measure is used (p=0.001).

Discussion

According to the present study results, gastric bypass surgery could improve obesity-related complaints in a small population of patients with morbid obesity in Iran. Furthermore, the dietary habits and eating disorders of the patients changed within six months after the surgery.

The improvement of anthropometric indices and body composition after bariatric surgery is a criterion for describing the efficacy of interventions and the success of patients in the treatment (22). Since the loss of muscle mass is inevitable in every weight loss program, and loss of less than 25% of the fat-free mass is considered acceptable (23), the present study results demonstrated that gastric bypass surgery had no adverse effect on body composition.

Impact of Gastric Bypass Surgery on Dietary Habits

We surveyed to evaluate the changes in the dietary habits of the patients. According to the obtained results, gastric bypass surgery could improve the "normal dietary habits" of 34.3% of the patients (five regular meals per day). At the same time, no significant change was observed in the frequency of other dietary habits during the study. The patients in the current research also received group counseling preoperatively and were exposed to the experiences of others who had undergone surgery before. Therefore, it is suggested that patients receiving gastric bypasssurgery benefit from targeted group therapy to acquire positive nutritional behaviors after surgery. In a study in this regard, Faria et al. demonstrated that snacking habits adversely affected weight loss/weight regain postoperatively. The subjects returning to normal dietary habits experienced the remarkable effectiveness of gastric bypass surgery (24). Although we expected no changes in the dietary habits of the subjects with eating five regular meals per day before the surgery, these changes could be attributed to possible postoperative psychological eating disorders (25).

Effects of Gastric Bypass Surgery on Eating Disorders

In the present study, the participants were asked whether they had one of the main eating disorders of overeating or NES before and/or six months after the surgery. The positive change expected to be achieved after the intervention could be affected by the psychological disorders due to high-calorie intake (26).

Moreover, it was observed that the impact of gastric bypass surgery on the elimination of overeating was up to 57.1%, which is in line with the findings of Sarwer et al. (27). Therefore, it could be inferred that these positive alterations may be associated with the secretion of gut hormones, such as glucagon-like peptide-1, peptide YY, and ghrelin, which changed after the gastric bypass surgery (28). Furthermore, some eating disorders have been reported to develop after bariatric surgeries, even in patients with preoperative normal

psychology (29). This issue could be associated with weight regain concerns, and close follow-up by a multi-disciplinary team and group therapy is recommended in this regard (30). Accordingly, organized patient follow-up and group therapy benefitted the patients with eating disorders in the present study.

According to the literature, NES is strictly associated with the effectiveness of surgical procedures for obesity (31-33). The current research demonstrated that gastric bypass surgery affected the NES completely, and the improved quality of sleep and resolution of sleep apnea could also have influenced the disorder postoperatively (34). Based on this hypothesis, our findings were consistent with our expectations since sleep apnea was resolved entirely six months after the surgery. However, since our observations were limited to six months, longitude follow -up is required for the detailed investigation of sleep apnea resolution (35). Previous findings have also denoted that physiological changes such as reducing inflammatory biomarkers and abdominal pressure induced by weight loss could also be responsible for the postoperative improvement of eating disorders (36,37).

Effects of Gastric Bypass Surgery on Obesity-related Complaints

The current research findings confirmed the positive effects of gastric bypass surgery on most of the obesity-related complaints in the patients six months postoperatively. For instance, the prevalence of knee pain reduced to 77.1% after the surgery, while reduced adipokines during weight loss could induce foot pain resolution (38).

Although we advocated no scale for the diagnosis of hirsutism, gastric bypass surgery was observed to improve hirsutism and acanthosis nigricans by 65.7% and 91.4%, respectively, in women of the reproductive age. Therefore, it could be inferred that improved insulin resistance and abdominal fat mass loss were responsible for these positive alterations (39). A significant reduction was consistently denoted in the insulin resistance index and fat mass in the patients after the surgery (18). According to the present study results, gastric bypass surgery had no significant effect on hair loss, and this issue remained the most prevalent complaint six months postoperatively. The main cause of hair loss could be protein and micronutrient deficiency, while lower hair loss could be achieved by slowing down the weight loss process in the following months after surgery (40). Although reports suggest that menstrual disorders could be positively affected by postoperative weight loss, gastric bypass surgery had no significant effect on the improvement of such conditions in the present study (41). However, the disruption of the menstrual cycles may occur due to adherence to diets with deficient calorie intake (42), while it could be improved through the regulation of sexual hormones (43).

Impact of Gastric Bypass Surgery on Need for Medications

The current research findings confirmed the impact of gastric bypass surgery on the intake of the medications used for obesity-related comorbidities. Correspondingly, the need for insulin and anti-hyperlipidemia, anti-hypertension, and anticoagulant agents was reduced by up to 94.3%. In addition, diabetes could improve six months after the surgery, and metformin was the only medication used by the patients. Compared to the previous studies in this regard (44), (45), reduced medication use within the early months after surgery was significant, where it substantially discontinued six months postoperatively.

Since eating disorders are among the causes of weight regain in patients after bariatric surgery, conducting studies in this field will help follow up and successfully operate patients. This study was one of the few studies in which patients' eating habits after gastric bypass surgery were examined, which was the first in Iran. However, one of the limitations of this study was the lack of a valid questionnaire to assess complaints related to eating disorders. The data of this study were evaluated based on self-administrated. Second, this study was a single-center experiment with a small sample size that could lead to bias.

Conclusion

According to the results, gastric bypass surgery exerted positive effects on the patients' comorbidities and complaints of morbid obesity six months after the surgery. Also, the use of various medications for obesity-related comorbidities in patients decreased. Additionally, after six months of surgery, Patients' overeating and NES complaints declined, and their meals became more regular. Adherence to "normal eating habits" in patients improved significantly.

However, the main limitations of the research were the small sample size and lack of valid questionnaires for data collection. Therefore, it is recommended that further investigations in this regard be performed in the form of long-term, comprehensive population-based studies using validated questionnaires in order to determine the effects of gastric bypass surgery on the rate of comorbidities in obese patients after the possible improvement of their dietary habits and eating disorders.

Conflicts of interest:

All authors declare that they have no conflicts of interest.

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