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Screening for depressive symptoms in postbariatric surgery patients using a validated Arabic version of Patient Health Questionnaire

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Abstract:

BACKGROUND: The prevalence of depressive symptoms in obese patients is higher than nonobese patients. Evidence shows an improvement of depressive symptoms after bariatric surgery, but this improvement fluctuates 3–4 years after surgery. Some studies report a worsening of depressive symptoms, but that the type of surgery and surgical complications contribute to the high depression rate. Our objective was to assess depressive symptoms in postbariatric surgery patients using an Arabic version of Patient Health Questionnaire-9 (PHQ-9).

MATERIALS AND METHODS: A cross-sectional study was conducted in a tertiary care hospital in Riyadh from January to December 2019 using a validated Arabic version of PHQ-9. The questionnaires sent through Google Survey link to patient phone numbers were registered in an electronic record system. Data analysis was analyzed using SPSS version 23. Frequency and percentages were computed for the categorical variables and mean and standard deviation were calculated for the continuous variables. Chi-square test performed to test for the association between categorical variables and depression and logistic regression analysis were performed to determine the risk factors for development of depression after bariatric surgery.

RESULTS: A total of 152 patients were included in the study. Fifty percent patients did not have depression, 26.3% had mild depression, 15.8% had moderate depression, 7.2% had moderately severe depression, and only one patient (0.7%) had severe depression. Only marital status was significantly associated with depression after bariatric surgery ($P=0.019$). Gender, education, marital status, and income when used in the multivariate logistic regression could not predict the incidence of depression.

CONCLUSION: Using a score of 10 in PHQ-9 as a cutoff, the prevalence of depressive disorder in postbariatric surgery patients was 23.7%, which is similar to the prevalence of nonobese general Saudi population of 20%.

Keywords:

Bariatric surgery, depression, Patient Health Questionnaire-9

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Introduction

Obesity is one of the most common chronic conditions associated with comorbid diseases as a result of excess body fat. Although there are multiple methods to

determine the relative amount of body fat, body mass index (BMI) is one of the most commonly used methods to determine obesity.

The World Health Organization (WHO) data showed that about 13% of the entire

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world population were obese in 2014.^[1] In the United States of America, the prevalence of obesity was 32.2% among adult men and 35.5% among adult women and the prevalence of morbid obesity (BMI >40) was 5.7% in 2007–2008.^[2]

Obesity and depression are known to have a close relationship. A meta-analysis showed that obesity increases the risk of depression (OR: 1.55).^[3] A study showed that there was a threefold increase in the rate of depression in patients with morbid obesity (BMI \geq 40) compared to grade 2 obese patients (BMIs between 35 and 39.9).^[4] Obese patients have approximately double the rates of depression compared to the nonobese population.^[5]

According to the WHO, the prevalence of depression in females is 10.4% and 5.5% in males in the US.^[6] According to a systematic review and meta-analysis, the total pooled prevalence of depression worldwide in the outpatient department in different clinical specialties was 27%.^[7] In the general population in the primary care setting in Saudi Arabia, the prevalence of depression was found to be 20%.^[8] In a study not yet published at a primary care facility, Alesaa *et al.*, found a significant association between depression and obesity, but with no comments on the prevalence of depression. In a systematic review on depression in 2010, Alibrahim *et al.*, showed a total prevalence of 41%.^[9] A study in a primary care setting by Al-Qadhi using Patient Health Questionnaire-2 (PHQ-2) and Patient Health Questionnaire-9 (PHQ-9) showed 31% mild, 13.4% moderate, 4.4% moderate-to-severe, and 1.0% severe cases.^[10]

Bariatric surgery has become the most effective treatment for morbid obesity (BMI \geq 40 kg/m²) and grade 2 obesity (BMI 35 kg/m²). According to a 2014 recommendation, surgery can be an option if there are weight-related comorbidities such as patients with BMI of 30 with diabetes. Moreover, depression has been found to be the most common psychiatric disorder, followed by anxiety disorders in bariatric surgery candidates.^[11]

Bariatric surgery procedures include laparoscopic gastric sleeve, Roux-en-Y gastric bypass (RYG), gastric band, and biliopancreatic diversion with duodenal switch, each with their own advantages and disadvantages. However, gastric bypass is associated with more neutral results and with better outcomes for patients with BMI <45.^[12,13] The gold standard procedure for weight loss bariatric surgery is gastric bypass according to the American Society for Bariatric Surgery and the National Institutes of Health. However, a recent study showed worse depression outcomes in gastric bypass compared to gastric sleeve.^[14]

A meta-analysis of systematic reviews of controlled trials showed an improvement and remission of diabetes mellitus.^[12,15] However, on the psychological aspect of bariatric surgery, studies have shown mood disorders, anxiety, eating disorder, personality disorder, substance abuse, and suicidal tendencies, and multiple studies have evaluated depression after bariatric surgery.^[16]

A recent systematic review showed that depressive symptoms were significantly reduced 2–3 years following bariatric surgery.^[17] A meta-analysis conducted with moderate-quality evidence showed that patients who undergo bariatric surgery have lower rates of depression postoperatively.^[18]

Two prospective cohorts, one in the US and the other in Taiwan that compared bariatric surgery patients with matching control obese patients, showed that bariatric surgery was associated with subsequent depression.^[14,19] Furthermore, in both studies, the type of bariatric surgery resulted in different depression symptoms. Malabsorption and bariatric surgery type (gastric bypass and duodenal switch) were associated with a higher risk of depression than restrictive surgery (gastric sleeve). Postoperative complications and nutrition deficiency, both associated with postsurgery depression, were more in malabsorptive surgery.^[19]

However, Beck depression inventory (BDI) score did not vary among surgical types^[20] as in two longitudinal studies done at different university hospitals in Germany. This showed one-half reduction in depression or depression symptoms scores. The first study involving a total of 107 patients, 76 gastric band patients, and 17 gastric bypasses showed a reduction in depression from 32% at baseline to 16% 2 years post surgery. A structured interview using Beck Depression Inventory was used to identify depression, but there were no significant changes in anxiety. The second study involving 76 gastric sleeves showed a decrease in depression from 36% at baseline to 21% at 4 years after surgery. A score of 10 and above on PHQ-9 was used to identify depression. Patients with depression before surgery were not excluded from either study.^[21,22]

However, the findings of two different studies in different countries show that the improvement of depression following bariatric surgery was not maintained after 3 years.

In the first study in the United Kingdom, data obtained from Clinical Practice Research Datalink indicated a total of 3045 participants, 43% of whom had the gastric band, 42% gastric bypass, and 16% gastric sleeve matched with obese control for 6 years. Patient records were used to extract patient information, and the study

found a significant decrease in clinical depression and the use of antidepressant medication in the first 3 years (odds ratio, 0.82 for year 1 [95% confidence interval (CI), 0.78–0.87] odds ratio, 0.83 for year 2 [95% CI, 0.76–0.90]; and odds ratio, 0.87 for year 3 [95% CI, 0.78–0.97]). However, this decrease in prevalence did not last longer than 3 years. By the 6th year, prevalence had returned to baseline.^[23]

The second study was a longitudinal assessment of bariatric surgery (LABS-3), a substudy from (LABS-2) which examined the long-term efficacy of bariatric surgery (LABS-1) and examined the short-term efficacy. Anyhow, LABS-3 examined the psychosocial impact of 199 gastric bypass and gastric band patients, which was evaluated by the Structured Clinical Interview Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-IV). Interviews conducted found no significant change in the prevalence of depression over 3 years (7.3% at baseline, 7.1% at 2 years, and 8.5% at 3 years).^[24]

A study conducted in Greece using the hospital anxiety and depression score (HADS) 1 year after surgery found a 50% reduction in depression scores regardless of surgery type.^[25]

A Swedish registry involving 480 primary care centers and 25 surgical departments, in which only gastric bypass and gastric band patients were involved, showed about 50% reduction in HADS score for depression which accords with the 1st year of the Greece study; however, this improvement was not maintained. Baseline depression in the surgical group was 24% and 16% in a matched obese group, falling to 15% after 10 years in the surgical group, and 14% in the conventional versus 6% in nonobese population. It was found that those who maintained $\geq 25\%$ weight loss of baseline had significant improvement in depressive symptoms compared to those who did not.^[26]

The risk of suicide after bariatric surgery has been assessed in multiple studies. One of these studies published in constrain library reviewed 30 studies that showed that bariatric surgery patients had higher rates of suicide than the general population.^[27]

A recent study that investigated bariatric surgery and its association with suicide and nonfatal self-harm showed a higher risk of suicide and nonfatal self-harm in the bariatric surgery group. However, the absolute risks were negligible and bariatric surgery should not be discouraged.^[28]

To our knowledge, this is the first study that has evaluated depressive symptoms in postbariatric surgery patients in Saudi Arabia.

The aim of this study was to assess depression symptoms in postbariatric surgery.

Materials and Methods

This was a cross sectional study conducted between January and December 2019 at a tertiary care hospital in Riyadh, Saudi Arabia. Ethical approval was obtained from the Institutional Review Board vide letter No. 1034 dated 06/03/2018, and informed written consent was taken from all participants. All patients who underwent laparoscopic sleeve gastrectomy (LSG) or RYG were included in the study. A Google Survey was sent to the patients' phone numbers, registered in the medical record system, from January to December 2019. The research tool was a self-report Questionnaire consisted of two parts, the first of which was demographic, socioeconomic, medical history, characteristics of the studied population such as married status, weight, height, BMI, gender, type of surgery, level of education, history of depression, history of diabetes, hypothyroidism, and history of cardiovascular disease (CVD).

The second part was a PHQ-9, the PHQ-9 of 9 items corresponding to the nine DSM-5 symptoms of depression; PHQ-9 severity cut-point scores were 5 for mild, 10 for moderate, 15 for moderately severe, and 20 for severe depressive symptoms. Data analysis was performed using Statistical Package for the Social Sciences, SPSS 23rd version (IBM, NY, USA). Categorical variables were displayed using frequency and percentages. Mean and standard deviation were used to present continuous variables. To test for the presence of association between categorical variables, Chi-square test was used. Paired *t*-test was also used to test for association. Multivariate logistic regression was used to determine the risk factors for the incidence of depression postbariatric surgery. The logistic regression model included the following variables: gender, marital status, education, and income. None of the factors were significantly predictive of the incidence of depression postbariatric surgery. The level of significance was set at 0.05.

Results

A total of 173 participants were initially recruited for the study. However, 19 were excluded because of a previous history of depression and 2 were excluded for incomplete data leaving a total of 152 participants with a mean age of 47 + 9 in the study. Table 1 shows the sociodemographic profile of the participants, 58 (38.2%) of whom were males and 94 (61.8%) were females. As regards education, 31 (20.4%) had an intermediate school education or less, 43 (28.3%) had a high school education, 70 (46.1%) had a bachelor's degree/diploma, and 8 (5.3%) had a higher education (master/PhD).

Regarding marital status, 36 (23.7%) were single, 107 (70.4%) were married, and 9 (5.9%) were divorced. Income levels showed that 67 (44.1%) were on low income of <7000 SR, 69 (45.4%) on a moderate income between 7000 and 15,000 SR, and 16 (10.5%) on a high income (higher than 15000 SR).

As regards the type of surgery the participants underwent, 10 (6.6%) had RYG and 142 (93.4%) had LSG.

Figure 1 presents participants' medical history. Twenty-five (16.4%) had a history of diabetes, 19 (12.5%) had a history of hypothyroidism, 5 (3.3%) had a history of CVD, and 1 (0.7%) had had a stroke. When the participants were asked if they ever took antidepressants or any other psychiatric medication or received cognitive behavior therapy for reasons other than depression, only 4 (2.6%) said yes.

Table 2 illustrates an assessment of participants' depression based on the PHQ-9 survey. The mean PHQ-9

score was 6.15 + 5.14.

Figure 2 shows the depression status postbariatric surgery based on PHQ-9 survey. Seventy-six (50%) did not have depression, 40 (26.3%) had mild depression, 24 (15.8%) had moderate depression, 11 (7.2%) had moderately severe depression, and 1 (0.7%) had severe depression.

Table 3 displays the comparative weight and BMI before and after bariatric surgery. A significant decrease ($P < 0.001$) in the weight was observed compared to the weight before and after the bariatric surgery (119.85 + 23.1 vs. 88.13 + 18.69). A significant DROP ($P < 0.001$) in the BMI was also seen when the BMI before and after the bariatric surgery were compared (42.25 + 5.11 vs. 30.83 + 5.67).

Table 4 demonstrates the factors associated with depression postbariatric surgery based on PHQ-9 assessment. Marital status was significantly associated with the incidence of depression ($P = 0.019$). It was noted that singles had higher rates of moderate to severe depression compared to other groups. Gender, education, and income were all not significantly associated with depression.

Table 5 presents the multivariate logistic regression determining risk factors for the incidence of depression postbariatric surgery. The logistic regression model included the following variables: gender, marital status, education, and income. None of the factors were significantly predictive of the incidence of depression postbariatric surgery.

Table 1: Sociodemographic profile of the study participants (n=152)

Characteristics	N (%)
Gender	
Male	58 (38.2)
Female	94 (61.8)
Education	
Intermediate school and less	31 (20.4)
High school	43 (28.3)
Bachelor's degree/diploma	70 (46.1)
Higher education (master/PhD)	8 (5.3)
Marital status	
Single	36 (23.7)
Married	107 (70.4)
Divorced	9 (5.9)
Income	
Low income (<7000 SR)	67 (44.1)
Moderate income (between 7000 and 15,000 SR)	69 (45.4)
High income (>15,000 SR)	16 (10.5)
Age, mean±SD	47±9

SD=Standard deviation

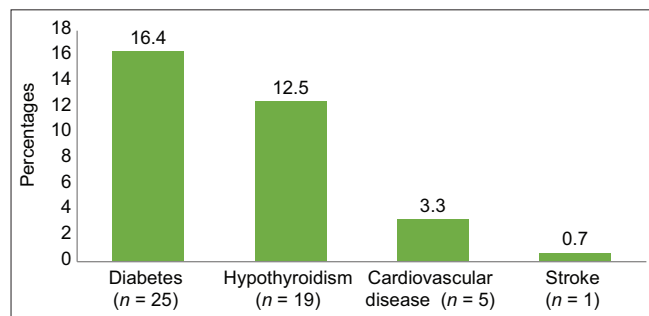


Figure 1: Medical history of study participants

Discussion

To our knowledge, this is the first study of the prevalence of depressive disorder in the bariatric population in Saudi Arabia that used the Arabic version of PHQ-9. In 2017, a PHQ-9 translation and validation was

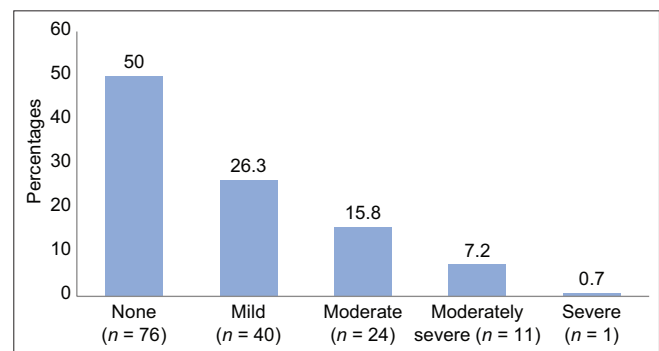


Figure 2: Depression status postbariatric surgery based on Patient Health Questionnaire-9 survey

Table 2: Participants assessment of depression after bariatric surgery based on Patient Health Questionnaire-9 survey (n=152)

Question	N (%)
Q1/Little interest or pleasure in doing things?	
Not at all	75 (49.3)
Several days	50 (32.9)
More than half the days	13 (8.6)
Nearly every day	14 (9.2)
Q2/Feeling down, depressed, or hopeless?	
Not at all	73 (48.0)
Several days	54 (35.5)
More than half the days	19 (12.5)
Nearly every day	6 (3.9)
Q3/Trouble falling or staying asleep, or sleeping too much?	
Not at all	82 (53.9)
Several days	42 (27.6)
More than half the days	15 (9.9)
Nearly every day	13 (8.6)
Q4/Feeling tired or having little energy?	
Not at all	41 (27.0)
Several days	69 (45.4)
More than half the days	24 (15.8)
Nearly every day	18 (11.8)
Q5/Poor appetite or overeating?	
Not at all	44 (28.9)
Several days	63 (41.4)
More than half the days	20 (13.2)
Nearly every day	25 (16.4)
Q6/Feeling bad about yourself - or that you are a failure or have let yourself or your family down?	
Not at all	104 (68.4)
Several days	28 (18.4)
More than half the days	8 (5.3)
Nearly every day	12 (7.9)
Q7/Trouble concentrating on things, such as reading the newspaper or watching television?	
Not at all	94 (61.8)
Several days	35 (23.0)
More than half the days	10 (6.6)
Nearly every day	13 (8.6)
Q8/Moving or speaking so slowly that other people could have noticed? Or the opposite - being so fidgety or restless that you move around a lot more than usual?	
Not at all	116 (76.3)
Several days	25 (16.4)
More than half the days	6 (3.9)
Nearly every day	5 (3.3)
Q9/Thoughts that you would be better off dead, or of hurting yourself in some way	
Not at all	139 (91.4)
Several days	8 (5.3)
More than half the day	2 (1.3)
Nearly every day	3 (2.0)
PHQ9 score, mean±SD	6.15±5.14

PHQ9=Patient Health Questionnaire-9, SD=Standard deviation

conducted by Alhadi in a Saudi population. PHQ-9 is a well-validated reliable screen tool for depression

Table 3: Comparison of weight and body mass index before and after bariatric surgery

Factor	Mean±SD	P-value
Weight		
Before operation	119.85±23.10	<0.001*
After operation	88.13±18.69	
BMI		
Before operation	42.25±5.11	<0.001*
After operation	30.83±5.67	

*Significant at level 0.05. BMI=Body mass index, SD=Standard deviation

in primary care and different clinical settings.^[29-31] PHQ-9 has been used to assess depression in bariatric populations in different studies either as the primary objective^[32-34] or secondary objective.^[35,36] One study done in 2013 showed that PHQ-9 was more effective than the Mini-International Neuropsychiatric Interview in a bariatric population.^[32] A review of the literature showed that depression was assessed by clinical interviews, self-reported questionnaires, or medical records. Of the different self-reported questionnaires used (Beck Depression Inventory [BDI-II], PHQ-9, HADS), the Beck Depression Inventory-II was shown to be most commonly used as a self-report measure of depressive symptoms for bariatric surgery patients. A recent study published in 2016 in the US supporting the use of the PHQ-9 as a valid alternative for BDI-II observed moderate-to-substantial agreement ($\kappa = 0.59$, CI 0.52–0.65, $P < 0.0001$) between a score of 10 in PHQ-9 (moderate depression) compared to a score of 20 in BDI which represents a cutoff for moderate depression.^[33]

A comparison of PHQ-9 with BDI-II shows that PHQ-9 corresponds to the nine diagnostic symptoms for major depressive disorder in the DSM-5. It is shorter to fill, cost-free, and valid in the Arabic language, but both differentiate between somatic symptoms of obesity and depression.^[21]

Out of our sample of 173 who underwent bariatric surgery 2 years after 2017, 19 patients reported a history of depression before surgical intervention. Out of the 19 patients, 7 had documented antidepressant selective serotonin reuptake inhibitors (SSRI) prescription together with clinical documentation of depression in their medical records, 3 patients were diagnosed with depression, 2 patients with depression and anxiety, and 2 patients with dysthymia with posttrauma stress disorder. One patient after reviewing their medical record showed that they had cyclothymia with complicated grief. This study was conducted to assess depressive symptoms in postbariatric surgery patients, and any patient with history of depression was excluded (cyclothymia with complicated grief is a different diagnosis and does not fulfill the criteria of major depressive disorder).

Table 4: Factors associated with depression after bariatric surgery (n=152)

Factor	Depression status					P-value
	No depression N (%)	Mild N (%)	Moderate N (%)	Moderately severe N (%)	Severe N (%)	
Gender						
Male	34 (58.6)	15 (25.9)	5 (8.6)	3 (5.2)	1 (1.7)	0.157
Female	42 (44.7)	25 (26.6)	19 (20.2)	8 (8.5)	0	
Education						
Intermediate school and less	13 (41.9)	8 (25.8)	8 (25.8)	2 (6.5)	0	0.328
High school	25 (58.1)	10 (23.3)	5 (11.6)	3 (7.0)	0	
Bachelor's degree/diploma	33 (47.1)	21 (30.0)	10 (14.3)	5 (7.1)	1 (1.4)	
Higher education (master/PhD)	5 (62.5)	1 (12.5)	1 (12.5)	1 (12.5)	0 (0.0)	
Marital status						
Single	16 (44.4)	9 (25.0)	9 (25.0)	1 (2.8)	1 (2.8)	0.019*
Married	56 (52.3)	28 (26.2)	13 (12.1)	10 (9.3)	0 (0.0)	
Divorced	4 (44.4)	3 (33.3)	2 (22.2)	0	0	
Income						
Low income (<7000 SR)	30 (44.8)	15 (22.4)	16 (23.9)	6 (9.0)	0	0.886
Moderate income (between 7000 and 15,000 SR)	39 (56.5)	18 (26.1)	7 (10.1)	5 (7.2)	0	
High income (>15,000 SR)	7 (43.8)	7 (43.8)	1 (6.3)	0 (0.0)	1 (6.3)	

*Significant at level 0.05. PHQ9=Patient Health Questionnaire-9

Table 5: Logistic regression analysis: Factors associated with development of depression after bariatric surgery

Factor	P-value	OR	CI
Gender (male vs. female)	0.304	0.60	0.23-1.59
Education (intermediate school and less is the referent)			
High school	0.461	0.64	0.19-2.11
Bachelor's degree/diploma	0.411	0.64	0.22-1.85
Higher education (master/PhD)	0.853	1.21	0.16-9.20
Marital status (single is the referent)			
Married	0.359	0.63	0.24-1.68
Divorced	0.554	0.58	0.10-3.51
Income (low income (<7000) is the referent)			
Moderate income (between 7000 and 15,000)	0.110	0.49	0.21-1.17
High income (>15,000)	0.263	0.36	0.06-2.18

*Significant at level 0.05. OR=Odds ratio, CI=Confidence interval

Post surgery, only one patient had a new incidence of documented depression in a primary care visit and given an antidepressant (SSRI) prescription. However, on being contacted for further evaluation, the patient reported a conservative improvement without taking the medication.

A total of 19 patients out of 173 (10.9%) reported a history of depressive disorder before bariatric surgery; seven had clinical documentation of depressive disorder with pharmacological management.

We found a similar percentage of depression and depressive symptoms score in PHQ-9 in postbariatric surgery patients and the general Saudi population. Our finding (26.3% mild, 15.8% moderate, 7.2% moderately severe, and 0.7% severe) is similar to the Alqadhi study in the nonobese Saudi population at King Abdulaziz National Guard primary care centers using PHQ-9 (31%

were mild, 13.4% moderate, 4.4% moderate-to-severe, and 1.0% severe cases).^[10]

A cutoff of 10 in PHQ-9 has a sensitivity and specificity of (88%–88%) which represents moderate depression and was used to identify depression. Based on that, the prevalence of depression in our study was 23.7%, similar to the Backer study in King Khalid University Hospital primary care of 20% using PHQ-9.^[8]

This finding has consistent with another study done in Germany with similar patient characteristics and surgical type and instrument tool used. That study was used to calculate our sample size. It was found that at 4 years after surgery, there was a remarkable decrease from 37.2% to 21.3% in depression.

Given that depression in the general German population is 8%^[37] and morbid obese bariatric surgery candidate

population is approximately 37%,^[38] these findings are in line with the literature that shows improvement in depression symptoms after bariatric surgery.

In the few studies that show a higher incidence of depression postbariatric surgery, an association between surgical complication, infection, nutritional deficiency, mainly B12, and depression score was found. This problem tends to be more in malabsorptive procedures (gastric bypass and duodenal switch) than restrictive procedure (gastric sleeve). In a Taiwan study, the RR of depression in malabsorptive procedure was 3.01 and 1.5 in restrictive procedure.^[14,19] Another finding is that binge eating disorder is more in patients with depressive disorder than patients without depressive disorder.^[38]

Conclusion

The prevalence of depressive disorder in postbariatric surgery patients is similar to the prevalence of nonobese in the general Saudi population (23.7%, 20%). One of the strengths of this study is the utilization of the medical record system which helped to identify patients with depression, antidepressant prescriptions and type of bariatric surgery, and weight presurgery to minimize recall bias. Depression is known to affect adherence to postsurgery instructions and worsen bariatric surgery outcomes. To enhance psychological functioning and improve postsurgery outcomes, it might be beneficial to have a psychological assessment before and after bariatric surgery for patients with depressive symptoms.

The limitation in this study is the use of a self-report questionnaire, and the absence of baseline depressive symptoms score presurgery. However, bariatric surgery patients sometimes minimize their depressive symptoms presurgery because they surmise that admitting the symptoms may delay their surgery or get it canceled. The real score may, therefore, not be properly reflected as there is no psychiatric assessment prebariatric surgery.

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Conflicts of interest

There are no conflicts of interest.

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