

Psychological changes among weight loss injection users compared with bariatric surgery patients in Saudi Arabia

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ABSTRACT

الأهداف: دراسة وتقييم الصحة العقلية والتغيرات النفسية لدى مستخدمي حقن فقدان الوزن وجراحة السمنة.

المنهجية: أجرينا دراسة وصفية وتحليلية مقطعية خلال الفترة من يوليو 2022م إلى ديسمبر 2022م. قمنا بتوزيع استبيان ذاتي بين المشاركين الذين يستخدمون منصات التواصل الاجتماعي. شمل الاستبيان الخصائص الاجتماعية والديموغرافية، والخصائص المرتبطة بفقدان الوزن، واضطراب القلق العام (GAD-7) لقياس القلق، واستبيان صحة المريض (PHQ-9) لقياس الاكتئاب الذي يعاني منه المرضى.

النتائج: من بين 721 مريضاً، 73.9% منهم إناث، و30.1% تتراوح أعمارهم بين 30 إلى 39 سنة. بلغت نسبة انتشار المرضى الذين خضعوا لفقدان الوزن عن طريق الجراحة والحقن 47.7% و41.2% على التوالي. وبشكل عام، تم اكتشاف أعراض القلق والاكتئاب لدى 19.7% و24% على التوالي. كان عامل الخطر المستقل للقلق والاكتئاب هو أحد أعراض الاضطراب النفسي قبل الجراحة، في حين كان عامل الحماية المستقل للقلق والاكتئاب هو التقدم في السن. كان الاكتئاب أعلى لدى مستخدمي حقن فقدان الوزن.

الخلاصة: أظهرت الدراسة أن ربع مجتمع الدراسة يعانون من القلق أو الاكتئاب بعد علاج فقدان الوزن. علاج فقدان الوزن عن طريق الحقن يزيد من خطر الإصابة بالاكتئاب. ومع ذلك، كان تحسن الثقة بالنفس والمزاج والعلاقات مع العائلة والأصدقاء من بين التغيرات الإيجابية التي أظهرها المرضى بعد خضوعهم لعلاج فقدان الوزن. التقييم النفسي المناسب ضروري قبل وبعد التدخل لإنقاذ الوزن.

Objectives: To assess and evaluate the mental health and psychological changes in weight loss injection users and bariatric surgery.

Methods: A descriptive and analytical cross-sectional study was conducted from July 2022 to December 2022. A self-administered questionnaire was given among participants using social media platforms. The questionnaire included socio-demographic

characteristics, weight-loss-related characteristics, General Anxiety Disorder (GAD-7) to measure anxiety, and Patient Health Questionnaire (PHQ-9) to measure depression experienced by the patients.

Results: Of the 721 patients, 73.9% were females, and 30.1% were aged between 30 to 39 years old. The prevalence of patients who underwent weight loss by surgery and injection was 47.7% and 41.2%, respectively. Overall, symptoms of anxiety and depression were detected in 19.7% and 24%, respectively. Independent risk factor of anxiety and depression was the symptom of the psychiatric disorder prior to surgery, while the independent protective factor for anxiety and depression was older age. Depression was higher in weight loss injection users.

Conclusion: Nearly one-quarter of the study population experienced anxiety or depression following weight loss treatment. Weight loss treatment by injections increases the risk of depression. However, improved self-confidence, mood, and relationships with family and friends were some of the positive changes exhibited by the patients after undergoing weight loss treatment. Appropriate psychiatric evaluation is necessary before and after weight loss intervention.

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According to the World Health Organization (WHO), obesity is a significant and chronic health condition characterized by the excessive accumulation of fat, which poses a risk to one's well-being. The WHO defines obesity as an abnormal or excessive fat accumulation in the body. To determine obesity, body mass index (BMI) is used, with a BMI above 25 classified as overweight and a BMI over 30 classified as obese.¹ Obesity has been identified as a risk factor for several serious health conditions, including type 2 diabetes, heart disease, and certain types of cancer.² In addition, obese individuals might develop psychosocial problems, self-esteem issues, and a negative impact on quality of life (QoL).³ There are numerous approaches to weight loss; however, many of them are only temporary and ineffective. Clinical guidelines suggest considering additional treatments, particularly for adults with a body mass index (BMI) of 30 or higher, or 27 or higher for individuals with accompanying health conditions. Nevertheless, the use of existing medications is still limited due to their limited effectiveness, safety concerns, and price.⁴

Current guidelines suggest criteria to decide on qualified candidates for bariatric surgery. To be eligible for bariatric surgery, candidates typically need to meet certain criteria, such as having a body mass index (BMI) of 35 kg/m² or higher along with obesity-related comorbidities or having a BMI of 40 kg/m² or higher.⁵ Numerous studies conducted globally have demonstrated a positive impact on the quality of life (QoL) following bariatric surgery.⁶ However, some studies have reported an increased chance of suicide attempts or self-harm postoperative.⁷

Locally, In 2021, a study conducted in Abha, Asir province, Saudi Arabia aimed to examine the impact of anxiety and depression on individuals who underwent bariatric surgery, along with the factors associated with these conditions. The findings revealed that 30.4% of the participants developed depression, while 33% experienced anxiety after the surgery. Moreover, it was observed that younger patients had a higher likelihood of developing post-bariatric surgery complications, as well as experiencing anxiety or depression 2 years after the procedure.⁸ Furthermore, a cross-sectional study was conducted in Riyadh from January to December 2019 using an electronic questionnaire that was sent by Google survey link. It was found that 50% does

not had depression, 26.3% were diagnosed with mild depression, 15.8% had moderate depression, 7.2% had moderately severe depression, and only one patient had severe depression.⁹ Globally, In 2011, a prospective follow-up study was conducted to examine the levels of anxiety and depression in individuals who underwent bariatric surgery. The findings of this study indicated that there was a significant decrease in the occurrence of depressive disorders after the surgery, but no significant change in anxiety disorders. It was observed that preoperative anxiety was a significant predictor of postoperative anxiety disorders at both follow-up time points. On the other hand, preoperative depressive disorders were found to be predictive of depressive disorders at 24-36 months after the surgery, but not at 6-12 months. Additionally, patients who experienced less weight loss following the surgery were found to have had depressive and anxiety disorders prior to the surgery, both in the present and throughout their lifetime.¹⁰ Additionally, another study focused on assessing the psychological profile of individuals before and after bariatric surgery. The results revealed significant improvements in anxiety, depression, and binge eating behaviors within the first 23 months following the surgery. However, it was noted that these improvements were transient, suggesting that the positive impact on these symptoms may be attributed to weight loss or the surgery itself.¹¹ Moreover, In another study, the objective was to compare patients who initiated GLP-1 analogues therapy (specifically exenatide) with those who started insulin treatment. The study aimed to prospectively assess changes in health-related quality of life and emotional well-being in these patients. The findings indicated that the group of patients treated with exenatide (n=71) had significantly higher levels of treatment satisfaction ($p<.05$), higher well-being scores at 6 months ($p<.05$), and lower scores on the hospital anxiety and depression scale ($p<.05$) when compared to the group treated with insulin (n=67).¹²

Studies have well revealed the association between psychological change and bariatric surgery. However, the effect of weight loss injections on psychology is not well researched, as there is a lack of knowledge to reveal the association between weight loss injection use and psychological changes in patients. Hence, this study aimed to assess and evaluate the mental health and psychological changes in weight loss injection users and bariatric surgery. To examine the QOL as an outcome of weight loss injection and bariatric surgery on patients.

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Methods. A descriptive and analytical cross-sectional study was conducted from July 2022 to December 2022.

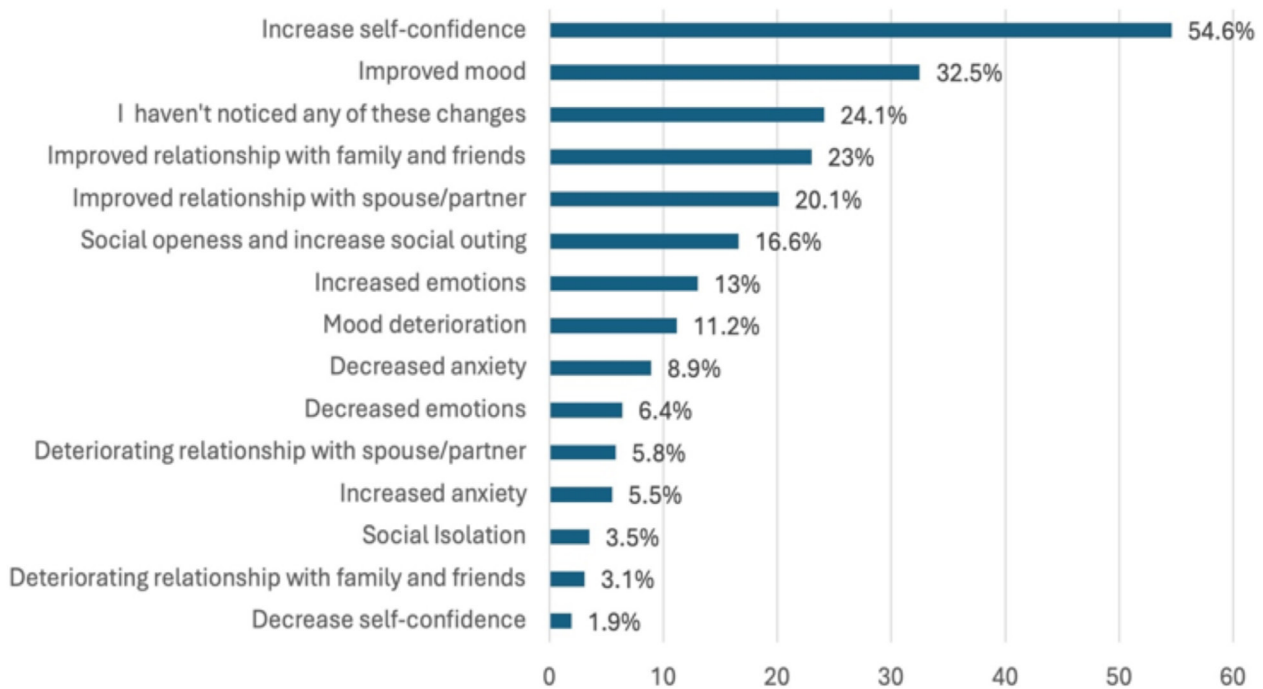


Figure 1 - Psychological changes being noticed after performing surgery.

Inclusion criteria encompass individuals residing within Saudi Arabia, including both Saudi nationals and non-Saudi residents, across the geographical expanse of the nation's five delineated regions: North, South, East, West, and Central. Eligible participants comprise those who have undergone bariatric surgery procedures or have availed themselves of weight loss injections within the Saudi Arabian healthcare context.

We calculated the sample size by using the Raosoft calculator (Raosoft Inc.), with an estimated population size of 20,000; assuming that 50% is the response distribution with a 99% confidence level and 5% margin of error, the calculated sample size was 643, a 15% from the total sample size were added to cover the non-response rates and the total sample size was 736. A Convenience sampling approach was employed, wherein a self-administered questionnaire (in the form of an online survey) was disseminated electronically through various social media platforms. This method was selected due to its alignment with the ethical principles outlined in the Declaration of Helsinki 2013. Before participation, all individuals involved were duly apprised of the study's objectives and procedures, and their informed consent was obtained.

The questionnaire was structured into 5 distinct sections delineated by thematic categories. The initial segment encompassed inquiries about the demographic profile of the participants. Subsequently, the second section addressed historical data concerning weight loss endeavors. The third section was dedicated to eliciting information concerning the medical and psychiatric background of the participants. Following this, the fourth section focused on investigating psychological alterations after weight loss interventions. Lastly, the questionnaire culminated with the incorporation of the Patient Health Questionnaire (PHQ-9) scale, serving as a tool for the assessment of depressive symptoms.

The anxiety symptoms were assessed by using General Anxiety Disorder (GAD-7). This is a 7-item questionnaire with a 4-point Likert scale category ranging from "Not at all" coded with 0 to "Nearly every day" coded with 3. The GAD-7 score ranges from 0 to 21 points. The severity of anxiety was classified as minimal (score 0 – 4), mild (score 5 – 9), moderate (score 10 – 14), and severe (score 15 – 21). Finally, a score of 10 or higher indicates positive anxiety symptoms.¹³

The depressive disorder was measured using the Patient Health Questionnaire (PHQ-9). This is a 9-item questionnaire with a 4-point Likert scale category

ranging from “Not at all” coded with 0 to “Nearly every day” coded with 3. The PHQ-9 score ranges between 0 to 27 points. The severity of depression was considered minimal (score 1 – 4), mild (score 5 – 9), moderate (score 10 – 14), moderately severe (score 15 – 19), and severe (score 20 – 27). Finally, a score of 10 or higher was considered a positive depressive symptom.¹⁸

The investigation was undertaken after obtaining ethical clearance from the Institutional Review Board (IRB) of Imam Mohammad Ibn Saud Islamic University. Strict confidentiality protocols were adhered to, ensuring that the data obtained was utilized solely for the predefined objectives of the study.

The data were calculated and analyzed using SPSS version 26 (Statistical Packages for Social

Sciences, Armonk, NY: IBM Corp.). Categorical data were described as frequency and proportion (%). Continuous data were computed and summarized as mean and standard deviation. The treatment method was compared with anxiety and depression using the Chi-square and Mann-Whitney U tests. The association between anxiety and depression according to the patient’s socio-demographic and weight loss-related characteristics was conducted using the Chi-square test. Significant findings were then placed into a multivariate regression model to determine the significant independent predictors of anxiety and depression, with

Table 1 - Patients’ socio-demographic characteristics (N=721).

Study variables	n (%)
Age group	
18 – 29 years	163 (22.6)
30 – 39 years	217 (30.1)
40 – 49 years	188 (26.1)
50 – 60 years	122 (16.9)
>60 years	31 (04.3)
Gender	
Male	188 (26.1)
Female	533 (73.9)
Nationality	
Saudi	700 (97.1)
Non-Saudi	21 (02.9)
Residency region	
Central Region	360 (49.9)
Eastern Region	89 (12.3)
Western Region	155 (21.5)
Northern Region	17 (02.4)
Southern Region	100 (13.9)
Educational level	
High school or below	146 (20.2)
Bachelor’s degree	475 (65.9)
Master or Higher education	100 (13.9)
Associated chronic disease	
Yes	307 (42.6)
No	414 (57.4)
Specific chronic disease †	
Diabetes	102 (14.1)
Hypertension	84 (11.7)
Dyslipidemia	96 (13.3)
Heart disease	20 (02.8)
Hypothyroidism	95 (13.2)
Polycystic Ovarian Syndrome	56 (07.8)
Others	30 (04.2)

† Some patients have more than one chronic disease

Table 2 - Weight loss-related characteristics (n=721).

Variables	N (%)
Current BMI	
Underweight (<18.5 kg/m ²)	04 (0.60)
Normal (18.5 – 24.9 kg/m ²)	157 (21.8)
Overweight (25 – 29.9 kg/m ²)	248 (34.4)
Obese (≥30 kg/m ²)	312 (43.3)
When did you start using treatment/When was the surgery?	
<1 year	290 (40.2)
1–5 years	289 (40.1)
>5 years	142 (19.7)
Was the treatment prescribed by a doctor?	
Yes	546 (75.7)
No	175 (24.3)
Was the treatment one of the following options?	
Weight loss surgery	344 (47.7)
Weight loss injection Saxenda	117 (16.2)
Weight loss injection Ozempic	180 (25.0)
Others	80 (11.1)
Was it a doctor’s suggestion or your suggestion?	
Doctor’s suggestion	287 (39.8)
My suggestion	420 (58.3)
Others	14 (01.9)
Have you undergone a psychological evaluation prior to the prescription/operation procedures?	
Yes	188 (26.1)
No	533 (73.9)
Having symptoms of the psychiatric disorder before performing the surgery	
Yes	274 (38.0)
No	447 (62.0)
Specific symptoms of disease before performing surgery	
General anxiety disorder	166 (23.0)
Depression	113 (15.7)
Binge eating disorder	112 (15.5)
Obsessive-compulsive disorder	23 (03.2)
Anorexia nervosa	10 (01.4)
Bipolar disorder	06 (0.80)
Others	05 (0.70)

Table 3 - Prevalence of anxiety using general anxiety disorder (GAD-7) questionnaire and depression using patient health questionnaire (PHQ-9) according to the treatment method (N=721).

Variables	Total n (%) (N=721)	Weight loss treatment method*		P-value §
		Surgical n (%) (n=344)	Injection n (%) (n=297)	
<i>Severity of anxiety</i>				
Normal (score 0 – 4)	405 (56.2)	189 (54.9)	170 (57.2)	0.539
Mild (score 5 – 9)	174 (24.1)	84 (24.4)	67 (22.6)	
Moderate (score 10 – 14)	84 (11.7)	38 (11.0)	39 (13.1)	
Severe (score 15 – 21)	58 (8.0)	33 (9.6)	21 (7.1)	
<i>Symptoms of anxiety</i>				
Positive (score ≥10)	142 (19.7)	71 (20.6)	60 (20.2)	0.891
Negative (score <10)	579 (80.3)	273 (79.4)	237 (79.8)	
<i>Severity of depression</i>				
Minimal (score 0 – 4)	333 (46.2)	170 (49.4)	124 (41.8)	0.030 **
Mild (score 5 – 9)	215 (29.8)	101 (29.4)	89 (30.0)	
Moderate (score 10 – 14)	89 (12.3)	37 (10.8)	43 (14.5)	
Moderately severe (score 15 – 19)	49 (6.8)	17 (4.9)	30 (10.1)	
Severe (score 20 – 27)	35 (4.9)	19 (5.5)	11 (3.7)	
<i>Symptoms of depression</i>				
Positive (score ≥10)	173 (24.0)	73 (21.2)	84 (28.3)	0.038 **
Negative (score <10)	548 (76.0)	271 (78.8)	213 (71.7)	

*Other treatment methods were excluded from the comparison, §p-value has been calculated using Chi-square test, †p-value has been calculated using Mann Whitney Z-test, **Significant at $p < 0.05$ level

corresponding odds ratios and 95% confidence interval. Statistical significance was established to $p < 0.05$ level.

Results. In total, 721 patients completed the survey. Around 30.1% were aged between 30 and 39 years, with females being dominant (73.9%). Nearly all were Saudis (97.1%), and 49.9% resided in the Central Region. Patients who were bachelor's degree holders constitute 65.9%. Most commonly associated chronic disease was diabetes (14.1%), followed by dyslipidemia (13.3%) and hypothyroidism (13.2%). Patients who had associated chronic disease constituted 42.6%, and the most commonly associated chronic disease was diabetes (14.1%), followed by dyslipidemia (13.3%) and hypothyroidism (13.2%) (Table 1). Around 43.3% were currently obese. Approximately 40.2% started treatment less than a year, with approximately three-quarters (75.7%) being advised by the doctor. Patients who underwent weight loss surgery constitute 47.7%, which was suggested by the patient himself (58.3%). Approximately 26.1% underwent a psychological evaluation before the treatment/operation procedure. Patients with symptoms of the psychiatric disorder prior to surgery were 38%. Among those with symptoms of psychiatric disorder, the most common

was general anxiety disorder (23%), followed by depression (15.7%) and binge eating disorder (15.5%) (Table 2). In Figure 1, the most common psychological improvement after undergoing surgical procedure was increased self-confidence (54.6), followed by improved mood (32.5%) and improved relationship with family and friends (23%).

When examining the prevalence of anxiety and depression, it was observed that the prevalence of anxiety disorder was 19.7% with 24.1% being mild. Regarding depression, the prevalence of depression in this study was 24%, with mild depression constituting 29.8%. When comparing weight loss treatment, it was observed there was a significant relationship between weight loss treatment in terms of the severity of depression ($p=0.030$) and the symptoms of depression ($p=0.038$) was found (Table 3).

When measuring the relationship between anxiety and depression among the socio-demographic and weight loss-related characteristics of the patients, it was found that the prevalence of patients with symptoms of anxiety was significantly more common among the younger age group ($p=0.008$) and among those with symptoms of psychiatric disorder ($p < 0.001$). Also, the prevalence of patients with symptoms of depression

Table 4 - Relationship between anxiety and depression according to the socio-demographic and weight loss-related characteristics of the patients (n=721).

Factors	Anxiety symptoms		Depressive symptoms	
	Positive n (%) (n=142)	Negative n (%) (n=579)	Positive n (%) (n=173)	Negative n (%) (n=548)
<i>Age group</i>				
<40 years	89 (62.7)	291 (50.3)	103 (59.5)	277 (50.5)
≥40 years	53 (37.3)	288 (49.7)	70 (40.5)	271 (49.5)
<i>P</i> -value	0.008 **		0.039 **	
<i>Gender</i>				
Male	31 (21.8)	157 (27.1)	37 (21.4)	151 (27.6)
Female	111 (78.2)	422 (72.9)	136 (78.6)	397 (72.4)
<i>P</i> -value	0.199		0.107	
<i>Residency region</i>				
Inside Central Region	71 (50.0)	289 (49.9)	88 (50.9)	272 (49.6)
Outside Central Region	71 (50.0)	290 (50.1)	85 (49.1)	276 (50.4)
<i>P</i> -value	0.985		0.778	
<i>Educational level</i>				
Highschool or below	33 (23.2)	113 (19.5)	38 (22.0)	108 (19.7)
Bachelor or higher	109 (76.8)	466 (80.5)	135 (78.0)	440 (80.3)
<i>P</i> -value	0.323		0.520	
<i>Current BMI</i>				
Normal or underweight	30 (21.1)	131 (22.6)	30 (17.3)	131 (23.9)
Overweight or obese	112 (78.9)	448 (77.4)	143 (82.7)	417 (76.1)
<i>P</i> -value	0.701		0.071	
<i>When did you start using treatment/when was the surgery?</i>				
<1 year	55 (38.7)	235 (40.6)	72 (41.6)	218 (39.8)
1 – 5 years	59 (41.5)	230 (39.7)	68 (39.3)	221 (40.3)
>5 years	28 (19.7)	114 (19.7)	33 (19.1)	109 (19.9)
<i>P</i> -value	0.908		0.910	
<i>Was the treatment prescribed by a doctor?</i>				
Yes	104 (73.2)	442 (76.3)	129 (74.6)	417 (76.1)
No	38 (26.8)	137 (23.7)	44 (25.4)	131 (23.9)
<i>P</i> -value	0.440		0.683	
<i>Was the treatment one of the following options? †</i>				
Weight loss surgery	71 (54.2)	273 (53.5)	73 (46.5)	271 (56.0)
Weight loss injection	60 (45.8)	237 (46.5)	84 (53.5)	213 (44.0)
<i>P</i> -value	0.891		0.038 **	
<i>Was it a doctor's suggestion or your suggestion? †</i>				
Doctor's suggestion	48 (34.3)	239 (42.2)	64 (37.2)	223 (41.7)
My suggestion	92 (65.7)	328 (57.8)	108 (62.8)	312 (58.3)
<i>P</i> -value	0.090		0.299	
<i>Have you undergone a psychological evaluation prior to the prescription/operation procedures?</i>				
Yes	28 (19.7)	160 (27.6)	34 (19.7)	154 (28.1)
No	114 (80.3)	419 (72.4)	139 (80.3)	394 (71.9)
<i>P</i> -value	0.054		0.027**	
<i>Associated chronic disease</i>				
Yes	62 (43.7)	245 (42.3)	77 (44.5%)	230 (42.0)
No	80 (56.3)	334 (57.7)	96 (55.5%)	318 (58.0)
<i>P</i> -value	0.771		0.556	
<i>Having symptoms of the psychiatric disorder before performing the surgery</i>				
Yes	90 (63.4)	184 (31.8)	104 (60.1)	170 (31.0)
No	52 (36.6)	395 (68.2)	69 (39.9)	378 (69.0)
<i>P</i> -value	<0.001**		<0.001**	

† Other category was included in the analysis. *P*-value has been calculated using Chi-square test. ** Significant at *p*<0.05 level

Table 5 - Multivariate regression analysis to establish the independent significant factor associated with anxiety and depression (n=721).

Anxiety	AOR	95% CI	P-value
<i>Age group</i>			
<40 years	Ref		
≥40 years	0.564	0.381 – 0.834	0.004**
<i>Symptoms of psychiatric disorder before surgery</i>			
Yes	3.822	2.595 – 5.629	<0.001**
No	Ref		
<i>depression's factors</i>			
<i>Age group</i>			
<40 years	Ref		
≥40 years	0.598	0.406 – 0.882	0.009**
<i>Weight loss treatment method</i>			
Weight loss surgery	Ref		
Weight loss injection	1.487	1.016 – 2.177	0.041**
<i>Undergone psychological evaluation before surgery</i>			
Yes	0.573	0.364 – 0.903	0.016**
No	Ref		
<i>Symptoms of psychiatric disorder before surgery</i>			
Yes	3.724	2.536 – 5.467	<0.001**
No	Ref		

AOR – Adjusted Odd Ratio; CI – Confidence Interval. † “Other” category was included in the analysis. **Significant at $p < 0.05$ level.

was significantly more common among the younger age group ($p=0.039$), those who underwent weight loss injections ($p=0.038$), those who underwent psychological evaluation prior to surgery ($p=0.027$), and those who had symptoms of psychiatric disorder prior to surgery ($p < 0.001$) (Table 4).

A multivariate regression analysis showed that the symptom of psychiatric disorder before surgery was the significant independent predictor of increased anxiety, while older age was the significant independent predictor of decreased anxiety. This further indicated that compared to the younger age group, patients who were older were predicted to decreased risk of anxiety by at least 44% (AOR=0.564; 95% CI=0.381 – 0.834; $p=0.004$), while patients with symptoms of psychiatric disorder before the surgery were predicted to increased risk of anxiety by at least 3.8 times higher than those without symptom (AOR=3.822; 95% CI=2.595 – 5.629; $p < 0.001$). On the other hand, older age and having undergone psychological evaluation before the surgery were the significant independent predictors of decreased depression, whereas weight loss injection and symptoms of psychiatric disorder before the surgery were the significant independent predictors of increased depression. This further suggested that compared to the younger age group, patients who were older were

predicted to decreased risk of depression by at least 40% (AOR=0.598; 95% CI=0.406 – 0.882; $p=0.009$). Patients who underwent psychological evaluation before the surgery were at decreased risk of depression by at least 43% (AOR=0.573; 95% CI=0.364 – 0.903; $p=0.016$). In contrast, compared to patients who underwent weight loss treatment by surgery, patients who underwent weight loss treatment by injection were predicted to increase the risk of depression by at least 1.5 times higher (AOR=1.487; 95% CI=1.016 – 2.177; $p=0.041$), while patients who had the symptoms of psychiatric disorder before surgery were 3.7 fold higher being associated with the symptoms of depression (AOR=3.724; 95% CI=2.536 – 5.467; $p < 0.001$) (Table 5).

Discussion. The present study investigated the psychological changes of patients who underwent weight loss treatment. The findings of this study revealed that the prevalence of patients with symptoms of anxiety was 19.7% (mean score: 5.25; SD 5.44). Of them, 24.1% had mild, and 19.7% had moderate to severe anxiety levels. This is almost consistent with the study of Abouzed et al.¹⁴ According to the reports, 29.2% of patients had anxiety following obesity treatment. It was further added that anxiety disorders were more common among the non-surgical group, but the surgical group had greater severity of anxiety than the non-surgical group. A slightly higher prevalence of anxiety following bariatric surgery (BS) was reported by Alsubaie et al,⁸ with a prevalence of 33%. Another study carried out in Riyadh documented that 20.7% of BS patients were detected to have mild anxiety, 11.2% had moderate, and 8.7% had high anxiety levels.¹⁵ Assessment of psychiatric disorders before and after the surgery is necessary to boost patients' weight loss and therapeutic outcomes.

Having psychiatric disorder symptoms before the surgery was a significant risk factor for anxiety while increasing age was likely its protective factor. In a study carried out in Germany,¹⁰ a significant association between preoperative and postoperative anxiety disorders at both points of follow-up time was found. However, postoperative anxiety disorder did not differ significantly with the degree of weight loss. Another study documented that the weight loss group suffered more with low well-being. Hypertension and high triglyceride prevalence increased in weight gainers but decreased in weight losers, and during the weight-loss period, all effects persevered for illness and life stress.¹⁵ However, in Abha, poorer health-related quality of life (HRQOL) was significantly predicted with severely

obese individuals, suggesting that increased BMI levels were associated with decreased HRQOL.³

The depression rate experienced by the study population was also measured using PHQ-9. In the current study, the prevalence of depression following weight loss treatment was 24% (mean score: 6.46; SD 5.96), with minimal depression being the most common (46.2%), followed by mild (29.8%), whereas moderate to severe depression was 23.7%. This is almost mirrored by the report of Alshammari et al.¹⁶ Accordingly, it was reported that low levels of depression were found in 46.9%, 29.4% had mild, 11.2% had moderate, 8.2% had moderately high, and 4.4% were severely depressed. In a systematic review and meta-analysis published by Alyahya et al,¹⁷ pool prevalence of post-BS depression was 15.3%, with minimal being the most common (64.9%), while severe and moderate depression were 1.9% and 5.1%, respectively. In addition, a paper published by Marwa et al¹⁸ revealed that 30.8% of females post-BS exhibited minimal to moderate depression with no complications; however, the majority were diagnosed with polycystic ovary syndrome (PCOS) following BS.

Data from the current study indicated that weight loss treatment by injection and symptoms of the psychiatric disorder before the surgery were the independent risk factors for depression, whereas increasing age and undergoing psychological evaluation before the surgery were recognized as preventive factors. Contradicting the current report, Alsubaie et al¹⁸ found that younger age and being single had a significant correlation with depression, adding that younger patients were more prone to post-surgery complications, anxiety, or depression during the course of 2 years of follow-up. Consistent with these reports, Marwa et al¹⁸ also found a significant relationship between age and depression. Incidentally, Dawes et al¹⁹ observed that the prevalence of depression consistently decreases following BS, which was contradicted by the reports of Alyahya et al.¹⁷

It is important to highlight that most of the patients had chosen weight loss treatment by surgery (47.7%) and weight loss treatment by injection (41.2%). Other patients underwent weight loss treatment by natural methods or medications, such as diet, exercise, pills, and herbs (11.1%). Furthermore, positive behaviors were seen in many patients following the procedure, such as improved self-confidence, better mood, and improved social status. In contrast, according to the report of Burgmer et al,¹¹ a significant decrease in depressive symptoms exhibited by patients following restrictive BS, while self-esteem and physical functioning showed considerable improvement. However, these changes were seen one year postoperatively but did not vary

significantly right after. Incidentally, among patients who used antiobesity drugs,²⁰ there were varying neuropsychiatric adverse events that had occurred. These drugs positively impacted mood and anxiety and might have added treatment benefits in obese patients with comorbid depression and anxiety disorders.

Limitation of the study. Participants in the study constituted a limited number. The study was based on a subjective questionnaire.

Anxiety and depression were common among patients who underwent weight loss treatment. Psychological disorders may improve with increasing age; however, weight loss treatment by injection increases the risk of depression but not anxiety. It is important to note that weight loss intervention improves self-confidence, positive attitude, and social status. Due to limited literature discussing the psychological changes after weight loss treatment, particularly by injections, further research is warranted to extract more data on the phenomena of this study discipline.

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