PREVALENCE OF DEPRESSION AMONG GASTRECTOMY PATIENT IN ASIR REGION, 2021

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ABSTRACT

Background – Obesity comes with higher risk of depression, anxiety, and mental stress. Various studies have found that “bariatric surgery” is the best way to treat “morbid obesity”. However, there are variations in outcome of bariatric surgery on mental health of patients. Comprehensive evaluation of “mental health of patients seeking gastrectomy surgery” is needed as depression may lead to serious outcomes. With the best of our knowledge, there is a lack of studies on “psychiatric outcomes after bariatric surgery in Saudi Arabia”. **Objective** – This study is aimed to assess the impact of “bariatric surgery on developing anxiety and depression symptoms”, factors responsible for depression after surgery and correlation between age and post-operative BMI of patients. **Methodology** – A “cross-sectional study was performed on patients underwent bariatric surgery” in Asir region. Inclusion criteria consists of patients above 18 years old, male and female, who can understand and read Arabic language, underwent “bariatric surgery over the past few years”, and haven’t been diagnosed with mental illness. Total 209 patients were interviewed after signing the consent form. Responses were analyzed through SPSS version 22 and quantitative variables with descriptive statistics. In addition, Spearman’s Correlation test was performed and analyzed to find out the “association between age and post-operative BMI and one-sample T test was performed to find out the significance of variables causing depression”. **Results** – The mean age of volunteers was 31.93 $\pm$ 8.85, mean pre-operative BMI was 43.47 $\pm$ 6.92 and post-operative BMI was 28.62 $\pm$ 5.38. “Significant association was found between age and post-operative BMI and significant impact of negative thoughts like sadness, self-criticism, feeling of punishment, self-hate, etc. on patients after surgery ($p<0.005$)”. Hence, these variables are highly responsible for post-surgery depression among patients.

Keywords – *depression, gastrectomy patient, Asir region, Saudi Arabia, bariatric surgery, post-operative depression, post-operative BMI*

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1. INTRODUCTION

Obesity is a serious health issue with increasing incidence across the world [1]. Around 1.9 billion adults have been overweight and 610 million are obese till date, making around 39% of total population [2,3]. Obesity adversely affects overall physical and mental health. It causes metabolic syndrome, insufficient heart health, respiratory illness, hepatobiliary diseases, infertility, cancer, and osteoarthritis. Along with it, obesity is associated with lack of "self-esteem, anxiety, depression and poor Quality of Life (QoL) [4-6]. These adverse consequences affect the overall performance of the patient, reduce their odds of getting job because of their looks, increase the frequency of absenteeism, and enhance risks of addiction and isolation [7,8]. Obese people are around 55% more vulnerable to depression symptoms than normal adults". In addition, around 45% of patients seeking gastrectomy surgery may have depressive symptoms [9,10].

A lot of changes have been proposed to treat obesity and "gastrectomy or bariatric surgery has been found to be the most effective and safest procedure to reduce weight, comorbidities related to obesity and improve survival rate [11-13]. The major goal of this surgery is to reduce obesity-related issues and improve weight loss after treatment [14]. Apart from weight loss, the success of treatment also relies on the improvement of mental health [9]". There are many patients showing improvement in mental health after surgery. But a lot of patients suffer persistent mental issues and even worsening effects in some cases [15].

Patients going through bariatric surgery are more likely to suffer fourfold rise in the risk of suicidal tendencies as compared to common people [16,17]. It is important to "assess the outcomes of psychological health after bariatric surgery to identify patients who are morbidly obese and need more supportive cure [18]. A deeper insight is needed on the mental health of patients going through bariatric surgery" for more detailed knowledge of patients who are at higher risk of depression after surgery [19].

1.1. Background

Obesity-related comorbidities may cause several mental and physical illnesses [20-22]. Gastrectomy surgery may improve various physical symptoms but it also worsens mental health in some cases [23]. After bariatric surgery, the assumption of worsening of mental health issues may be related to overstated "expectations before surgery on the potential psychological and physical health benefits of weight-loss [24,25]" or unusual changes in social life [26]. Some cases have reported symptoms like substance abuse, dissatisfaction from body image, eating disorders, anxiety, depression and even suicide [27,28].

In Saudi Arabia, obesity is one of the serious health issues. Around 10% of adults are "morbidly obese (BMI > 40 kg/m^2)" and 33% are suffering from obesity in Saudi Arabia. It may cross 59.5% by the end of 2022 [29,30]. There is a lack of studies on psychological changes that take place post bariatric surgery in Saudi Arabia and other Arab countries [31]. The onset of anxiety and depression after bariatric surgery are clinically viable as it is a period when these symptoms and disorders are developed and often overlooked [32,33]. Hence, this study is aimed to study the "prevalence of depression" among gastrectomy patients in Asir region of Saudi Arabia and determine the variables

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related to post-operative depression in those patients.

2. LITERATURE REVIEWS

Even though anxiety, depression and binge eating are common symptoms of "bariatric surgery, their effect on weight loss" is still not known post sleeve gastrectomy. **Brunault et al**. [34] assessed the relation between "weight loss and anxiety, depression and binge eating scores before surgery in patients seeking sleeve gastrectomy due to morbid obesity. They conducted a cohort study on 34 patients who went through sleeve gastrectomy from May 2006 to Feb 2010 in a tertiary referral center in France. Phobic anxiety, higher depression before operation, binge eating and interpersonal sensitivity are related to low post-operative weight loss among patients going through sleeve gastrectomy. It is important to determine prevalence of subsyndromal/syndromal atypical depression before operation and its relevance with weight loss after operation in bariatric surgery" patients.

There is a "significant uncertainty on the prevalence of depression among gastric cancer patients. **Kouhestani et al** [35] summarized the prevalence of depression among those patients. They summarized the regional and global prevalence among gastric cancer patients. Gastric cancer is a prevalent malignancy across the world with high rate of fatality, especially among elderly men. It is found that there is a high prevalence of depression among those patients. Health authorities must design special psychosocial care support and services like tests for depression for those patients.

These days, obesity is well regarded among the serious health conditions across the world and it is related to psychosocial morbidity as well as significant physical disorders. Bariatric surgeries are effective and proven therapeutic treatment in several studies for severe obesity. Since surgery is an invasive procedure, there are some concerns related to side-effects on psychological health of a patient. Hence, **Timofte et al.** [36] evaluated the common positive impact of "laparoscopic sleeve gastrectomy" on controlling depression. It is found that there is a decline in prevalence of depression after surgery. The score was significantly declined after the treatment. Their findings favored significant improvements in mental health and depressive signs during the first year of laparoscopic sleeve gastrectomy".

The subsequent cure and diagnosis of neck and head cancer may be highly devastating to mental and social well-being of patients. Even though the negative effects of radiation therapy (RT) on physical health in the long term have been described well for neck and head cancer, only a few studies have calculated psychosocial well-being of patients after treatment. **Chen et al.** [37] determine the prevalence of depression self-reported by survivors of neck and head cancer getting back for follow-up after treatment from radiation therapy. They conducted a cross-sectional study on 211 patients in a comprehensive cancer care unit, who had been treated with RT, suffering from "squamous cell carcinoma of neck and head", and were healthy with follow-up for at least a year. The study excluded patients suffered from mood disorder, used mental health care solutions previously, and have been using anxiolytics or antidepressants (but not sleep medications). They used a validated, brief, self-administered questionnaire named "University of Washington Quality of Life (UW-QOL)" to analyze depression. Mental health services are highly underutilized despite having high depression rate among patients suffering from neck and head cancer.

Negative body image is a serious concern among people suffering from severe obesity. After "bariatric surgery and other traditional weight-loss programs, there have been changes in body image. However, there is a lack of research on body image after "laparoscopic sleeve gastrectomy (LSG". Poor body image was reported by patients before surgery. After one years of LSG, negative perception of body dynamics and vitality had improved without any healthy markers. There was no correlation between weight-associated parameters like BMI and body image. There was an improvement of body image after LSG and it might show changes in attitudes, thoughts, and beliefs of patients, instead of actual weight loss" [38]. Further studies are needed to determine the factors mediating body image changes after surgery.

The most prevalent disorder among cancer patients, depression significantly affects quality of life. There are several risk factors which may affect and interact depressive state of a cancer patient. **Maeda et al** [39] determined the relation between experience of postoperative symptoms and depression, psychological factors, and personality in gastrectomy patients in Japan. They also determined causal relationships of such variables. Participants of the study "included 82 gastrectomy patients who were discharged over the past 3 years of study without any sign of cancer recurrence. Researchers found significant correlations between age and depression, discharge time, frequency of symptoms, experience of postoperative symptoms, emotional support and self-esteem. There was a direct impact of marital status, interpersonal dependency, and emotional support on self-esteem which had a direct impact on depression". Findings suggest a vital reference to get proper knowledge on the mental health of those patients.

2.1. Research Gap

There is a lack of clarity on the subsequent outcomes and prevalence of depression post bariatric surgery in the recent studies [40-42]. Earlier studies have focused on depression before surgery and there is a knowledge gap on the impact of depression post bariatric surgery in Saudi Arabia [43]. It is important to identify the relation between success rate of bariatric surgery in terms of depressive symptoms, given that lack of weight loss might cause reemergence of obesity after surgery and complications related to it, while impairing the quality of life of patients [44].

2.2. Importance of the Study

This study will be helpful for healthcare providers to identify vulnerable patients and employ the right and timely depression management after bariatric surgery in order to avoid its common consequences in the long term. Hence, the current cross-sectional study was conducted to determine the prevalence of depression and their short-term and long-term impact of bariatric surgery.

2.3. Objective of the Study

- To find out the prevalence of depression among gastrectomy patients in Asir region
- To determine independent variables responsible for post-surgery depression
- To find out the correlation between age and post-operation BMI of gastrectomy patients

2.4. Research Questions

- Is there any relation between age and post-operation BMI of gastrectomy patients?
- What are the factors responsible for post-operative depression among those patients?

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2.5. Hypothesis

H1 = There is a "significant correlation between age and post-operative BMI of gastrectomy patients"

H0 = There is no "significant correlation between age and post-operative BMI of gastrectomy patients"

3. METHODOLOGY

3.1. Research Design

A "cross-sectional descriptive study was carried out on patients who went through bariatric surgery" in Asir region of Saudi Arabia. Patients who are male and female and above 18 years old, capable to understand and read Arabic language, underwent gastrectomy surgery over the past 2 years, not diagnosed with any mental illness before surgery, and can sign the consent are included in this study. There was total 209 patients who were included and contacted over phone. All of the participants agreed to be the part of this study. They have given an online consent. All of those participants attended a brief, self-structured questionnaire to analyze their physical and mental health before and after gastrectomy surgery. An online questionnaire was used to gather data about "medical, socio-demographic, mental health, and surgical characteristics" of patients.

3.2. Research Approach

SPSS version 22 was used to analyze and interpret the findings of the study. Quantitative variables were analyzed through descriptive statistics. Numbers and percentages were used to analyze qualitative variables. The association between post-operative BMI and age was analyzed through Spearman's Correlation test. Significance of Independent variables responsible for depression were detected by performing One-sample TTest.

4. DATA ANALYSIS

4.1. Socio-Demographic Profile of Participants

In this study, almost all of the participants live in Asir region, except one (Table 1) (Figure 1).

Table 1 - Participants from Asir region

Do you live in Asir region?		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	1	.5	.5	.5
	yes	208	99.5	99.5	100.0
	Total	209	100.0	100.0	

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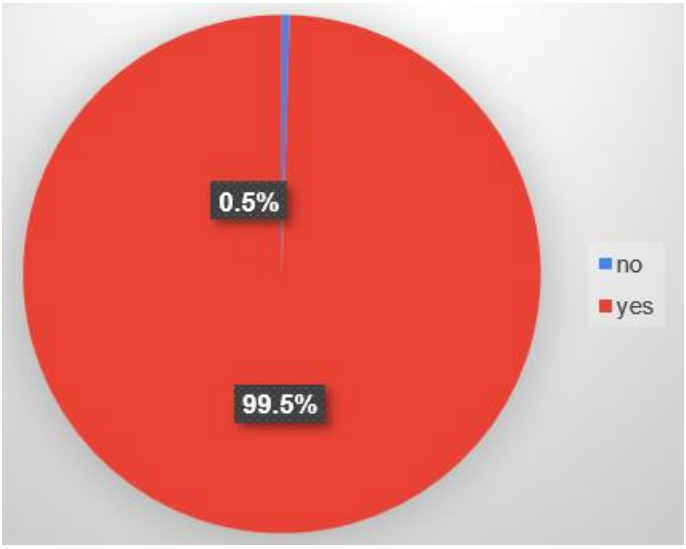
Figure 1 –Participants from Asir region

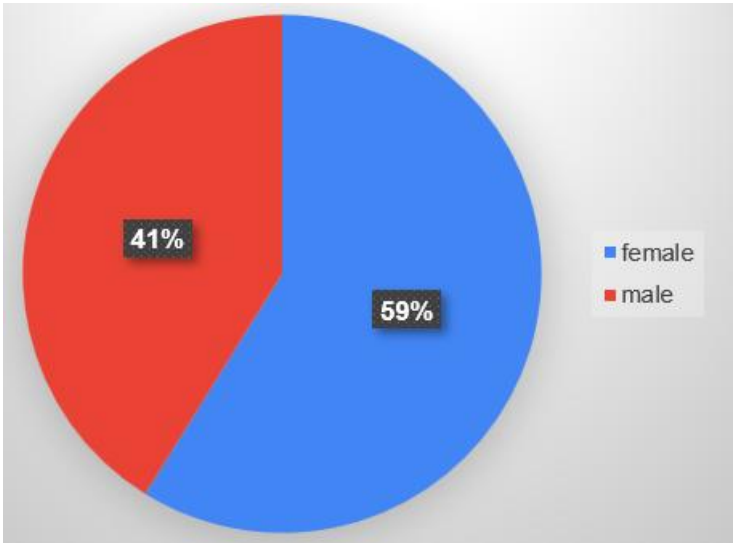


In this study, majority (58.9%) of participants are female and 41.1% participants are male out of 209 respondents (Table 2) (Figure 2).

Table 2 –Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	female	123	58.9	58.9	58.9
	male	86	41.1	41.1	100.0
	Total	209	100.0	100.0	

Figure 2 – Gender

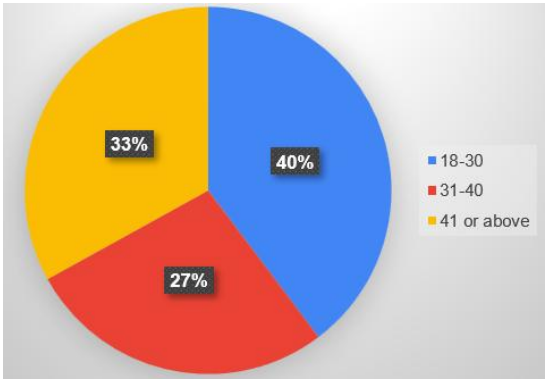


Majority participants in this study are 18 to 30 years old, i.e., 39.7%. In addition, 27.3% participants are aged 31 to 40 years old and 33% participants are above 41 years old (Table 3) (Figure 3).

Table 3 - Age (in years)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-30	83	39.7	39.7	39.7
	31-40	57	27.3	27.3	67.0
	41 or above	69	33.0	33.0	100.0
	Total	209	100.0	100.0	

Figure 3 – Age of the participants

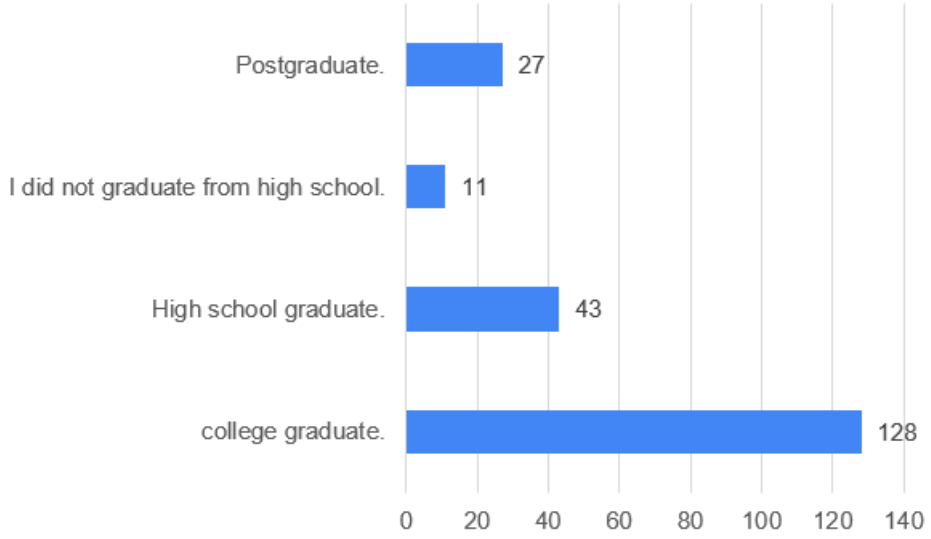


When it comes to educational status, majority (61.2%) participants are college graduate, 20.6% are high-school graduate, 12.9% participants are post-graduate and 5.3% participants haven't graduated from high school (Table 4) (Figure 4).

Table 4 - Educational Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	college graduate.	128	61.2	61.2	61.2
	High school graduate.	43	20.6	20.6	81.8
	I did not graduate from high school.	11	5.3	5.3	87.1
	Postgraduate.	27	12.9	12.9	100.0
	Total	209	100.0	100.0	

Figure 4 - Education Status

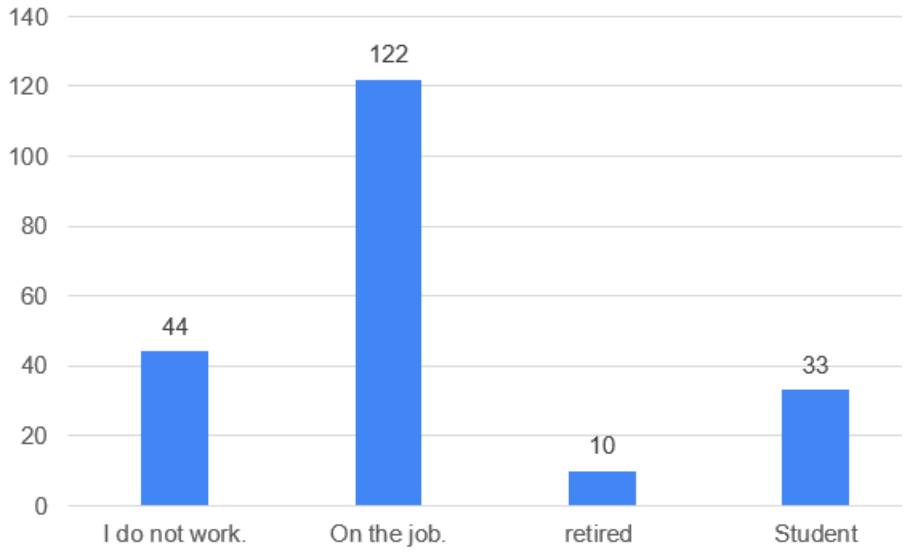


In this study, 122 (58%) participants are on the job, 44 (21.1%) participants don't work, 33 (15.8%) participants are students, and 10 (4.8%) participants are retired (Table 5) (Figure 5).

Table 5 - Professional status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I do not work.	44	21.1	21.1	21.1
	On the job.	122	58.4	58.4	79.4
	retired	10	4.8	4.8	84.2
	Student	33	15.8	15.8	100.0
	Total	209	100.0	100.0	

Figure 5 – Professional Status

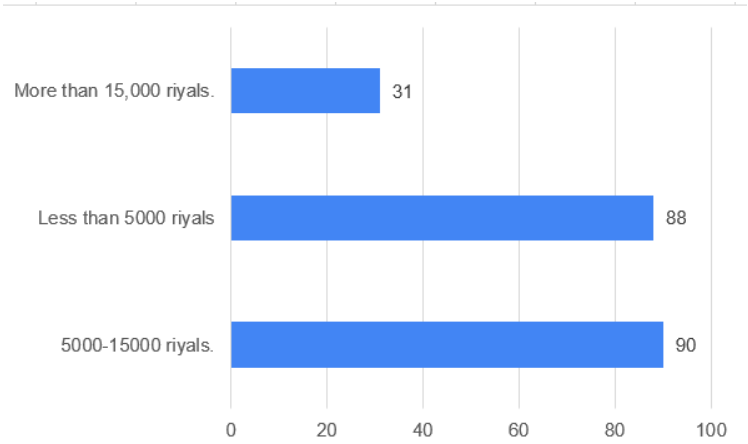


In this study, 43.1% participants earn 5000 to 15000 riyals, 42.1% participants earn less than 5000 riyals, and only 14.8% participants manage to earn more than 15,000 riyals (Table 6) (Figure 6).

Table 6 – income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5000-15000 riyals.	90	43.1	43.1	43.1
	Less than 5000 riyals	88	42.1	42.1	85.2
	More than 15,000 riyals.	31	14.8	14.8	100.0
	Total	209	100.0	100.0	

Table 6 – Income

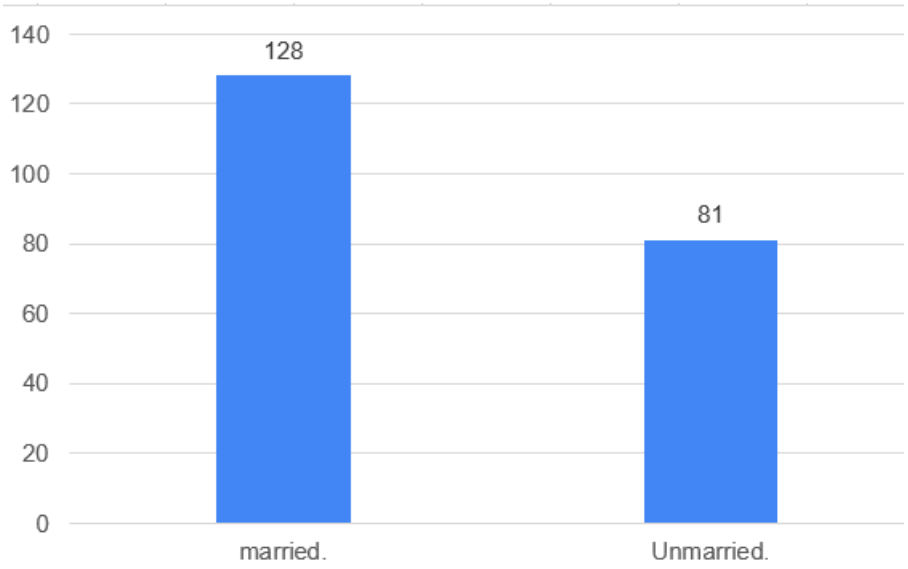


In this study, 128 (61.2%) participants are married and 81 (38.8%) participants are unmarried (Table 7) (Figure 7).

Table 7 - Marital status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	married.	128	61.2	61.2	61.2
	Unmarried.	81	38.8	38.8	100.0
	Total	209	100.0	100.0	

Figure 7 – Marital Status of participants

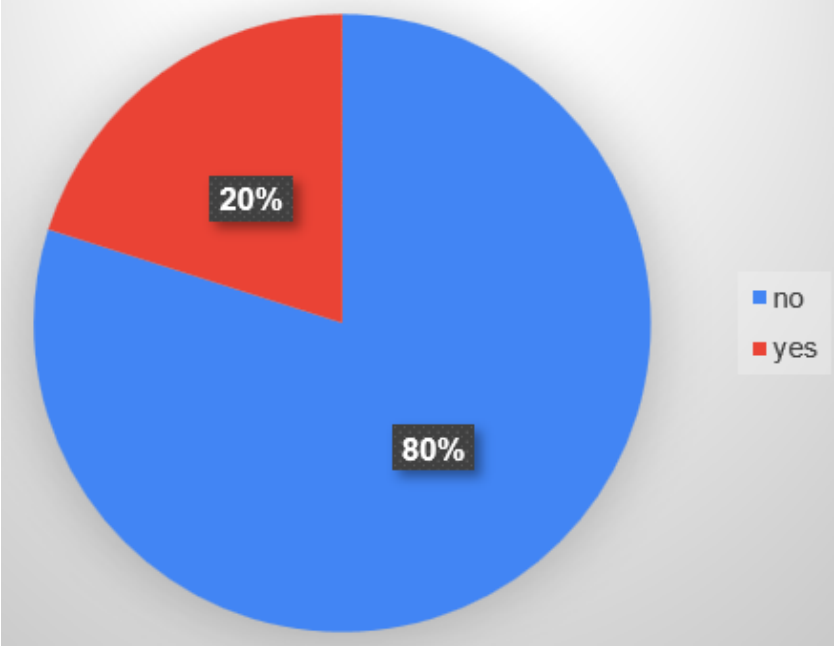


In this study, majority (79.9%) participants don't suffer from any chronic illness, while only 20.1% participants are suffering from chronic illness (Table 8) (Figure 8).

Table 8 – Presence of chronic illness

Do you suffer from any chronic disease?		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	167	79.9	79.9	79.9
	yes	42	20.1	20.1	100.0
	Total	209	100.0	100.0	

Figure 8 – Suffering from chronic illness

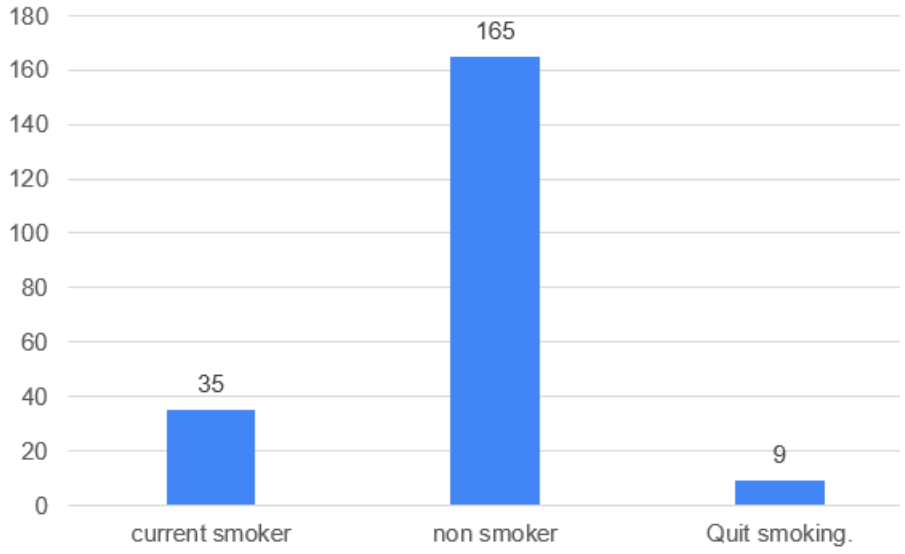


In this study, majority (78.9%) participants are non-smokers, while only 16.7% participants are currently smokers and 4.3% participants have quit smoking (Table 9) (Figure 9).

Table 9 - Smoking status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	current smoker	35	16.7	16.7	16.7
	non smoker	165	78.9	78.9	95.7
	Quit smoking.	9	4.3	4.3	100.0
	Total	209	100.0	100.0	

Figure 9 – Smoking Status

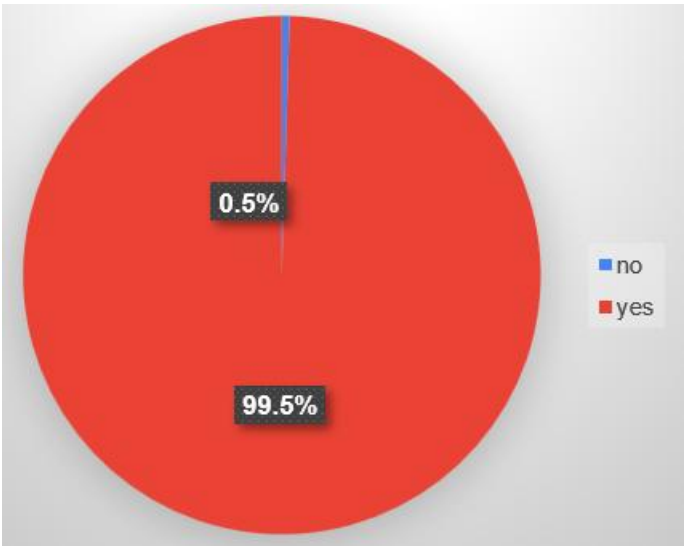


In this study, almost all the participants had undergone gastric sleeve surgery, except one (Table 10) (Figure 10).

Table 10 – Gastric Sleeve Surgery

Have you had gastric sleeve surgery?		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	1	.5	.5	.5
	yes	208	99.5	99.5	100.0
	Total	209	100.0	100.0	

Figure 10 – Participants had gastric sleeve surgery

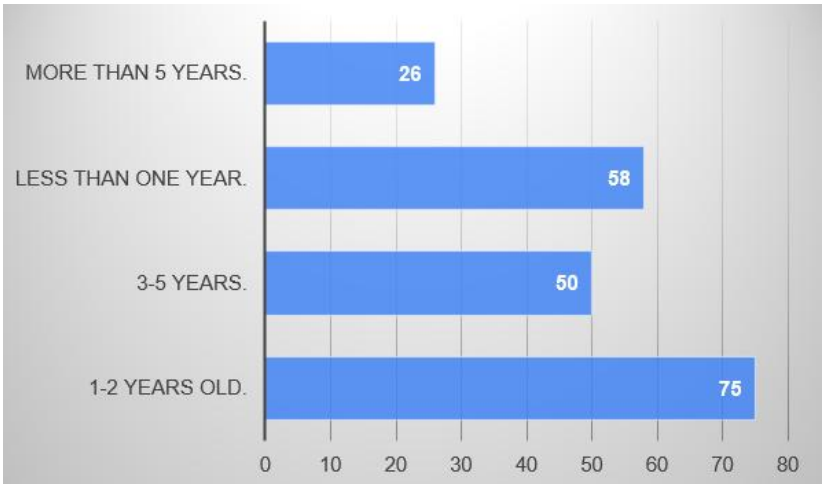


In this study, there are 35.9% participants who had their surgery done 1 to 2 years ago, 23.9% participants had their surgery done 3 to 5 years ago, 12.4% participants had their surgery done more than 5 years, while 27.8% participants got their surgery done quite recently, i.e., less than a year (Table 11) (Figure 11).

Table 11 – Time since surgery done

When was the surgery done?		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-2 years ago.	75	35.9	35.9	35.9
	3-5 years.	50	23.9	23.9	59.8
	less than one year.	58	27.8	27.8	87.6
	More than 5 years.	26	12.4	12.4	100.0
	Total	209	100.0	100.0	

Figure 11 – Time since surgery done

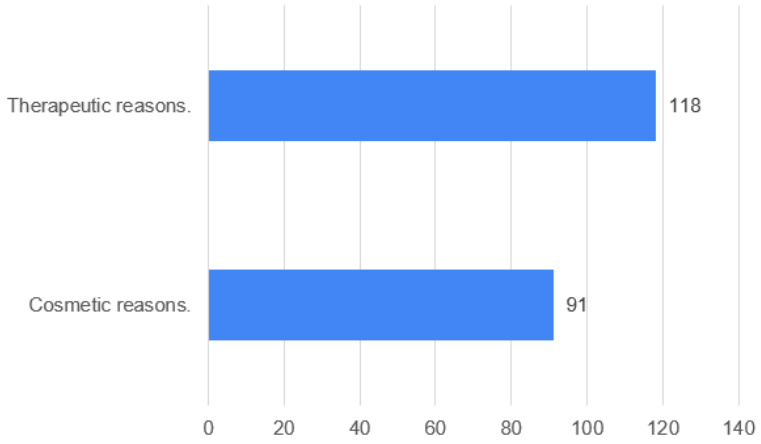


There are 56.5% participants who underwent their gastrectomy surgery for therapeutic reasons, while 43.5% participants have their surgery done for cosmetic reasons (Table 12) (Figure 12).

Table 12 – Purpose for surgery

Why did you have the surgery?		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cosmetic reasons.	91	43.5	43.5	43.5
	Therapeutic reasons.	118	56.5	56.5	100.0
	Total	209	100.0	100.0	

Figure 12 – Purpose for surgery

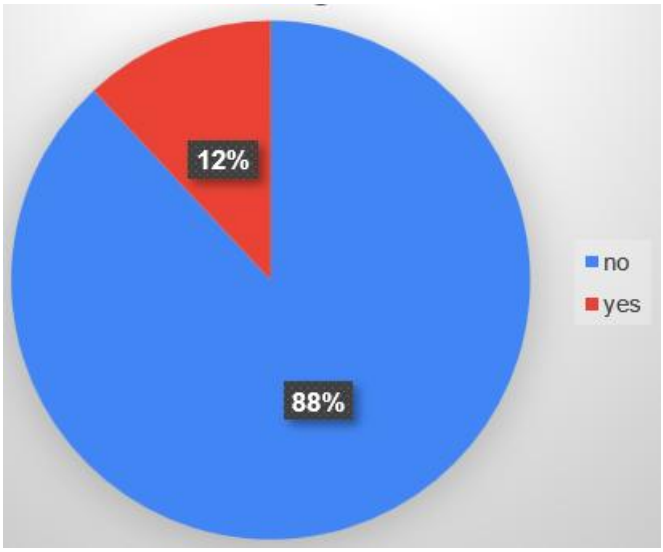


In this study, majority (88%) participants haven't faced any complications during or after the surgery, while only 12% participants faced complications (Table 13) (Figure 13).

Table 13 – Complications of surgery

Are there any complications during or after the surgery?		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	184	88.0	88.0	88.0
	yes	25	12.0	12.0	100.0
	Total	209	100.0	100.0	

Figure 13 – Complications of surgery

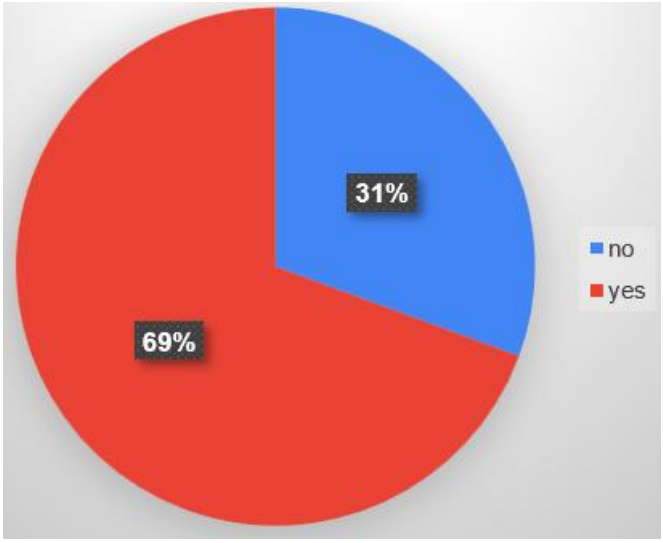


Majority (69.4%) participants in this study are regular on the medications and advice given by the doctor after operation, while 30.6%) participants have not followed the prescription.

Table 14 – Participants following prescriptions after surgery

Are you regular on the medications and advice prescribed by the doctor after the operation?		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	64	30.6	30.6	30.6
	yes	145	69.4	69.4	100.0
	Total	209	100.0	100.0	

Figure 14 – Participants following prescriptions after surgery



4.2. Age and Post-Operative BMI of Gastrectomy Patients

In this study, mean age of study participants was 31.93 ± 8.85 years. In addition, pre-operation mean BMI of the study subjects was 43.47 ± 6.92 and post-operation BMI of the participants was 28.62 ± 5.38 (Table 15).

Table 15 - Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
BMI (Pre-Operation)	209	27.7	60.6	43.473	6.9205
BMI (Post-Operation)	209	17.3	44.4	28.621	5.3793
Age (in years):	209	18	41	31.93	8.85
Valid N (listwise)	209				

In order to find out the association between post-operative BMI and age, non-parametric correlations were calculated using Spearman's Correlation test. Significant correlation was found at 0.01 level (2-tailed). Hence, H1 was approved, i.e., there is a significant correlation between age and post-operative BMI of gastrectomy patients.

Table 16 – Correlation between age and BMI

			Age (in years):	BMI (Pre-Operation)	BMI (Post-Operation)
Spearman's rho	Age (in years):	Correlation Coefficient	1.000	.091	-.087
		Sig. (2-tailed)	.	.189	.213
		N	209	209	209
	BMI (Pre-Operation)	Correlation Coefficient	.091	1.000	.483**
		Sig. (2-tailed)	.189	.	.000
		N	209	209	209
	BMI (Post-Operation)	Correlation Coefficient	-.087	.483**	1.000
		Sig. (2-tailed)	.213	.000	.
		N	209	209	209

**. Correlation is significant at the 0.01 level (2-tailed).

5. RESULTS

In order to find out the prevalence of depression among gastrectomy patients in Asir region, there is a need to find out individual variables responsible for depression after surgery. For doing this, these variables were asked from respondents through a questionnaire and tested through SPSS. In order to find out the significance of independent variables of depression post-surgery, one-sample t test was performed. The value of significance was $p<0.005$, which shows that there is a significant impact of all the variables like sadness, pessimism, past failure, loss of pleasure, guilt, feeling of punishment, self-hate, self-criticism, suicidal tendencies, agitation, crying, loss of interest, irritability, etc. on post-surgery life (Table 17). These are some of the independent variables responsible for post-surgery depression. There is a need to look after mental health of gastrectomy patients, especially after surgery.

Table 17 - One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Sadness	28.238	208	.000	1.411	1.31	1.51
Pessimism	25.365	208	.000	1.411	1.30	1.52
Past Failure	29.048	208	.000	1.273	1.19	1.36
Loss of Pleasure	28.903	208	.000	1.359	1.27	1.45
Guilty Feelings	24.696	208	.000	1.584	1.46	1.71
Punishment Feelings	23.589	208	.000	1.330	1.22	1.44
Self-Dislike	30.627	208	.000	1.287	1.20	1.37
Self-Criticalness	24.223	208	.000	1.450	1.33	1.57

Suicidal Thoughts or Wishes	23.949	208	.000	1.541	1.41	1.67
Crying	22.538	208	.000	1.440	1.31	1.57
Agitation	25.757	208	.000	1.617	1.49	1.74
Loss of Interest	26.594	208	.000	1.541	1.43	1.65
Indecisiveness	26.520	208	.000	1.392	1.29	1.50
Worthlessness	26.261	208	.000	1.445	1.34	1.55
Irritability	25.880	208	.000	1.469	1.36	1.58
Changes in Sleeping Pattern	27.241	208	.000	1.426	1.32	1.53
Tiredness or Fatigue	28.209	208	.000	1.483	1.38	1.59
Changes in Appetite	26.293	208	.000	1.694	1.57	1.82
Weight change	24.229	208	.000	1.804	1.66	1.95
interesting of health	25.785	208	.000	1.656	1.53	1.78
Loss of Interest in Sex	25.417	208	.000	1.373	1.27	1.48

This study was conducted on 209 participants who underwent bariatric surgery in Asir region of Saudi Arabia. There are 58.9% female participants and 41.1% male participants, 39.7% participants are 18 to 30 years old, 27.3% participants are 31 to 40 years old and 33% participants are above 41 years old. In addition, 61.2% participants have completed graduation, 20.6% have done high school education, 12.9% are post-graduate and 5.3% haven't completed high school. Majority of participants have full-time job, while 22% participants are jobless, 33% are students and some are retired. When it comes to income status, most of the participants are middle-income groups, i.e., earning 5000 to 15000 riyals and similar percentage of participants are also earning less than 5000 riyals.

There are 61.2% participants who are married and 38.8% participants are unmarried. The best part is that 79.9% participants don't have any chronic illness and 78.9% are non-smokers. However, all of the participants went through gastric sleeve surgery around 1-2 years ago and most of them chose this surgery for therapeutic reasons. Most of the patients haven't faced any complications during or after the surgery. In addition, they are also regularly following medications and doctor's advice after the surgery. The mean age of participants found was 31.93 $\pm$ 8.85, while mean pre-operative BMI was 43.47 $\pm$ 6.92 and post-operative BMI was 28.62 $\pm$ 5.38. There was also a "significant association between age and post-operative BMI and significant impact of negative thoughts like sadness, self-criticism, feeling of punishment, self-hate, etc." on patients after surgery ($p<0.005$). These variables are highly responsible for post-surgery depression among patients.

This study was "aimed to determine the prevalence of depression in gastrectomy patients after bariatric surgery and the variables responsible for depression among those patients. It is observed that there was a significant impact of those variables on mental health, which is similar to a study in Jeddah, Saudi Arabia [30]. In another study, there was 32% prevalence of depression after bariatric surgery in patients in the US"[45]. According to Dixon et al. [46], there was a rise in depression after one year of surgery among 3.8% patients. On the other side, there was a rise in rates of depression among 16.5% patients after one year of surgery and 14.3% patients after 2 years of surgery [47].

Heterogeneity of "depression after bariatric surgery is known to be higher than most of the depression cases in common public in Saudi Arabia and across the world [48]. There was 1.9% prevalence of "Generalized Anxiety Disorder-7 (GAD-7)" and 6% of prevalence in major depressive disorder, according to the "Saudi national mental health survey" [48]. There was 18.7% prevalence of anxiety after bariatric surgery in a study in Saudi Arabia [49] and 16.8% prevalence in a study by de Zwaan et al. [33]. Some studies have found either no change or decline in anxiety post bariatric surgery. Such changes might be due to the use of "disparate anxiety questionnaire". After bariatric surgery, anxiety is still higher than prevalence" in common public [44].

Sociodemographic factors associated with anxiety and depression have been tested in different studies. It is found that there is an association between severe depression with male and younger age, anxiety with family history of "major depressive disorder", female, lack of self-esteem, child sexual abuse, low educational background, white race, unhealthy family environment, and number of traumatic experiences by 21 years of age [54]. There is a huge prevalence of mental health issues among youth aged 24 years in Saudi Arabia, 3% of males in Saudi are diagnosed with depression at some point, "1% males are diagnosed with GAD-7 in Saudi, and 9% females are diagnosed with depression" at some point and 3% with GAD-7 [51].

Complications related to surgery also add another mental or physical burden [51]. There has been a rise in anxiety and depression after 2 years of surgery among obese subjects in Sweden [52]. There was a rise in prevalence of depression reported in a study after one year of surgery [53]. Around 6 to 12 months of surgery is a critical time-period to detect changes in mood. In addition, this period is related to suicidal risk and ideations [54].

Bariatric surgery leads to "significant weight loss, improvements in comorbidities related to obesity, and higher life expectancy [55]. It has positive effects on mental and physical aspects of life like social well-being, daily life, body image, mental health, and eating behaviour. There is a relative change in weight-loss after surgery and some patients might suffer worse psychological health [56,57]. Despite having a lot of evidence on the outcomes of bariatric surgery, there is a lack of study on the impact on mental health [58]. Hence, this study was conducted to determine the prevalence of post-operative depressive symptoms and determine how they affect surgery results.

Post-operative depressive disorder might not cause weight regain significantly in the short term. Initially, weight is lost because of metabolic changes due to bariatric surgery, instead of psychological or behavioral factors. Most of the weight-loss takes place during the first year. This weight-loss provides rewarding experience to patients who always wanted to lose weight". However, patients have to adopt highly restrictive behavioral and nutritional changes in the long term to lose more weight [59]. The weight loss plateaus and loose skin are associated with increased risk of negative body image after rapid weight loss [60].

Those situations often result in unrealistic expectations related to constant body contouring and weight loss, which adds another stress for patients [61]. Patients need to be monitored closely who are at "higher risk of depression after bariatric surgery. It consists of exhaustive assessment of psychological illness

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and depression after operation, apart from effective and timely anti-depressive approaches [62]. It could improve the effectiveness of surgery, improve quality of life in the long term, and amplify post-surgery weight loss. However, further studies are needed in the long term to understand the trajectory of weight regain and depressive manifestations after bariatric surgery in the long term.

Geerts et al. [63] also found that weight loss after surgery was related to binge eating, depression, and eating disorders. Switzer et al. found strong relation between depressive disorder and weight regain after surgery [64]. Hindle et al. [65] found significant relation between eating disorder, post-operative weight loss and long-term weight loss. However, the evidence was not enough" and inconsistence to reach a specific conclusion.

Obesity is among the serious health issues which causes several comorbidities like metabolic syndrome, heart disease, and higher mortality [66-71]. There is a significant risk of depression, psychological distress, impaired quality of life, anxiety, etc. [72]. There is a lack of understanding on clinical significance of mental disorders in obese adults, elevated risk of depression among obese patients and comorbidities like T2DM and heart disease [73]. In various studies, it is found that "bariatric surgery is the best treatment modality to deal with morbid obesity [68,69], which have been effective to lose weight, improve survival rate and reduce mortality [74]. There are changes in outcomes of bariatric surgery on depression, mental health, and anxiety among people. Mood disorders, anxiety, binge eating, mood disorders, and personality disorders are some of the common mental illnesses related to bariatric surgery [75-77].

A Norway-based study has observed a huge loss in prevalence of mental disorders from assessment to one year of follow-up after surgery [78], while a Germany-based study found a gradual decline in depression at baseline from 32.7% to 16.5% at one year and 14.3% at up to 3 years post-surgery [33]. Other studies have also found decline in depression levels up to 2-4 years after operation [79]. However, some studies have found the opposite, such as conditions in which improvements may not be maintained after surgery within the first year after operation [80] and it may worsen depressive symptoms in some patients [81]. Others found that patients who have been through bariatric surgery may have increased risk of anxiety, depression, and other mental illness" in comparison to other obese people with same characteristics before operation [72]. Further studies have also found 65% of patients had lifetime history of mood disorder and depression [82,83].

5.1. Research Limitations

There are some limitations of the study which should be considered. First of all, the "ability to measure temporal associations between anxiety and depressive symptoms post-surgery and other variables is limited by its cross-sectional design. Hence, longitudinal research is required to determine the association between post-bariatric surgery and mental disorder during follow-up". Secondly, psychological status was not evaluated before surgery. Hence, it is recommended to conduct pre-operative psychological measurements to evaluate the same with mental health after surgery. Third, recall bias may have affected most of the subjective variables. In the same time, valuable assessment would be provided with objective measurements. Fourth, the sample size of the study relied on only one center and over a certain limit of one area, which further makes it

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harder to generalize its findings. So, it is advised for researchers to do further studies on multiple centers and/or regions.

6. CONCLUSION

There is a "significant prevalence of depression post bariatric surgery". Depression is related to eating disorders, weight regain, and affected quality of life. In healthcare protocols, these findings may be integrated for healthcare providers to identify patients who are at "significant risk of depression and improve outcomes of bariatric surgery by stratifying patients to the effective and right treatment in timely manner". However, further studies are needed to deal with challenges of meta-analysis in this study. It is recommended for healthcare units to provide psychological counseling and treatment before and after bariatric surgery to improve results. Further studies are needed for pre- and post-operative psychological counseling.

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