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Anthropometric and Body Composition Changes over Five Years after Bariatric Surgery in Patients with Obesity, Diagnosed or Not Diagnosed with Binge Eating Disorder (BED) in the Preoperative Period

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Abstract: Obesity is a complex disease with a multifactorial etiology and could be associated with psychiatric disorders, such as Binge Eating Disorder (BED), characterized by recurrent episodes of binge eating in the absence of compensatory behaviors. The present study aimed to analyze anthropometric and body composition changes over five years after bariatric surgery in patients diagnosed or not diagnosed with BED, depression, and anxiety in the preoperative period. One hundred and eighteen patients undergoing bariatric surgery were evaluated and divided into two groups according to the presence or absence of BED. The patients were submitted to anthropometric and body composition evaluation. We also analyzed BED diagnosis, depression, and anxiety according to the DSM-5 and validated questionnaires. The Kolmogorov–Smirnov, *t*-test, Fisher's, and chi-square tests were used for statistical analysis. Over five years after bariatric surgery, only the BED group exhibited an increased weight and BMI ($p < 0.05$). In the preoperative period, patients with BED had severe depression (13,11%, $p = 0.0079$) and a higher frequency of moderate (22.95%, $p < 0.01$) or severe (14.75%, $p < 0.01$) anxiety. In conclusion, patients with BED had more intense symptoms of depression and anxiety in the preoperative period, and this disorder may persist in the postoperative period of bariatric surgery, contributing to weight gain and increased BMI.

Keywords: binge eating disorder; obesity; bariatric surgery; anxiety; depression

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1. Introduction

Obesity, a complex disease with a multifactorial etiology, is considered one of the most severe public health problems worldwide [1]. Currently, more than one-third of the world's population is overweight, and by 2030, an estimated 38% of the world's adult population will be overweight and 20% will be obese [2,3]. Obesity is regularly associated with Binge Eating Disorder (BED), and some studies showed that the prevalence of BED in individuals with obesity ranges from 3.3 to 5.5% [4]. In addition, individuals with obesity and BED

have a higher food intake, a higher risk of developing diseases associated with obesity, a lower quality of life, and a higher risk of developing psychiatric disorders when compared to individuals with obesity without BED [5].

BED, according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), is an eating disorder characterized by recurrent episodes of binge eating in the absence of appropriate compensatory behaviors such as purging, excessive exercise, fasting, or the use of laxatives [6]. The causes of BED are extensive and involve psychological, psychiatric, genetic, biological, and environmental factors [7,8]. BED frequently impacts the quality of life of the patients and is associated with psychopathological features (mainly stress, depression, anxiety, and negative affect) [5]. BED patients tend to have difficulties with emotional regulation that may be related to psychiatric factors such as depression and anxiety, leading to changes in food intake [9].

The literature indicated a 6% to 69% BED prevalence in patients undergoing bariatric surgery [7,10]. This condition could affect the maximum weight loss in the first two years after bariatric surgery since eating problems and psychiatric factors have been associated with less weight loss [11–13]. Also, BED could increase difficulties in weight maintenance after bariatric surgery, especially considering the weight regain, which is expected after the second year of surgery and more frequently after five years [11–14]. However, there is no consistency across studies, and methodological variations have been identified [15].

In this context, the present study aimed to analyze anthropometric and body composition changes over five years after bariatric surgery in patients with obesity, diagnosed or not diagnosed with BED, depression, and anxiety in the preoperative period.

The study's novelty is that patients with BED in the preoperative period of bariatric surgery had more intense symptoms of depression and anxiety, more significant weight gain, and increased BMI in the late postoperative period.

2. Materials and Methods

We evaluated 118 individuals aged 18 to 65 years, of admixture ethnicity, of both sexes, and with grade III obesity (BMI $\geq$ 40 kg/m^2), who underwent bariatric surgery (Roux-en-Y gastric bypass). The Bariatric Surgery Outpatient Clinic of the Clinical Hospital of the Ribeirao Preto Medical School (HCFMRP) monitored the individuals. The patients were divided into two groups: Group 1, patients with BED, and Group 2, patients without BED. The study was approved by the Research Ethics Committee of the Research Ethics Committee of the Ribeirao Preto Medical School of the University of Sao Paulo (Process 14375/2018, CAAE: 04639118.7.0000.5440), and all participants signed the Informed Consent Form (ICF). The inclusion criteria were patients aged between 18 and 65 years who had a recommendation to undergo bariatric surgery (Roux-en-Y gastric bypass) and were monitored by the Bariatric Surgery Outpatient Clinic of the Clinical Hospital of the Ribeirao Preto Medical School (HCFMRP) team. The following exclusion criteria were adopted in the study: patients under 18 years of age or over 65 years of age; patients with a history of liver disease; those who were anticoagulated or with clotting disorders; pregnant women; those who were severely malnourished, anemic, or chronic users of alcohol or drugs; those with a history of recent neoplasia; those who were reoperated on or with immediate or late postoperative complications; and patients who were lost to follow-up during the postoperative period.

Anthropometric and body composition measurements [height (H), body weight (W), body mass index (BMI), lean mass (LM), and fat mass (FM)] were performed at the preoperative period and over five years after surgery. The Binge Eating Scale (BES) [16], Beck Depression Inventory (BDI) [17], and Beck Anxiety Inventory (BAI) [18] were applied at the preoperative period.

2.1. Anthropometric and Body Composition Assessment

For anthropometric assessment, the following indicators were used: weight, height, Body Max Index (BMI), and weight regain (%). The patients were weighed on a Filizola®

(Sao Paulo, Brazil) digital scale, of the platform type, with a capacity of 300 kg and a precision of 0.2 kg. To measure height, a vertical nail with a 0.5 cm graduation was used. The BMI was obtained using the formula Body Max Index = Weight/Height^2 (BMI = W/H^2) for the three weighing periods (preoperative [W1], a year and a half after surgery [W2] and 5 years after surgery [W3]); to calculate the percentage of weight regain (WR), the formula WR = 100 × (5 years after surgery − a year and a half after surgery)/(preoperative − a year and a half after surgery) was used; to calculate the ideal weight (IW), that is, BMI = 25 kg/m^2, the formula IW = 25 × H^2 was used; to calculate the current excess weight (EW), the formula EW = W3 – IW was used. The measurement of waist circumference (WC) was obtained by passing an inextensible measuring tape, with a graduation of 0.1 mm, in the largest circumference between the last rib and the iliac crest. The values stipulated by the World Health Organization (WHO) were used as references: ≤80 cm for women and ≤94 cm for men [19].

The Bioelectrical Impedance device, model Quantum BIA 101 Q-RJL System, was used to analyze the body composition. The examination was performed after twelve hours of fasting, with an empty urinary bladder and the patient lying down with legs apart and arms in parallel, away from the body. According to the technical description, two adhesive electrodes were placed on the hand (one on the dorsal surface of the right wrist between the ulnar and radius bones and the other on the third metacarpal) and two were placed on the foot (one on the anterior surface of the right ankle, between the portions bones, and one on the dorsal surface of the third metacarpal) of the individual. A low-amplitude electrical current (between 500 and 800 A) with a frequency of 50 kHz was applied to the distal electrodes of the hand and foot. The resistance and reactance values were placed in unique formulas for analyzing the body composition of individuals with obesity, thus obtaining the lean mass (LM) values. To obtain the values of body fat (FM), the amount of LM (kg) was subtracted from the total weight (kg).

2.2. Psychiatric Evaluation

The analysis of BED diagnosis, depression, and anxiety was performed in clinical interviews by trained professionals from the Bariatric Surgery Outpatient Clinic (HCFMRP) through the service protocol, according to the DSM-5 criteria [6] and the application of validated questionnaires (Binge Eating Scale, Beck Depression Inventory, and Beck Anxiety Inventory) [16–18]. All patients included in the study underwent psychiatric evaluation.

2.3. Binge Eating Scale (BES)

The BES is a self-administered questionnaire developed by Gormally et al. [16] and is considered a valid BED tracker for candidates for bariatric surgery [20]. It consists of a list of 16 items and 62 statements, from which the individual must select the one that best represents each item. Each statement corresponds to a score from 0 to 3 and ranges from the absence (“0”) to the maximum severity (“3”) of binge eating. The BES score correction grid was used to distribute patients into the studied groups (with and without BED) according to the total score in the questionnaire. Patients with scores ≤ 17 were allocated to the group without BED, and patients with scores > 17 points were allocated to the group with BED.

2.4. Beck Depression Inventory (BDI)

The BDI is a 21-item self-report scale developed by Beck et al. [17]. The scale items are rated from 0 to 3, in ascending order of the severity of depression symptoms, according to four levels: minimum, mild, moderate, and severe, with the item scores being added together and the total score ranging from 0 to 63. The total score analyzes the intensity of symptoms and the classification of depression according to the score range, ranging from 0 to 11 points: minimum; from 12 to 19 points: mild; from 20 to 35 points: moderate; and from 36 to 63 points: severe.

2.5. Beck Anxiety Inventory (BAI)

Anxiety was measured using the 21-item self-assessment BAI [18]. The individuals rated the items on a four-point scale that reflects: 1—slightly, 2—it did not bother me too much, 3—moderately: it was very unpleasant, but I could bear it, and 4—severely: difficult to bear. Each item was scored from 0 to 3 according to the severity of anxiety symptoms. The item scores were added together, and the total score (0 to 63) was correlated with the level of anxiety, which can be a minimum level (scores from 0 to 10); a mild level (scores from 11 to 19); a moderate level (scores from 20 to 30); and a severe level (scores of 31 and 63).

2.6. Statistical Analysis

The Kolmogorov–Smirnov test verified the normality of the data distribution, and the continuous variables were described as mean and standard deviation values (all analyzed variables passed the normality test). Differences between groups and periods shown in Tables 1 and 2 were analyzed by the mixed-effect model or analysis of variance (ANOVA) (all parametric data). The odds ratio (OR) was calculated to check the relative risk for BED in selected patients. The analysis of the frequency and classification of depression and anxiety was performed using Fisher's exact test or the chi-square test (Table 3). Statistical significance (*p*-value) was established at $p < 0.05$. The analysis was performed using the Statistical Package for Social Science software (SPSS version 20.0 (Inc., Chicago, IL, USA)).

Table 1. Sociodemographic, anthropometric, and body composition data of patients with and without binge eating disorder.

Variables	With BED			Without BED			*p*-Value
	n = 61			*n* = 57			
Sociodemographic	***n***	**%**		***n***	**%**		
Female	53	86.9		44	77.2		0.07
Male	8	13.1		13	22.8		
Anthropometric	**Preoperative**	**PO 1**	**PO 2**	**Preoperative**	**PO 1**	**PO 2**	
	M ± SD	**M ± SD**	**M ± SD**	**M ± SD**	**M ± SD**	**M ± SD**	
Age (years)	40.1 ± 9.9	-	-	39.0 ± 10.5	-	-	0.58
Weight (kg)	133.4 ± 23.0	83.5 ± 15.5 **	92.6 ± 16.5 ***	132.4 ± 27.3	86.5 ± 19.6 **	94.2 ± 20.8	#
Height (m)	1.63 ± 0.09	-	-	1.65 ± 0.09	-	-	0.23
BMI (kg/m^2)	51.0 ± 7.9	32.1 ± 5.7 ***	34.3 ± 7.2 **	50.2 ± 8.2	32.4 ± 5.6 ***	32.8 ± 10.6	#
Ideal weight (kg)	66.7 ± 7.4	-	-	68.3 ± 7.3	-	-	0.23
Overweight (kg)	29.5 ± 22.0	-	-	23.4 ± 20.1	-	-	0.42
Regain (%)	-	-	18.8 ± 23.2	-	-	9.1 ± 38.7	0.32
WC-F (cm)	137.6 ± 27.0	101.5 ± 12.4 *	107.1 ± 10.8	141.1 ± 15.1	111.5 ± 13.1 ***	102.0 ± 17.6	#
WC-M (cm)	155.9 ± 16.0	111.6 ± 13.2 ***	119.0 ± 9.9	155.9 ± 16.0	111.6 ± 13.2 **	119.0 ± 9.9	#
LM (kg)	66.9 ± 16.4	55.4 ± 10.9 *	56.6 ± 13.0	70.2 ± 15.1	55.6 ± 9.9 ***	52.2 ± 6.9	#
LM (%)	51.1 ± 8.1	67.7 ± 10.2 ***	65.5 ± 4.6	52.1 ± 6.9	67.6 ± 10.3 *	66.6 ± 13.1	#
FM (kg)	70.8 ± 18.9	31.6 ± 14.7 ***	35.9 ± 12.4	67.9 ± 15.4	26.3 ± 13.0 ***	27.5 ± 14.6	#
FM (%)	51.14 ± 8.99	33.31 ± 7.63 ***	36.59 ± 4.79	47.58 ± 7.99	30.56 ± 10.63 *	33.37 ± 13.1	#

t-test and chi square test; *p*-value = significance level for $p < 0.05$; *** $p < 0.001$ compared to the previous period; ** $p < 0.01$ compared to the previous period; * $p < 0.05$ compared to the previous period; PO = Postoperative; PO 1 = one and a half years after surgery; PO 2 = five years after surgery; M = mean; SD = standard deviation; M ± SD = mean ± standard deviation; BMI = Body Mass Index; *n* = number; WC = waist circumference; LM = lean mass; FM = fat mass; # = values described in the text.

Table 2. Score and mean classification of depression and anxiety symptoms of patients with and without Binge Eating Disorder (BED) in the preoperative period of bariatric surgery.

Variables	BDI with BED *n* = 61	BDI without BED *n* = 57	*p*-Value	BAI with BED *n* = 61	BAI without BED *n* = 57	*p*-Value
	M ± SD	**M ± SD**		**M ± SD**	**M ± SD**	
Preoperative	18.9 ± 12.9 **	11.6 ± 7.9	0.0082	15.7 ± 11.0 ***	6.6 ± 5.2	<0.0001
Average rating	Mild	Minimum		Mild	Minimum	

t-test; *p* value = significance level for $p < 0.05$; *** $p < 0.001$ compared to the group without BED; ** $p < 0.01$ compared to the group without BED; M = mean; SD = standard deviation; M ± SD = mean ± standard deviation; BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory.

Table 3. Preoperative depression and anxiety classification and frequency in patients with or without Binge Eating Disorder (BED).

Variables	BDI with BED $n = 61$	BDI without BED $n = 57$	p-Value (OR/CI)	BAI with BED $n = 61$	BAI without BED $n = 57$	p-Value (OR/CI)
	n (%)	n (%)		n (%)	n (%)	
Minimum	21 (34.43)	32 (56.14)	0.14 (1.63/0.84–3.11)	27 * (44.26)	46 (80.70)	0.0475 (1.82/1.01–3.24)
Mild	13 (21.32)	15 (26.32)	0.62 (1.24/0.55–2.87)	11 (18.03)	10 (17.54)	0.95 (0.97/0.37–2.46)
Moderate	19 (31.15)	10 (17.54)	0.18 (0.56/0.24–1.29)	14 ** (22.95)	1 (1.75)	0.0022 (0.07/0.007–0.51)
Severe	8 ** (13.11)	0 (0.0)	0.0079 (0.00/0.00–0.52)	9 ** (14.75)	0 (0.0)	0.005 (0.00/0.00–0.44)

Fisher's exact test or chi-square test; OR = Odds Ratio; CI = Confidence Interval; p-value = significance level for $p < 0.05$; ** $p < 0.01$ compared to the group without BED; * $p < 0.05$ compared to the group without BED; n = number; % = percentage. BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory.

3. Results

3.1. Sociodemographic, Anthropometric, and Body Composition Data

Table 1 presents the sociodemographic, anthropometric, and body composition data of patients with obesity who underwent bariatric surgery ($n = 118$), distributed in groups with BED ($n = 61$, 51.7%) and without BED ($n = 57$, 48.3%). Each group had three analysis periods (preoperative, postoperative 1—one and a half years, postoperative 2—five years). The groups with and without BED did not differ from each other for all assessed variables. Women prevailed in both groups (86.9% and 77.2% for the groups with and without BED, respectively), with no significant difference between them ($p = 0.065$). The mean age did not differ between the groups: 40.1 $\pm$ 9.9 years for those with BED and 39.0 $\pm$ 10.5 years for those without BED ($p = 0.58$).

Regarding weight, a significant reduction in this variable was noted when comparing the preoperative periods and the period after weight loss in postoperative 1 for both groups ($p < 0.01$), but only the group with BED showed weight regain between postoperative 1 and 2 ($p < 0.001$). Furthermore, both groups presented a reduction in BMI in postoperative 1 ($p < 0.001$), but only individuals with BED had an increased BMI between the two postoperative periods presented ($p < 0.01$). On the other hand, the percentage of weight regain for the BED group was 18.8% and 9.05% for the group without the disorder; no significant difference was identified between the groups ($p = 0.32$).

There was no significant difference in comparing weight and BMI for the groups with and without BED in all periods analyzed ($p > 0.05$), showing that the studied groups (with and without BED) are homogeneous for these indicators (Table 1).

According to Table 1, patients of both sexes with BED significantly reduced their waist circumference between the preoperative and postoperative periods 1 (female: $p < 0.05$; male: $p < 0.001$), followed by maintenance until postoperative 2. No significant difference was identified between the means of waist circumference and sex in the three analysis periods ($p = 0.99$; $p > 0.99$; and $p = 0.35$). In addition, female and male patients without BED significantly reduced their waist circumference ($p < 0.001$; $p < 0.01$, respectively) between preoperative and postoperative 1, followed by maintenance until postoperative 2. No significant difference was identified between the means of waist circumference concerning sex in the three analysis periods ($p = 0.21$; $p > 0.99$; and $p > 0.99$). Regarding the influence of BED on the evolution of the abdominal circumference measurement in the preoperative period and throughout the postoperative period of female and male individuals, no significant difference was identified between the groups in all periods analyzed.

It is observed in Table 1 that both groups presented a reduction in lean mass in kilograms between the preoperative period and postoperative period 1 (BED group: $p < 0.05$; group without BED: $p < 0.001$), followed by stabilization until postoperative 2 (BED group: $p = 0.99$; group without BED: $p > 0.99$). On the other hand, in postoperative 1, an increase

in the percentage of lean mass was observed in both groups (BED group: $p < 0.001$; group without BED: $p < 0.05$), followed by stabilization until postoperative 2 (BED group: $p > 0.99$; group without BED: $p > 0.99$). In all periods analyzed, there was no significant difference in the lean mass in kilograms and in the percentage between the groups with and without BED ($p > 0.05$). In addition, it was identified that both groups presented a reduction in fat mass in kilograms and a percentage between preoperative and postoperative period 1 (BED group: $p < 0.001$ and $p < 0.001$; group without BED: $p < 0.001$ and $p < 0.05$, respectively), followed by stabilization until postoperative 2 (BED group: $p = 0.63$ and $p = 0.99$; group without BED: $p > 0.99$ and $p = 0.98$). In all periods evaluated, there was no significant difference in fat mass in kilograms and the percentage between the groups with and without BED ($p > 0.05$).

3.2. Depression and Anxiety Data

As shown in Table 2, it was observed that the group with BED had a higher mean score in the assessment of symptoms of depression using the Beck Depression Inventory (BDI) in the preoperative period than the group without BED ($p < 0.01$). For this analysis, the BED group was classified with mild depression and the group without BED was classified with minimal depression. Furthermore, it was also observed that the group with BED had a higher mean score in the assessment of anxiety symptoms using the Beck Anxiety Inventory (BAI) than the group without BED ($p < 0.001$). Based on the identified results, the group with BED was classified with mild anxiety, and the group without BED was classified with minimal anxiety (Table 2).

When analyzing the classification of depression individually, we observed in Table 3 that while minimal and mild depression was more frequent in the group without BED (56.1% and 26.3%, respectively), moderate depression and severe depression were more frequent in the BED group (31.2% and 13.1%, respectively). Furthermore, patients with or without BED did not present significant differences for minimal, mild, and moderate depression ($p > 0.05$). However, only patients with BED had severe depression in the preoperative period ($p < 0.01$). Regarding the classification of anxiety and frequency in the preoperative period, it was observed that the group without BED had a higher frequency of individuals with minimal anxiety (80.7%, $p < 0.05$). On the other hand, it was identified that individuals with BED had a higher frequency of moderate (23.0%, $p < 0.01$) and severe (14.8%, $p < 0.01$) anxiety in the preoperative period of bariatric surgery.

4. Discussion

In this study, we found that patients with obesity and BED had higher levels of depression and anxiety in the preoperative period of bariatric surgery and increased weight and BMI in the late postoperative period of bariatric surgery. The literature suggests that in pre-bariatric surgery patients, the prevalence of BED may vary between 6 and 69% [7,10]. Our finding of a 51.7% BED prevalence was closer to the upper end of this spectrum.

In line with other studies, age, sex, and BMI were not different between groups [12,21,22], and both groups with or without BED had similar changes in waist circumference (WC) and body composition over five years after bariatric surgery. Although both groups and both sexes showed a significant reduction in WC between the pre- and postoperative periods, the values remained above those stipulated by the WHO [19], conferring a greater cardiometabolic risk in this population [23].

Weight regain is a complex, multifactorial mechanism associated with several factors such as lifestyle, mental health, hormones, surgical factors, inappropriate nutrition [24], ethanol consumption [25], and a lack of physical activity [26]. A cohort study on 1406 patients showed that the maximum weight loss occurs in the first two years after bariatric surgery—on average, 37.4% of the pre-surgery weight. After this period, it is common for patients to regain weight, and after five years of the maximum weight loss, 43.6% recovered five points of BMI, and 67.3% recovered 20% of the maximum weight loss [14]. In our sample, although the regained weight between the groups did not show a significant difference, it was observed that only the group of patients with BED had

increased weight and BMI in the fifth year after bariatric surgery, suggesting the recurrence of this disorder at a later period.

Another relevant factor for weight regain in the postoperative period is psychiatric disorders, such as depression and anxiety. Some studies showed a higher prevalence of these disorders among patients with obesity, who are candidates for bariatric surgery [27,28]. In the present study, all patients had some level of depression and anxiety preoperatively. Still, patients with BED had a higher prevalence of moderate and severe types of these disorders (Figures 1 and 2). It was observed that the BED group had a higher mean score preoperatively in the assessment of depression symptoms using the Beck Depression Inventory (BDI) than the group without BED and a higher frequency of severe depression (13.11%). In addition, it was also observed that the group with BED preoperatively had a higher mean score in the assessment of anxiety symptoms using the Beck Anxiety Inventory (BAI) than the group without BED and a higher frequency of moderate (23.0%) and severe (14.8%) anxiety. These results corroborate the literature, since studies showed that individuals with obesity and BED have higher rates of depression and anxiety than individuals with obesity and without BED [7,29,30]. Furthermore, these results suggested that patients with BED before surgery presented a series of factors that should be considered as risk factors after bariatric surgery, such as weight regain, psychiatric disorders, and the development of post-surgical complications [24,28]. In addition, a study by Peterson et al. [31] identified in a series of 32 women with grade I obesity that patients with BED (n = 15) had significantly more symptoms of depression (10.1 versus 4.8, p = 0.005) and anxiety (8.5 versus 2.7, p = 0.003) than normal-weight patients (n = 17), demonstrating that normal-weight and non-BED individuals have a lower frequency of these symptoms.

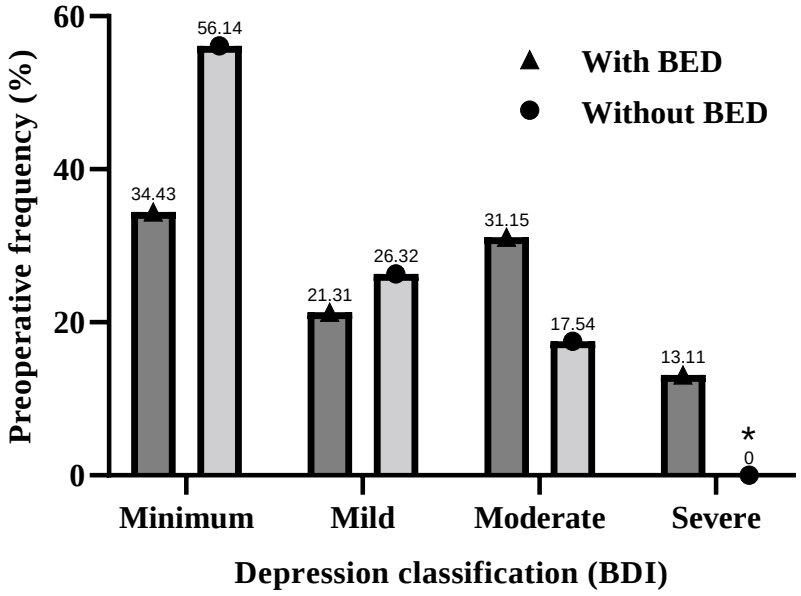

Figure 1. Preoperative depression classification and frequency in individuals with or without BED. Fisher's exact test or X^2; * $p < 0.05$ regarding the group with BED; gross and p values described in Table 3.

The strength of this study is that it was possible to follow the participants who underwent bariatric surgery for an extended period. In contrast, most published studies with BED in the preoperative period do not follow the patients throughout the postoperative period or follow up within two years after surgery. In addition, it was possible to associate BED with higher levels of depression and anxiety in the preoperative period and to monitor anthropometric and body composition variables in patients with obesity five years after bariatric surgery.

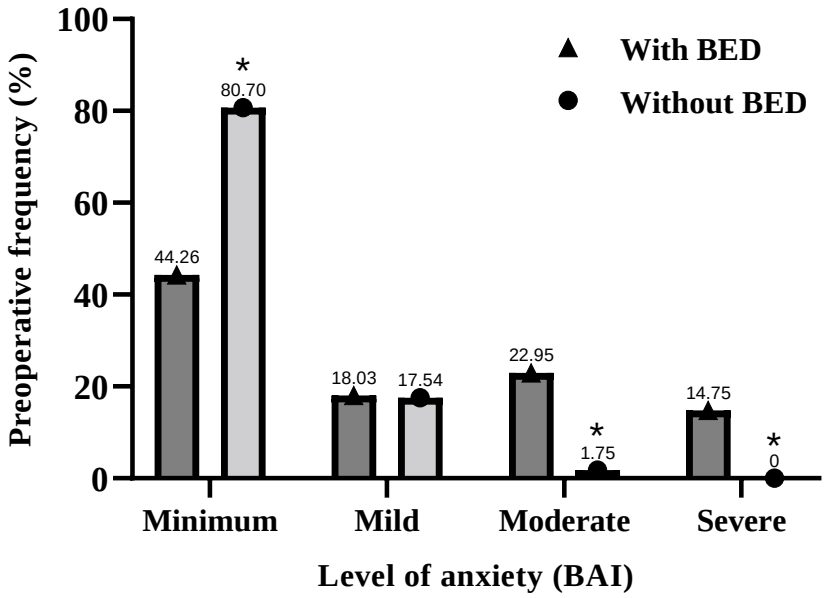

Figure 2. Preoperative anxiety classification and frequency in individuals with or without BED. Fisher's exact test or X^2; * $p < 0.05$ regarding the group with BED; gross and p values described in Table 3.

However, our study has a few limitations. One is related to the sample size. Still, it is a problem reported in the literature, as many patients who undergo bariatric surgery lose follow-up in the first postoperative years. Several studies have shown increasingly lower adherence rates to scheduled postoperative appointments, with 50% in the first year, 30% in 2 years, and <10% in 10 years [32–35]. Another limitation is the no revaluation of BED, depression, and anxiety throughout the postoperative period, which limited our association with anthropometric data throughout this period. However, in addition to BED being common in preoperative patients with obesity, this eating disorder can reappear in the postoperative period and contribute to reducing the effects of bariatric surgery [36]. Despite the physical limitations of surgery on the stomach capacity and food intolerances developed during the postoperative period, binge eating is not always eliminated. In the short term, binge eating episodes can decrease or even be eliminated; however, some long-term studies report a considerable number of binge eating episodes after bariatric surgery, especially if they were already present before surgery [37,38].

On the other hand, the weight gain and increased BMI identified in patients with BED in the late postoperative period suggested the recurrence of this disorder, which could be associated with symptoms of anxiety and depression. Based on this, additional studies are needed to provide more precise answers about long-term weight maintenance and the influence of BED, depression, and anxiety throughout the postoperative period. Furthermore, since a wide variety of psychiatric disorders are present in most patients affected by BED [5], future studies need to investigate the possible mediating factors of these interrelationships, especially in the context of obesity.

In addition, the clinical management of patients diagnosed with BED in the preoperative period of bariatric surgery must be more precise and must occur throughout the postoperative period, as it can be a determining factor in weight regain [36,39]. Sessions of psychotherapy, structured self-help treatment, neuropsychological assessment, and pharmacotherapy for patients with BED have been suggested throughout the postoperative period [40,41].

5. Conclusions

Patients with obesity and BED had more intense symptoms of depression and anxiety in the preoperative period of bariatric surgery. In addition, patients who were identified

with BED in the preoperative period showed weight gain and increased BMI in the late postoperative period of bariatric surgery, suggesting a possible recurrence of this disorder and a potential association with symptoms of depression and anxiety. Given the numerous determining factors for weight regain after bariatric surgery, the importance of more excellent monitoring of these patients stands out, especially regarding mental health. In addition, more studies are needed to investigate the interrelationship between psychiatric disorders and weight regain during the postoperative period of bariatric surgery.

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