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Anxiety level, income and psychological monitoring can influence the recurrence of body weight in women submitted to bariatric surgery

O nível de ansiedade, a renda e o acompanhamento psicológico podem influenciar na recorrência de peso corporal em mulheres submetidas a cirurgia bariátrica

Abstract

Introduction: The improvement in anxiety symptoms after bariatric surgery may not remain stable in the long term, favoring the adoption of dysfunctional eating behaviors. *Objective:* To test the correlation between anxiety level and weight recurrence in women in the late postoperative period of bariatric and metabolic surgery. *Methods:* Fifty adult women with at least 24 months after bariatric and metabolic surgery were evaluated. Sociodemographic data (age, income and level of education) and psychological monitoring were collected. Anthropometric data (weight and height) were measured. To assess the level of anxiety symptoms, the Beck Anxiety Inventory was used. *Results:* A mean age of 40.9±11.4 years was found. All had moderate to severe anxiety symptoms. Those who were without psychological support had higher body weight (p=0.049) and greater recurrence of weight (p=0.040). There was a positive correlation between the anxiety score and body weight recurrence, and a negative correlation between the anxiety score and family income. In the linear regression model, the correlation between anxiety score and weight recurrence (B=0.276; CI 0.003; 0.594; p=0.048) and income (B=-0.310; CI -0.004; 0.000; p=0.027) remained significant. However, when adding the variable "surgery time", there was a loss of significance between anxiety and weight recurrence (B=0.270; CI -0.040; -0.624; p=0.083), but the correlation with income was maintained (B=-0.310; CI -0.004; -0.000; p=0.029). *Conclusions:* We emphasize the importance of financial support in the postoperative period, due to treatment costs, in addition to maintaining monitoring with the multidisciplinary team in the long term.

Keywords: Anxiety. Bariatric surgery. Body weight changes.

Resumo

Introdução: A melhora nos sintomas de ansiedade após a cirurgia bariátrica pode não permanecer estável em longo prazo, favorecendo a adoção de comportamentos alimentares disfuncionais. *Objetivo:* Testar a correlação entre o nível de ansiedade e a recorrência de peso em mulheres no pós-operatório tardio de cirurgia bariátrica e metabólica. *Métodos:* Foram avaliadas 50 mulheres adultas com no mínimo 24 meses após a cirurgia bariátrica e metabólica. Foram coletados dados sociodemográficos (idade, renda e nível de escolaridade) e de acompanhamento psicológico. Foram aferidos dados antropométricos (peso e altura). Para avaliar o nível de sintomas de ansiedade, foi utilizado o Inventário de Beck. *Resultados:* Foi encontrada média de idade de 40,9±11,4 anos. Todas apresentavam sintomas de ansiedade moderados a graves. Aquelas que estavam sem acompanhamento psicológico apresentavam maior peso corporal (p=0,049) e maior recorrência de peso (p=0,040). Observou-se correlação positiva entre o escore de

ansiedade e a recorrência de peso, e correlação negativa entre o escore de ansiedade e a renda familiar. No modelo de regressão linear, a correlação entre o escore de ansiedade com a recorrência de peso (*B*=0,276; IC 0,003;0,594; p=0,048) e a renda (*B*=-0,310; IC -0,004;0,000; p=0,027) permaneceu significativa. Contudo, ao adicionar a variável "tempo de cirurgia", observou-se perda de significância entre ansiedade e recorrência de peso (*B*=0,270; IC -0,040; -0,624; p=0,083), mas manteve-se a correlação com a renda (*B*=-0,310; IC -0,004;-0,000; p=0,029). *Conclusões*: Ressalta-se a importância de suporte financeiro no pós-operatório, pelos custos com o tratamento, além de manter o acompanhamento com a equipe multiprofissional em longo prazo.

Palavras-chave: Ansiedade. Cirurgia Bariátrica. Alterações do Peso Corporal

INTRODUCTION

Bariatric surgery is indicated as an effective therapy for individuals with a body mass index (BMI) ≥35 kg/m², regardless of the presence, absence or severity of comorbidities; and for individuals with metabolic disease and a body mass index of 30-34.9 kg/m².[1] This procedure promotes adequate reduction of body weight, but there are indications that, mainly after two years of surgery, there may be a recurrence of significant body weight.[2]

According to El Ansari and Elhag,[3] there are several studies in the literature with different cutoff points to consider recurrence of body weight, the most used being the cutoff point greater than 15% in relation to the Nadir weight.[4-7]

Regarding anxiety, Amiri and Behnezhad [8] observed a higher frequency in people with obesity and overweight compared to people with normal weight. After the surgical procedure, the anxiety symptoms associated with severe obesity may decrease, pointing to significant improvements in the first 24 months.[9,10] However, these changes may not remain stable after 24 months, when there are indicators of worsening and of return in increased levels. [11-13]

The presence of anxiety symptoms is also associated with the recurrence of body weight in the long term in these individuals.[11] In the study by Kikuchi et al.,[14] the authors suggest the hypothesis that, with the stabilization or recovery of body weight, the symptoms of anxiety may (re)appear, although a cause and effect relationship between anxiety symptoms and body weight recurrence cannot be established.

In addition, patients with changes in eating behavior may be more susceptible to the development of anxiety symptoms.[11,13,15] Thus, Ribeiro et al.[13] used the Beck Anxiety Inventory (BAI) instrument in order to assess the level of anxiety, and the Binge Eating Scale, in patients before surgery (T0), at 23 months after surgery (T1), at 59 months after surgery (T2) and at 60 months after surgery (T3). They found that there was an improvement in symptoms related to anxiety and binge eating in the first 23 months after surgery. However, in T2 and T3, there was an increase in these indicators.[13]

The presence of problematic eating behaviors and concern about weight and body shape are also significantly and positively correlated with higher levels of anxiety, depression and stress in individuals after bariatric surgery.[16] Individuals undergoing bariatric surgery, with an altered eating behavior profile associated with body weight recurrence, have a greater presence of emotional eating when compared to the group of patients who did not have recurrence, and those with recurrence were more vulnerable to eating when they were anxious.[15]

Thus, investigating factors related to anxiety and body weight recurrence are extremely relevant. Moreover, existing studies are still poorly understood, due to the fact that most assess the level of anxiety associated with the level of depression. Therefore, the present study aimed to evaluate the correlation between the level of anxiety and body weight recurrence in women undergoing bariatric surgery.

METHODS

Study type

Cross-sectional, descriptive and analytical study, carried out with adult women who underwent bariatric surgery at least 24 months ago in data collection period. Data collection was carried out from August 2018 to March 2020.

Participants

The study included 50 women, aged between 18 and 59, who had undergone bariatric surgery at least 24 months, through the surgical techniques of Gastric Bypass or Sleeve and who agreed to participate in the research by signing the Free and Informed Consent Form (FICF). Of the total number of participants, 22 (44.0%) underwent surgery through SUS and 28 (56.0%) through the supplementary network (health plan).

Women who became pregnant after surgery, who used medications that could change their anxiety level or body weight, and who lived outside the metropolitan region of Belém-PA and could not attend the research evaluation stages were excluded from the study.

Non-probabilistic convenience sampling was performed. The participants were invited by telephone contact by an extension project, linked to a public university in Belém, Pará, Brazil, which performs nutritional monitoring of patients after bariatric surgery.

It is important to highlight that the study included only women, as there were only three males in the sample. Because of this, knowing that body composition and energy expenditure are different between genders, and one of the variables studied was body weight recurrence, gender was homogenized in order to avoid methodological bias.

Sociodemographic and clinical data

A form was used to collect information regarding age, income, education level, date of surgery, initial pre-surgical weight and Nadir weight.

Anthropometric assessment

The anthropometric assessment consisted of measuring weight and height. Body weight was measured using a Welmyr© platform scale, with a capacity of 150 kg, and a stadiometer attached (200 cm, 1 mm precision), which was used to measure height. For the evaluation, the patients were barefoot and wearing light clothing. From the measured weight and height, the body mass index ($BMI = Weight/Height^2$) was calculated, obtaining the classification of nutritional status recommended by the World Health Organization.[17] Pre and post-surgical weight values were also evaluated, considering the weight in the first pre-operative appointment, the weight in the week after the surgery, and the Nadir weight.

The ideal weight was calculated from the Metropolitan Life Foundation table (1983), as suggested by the Brazilian Consensus of Bariatric Surgery,[18] as well as for the calculation and evaluation of the percentage of excess weight loss (%EWL). The calculation of the body weight recurrence percentage (%WR) was based on the difference between the current weight and the Nadir weight, considering a significant body weight recurrence from 15%.[3]

Assessment of anxiety symptoms

Anxiety level analysis was estimated using the (BAI), translated and validated for Brazil.[19] BAI is a self-report instrument consisting of 21 items with descriptive statements of anxiety symptoms. The BAI reliability test showed a coefficient considered excellent (α=0.92) in groups of patients with obesity. The instrument's items are evaluated by the participant on a scale with four response options: 0- absolutely not; 1- mildly: it didn't bother me much; 2- moderately: it was very unpleasant, but I could bear it; and 3- severely: hard to

bear. The score was performed by adding the individual scores, which vary from 0 to 63. Anxiety symptoms were classified as: minimum level - scores from 0 to 10; mild level - scores from 11 to 19; moderate level - scores from 20 to 30; and severe level - scores from 31 to 63.

Psychological monitoring

Patients were asked about regular psychological monitoring after surgery. Regular psychological monitoring was considered when the patient reported having had appointments with a psychologist in the last three months, with a maximum interval of 15 days.

Ethical aspects

This research was approved by the Research Ethics Committee of the Health Sciences Institute of the Federal University of Pará, and is part of the research project "Effects of three types of intervention on the nutritional profile, eating behavior and quality of life of patients with body weight recurrence after 24 months of gastric bypass". It was registered under opinion N. 3,329,834 and complied with the legal requirements of Resolution 466/2012, of the National Health Council. All participants signed the Free and Informed Consent Form.

Statistical analysis

For descriptive statistics, data were expressed using measures of central tendency and dispersion. Statistical tests were chosen according to the classification of variables and sample distribution. The t-test for independent samples was performed to compare the level of anxiety and the anthropometric profile according to adherence or not to psychological monitoring. Pearson's correlation test was used to test the correlation between anxiety score, body weight recurrence and sociodemographic data. The variables that presented statistically significant correlation in the bivariate analysis were inserted in the linear regression model, in which the anxiety score was used as the dependent variable. In model 1, the correlation with recurrence of body weight and income was tested; and in model 2, the duration of surgery was added as an independent variable to test whether this variable influenced such correlation. The Statistical Package for Social Science program version 24.0 was used, considering the statistical significance level of $p<0.05$.

RESULTS

Fifty women with a mean age of 40.9±11.4 years were evaluated. As for education, there was an average of 14.5±2.5 years of study, and 56.0% had no partner (n= 28). The average income observed was R$3052.8±1755.9, equivalent to 2 to 3 minimum wages. As for the surgical technique, 68% (n=34) of the participants underwent gastric bypass and 32% (n=16) sleeve, with an average surgery time of 61.9±47.18 months (Table 1).

Table 1. Sociodemographic and nutritional profile, anxiety level and psychological monitoring of women with more than 24 months of bariatric surgery (n=50). Belém, PA, 2020.

Variables	Mean ± DP / n	Interval / %
Age (years)	40.9± 11.4	21 – 59
Marital status	-	-
No partner	28	56.0
With partner	22	44,0
Study years	14.5± 2.5	6 – 18
Income (*reais*)	3052.8± 1755.9	954 – 11448
Surgical technique	-	-
Gastric bypass	34	68.0
Sleeve	16	32.0
Surgery time (months)	61.9±47.18	24-204
Body mass index (kg/m^2)	29.7±5.4	20.8 - 43.7
Body mass index (kg/m^2) (pre-operatory)	44.04±6.60	32.9-57.5
Excess weight loss (%)	75.6±28.8	24.1 - 137.5
Body weight recurrence (kg)	11.8±10.2	0.0 - 54.3
Body weight recurrence (%)	16.1±14.5	0.0 - 81.0
Anxiety level		
Minimum	0	0
Mild	0	0
Moderate	18	36,0
Severe	32	64,0
Psychological monitoring		
Yes	23	46
No	27	56

SD = standard deviation; Interval = minimum and maximum values found.

Regarding anthropometric parameters (Table 1), a mean BMI of 29.7±5.4 kg/m2 was observed, characterizing overweight, and a mean preoperative BMI of 44.04±6.60 kg/m2. The %EWL observed was 75.6±28.8%, and the mean body weight recurrence was 11.8±10.2kg and 16.1±14.5%, with significant recurrence observed in 60% (n=30) of the sample.

As for the characterization of the participants' anxiety level, it is observed that most were classified as severe (n=32; 64%), followed by moderate (n=18; 36%). Regarding psychological monitoring, 56% (n=27) of the participants did not have it (Table 1).

Table 2 shows the characterization of the level of anxiety and anthropometry according to the presence or absence of psychological support. It was observed that the group that did not undergo psychological monitoring had higher body weight (82.2±19.5 kg; p=0.049) and greater body weight recurrence (14.5±11.7kg; p=0.040; 29.3 ±20.7%; p=0.010) (Table 2).

Table 2. Level of anxiety and anthropometry according to the presence or absence of psychological monitoring in women with more than 24 months of bariatric surgery (n=50). Belém, PA, 2020.

Variables	Psychological monitoring		p-value *
	No (n=27)	Yes (n=23)	
Anxiety score	35.1±9.8	36.6±13.0	0.653
Surgery time (months)	71.1±54.3	51.2±35.4	0.138
Current weight (kg)	82.2±19.5	73.6±11.5	**0.049**
Body mass index (kg/m^2)	30.9±6.0	28.4±4.4	0.114
Excess weight loss (%)	73.4±25.6	78.1±32.6	0.570
Body weight recurrence (kg)	14.5±11.7	8.6±7.0	**0.040**
Body weight recurrence (%)	29.3±20.7	16.4±12.5	**0.010**

* T Test for independent samples.

In the bivariate correlation test (Table 3), a correlation was found between the score of anxiety symptoms and body weight recurrence (r^2= 0.239; p=0.047) and income (r^2=-0.253; p=0.038), that is, the higher the anxiety score, the greater the recurrence of weight and the lower the income. There was also an inverse correlation between psychological monitoring and body weight recurrence (r^2= -0.284; p=0.023), so that women who did not undergo psychological monitoring had greater body weight recurrence. And yet, a direct correlation between surgery time and recurrence (r^2=0.528; p<0.001), that is, recurrence increases as time elapsed after surgery increases.

Table 3. Factors associated with the level of anxiety and recurrence of body weight in women with more than 24 months of bariatric surgery (n=50). Belém, PA, 2020.

	r^2	p-value*
Anxiety score Body weight recurrence (kg)	0.239	0.047
Anxiety score Income (*reais*)	-0.253	0.038
Body weight recurrence (kg) Psychological monitoring	-0.284	0.023
Body weight recurrence (kg) Surgery time (months)	0.528	<0.0001

* Spearman correlation test

According to the significance shown in the bivariate analysis, the variables were chosen for the linear regression model shown in Table 4. In this analysis, the anxiety score was used as the dependent variable, and as the independent variable the body weight recurrence (B= 0.276; CI 0.003; 0.594; p=0.048) and income (B= -0.310; CI -0.004; 0.000; p=0.027), which maintained a significant correlation (Model 1) (Table 4).

Table 4. Regression analysis between anxiety score, income, body weight recurrence and surgery time of women with more than 24 months of bariatric surgery (n=50). Belém, PA, 2020.

	B	CI 95% (min; max)	p-value*
Model 1			
Body weight recurrence (kg)	0.276	0.003; 0.594	**0.048**
Income (*reais*)	-0.310	-0.004; 0.000	**0.027**
Model 2			
Body weight recurrence (kg)	0.270	-0.040 - 0.624	0.083
Income (*reais*)	-0.310	-0.004 - 0.000	**0.029**
Surgery time (months)	0.013	-0.068 - 0.074	0.930

Notes: *Model of linear regression; Dependent variable: anxiety score; co-variable: body weight recurrence (kg); income (*reais*); surgery time (months). B = regression coefficient.

However, when the variable time of surgery was added, there was a loss of significance for the correlation between anxiety and body weight recurrence, but the correlation with income was maintained (B= -0.310; CI -0.004; -0.000; p=0.029) (Model 2). That is, the correlation between anxiety and body weight recurrence depends on the time of surgery, but the correlation of anxiety with income is independent of it (Table 4).

DISCUSSION

In the present study, it was possible to evaluate the correlation between the level of anxiety and body weight recurrence in women in the late postoperative period of bariatric surgery. The sociodemographic characterization was similar to that observed in other studies. [3,20,21] Data from the International Federation for Surgery of Obesity and Metabolic Diseases[22] indicate that patients undergoing bariatric surgery have a mean age of 43 years.

As for the level of education, the average study time was close to that found by Pavan et al.,[23] in which the average study time was 12 years. It is important to note that lower levels of education can lead to worse postoperative weight loss results, as individuals may have difficulty understanding the dietary changes necessary for the success of the surgery.[24] Furthermore, the frequency of obesity decreased with the increase in the level of education for women.[25] This suggests that sociodemographic aspects, such as the level of education, may be associated with weight gain.

Regarding family income, it was similar to that observed by Oliveira and Pinto[25], in which the maximum income among the assessed patients was 2 to 4 minimum wages. It is important to take into account the socioeconomic conditions of patients, because in the study by Blaudet al.,[26] the authors evaluated the situation of food insecurity, social, economic and anthropometric indicators in candidates for bariatric surgery, and observed that low *per capita* income stands out among the main factors associated with the risk of food insecurity and is directly related to the acquisition of food.

Regarding the surgical technique, there is a higher prevalence of the use of the gastric bypass, similar to the results of Bardal, Ceccatto and Mezzomo.[27] According to Data from the International Federation for Surgery of Obesity and Metabolic Diseases (IFSO), gastric bypass is the most practiced bariatric technique in Brazil (76.6%), followed by sleeve.[22]

As for the anthropometric profile, it was observed in the present study BMI of overweight in the borderline range for grade I obesity, as observed in studies. 27 It is noteworthy that this finding highlights the need to maintain multidisciplinary monitoring in the long term on a regular basis, in order to prevent associated clinical complications.

Regarding the average EWL, a success in weight loss was observed, since one of the criteria for evaluating surgical success is a (%EWL) equal to or greater than 50%[2] Similar data were found in the literature when analyzing patients with more than 24 months after surgery, with 78.5% of EWL being observed.[27]

On the other hand, the average body weight recurrence of the participants in this study was 16.1%. Recurrence of significant weight is considered when the result is greater than 15%.[16] Similar means of recurrence of weight equal to 11.3 ± 8.8% were observed in the study by Masood et al.[28] It is important to emphasize the importance of weight maintenance, in order to avoid compromising of the results achieved and the risk of recurrence of comorbidities.[28]

Regarding the level of anxiety, all study participants had a moderate or severe degree. Ribeiro et al.,[13] in their study, when using the same instrument in their analysis, found that women had 13.6% moderate level of anxiety.13 It is assumed that the results related to weight regain, feeling of dissatisfaction with the body image and changes in eating behavior after surgery influence anxiety level indicators.[11,13]

As for anthropometry, according to the presence or absence of psychological monitoring, it was observed in this study that women who were without psychological support had higher body weight. Postoperative psychological monitoring is part of the fundamental multidisciplinary care to be maintained.[29] Such psychological interventions contribute, in addition to the patient's demands and adaptation after surgery, to changes in eating patterns, and are directly related to the prevention and evaluation of possible psychological problems, such as anxiety.[29]

Kalarchian and Marcus[30] found, however, that there is no assiduity related to psychological monitoring in the bariatric postoperative period. In the study by Ristanto and Caltabiano,[29] patients who attended more psychosocial counseling appointments after surgery had better physical and mental well-being results.

Regarding correlations, it was observed that the higher the anxiety score, the greater the recurrence of body weight and the lower the income. After linear regression analysis, it was observed that the correlation between anxiety and body weight recurrence depends on the surgery time, but the correlation of anxiety with income is independent of it.

Other studies with patients undergoing bariatric surgery also found a correlation between the severity of anxiety symptoms and weight recovery,[11,31] and increased levels of anxiety symptoms were observed from 24 months after surgery.[11,31,13] This suggests that when weight loss begins to decrease after 24 months, there is a relation between a decrease in feelings of satisfaction and an increase in anxiety scores.[13] The findings reinforce the need to maintain long-term multidisciplinary monitoring after bariatric surgery.

Regarding the correlation between income and body weight recurrence, in a study that evaluated the impact of low socioeconomic status in the long term, the authors observed less weight loss in low-income patients, which can be considered a potential barrier to the weight loss expected results due to access to postoperative care.[32] However, the factors that affect this access are not fully understood and elucidated in the literature. Thus the suggested hypothesis is that low family income may hinder continuous and long-term treatment, therefore affecting the results related to maintenance of lost weight and quality of life.

In addition, a correlation was observed between psychological monitoring and body weight recurrence, so that not having continued psychological monitoring seems to be correlated with greater weight recurrence

in the long term. In the literature, it is also highlighted that patients with weight regain had a lower number of psychological appointments, when compared to those with stable weight, a factor that can influence weight recurrence and compromise surgical success.[2]

As for the correlation observed between surgery time and body weight recurrence, Athanasiadis et al.[2] mention in their systematic review that surgery time is related to weight recurrence. In a study in which the authors evaluated individual experiences of patients with body weight recurrence two years after bariatric surgery (gastric bypass), it was observed that some participants mentioned that they did not know they could have weight recurrence; others reported that they expected to recover small amounts over a long period or that recurrence might only happen to other people but not to themselves.[17] Therefore, the need for long-term multidisciplinary monitoring is emphasized, in order to clarify doubts and beliefs about the clinical evolution after surgery, as well as to enhance adherence to treatment.

The present study has as limitations the sample size and the difference in surgery time of the patients, the latter being controlled by statistical analysis. Nonetheless, it is a relevant study, since it assessed the correlation between the level of anxiety and body weight recurrence in women in the late postoperative period of bariatric surgery, and made it possible to identify that family income can influence the level of anxiety. Therefore, new studies are suggested that separately assess the factors associated with anxiety symptoms after bariatric surgery, as well as intervention studies with psychological monitoring that investigate the correlation between the level of anxiety, body weight recurrence, lifestyle and eating behavior.

CONCLUSION

It was observed that most participants were classified as having a severe level of anxiety, followed by a moderate level, and that there was a correlation between the level of anxiety and body weight recurrence; that is, the higher the levels of anxiety in the participants, the greater the recurrence of body weight. It is also noteworthy that the level of anxiety also correlated with family income, and the participants who did not undergo psychological counseling had higher body weight and greater body weight recurrence.

REFERENCES

1. Eisenberg D, Scott A, Shikora MD, Edo A, Aminian A, Angrisani L, Cohen R, et al. 2022 American Society for Metabolic and Bariatric Surgery (ASMBS) and International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO): Indications for Metabolic and Bariatric Surgery. Surgery for Obesity and Related Diseases, 2022. https://doi.org/10.1016/j.soard.2022.08.013

2. Athanasiadis DI, Martin A, Kapsampelis P, Monfared S, Stefanidis D. Factors associated with weight regain post-bariatric surgery: a systematic review. Surg Endosc . 2021 Mar;35(8):4069-4084 http://dx.doi.org/10.1007/s00464-021-08329-w.

3. El Ansaril W; Elhag W. Weight regain and insufficient weight loss after bariatric surgery: definitions, prevalence, mechanisms, predictors, prevention and management strategies, and knowledge gaps—a scoping review. Obes Surg. 2021;31(4):1755-1766 http://dx.doi.org/10.1007/s11695-020-05160-5.

4. King WC, Hinerman AS, Belle SH, Wahed AS, Corcoulas AP. Comparison of the performance of common measures of weight regain after bariatric surgery for association with clinical outcomes. JAMA. 2018;320(15):1560–9. https://doi.org/10.1001/jama.2018.14433.

5. Roth AE, Thornley CJ, Blackstone RP. Outcomes in bariatric and metabolic surgery: an updated 5-year review. Curr Obes Rep. 2020;9(3):380–9. https://doi.org/10.1007/s13679-020-00389-8.

6. Amundsen T, Strømmen M, Martins C. Suboptimal weight loss and weight regain after gastric bypass surgery-postoperative status of energy intake, eating behavior, physical activity, and psychometrics. Obes Surg. 2017;27(5):1316–23. https://doi.org/10.1007/s11695-016-2475-7.

7. Bastos ECL, Barbosa EMWG, Soriano GMS, et al. Determinants of weight regain after bariatric surgery. Arq Bras Cir Dig ABCD Braz Arch Dig Surg. 2013;26(Suppl 1):26–32. https://doi.org/10.1590/s0102-67202013000600007.

8. Amiri, S., & Behnezhad, S. (2019). Obesity and anxiety symptoms: a systematic review and meta-analysis. Neuropsychiatr. 2019;33(2):72-89. https://doi.org/10.1007/s40211-019-0302-9.

9. Duarte-Guerra LS, Coêlho BM, Santo MA, Lotufo-Neto F, Wang YP. Morbidity persistence and comorbidity of mood, anxiety, and eating disorders among preoperative bariatric patients. Psychiatry Res. 2017;257:1–6. https://doi.org/10.1016/j.psychres.2017.07.020

10. Gill H, Kang S, Lee Y, Rosenblat JD, Brietzke E, Zuckerman H, et al. The long-term effect of bariatric surgery on depression and anxiety. J Affect Disord. 2019;246(October 2018):886–94. Available from: http://dx.doi.org/10.1016/j.jad.2018.12.113

11. Freire CC, Zanella MT, Segal A, Arasaki CH, Matos MIR, Carneiro G. Associations between binge eating, depressive symptoms and anxiety and weight regain after Roux-en-Y gastric *Bypass* surgery. Eat Weight Disord. 2021;26(1):191–9. https://doi.org/10.1007/s40519-019-00839-w

12. Kalarchian MA, King WC, Devlin MJ, Hinerman A, Marcus MD, Yanovski SZ, et al. Mental disorders and weight change in a prospective study of bariatric surgery patients: 7 years of follow-up. Surg Obes Relat Dis. 2019;15(5):739–48. http://dx.doi.org/10.1016/j.soard.2019.01.008.

13. Ribeiro GAN de A, Giampietro HB, Belarmino LB, Salgado-Júnior W. Depression, anxiety, and binge eating before and after bariatric surgery: problems that remain. ABCD Arq Bras Cir Dig. 2018 Jun 21;31(1):e1356. Available from: http://dx.doi.org/10.1590/0102-672020180001e1356

14. Kikuchi JLD, Carvalhal MM de L, Costa AP da S, Vasconcelos JASB, Paracampo CCP & Gomes DL. Correlation between anxiety symptoms and perceived quality of life in women with more than 24 months of bariatric surgery. Int J Environ Res Public Health. 2022;19 (12):7052. http://dx.doi.org/10.3390/ijerph19127052

15. Jesus AD, Barbosa KBF, Souza MFC de S, Conceição AM dos S. Comportamento alimentar de pacientes de pré e pós-cirurgia bariátrica. Rev Bras Obesidade, Nutr e Emagrecimento. 2018;2(12):588–96.

16. Conceição EM, Mitchell JE, Pinto-Bastos A, Arrojado F, Brandão I, Machado PPP. Stability of problematic eating behaviors and weight loss trajectories after bariatric surgery: a longitudinal observational study. Surg Obes Relat Dis. 2017;13(6):1063–70. http://dx.doi.org/10.1016/j.soard.2016.12.006

17. Who Health Organization. Physical Status: The use and interpretation of anthrometry. J Public Health (Bangkok). 1995 Jun http://link.springer.com/10.1007/s10389-020-01340-w

18. Sociedade Brasileira de Cirurgia Bariátrica e Metabólica (SBCBM). Consenso Bariátrico. 2008;16. Disponível em: https://www.sbcbm.org.br/consenso/

19. Cunha JA. Manual da versão em português das escalas Beck. São Paulo: Casa do Psicólogo. 2001.

20. Lasagni V, Palma R, Ríos B, Vázquez-Velázquez V, Severo L, Malischesqui I, et al. Propuesta de guía para el tratamiento de la reganancia de peso después de cirugía bariátrica. Bariátrica & Metabólica Ibero-Americana. 2018;2318–22.

21. Reichmann MTF, Todeschini S, Setter N, Vilela RM, Radominski RB. Comparison of the dietary intake amongst women in the late postoperative period after Roux-en-Y gastric *Bypass* with the bariatric food pyramidof dietary intake with reference values among women in late postoperative of y-en-roux gastric *Bypass*. Nutr Hosp. 2019;36(3):599–603. http://dx.doi.org/10.20960/nh.2340

22. The International Federation for the Surgery of Obesity and Metabolic Disorders. 5th IFSO Global Registry Report 2019. Ifso. 2019. Available from: https://www.ifso.com/pdf/5th-ifso-global-registry-report-september-2019.pdf

23. Pavan C, Marini M, De Antoni E, Scarpa C, Brambullo T, Bassetto F, et al. Psychological and Psychiatric Traits in Post-bariatric Patients Asking for Body-Contouring Surgery. Aesthet. Plast Surg. 2017;41(1):90–7. http://dx.doi.org/10.1007/s00266-016-0752-4

24. Mahoney ST, Strassle PD, Farrell TM, Duke MC. Does Lower Level of Education and Health Literacy Affect Successful Outcomes in Bariatric Surgery? J Laparoendosc Adv Surg Tech. 2019;29(8):1011–5. http://dx.doi.org/10.1089/lap.2018.0806

25. Oliveira CCA, Pinto SL. Perfil nutricional e perda de peso de pacientes submetidos à cirurgia de *Bypass* gástrico em Y de Roux. Rev Bras Nutr Clin. 2016;31(1):18–22.

26. Blaudt LS, Bento CT, Rosado EL, Carneiro JRI, de Souza, AAP, Magno FCCM. Percepção de insegurança alimentar, perfil socioeconômico e antropométrico em pacientes obesos candidatos à cirurgia bariátrica atendidos em um ambulatório universitário. RBONE-Revista Brasileira de Obesidade, Nutrição e Emagrecimento. 2019;13(80):614-623.

27. Bardal AG, Ceccatto V, Mezzomo TR. Fatores de risco para recidiva de peso no pós-operatório tardio de cirurgia bariátrica. Sci Med (Porto Alegre, Online) . 2016;26(4):24224. http://dx.doi.org/10.15448/1980-6108.2016.4.24224.

28. Masood A, Alsheddi L, Alfayadh L, Bukhari B, Elawad R, Alfadda AA. Dietary and Lifestyle Factors Serve as Predictors of Successful Weight Loss Maintenance Postbariatric Surgery. J Obes. 2019;2019:1–6. Available from: http://dx.doi.org/10.1155/2019/7295978

29. Ristanto A, Caltabiano ML. Psychological Support and Well-being in Post-Bariatric Surgery Patients. Obes Surg. 2019;29(2):739–43. http://dx.doi.org/10.1007/s11695-018-3599-8

30. Kalarchian MA, King WC, Devlin MJ, Hinerman A, Marcus MD, Yanovski SZ, et al. Mental disorders and weight change in a prospective study of bariatric surgery patients: 7 years of follow-up. Surg Obes Relat Dis. 2019;15(5):739–48. http://dx.doi.org/10.1016/j.soard.2019.01.008

31. Carden A, Blum K, Arbaugh CJ, Trickey A, Eisenberg D. Low socioeconomic status is associated with lower weight-loss outcomes 10-years after Roux-en-Y gastric *Bypass*. Surg Endosc. 2019;33(2):454–9. http://dx.doi.org/10.1007/s00464-018-6318-6

32. Da Silva FBL, Gomes DL, Carvalho KMB. Poor diet quality and postoperative time are independent risk factors for weight regain after Roux-en-Y gastric *Bypass*. Nutrition. 2016;32(11–12):1250–3. http://dx.doi.org/10.1016/j.nut.2016.01.018

Contributors

Lima IC, Costa SG, Carvalhal MML, Kikuchi JLD and Gomes DL participated in the conception and design; data analysis and interpretation; Lima IC, Costa SG, Carvalhal MML, Kikuchi JLD, Reis CC and Gomes DL participated in the review and final approval.

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