Relationship between eating behavior, quality of life and weight regain in women after bariatric surgery

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Abstract

Purpose

Evaluate the relationship between eating behavior, perception of Quality of Life (QOL) and weight regain in women after 24 months of bariatric surgery.

Methods

Transversal study carried out with 50 adult women. Sociodemographic, anthropometric, eating behavior (Three Factor Eating Questionnaire - TFEQ-21) and perception of QOL (Item Short Form Healthy Survey - SF-36) data were collected.

Results

In 60% (n = 30) there was weight regain (≥ 15%), with a mean weight regain of 23.3% (± 18.4). Emotional eating was the most frequent pattern (p = 0.047) in groups with and without weight regain. Regarding QOL, the functional capacity and limitation due to physical aspects domains had a better perception (p < 0.0001). Women without weight regain showed a better perception of the functional capacity aspects (p = 0.007), limitation due to physical aspects (p = 0.044), social aspects (p = 0.048) and general physical components (p = 0.016). Weight regain was associated with uncontrolled eating habits (p = 0.041) and also had an inverse association with the perception of QOL in physical components (p = 0.008).

Conclusion

Weight regain can damage the perception of QOL, especially physical capacity. Long-term follow-up is essential to evaluate the behavior of people who have undergone BS, in order to prevent weight regain and QOL damage.

Level III - Case-control analytic study.

Introduction

Bariatric surgery (BS) is the most suitable treatment for severe obesity. However, it promotes severe changes in the individual's body, and may extend to psychological difficulties related to physiological and behavioral alterations [1]. It is common to see the effects of weight loss in the first months after surgery, although it is necessary to observe whether there is weight regain in long term, especially after 24 months postoperative [2]. There is no consensus on the proportion of weight regain considered harmful. Some studies use the proportion of 15% in relation to the lowest stable weight achieved after surgery as a weight regain that can bring metabolic damage to the patient [3, 4].

Intrinsic and extrinsic factors can interfere with the maintenance of body weight and lead to this regain, especially after 24 months, factors related to non-adherence to changes in lifestyle, especially in eating
behavior, in addition to psychological aspects and hormonal and metabolic changes [1, 3, 5].

BS also can interfere on Quality of Life (QOL). To evaluate QOL, studies have used the Medical Outcome Study 36 - Item Short Form Healthy Survey (SF-36) [6], which, though not specific for BS, is more complete because it encompasses 8 domains related to QOL [7, 8]. Akkayağlı and Çelik [9], when evaluating QOL in patients who had undergone BS, they observed an increase in the mean scores of all dimensions of the SF-36 in the postoperative period, when compared to the period prior to surgery.

In the study by Jesus et al. [10], a tendency was observed, after 5 years of surgery, of higher scores for emotional eating among patients, being higher among those with weight regain. Another study, conducted only with women with more than 24 months of Roux-en-Y Gastric Bypass (RYGB), found that the higher the emotional eating scores, the lower the Excess Weight Loss (EWL), regardless of surgery time [11].

Engström et al. [12] investigated changes in the perception of food control by comparing the preoperative period with reassessments after 1 and 2 years of surgery, analyzing possible influences on weight loss and QOL. The group with good eating control showed better results in QOL in terms of social and mental health aspects and, after 2 years, showed significant improvement in general aspects of QOL, except in the domain of pain. The group with inadequate eating control showed more dysfunctional eating behaviors both 1 year and 2 years after surgery. However, in this study there was no separation by gender, the participants were super obese (Body Mass Index - BMI > 50 kg/m²), they were evaluated only up to 2 years postoperative and the surgical techniques included RYGB and Biliopancreatic Derivation.

Thus, due to the scarcity of studies using these tools and in a postoperative period longer than 24 months, considering that BS is more performed in women and the types of BS most performed in Brazil, this study aims to test the association between the perception of QOL and the different eating patterns of women, also analyzing whether this relationship is influenced by the occurrence or not of weight regain and the time of surgery.

Methodology

Design and participants

Transversal, descriptive and analytical study, carried out with 50 women, aged between 18 and 59 years old, with a minimum postoperative period of 24 months after BS (RYGB or Sleeve) and who agreed to participate in the research by signing the Informed Consent Form (ICF). Exclusion criteria: having undergone another type of surgery, having become pregnant after surgery, using drugs that could confuse data analysis and living outside the metropolitan region of Belém / PA.

Data collect

Participants were selected through a research and extension project at a university hospital in a public university in the city of Belém, Brazil. Individual interviews were scheduled for data collection, held
between June 2018 and February 2020.

**Anthropometry**

Reported body weight data were collected before surgery. To measure current weight and height, a platform scale with a capacity of 300 kg and a graduation of 0.1 kg was used, with a 200 cm coupled stadiometer (precision of 0.5 cm) from the Welmy® brand. Preoperative BMI (kg/m$^2$), current BMI (kg/m$^2$), % Excess Weight Loss (% EWL), weight regain (kg and %) were calculated. BMI was calculated using the formula: weight (kg) / height (m)$^2$. To calculate the EWL (%), the equation was used: % EWL = Weight loss in the postoperative period (kg) x 100 / preoperative initial weight (kg) - ideal weight (kg), considering surgical success as an overweight loss (%) ≥ 50%. The ideal weight used in this formula was calculated using the method recommended by the Brazilian BS consensus according to the formula: Ideal weight (kg) = 53.975 + [(height in meters − 1.524) x 53.5433]. Weight regain (kg) was calculated from the subtraction: current weight (kg) - lowest stable weight (kg) achieved in the postoperative period, which was later converted into a percentage (%) for analysis of the proportion of weight regain in relation to the lowest stable weight after surgery, being considered significant a regain of ≥ 15%.

**Eating behavior**

The Three Factor Eating Questionnaire (TFEQ-21) was applied, which assesses, through 21 questions, attitudes related to eating behavior in obese adult women and in BS, through three dimensions of eating behavior: emotional eating, cognitive restriction, and uncontrolled eating [13]. Self-reports were identified based on responses to a Likert scale with four options: 1 - totally false; 2 - false most of the time; 3 – true most of the time; 4 - totally true. The score can vary from 0 to 100, and the higher the score, it means that more present is that behavioral pattern in the individual's repertoire.

**Quality of life**

It was used the Item Short Form Healthy Survey (SF-36), translated and validated into Portuguese and which uses 36 questions on various aspects that may be related to perception and QOL related to health. The domains of this instrument are grouped into: Physical Component (PC) (domains of functional capacity, limitation due to physical aspects, pain and vitality); and Emotional Component (EC) (mental health domains, general health status, limitation due to emotional and social aspects). Each category varies from 2 to 10 items and all of them can be summarized in two components: General Score of Physical Components and General Score of Emotional Components. The results are expressed in a score on a scale from 0 to 100, in which 0 corresponds to the worst perception and 100 to the best perception of QOL.

**Ethical aspects**

The research was approved by the Human Research Ethics Committee (opinion No. 2.170.863), complying with the legal requirements of Resolutions 466/12 and 510/16 of the National Health Council. Data collection was only initiated after the ICF participants’ signature.

**Data analysis**
It used the Statistical Package for the Social Sciences (SPSS) software, version 24.0. Descriptive results were expressed in measures of central tendency and dispersion. The Kolmogorov-Smirnov normality test was applied. For comparison between groups, the Mann-Whitney test was performed and for intra-group comparison, the Kruskal-Wallis test was applied. In these tests, the sample was divided into two groups based on the presence and absence of weight regain. The covariate correlations were performed using the Spearman correlation test and those variables that showed statistical significance in the covariate analysis were inserted in a multiple linear regression model (statistical significance p < 0.05).

Results

Fifty women participated, aged between 21 and 59 years old, with an average of 40 (± 11.4) years old, the majority single (56.0%), with 14 years (± 2.5) of study. The average income was R$ 3052.80 (± 1755.90), that is, about three current Brazilian minimum wages (2021). About 68% of the women underwent RYGB and 32% sleeve, 60% had significant weight regain, with an average of 23.3% (± 18.4). The postoperative period was on average 62 months (61.9 ± 47.2), the mean BMI in the preoperative period was 44.0 kg/m² (± 6.6), and the current average BMI was 29.7 kg/m² (± 5.4). The average excess weight loss was 75.6% (± 28.8).

It was observed that the emotional eating behavior was the most frequent (p=0.047). The domains with the best perception were the functional capacity and limitation to physical aspects, demonstrating a perception of good quality in aspects related to movement and physical activity. The worst perceptions were in the domains of pain and vitality, demonstrating pain during daily activities and low vigor and motivation (p <0.0001) (Table 1).

Table 1- Characterization of eating behavior and perception of quality of life in women with more than 24 months after bariatric surgery.
|                          | Mean ± SD | Range          | p-value*       |
|--------------------------|-----------|----------------|----------------|
|                          | Minimum - maximum |                 |                |
| **Eating behavior**      |           |                |                |
| Cognitive restriction    | 48.7±19.8 | 0.0-83.0       | 0.047          |
| Emotional eating         | 57.5±28.9 | 0.0-100.0      |                |
| Uncontrolled eating      | 46.9±26.5 | 4.0-100.0      |                |
| **QOL**                  |           |                |                |
| Functional capacity      | 78.8±18.1 | 25.0–100.0     | <0.0001        |
| Limitation due to physical aspects | 72.5±37.2 | 0.0-100.0 |             |
| Pain                     | 56.6±24.5 | 0.0-100.0      |                |
| General health status    | 60.3±15.8 | 25.0-87.0      |                |
| Vitality                 | 57.3±20.7 | 0.0-90.0       |                |
| Social aspects           | 68.5±25.9 | 12.5-100.0     |                |
| Limitation due to emotional aspects | 67.3±42.9 | 0.0-100.0 |             |
| Mental Health            | 68.0±17.0 | 28.0-100.0     |                |

* Kruskal-Wallis / SD test = standard deviation

In the group without weight regain, the emotional eating score was significantly higher (p = 0.048).
Nevertheless, there was no significant difference between groups when comparing the domains of eating behavior (Table 2).

In both groups, the functional capacity domain was the one that stood out the most with a significantly higher score (p = 0.0001). In the comparison between the groups, statistically significant differences were found in the scores on functional capacity (p = 0.007), limitation by physical aspects (p = 0.044) and social aspects (p = 0.048) and general physical QOL component (p = 0.016), suggesting that weight regain may be a factor that contributes to a worse perception of QOL (Table 2).

In the covariate analysis, it was found the following significant direct associations with the time of surgery: current weight ($r^2 = 0.310; p = 0.014$) and weight regain ($r^2 = 0.528; p <0.0001$). Inversely correlated are: excess weight loss ($r^2 = -0.238; p = 0.048$), functional capacity ($r^2 = -0.424; p = 0.001$) and limitation due to physical aspects ($r^2 = -0.274; p = 0.027$).

Regarding the excess weight loss, the direct correlation is with QOL domains: functional capacity ($r^2 = 0.272; p = 0.028$), limitation due to physical aspects ($r^2 = 0.345; p = 0.007$), vitality ($r^2 = 0.246; p = 0.043$) and limitation due to emotional aspects ($r^2 = 0.271; p = 0.028$). When analyzing the variables inversely
correlated with weight regain, were observed functional capacity ($r^2 = -0.371; p = 0.004$), limitation due to physical aspects ($r^2 = -0.424; p = 0.001$), pain ($r^2 = -0.254; p = 0.038$) and social aspects ($r^2 = -0.255; p = 0.037$).

The scores in the domain of uncontrolled eating had a direct correlation with weight regain ($r^2 = 0.272; p = 0.028$) and current weight ($r^2 = 0.263; p = 0.032$); in addition, an inverse correlation was observed with the scores of functional capacity ($r^2 = -0.356; p = 0.006$), social aspects ($r^2 = -0.259; p = 0.035$), general physical component ($r^2 = -0.272; p = 0.028$) and general emotional component ($r^2 = -0.270; p = 0.029$) of QOL.

Table 2 - Eating behavior and QOL according to the presence or absence of weight regain in women with more than 24 months of BS.
Weight regain (n=50)  

| Eating behavior          | Mean ± SD | Median (P5-P95)     | Mean ± SD | Median (P5-P95)     | p-value* |
|---------------------------|-----------|---------------------|-----------|---------------------|----------|
| Absent (n=20)            | Present (n=30) |
| Cognitive restriction    | 53.4±19.9 | 58.5 (44.1-62.7)    | 45.6±19.5 | 47.2 (38.3-52.9)    | 0.093    |
| Emotional eating         | 58.4±27.5 | 67.0 (45.5-71.2)    | 56.9±30.3 | 53.0 (45.6-68.2)    | 0.984    |
| Uncontrolled eating      | 39.2±26.0 | 26.5 (27.0-51.3)    | 52.0±26.0 | 50.0 (42.3-61.7)    | 0.069    |
| **p-value**              | 0.048     |                     | 0.393     |                     |          |

| QOL                      | Mean ± SD | Median (P5-P95)     | Mean ± SD | Median (P5-P95)     | p-value* |
|--------------------------|-----------|---------------------|-----------|---------------------|----------|
| General score of physical components | 74.0±11.7 | 76.1 (68.5-79.5)    | 62.4±18.1 | 68.9 (55.7-69.2)    | 0.016    |
| Functional capacity      | 86.5±14.8 | 87.5 (79.6-93.4)    | 73.7±18.5 | 75.0 (66.8-80.6)    | 0.007    |
| Limitation due to physical aspects | 83.8±32.7 | 100.0 (68.4-99.1)   | 65.0±38.6 | 75.0 (50.6-79.4)    | 0.044    |
| Pain                     | 61.7±21.5 | 62.0 (51.7-71.7)    | 53.2±26.1 | 51.0 (43.5-63.0)    | 0.251    |
| General health status    | 64.1±13.4 | 67.0 (57.8-70.3)    | 57.8±17.0 | 64.5 (51.4-64.2)    | 0.205    |
| General score of emotional components | 68.6±18.6 | 76.0 (59.9-77.3)    | 63.1±20.8 | 66.9 (55.3-70.9)    | 0.332    |
| Vitality                 | 61.8±15.8 | 61.8 (54.3-69.2)    | 54.3±23.1 | 57.5 (45.7-63.0)    | 0.296    |
| Social aspects           | 76.3±26.3 | 87.5 (64.0-88.5)    | 63.3±24.8 | 62.5 (54.1-72.6)    | 0.048    |
| Limitation due to emotional aspects | 71.1±39.4 | 100.0 (53.2-90.1)   | 64.4±45.4 | 100.0 (47.5-81.4)   | 0.608    |
| Mental health            | 64.6±16.5 | 64.0 (56.9-72.3)    | 70.3±17.3 | 72.0 (63.8-76.7)    | 0.218    |
| **p-value**              | 0.0001    |                     | 0.0001    |                     |          |

* Mann-Whitney test ** Kruskal-Wallis test

There was correlation between weight regain and the domain of uncontrolled eating (p = 0.045), which remained significant in linear regression, in addition to show the statistical significance with uncontrolled
eating (p = 0.041) when included the time of surgery in a second model, suggesting that this correlation remains independent of the time of surgery (Table 3).

Table 3 - Correlation between weight regain and uncontrolled eating behavior in women with more than 24 months after BS.

|               | B  | IC 95%               | p-value |
|---------------|----|----------------------|---------|
|               |    | (minimum, maximum)   |         |
| **Model 1**   |    |                      |         |
| Weight regain | 0.285 | 0.017, 1.467        | 0.045   |
| **Model 2**   |    |                      |         |
| Weight regain | 0.326 | 0.038, 1.659        | 0.041   |
| Time after surgery | -0.094 | -0.228, 0.122   | 0.546   |

Notes: Linear regression; Dependent variable: uncontrolled eating behavior; covariate: Weight regain (kg) and time after surgery (months). B = Regression coefficient.

A second linear regression points out that the weight regain was directly correlated with the physical QOL component (p = 0.001). When the variable time of surgery was included in model 2, the correlation found in model 1 maintained statistical significance (p = 0.008), however the time of surgery was not significant in QOL (p = 0.528) (Table 4).

Table 4 - Correlation between QOL and weight regain in women with more than 24 months after BS.

| Physical components of QOL | B     | IC 95%               | p-value |
|----------------------------|-------|----------------------|---------|
|                            |       | (minimum, maximum)   |         |
| **Model 1**                |       |                      |         |
| Weight regain              | -0.443 | -1.156, -0.300      | 0.001   |
| **Model 2**                |       |                      |         |
| Weight regain              | -0.403 | -1.141, -0.184      | 0.008   |
| Time after surgery         | -0.092 | -0.136, 0.070       | 0.528   |

Notes: Linear regression; Dependent variable: physical components of QOL; Co-variables: Weight regain (kg) and time after surgery (months). B = regression coefficient.

It was evaluated whether there was a difference in the profile of eating pattern and QOL score of the participants according to the surgical technique performed, however, no statistically significant difference was found.
Discussion

The results pointed out that eating behavior, QOL and weight regain were interconnected in the women studied. Weight stabilization is expected to occur between 12 and 18 months after surgery, and it is natural that there is a recovery of part of the lost weight [14, 15]. However, more than half of the sample presented weight regain, with the average proportion of this regain greater than 20%, which is considered significant in Brazilian studies [5, 16].

Emotional eating was the most present and it was also the highest score in the group without regain. When comparing the score of eating patterns between groups based on weight regain, there was no difference between them, as showed in the study by Silva et al. [5], performed with 80 patients after 24 months of RYGB. A hypothesis that needs to be tested in future studies is the possibility of cognitive restriction could do the individual vulnerable to emotional eating behavior [13], which demonstrates the relationship between the domains, in which one dysfunctional behavior can lead to another, explaining even the highest cognitive restriction scores and emotional eating found in the group with no weight regain in the present study.

There was a significant correlation between weight regain and uncontrolled eating. Some studies did not find these results [17, 18], though, they were carried out up to 2 years after BS. Engström et al. [12], on the other hand, found that the group with uncontrolled eating had a reduction in emotional eating 1 year after BS, but in 2 years it returned to the same level as the preoperative period. The group that did not present uncontrolled eating had a reduction, over two years, of emotional eating and increased cognitive restriction. There is still no single pattern of eating behavior in patients who underwent BS, which suggests the need for further studies, especially with a qualitative methodology.

Functional capacity and limitation due to physical aspects were the domains of QOL with the highest scores, indicating a better function on these aspects by the participants. Other studies suggested that BS is able to improve the perception of QOL in the individual, since the significant reduction in weight allows achievements both in the physical and emotional spheres that were previously made impossible by overweight [12, 19, 20].

Women without weight regain had higher scores on physical components in general, functional capacity, limitation due to physical aspects and social aspects. This result is in line with that of Perdue et al. [21], that the differences in SF-36 were significant in the domains of vitality, mental health and summary of emotional components, all of which were smaller in women who still considered themselves obese, which may mean that BS and weight loss as a result of it are processes that are too fast for the brain and they have an identification of themselves as obese even if the body no longer corresponds to this.

It was observed that pain was the domain with the lowest score, demonstrating impairment of activities due to pain. The study by Høgestøl et al. [22] found that a considerable part of the patients who underwent RYGB after 5 years of the surgery still had abdominal pain and this interfered with the perception of QOL. In the study by Laurino Neto and Herbella [23], using the SF-36, it was found that in
the short-term postoperative period there was an improvement in pain, however, in 7 years the score for this domain decreased again. The authors list the possible explanations: weight regain, aging and presence or recurrence of comorbidities.

The time of surgery was correlated to weight regain increases, decreasing the excess weight loss and the perception of QOL. After all, the more weight the person regains, the more difficulties are reported. The relationship between time of surgery and weight loss was also found in a survey that evaluated 50 adults (72.5% women) in 1 and 5 years after sleeve and found a significant weight regain average in the fifth postoperative year when compared to the first year, in which the average % EWL decreased [24].

There are many factors that work simultaneously influencing weight loss and maintaining the success of BS [25]. In the first 2 years after BS, the patient is more likely to follow nutritional recommendations, the reduction in the amount of food eaten is greatly influenced by anatomy and physiological changes, there is an increase in the feeling of well-being and a decrease in possible psychopathologies. Nonetheless, after this period, new changes in behavior occur, with a tendency to recover lost weight [15, 16]. That is, the time of surgery and the poor quality of food can be predictive factors for regain after 24 months of surgery [5, 26], though they can also influence weight regain a practice of physical activities and anatomy and physiological changes [5], besides psychological, metabolic, hormonal issues and even complications arising from the surgical procedure [27]. The study by Rocha, Hociko and Oliveira [16] found that the factors most associated with regaining weight were inadequate nutrition, lack of physical activity and lack of nutritional monitoring in the postoperative period.

The increase in lack of control eating seems to increase weight regain and to decrease the perception of QOL components. Devlin et al. [7] found that the lack of eating control was associated with lower weight loss and long-term weight regain (7 years) in people undergoing RYGB, which could compromise the results of the surgery. Wiedemann, Ivezaj, and Grilo [28] pointed out that the presence of uncontrolled eating and emotional eating may be predictors of worse results related to postoperative weight, though, the instrument used by them was not the TFEQ-21 and they analyzed only patients submitted to the sleeve less than one year after the surgery.

There was also an inverse relationship between weight regain and the perception of physical components of QOL. In a systematic review and meta-analysis including 82 studies in which QOL was analyzed (the most used was SF-36) before and after BS, inverse and significant relationships were found between BMI and QOL [29]. This result reinforces that even with improvements, the mental / social components are always below the physical components. Probably the improvement in QOL occurs due to weight reduction and remission of associated diseases.

This study has limitations such as the small sample size, the lack of a specific questionnaire for the targeted public and also the failure to monitor the women studied. Therefore, it is not possible to generalize these results. Despite the limitations, the study is relevant to contribute scientifically to the understanding of the processes that permeate weight regain and eating pattern in women submitted to long-term BS and the influence on their QOL.
Conclusion

The perception of QOL was relatively higher in relation to physical aspects, demonstrating that there is a better perception of functional capacity and that there are fewer limitations caused by physical assignments. Women who did not present weight regain expressed a better perception of QOL. The perception of QOL in the domains of functional capacity and limitation due to physical aspects decreases with the postoperative time and with weight regain, moreover, the occurrence of weight regain still reduces QOL in the domains of social aspects and pain. There was an association between weight regain and decreased perception of the physical components of QOL, just as weight regain was associated with the presence of uncontrolled eating, a relationship strengthened by the increase in the time of surgery.

Declarations

Declarations of interest: The authors have no financial or proprietary interests in any material discussed in this article.

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Ethics approval: The research was approved by the Human Research Ethics Committee No. 2.170.863 from Institute of Health Sciences/ Federal University of Pará/ Brazil, according to 1964 Helsinki Declaration.

Consent to participate: All participants accept and who agreed to participate in the research by signing the Informed Consent Form (ICF).

Consent for publication: All participants accept and consent to publish the data.
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