CHANGES IN NUTRITIONAL PROFILE AFTER 6 MONTHS OF BARIATRIC SURGERY: RETROSPECTIVE ANALYSIS OF ACADEMIC STUDY IN BARIATRIC SURGERY-ASBS

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ABSTRACT

The aim of this study was to verify, through a densitometric laboratory database, the changes in the nutritional profile of women after 6 months of bariatric surgery. **Methods**. A total of 23 Brazilian women aged 40.8±10.4 yrs were included in this study. The sample was recruited at densitometric laboratory database. The analysis was made between 2018 to 2019. Body composition assessments were performed through dual-energy X-ray absorptiometry immediately before and after 6-months Roux-en-Y gastric bypass (RYGB). Data collected pre and post RYGB were included. Food consumption occurred by method of food record, which used data on total caloric intake, macronutrient and micronutrient intake. The collected data was evaluated using the nutritional software WebDiet. **Results**. Nutritional variables decreased with the exception of the protein and calcium which showed a small increase after surgery following lower calorie intake. Total mass and BMI presented a significant difference, but for the nutritional analysis, despite the important differences between the two stages, they did not present a statistically significant difference. We verified that the Kcal had an important influence in the others nutritional variables in both stages, pre and post surgery, mainly in carbohydrate. **Conclusions**. We conclude that for this sample there was an important change in eating habits after six months of bariatric surgery and these changes together with bariatric surgery may be the cause of changes and maintenance of weight loss in the patients involved.
Palavras-chaves: Nutritional profile; Bariatric surgery; Dual-energy X-ray absorptiometry; Fracture prevention; Body composition.

1. INTRODUÇÃO

Obesity is a chronic metabolic disease characterized by an increase in body mass, mainly in body fat stores, which in clinical practice is defined by the body mass index (BMI). It is now considered a primary focus for health problems and has become a leading cause of disability and death. Appropriate clinical follow-up should include treating comorbidities and improving the quality of life of obese patients, in addition to prioritizing appropriate weight management goals emphasizing realistic weight loss to reduce health risks. It should be clear that obesity is a chronic disease, so weight control should last a lifetime[1]

Bariatric surgery is the most effective treatment for morbid obesity in terms of weight loss, reducing comorbidities and improving quality of life and consequently decreasing the degree of mortality[2]. Is an important therapeutic approach in morbid obesity with significant improvements in cardiovascular risk factors[3]. European Interdisciplinary Guidelines on Bariatric and Metabolic Surgery, published in 2013 a comprehensive view of surgical possibilities for obesity and related comorbidities, supported by the European Association for the Study of Obesity (EASO)[4].

However, there are also several adverse outcomes of this procedure, such as excessive loss of muscle mass, malabsorption of macronutrients, hydroelectric disturbance, and increased bone loss[5]. Surgery should be considered for patients aged 18 to 60 years with a BMI ≥ 40.0 kg/m2 or with a BMI between 35.0 and 39.9 kg/m2 with the presence of comorbidities[6].

Clinical and nutritional follow-up after surgical procedures becomes important to identify risk factors that lead to insufficient weight loss or weight recovery. Strong evidence indicates that dietary pathology before surgery is an inconsistent predictor of weight loss outcomes, but the existence of dietary pathology after surgery is a more strongly associated predictor[7]. Thus, being diagnosed with an eating disorder after surgery was associated with less weight loss two and three years after surgery[8].

Therefore, the main objective of this research was to verify the association between changes in body components and the nutritional profile after 6 months of bariatric surgery.

2. MATERIAIS E MÉTODOS

2.1. Sample

This is the nutritional analysis of the first data collection (phase I) as part of a longitudinal study carried out by Academic Studies in Bartric Surgery (ASBS), a research group of the Laboratory of Studies in Anthropometry and Densitometry of the Federal University of Technology – Parana- Brazil.

The database showed that 35 women participated in the initial assessment before surgery and of these 23 performed the second assessment 6 months after surgery.

2.2. Inclusion and exclusion criteria

According to the retrospective analysis of the program's database, all participants included in the study were women, being classified as grade II obesity (BMI> 35.0 kg / m2), with comorbidities or with BMI > 40.0 kg/m2. To determine reproductive status, a modified Reproductive Aging Workshop (STRAW) staging system was used Executive Summary. The exclusion criterion was only not having participated in the second evaluation 6 months after surgery.

2.3. Measurements

All personal and anthropometric data were obtained through a questionnaire applied on the day of the first assessment and stored in the laboratory's database. The evaluation of body composition was carried out for the whole body, where its components (body mass index, percentage of fat mass, percentage of lean mass and bone mass) were obtained immediately before and after six months of surgical intervention by means of Dual Energy X-Ray Absorptiometry (DXA) (Hologic # Discovery, Mississauga, ON, Canada). The protocol and equipment used to monitor the patients strictly followed the same criteria for the two phases of analysis.

The analysis of food consumption occurred by method of food record, which used data on total caloric intake, macronutrient and micronutrient intake. The collected data was

evaluated using the nutritional software WebDiet.

2.4. Statistical analysis

From the tabulation of the data, the analysis of normality and homogeneity of the sample was used the Shapiro Wilk. As the sample proved to be non-homogeneous sample, we performed Wilcoxon test of paired samples was performed to verify differences in the means PRE and POST moments. For association between variables, was used the Spearman correlation test, and Linear regression to verify the influence between variables. Body composition and nutritional data were tabulated in Microsoft Excel 365 -version 2021. Statistical procedures were performed using SPSS 17.0 for Windows (SPSS Inc. Released 2008. SPSS Statistics for Windows, Version 17.0. Chicago: SPSS Inc.).

3. RESULTADOS

The main data of this study was obtained by Nutritional and body composition assessment. Food consumption occurred by method of food record, which used data on total caloric intake, macronutrient and micronutrient intake. All evaluations took place on the same day and their results are shown in Table 1.

Table 1. Sociodemographic and Nutritional data for 23 women with mean, Standard Deviation and difference between both.

Variables	Pre Surgery	Post 6 months	Difference	P
Age	40.8 ± 10.4	40.9 ± 10.5	0.1	-
BMI (Kg/m^2)	43.0 ± 3.6	31.7 ± 3.1	-11.3	0.000*
Total mass (Kg)	110.1 ± 13.7	81.4 ± 8.9	-28.7	0.000*
Height (m)	1.60 ± 0.10	1.60 ± 0.10	0	-
Kcal	1496.3 ± 724.6	1235.1 ± 565.7	-261.2	0.301
Carbohydrates (g)	194.9 ± 104.2	153.9 ± 58.4	-41	0.121
Protein (g)	80.1 ± 42.0	72.7 ± 30.0	-7.4	0.627
Lipids (g)	48.4 ± 27.7	45.8 ± 39.0	-2.6	0.693
%Carbo	49.1 ± 8.9	48.5 ± 9.6	-0.6	0.802
%Protein	22.1 ± 7.3	25.1 ± 8.5	3.0	0.299
%Lipids	28.8 ± 7.3	26.4 ± 9.8	-2.4	0.360
Calcium (mg)	496.6 ± 315.5	508.8 ± 305.2	12.2	0.872
***p≤ 0.05 statistically significant difference.**				

In table 1 we present the mean values of the comparative variables between two analyzes.

After 6 months of surgery, BMI followed the large body mass losses with less 11.3Kg/m^2. Overall, nutritional variables decreased with the exception of the protein and calcium witch showed a small increase after surgery. The mean daily calorie intake decreased by 261.2 Kcal. The clinical anamnesis presented as the most cited previous diseases Diabetes (3), Heart Diseases (3), Dyslipidemia (5) and Hypertension (13).

The t-test of paired samples was performed to verify differences in the means PRE and POST stages. We found that for the composition variables, total mass and BMI presented a significant difference, but for the nutritional analysis, despite the important differences between the two stages, they did not present a statistically significant difference.

To verify the correlation between the variables, the Pearson correlation test was used.

Table 2 Spearman correlation test values between variables and significance

Variables	Rs	p
Total Mass Post and BMI Post	0.733**	0.000

Total Mass Post and Protein Post	-0.462*	0.026
BMI Pre and Post	0.722**	0.000
Kcal Pre and Carbo Pre	0.873**	0.000
Kcal Pre and Protein Pre	0.686**	0.000
Kcal Pre and Lipids Pre	0.852**	0.000
Kcal Post and Carbo Post	0.847**	0.000
Kcal Post and Protein Post	0.778**	0.000
Kcal Post and Lipids Post	0.781**	0.000
Kcal Post and Calcium Post	0.536**	0.008
Carbo Pre and Protein Pre	0.484*	0.019
Carbo Pre and Lipids Pre	0.731**	0.000
Carbo Post and Protein Post	0.463*	0.026
Carbo Post and Lipids Post	0.540**	0.007
Calcium Post and Calcium Post	0.501*	0.015
%Lipids Pre and Calcium Pre	-0.419*	0.046
% Lipids Post and Protein Pre	-0.431*	0.040

****p≤ 0.01 statistically significant difference**

***p≤ 0.05 statistically significant difference**

Table 2 present the correlation analysis and the degree of significance for the variables of body composition and nutritional analysis The variables of body components showed significant differences between the phases in the comparison of means test and we can prove that these differences also have a strong correlation with Total Mass Pre and Post with 0.878 and BMI Pre and Post with 0.722, both with statistical differences.

Overall the nutritional variables had the strong and statistically significant differences between them, Kcal Pre had a direct influence on the Nutritional variables Pre, and in the same way the Kcal Post represented a strong influence on the Nutritional variables Post. Negative and Moderate correlation occurred with Lipids and Calcium Pre 0.419* and Lipids Pre and Protein Post.

Table 3 Linear Regression Test for Nutritional variables.

Variable	Influence	*p*
Kcal Pre and Carbohydrate Pre	87%	0,000**
Kcal Pre and Protein Pre	52%	0,000**
Kcal Pre and Lipids Pre	79%	0,000**
Kcal Post and Carbo Post	71%	0,000**
Kcal Post and Protein Post	60%	0,000**
Kcal Post and Lipids Post	61%	0,000**
Kcal Post and Lipids Post	28%	0,008**

*****p<0,01***

In table 3 we presented that Linear regression analysis, we can verified that the Kcal had an important influence in the others nutritional variables in both moments, pre and post surgery, mainly in carbohydrate.

4. DISCUSSÃO

The presented study showed that after 6 months of surgery, BMI followed the large body mass losses with less 11.3Kg/m2. Overall, nutritional variables decreased with the exception of protein and calcium which showed a small increase after surgery. The mean daily calorie intake decreased by 261.2 Kcal. A survey of 2010 patients examined whether dietary changes 6 months after surgery could predict weight change in 10 years. The main findings indicated that the self-reported reduction in energy intake 6 months after bariatric surgery, as well as the higher intake of protein compared to carbohydrate was associated with greater weight loss in 10 years9.

In the same line, an evaluation of 50 patients undergoing bariatric surgery analyzed dietary quality and lifestyle to explore this association and identify potential predictors of weight gain in patients after surgery. The main findings were that 54% followed healthy eating habits, and for those who maintained the losses, what stood out the most was: eating a regular breakfast, having greater water intake and eating foods with high dietary fiber content, which included vegetables and fruits. While for those who have regained weight, food choices cited include increased consumption of carbohydrates and simple foods high in sugar, along with a limited intake of fiber and water10.

The comorbidities that accompany obesity are worrisome. In our study, we found that in the clinical anamnesis, the participants presented as the most cited previous diseases, Diabetes (3), Heart Diseases (3), Dyslipidemias (5) and Arterial Hypertension (13). For Cena, presented a survey that evaluated eating habits and lifestyle patterns, mainly physical activity and smoking, of obese patients undergoing bariatric surgery and concluded that there was a tendency for patients to improve food frequency and eating habits, but activity physical activity and smoking remained unchanged11.

The study found significant differences between body components and a strong correlation with total mass pre and post with 0.878 and BMI pre and post with 0.722. A recent study investigated the association between pre-surgical taste preferences and post-surgical weight gain. Patients who underwent RYGB or Sleeve gastrectomy with at least 2 years of follow-up were included. The results showed that patients with a preference for sweet foods regained 5.5 kg of weight and patients with a preference for salty foods regained 6.1 kg of weight compared to patients with no preference for taste12. An important aspect of weight loss failure after bariatric surgery is related to the presence of eating disorders. A higher prevalence of binge eating disorder is being observed among patients undergoing bariatric surgery with weight recovery13.

The topic of nutritional monitoring to help and maintain weight loss after bariatric surgery is limited, due to generally small sample size, as well as a lack of standardization in this support, without specifying settings, schedules, duration, type of surgery and other important associations14. However, for us It was clear that the effects of the surgery and probably of the dietary changes demonstrated in Table 1, that at least until the 6-month follow-up, the loss of body mass was important and followed by the also significant decrease in caloric intake (Kcal -261.2 and BMI -11.3). Israeli researchers investigating the topic recognized the need for more effective and evidence-based guidelines and analyzed several publications on nutritional care for bariatric patients, both pre- and postoperatively, in order to trace more direct and efficient patterns preventing nutritional complications and their physiological consequences15.

Regarding nutritional quality, we showed that the percentage of protein increased by 3% per day after bariatric surgery, with a high correlation with the decrease in Kcal for the same phase. This can represent an important change in the concentrations and proportions of each nutrient in eating habits. In this line, for Bavaresco Higher protein intake is considered a protective nutritional form against lean body mass loss in any clinical or physiological condition in which rapid mass loss occurs. However, protein intake is generally reduced after bariatric surgery16.

5. CONCLUSÃO

Nutritional variables decreased with the exception of the protein and calcium witch showed a small increase after surgery. We concluded that the decrease in body components can be occurred by decrease in the Nutritional intake and obviously for restriction surgery. Thus, this study can conclude that there was an important change not only in eating habits but also that there was an important relationship between food and changes in body components after 6 months of surgery.

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