










NUTRITIONAL AND CLINICAL STATUS OF PATIENTS SUBMITTED TO BARIATRIC SURGERY

ESTADO NUTRICIONAL E CLÍNICO DE PACIENTES SUBMETIDOS À CIRURGIA BARIÁTRICA

ESTADO NUTRICIONAL Y CLÍNICO DE LOS PACIENTES SOMETIDOS A CIRUGÍA BARIÁTRICA

 Leyla Gabriela Verner Amaral Brandão¹
 Thales Philipe Rodrigues Silva¹
 Anny Leal Gotschalg¹
 Thais Zielke Dias Cardoso¹
 Tércia Moreira Ribeiroda Silva¹
 Fernanda Batista Oliveira Santos¹
 Delma Aurélio da Silva Simão¹
 Fernanda Penido Matozinhos¹
 Nathércia Percegoni²

¹Universidade Federal de Minas Gerais - UFMG, Escola de Enfermagem. Belo Horizonte, MG - Brazil.

²Universidade Federal de Juiz de Fora - UFJF, Nutrição. Juiz de Fora, MG - Brazil.

Corresponding Author: Fernanda Penido Matozinhos
E-mail: nandapenido@hotmail.com

Authors' Contributions:

Conceptualization: Thales P. R. Silva, Fernanda P. Matozinhos;
Data Collection: Thales P. R. Silva, Anny L. Gotschalg, Thais Z. D. Cardoso, Fernanda P. Matozinhos, Nathércia Percegoni;
Investigation: Thales P. R. Silva, Anny L. Gotschalg, Thais Z. D. Cardoso, Fernanda P. Matozinhos, Nathércia Percegoni;
Methodology: Thales P. R. Silva, Fernanda P. Matozinhos;
Project Management: Fernanda P. Matozinhos;
Resources Management: Fernanda P. Matozinhos;
Statistical Analysis: Thales P. R. Silva, Fernanda P. Matozinhos; Aquisição de Financiamento: Fernanda P. Matozinhos; **Supervision:** Thales P. R. Silva, Fernanda P. Matozinhos; **Writing – Original Draft Preparation:** Leyla G. V. A. Brandão, Thales P. R. Silva, Anny L. Gotschalg, Thais Z. D. Cardoso, Fernanda P. Matozinhos, Nathércia Percegoni; **Writing – Review and Editing:** Leyla G. V. A. Brandão, Thales P. R. Silva, Anny L. Gotschalg, Thais Z. D. Cardoso, Tércia M. R. Silva, Fernanda B. O. Santos, Delma A. S. Simão, Fernanda P. Matozinhos, Nathércia Percegoni; **Validation:** Leyla G. V. A. Brandão, Thales P. R. Silva, Anny L. Gotschalg, Thais Z. D. Cardoso, Fernanda P. Matozinhos, Nathércia Percegoni; **Visualization:** Leyla G. V. A. Brandão, Thales P. R. Silva, Anny L. Gotschalg, Thais Z. D. Cardoso, Fernanda P. Matozinhos, Nathércia Percegoni.

Funding: Programa Institucional de Auxílio à Pesquisa de Doutores Recém-Contratados da Universidade Federal de Minas Gerais - UFMG (05/2016) and Fundação de Amparo à Pesquisa do Estado de Minas Gerais - FAPEMIG (0334617).

Submitted on: 03/24/2021

Approved on: 12/20/2021

Responsible Editors:

 Allana dos Reis Corrêa
 Tânia Couto Machado Chianca

ABSTRACT

Objective: to analyze the clinical and nutritional status of patients submitted to bariatric surgery. **Methods:** this is an observational epidemiological study, with a cross-sectional design, guided by the STROBE tool. It was carried out between 2015 and 2016, with data from patients undergoing Roux-en-Y bariatric surgery in the years 2012 to 2014, in a private hospital in Minas Gerais. Data collection took place through a semi-structured questionnaire developed by the researchers. To verify the existence of an association between the variables of nutritional and clinical status and the time after surgery, Pearson's chi-square test or Fisher's exact test was used for categorical variables. And for continuous ones, the Kruskal-Wallis or Mann-Whitney tests. **Results:** there was statistical significance for the variables: 'weakening of nails' ($p=0.002$), 'emesis' ($p=0.018$), 'frequency of alcohol consumption' ($p=0.018$) and 'number of daily meals' ($p=0.028$) in the female group. **Conclusion:** this study revealed changes in the clinical and nutritional component of patients undergoing bariatric surgery. There were statistically significant associations in the female group, including changes in the clinical profile of greater episode of emesis and greater frequency of alcohol consumption. Regarding the nutritional profile, female patients had higher proportions in the number of meals and more weakening of the nails after the surgical procedure. The importance of monitoring and continuous nutritional and psychological guidance, pre- and post-surgical, is reinforced, minimizing the negative impacts of this result on the health of individuals.

Keywords: Bariatric Surgery; Nutritional Status; Epidemiology; Gastric Bypass.

RESUMO

Objetivo: analisar o estado clínico e nutricional de pacientes submetidos à cirurgia bariátrica. **Métodos:** trata-se de estudo epidemiológico observacional, com delineamento transversal, norteado pela ferramenta STROBE. Foi realizado entre 2015 e 2016, com dados de pacientes submetidos à cirurgia bariátrica em Y de Roux nos anos de 2012 a 2014, em um hospital privado de Minas Gerais. A coleta de dados ocorreu por meio de questionário semiestruturado, elaborado pelos pesquisadores. Para verificar a existência da associação entre as variáveis do estado nutricional e clínico e o tempo pós-cirúrgico, utilizou-se o teste qui-quadrado de Pearson ou exato de Fisher para as variáveis categóricas. E para as contínuas, os testes Kruskal-Wallis ou Mann-Whitney. **Resultados:** verificou-se significância estatística para as variáveis: "enfraquecimento de unhas" ($p=0,002$), "êmetese" ($p=0,018$), "frequência de consumo alcoólico" ($p=0,018$) e "número de refeições diárias" ($p=0,028$) no grupo feminino. **Conclusão:** este estudo revelou alterações no componente clínico e nutricional das pacientes submetidas à cirurgia bariátrica. Houve associações estatisticamente significativas no grupo feminino, incluindo mudanças no perfil clínico de maior episódio de êmese e maior frequência no consumo de álcool. Em relação ao perfil nutricional, pacientes do sexo feminino apresentaram maiores proporções no número de refeições e mais enfraquecimento nas unhas após o procedimento cirúrgico. Reforça-se a importância do acompanhamento e da orientação nutricional e psicológica contínuas, pré e pós-cirúrgicas, minimizando os impactos negativos deste resultado na saúde dos indivíduos.

Palavras-chave: Cirurgia Bariátrica; Estado Nutricional; Epidemiologia; Derivação Gástrica.

RESUMEN

Objetivo: analizar el estado clínico y nutricional de los pacientes sometidos a cirugía bariátrica. **Métodos:** se trata de un estudio epidemiológico observacional, con un diseño transversal, guiado por la herramienta STROBE. Se realizó entre 2015 y 2016, con datos de pacientes sometidos a cirugía bariátrica en Roux-en-Y en los años 2012 a 2014, en un hospital privado de Minas Gerais. La recolección de datos se realizó a través de un cuestionario semiestructurado desarrollado por los investigadores. Para verificar la existencia de asociación entre las variables de estado nutricional, clínico y tiempo posquirúrgico se utilizó la prueba qui cuadrado de Pearson o la prueba exacta de Fisher para las variables categóricas. Y para las continuas, las pruebas de Kruskal-Wallis o Mann-Whitney. **Resultados:** hubo significancia estadística para las variables: "debilitamiento de las uñas" ($p = 0,002$), "emesis" ($p = 0,018$), "frecuencia de consumo de alcohol" ($p = 0,018$) y "número de comidas diarias" ($p = 0,028$) en el grupo de mujeres. **Conclusión:** este estudio reveló cambios en el componente clínico y nutricional de los pacientes sometidos a cirugía bariátrica. Hubo asociaciones estadísticamente significativas en el grupo femenino, incluyendo cambios en el perfil clínico de mayor episodio de emesis y mayor frecuencia de consumo de alcohol. En cuanto al perfil nutricional, las pacientes del sexo femenino presentaron mayores proporciones en el número de comidas y mayor debilitamiento de las uñas tras el procedimiento quirúrgico. Se refuerza la importancia del seguimiento continuo y la orientación nutricional y psicológica, pre y posquirúrgica, minimizando los impactos negativos de este resultado en la salud de las personas.

Palabras clave: Cirugía Bariátrica; Estado Nutricional; Epidemiología; Derivación Gástrica.

How to cite this article:

Brandão LGVA, Silva TPR, Gotschalg AL, Cardoso TZD, SilvaTMR, Santos FBO, Simão DAS, Matozinhos FP, Percegoni N. Nutritional and clinical status of patients submitted to bariatric surgery. REME - Rev Min Enferm. 2022[cited _____];26:e-1428. Available from: _____
DOI: 10.35699/2316-9389.2022.38664

INTRODUCTION

Obesity can be understood as a multifactorial chronic condition, with genetic, behavioral, and environmental origins. And it is also considered a significant contributor to chronic non-communicable diseases.¹ In this sense, the condition of excessive accumulation of body fat predisposes to the development of other chronic conditions and health compromises. After the multidisciplinary assessment and verification of obesity (body mass index/BMI ≥ 30 kg/m²), recommendations for treatment are established: variations include pharmacological and dietary treatment, cognitive-behavioral therapy, and the surgical method.²

According to the Brazilian Society of Bariatric and Metabolic Surgery, Brazil is the second country in the world that performs the most bariatric procedures, with approximately 100,500 surgeries in 2016, of which about 75% were performed on women.³ The main indications for bariatric surgery are: age 18 to 65 years, BMI above 40 kg/m² or 35 kg/m² with one or more serious comorbidities associated with obesity and evidence that the individuals were unable to lose weight or maintain weight loss - despite appropriate care taken regularly for at least two years, such as diet therapy, psychotherapy, pharmacological treatment and physical activity.²

Overweight is one of the biggest public health problems in the world and the number of obese and overweight individuals is increasing every year. From 2006 to 2016, obesity rates grew from 11.8 to 18.9% in Brazil, increasing by 60% in 10 years. The World Health Organization (WHO) projects, by 2025, that more than 700 million people will be obese.²

In Brazil, 2018 data from the Surveillance of Risk and Protection Factors for Chronic Diseases by Telephone Survey (VIGITEL) survey revealed that 55.7% of the population were overweight and 19.8% were obese.⁴

Bariatric surgery has been a growing treatment option for the Brazilian population, especially due to the expansion of knowledge about the benefits achieved with the surgical method.⁵ Despite the proven benefits of the surgical procedure (such as effective weight reduction, improved quality of life and reduced of the prevalence of comorbidities), there are controversies regarding its cost-effectiveness arising from short and long-term results, which limit the loyalty of subsequent treatment between patients and health professionals.^{5,6}

After performing bariatric surgery using the Roux-en-Y bypass surgical technique, some parameters related to nutrition, such as body weight, glucose, and inflammation, may show considerable improvement.⁷

However, some long-term events can arise, such as: vitamin and mineral deficiencies, hypoglycemia, substantial loss of lean mass, excess skin, hair loss and even a decrease in mental health.^{2,8,9} Such events may occur due to limited food consumption, in addition to incorrectly following the recommendations of the multidisciplinary team.⁷

With the surgical procedure, many diseases tend to be more controlled. As compensatory mechanisms of the body itself, however, many patients regain weight and present initial comorbidities, often with aggravating factors, such as severe nutritional deficiencies, depending on whether the surgical method used is irreversible, as in the case of Roux-en-Y bypass.⁸ Considering the theoretical framework presented and that care aimed at the clinical and nutritional status of the individual undergoing such a procedure can contribute to alleviating unwanted results, such as the reappearance of already controlled diseases and the emergence of nutritional deficiencies, the question is: what changes in the clinical and nutritional component of patients undergoing Roux-en-Y bariatric surgery occur after the surgical procedure? The hypothesis of this study is that patients, after Roux-en-Y bariatric surgery, present clinical and nutritional changes.

It is therefore essential to recognize the influence of clinical and nutritional aspects on the quality of life of individuals who underwent bariatric surgery, emphasizing that the evaluation of the surgical procedure must go beyond the effective loss of weight. This attention can contribute to the development of strategies for the prevention of weight regain after the surgical procedure, in order to minimize the negative impacts of this result on the health of individuals and to support Nursing care practices for adult health regarding the prevention of obesity.

OBJECTIVE

To analyze the clinical and nutritional status of patients undergoing bariatric surgery according to the time after surgery (up to 12 months, 12 to 24 months, and more than 24 months after bariatric surgery).

METHOD

Study design, period, and location

This is an observational epidemiological study, with a cross-sectional design guided by the STROBE tool, carried out between 2015 and 2016 with data from patients undergoing Roux-en-Y bariatric surgery from 2012 to 2014, in a private hospital in *Minas Gerais*.

Roux-en-Y bariatric surgery has a mixed effect, that is, a restrictive effect (reduces the volume or capacity of the stomach, reducing food intake) and malabsorptive effect (reduces the absorption of calories and nutrients ingested, limiting contact with pancreatic secretions). and bile acids), in addition to hormonal and anatomical changes.⁹

Population or sample and inclusion and exclusion criteria

As this is a hospital census, no sample size calculation was performed. All individuals aged ≥ 18 years who underwent Roux-en-Y bariatric surgery were included in this study. Patients who did not have a telephone number registered in their medical records and those with severe mental disorders that prevented them from participating in the telephone follow-up were excluded. A total of 289 patients were included in the study.

Study Protocol

Data collection was performed by professional nurses duly trained by the main researchers. The training of these nurses was divided into different days and times, with an average duration of 90 minutes, and on that occasion the data collection instrument was presented, doubts were clarified, and other important aspects of data collection were discussed. It was divided into two stages and took place in the years 2015 and 2016. In the first stage, data collection took place through a semi-structured questionnaire, prepared by the researchers, and the medical records of patients who underwent surgery were used as a source of data. bariatric surgery in the years 2012 to 2014. In the second stage, patients were followed up by telephone and questionnaires prepared by the researchers were applied; this step was performed in the three post-surgical periods detailed below.

The questionnaires contained sociodemographic (gender, age, self-reported skin color, current income, education, and marital status), clinical (comorbidities, body mass index/BMI, emesis, hypoglycemia, and alcohol consumption) and nutritional (hair loss and weakening of nails after surgery and number of daily meals). The variables were selected based on scientific evidence.^{5,10}

Ten attempts were made to call each individual participating in the research, on alternate days and times/shifts – including weekends and holidays. In case of failure, an attempt was also made via a multiplatform instant messaging and voice call application for smartphones (“WhatsApp”).

It was decided to group the patients according to the postoperative period, as follows: first period of up to 12 months, phase in which there is maximum weight loss after the bariatric surgical procedure, reaching up to 75% of weight loss in this period.^{9,11} The second time (between 12 and 24 months of surgery) was chosen because it is a half-plateau, in which no more weight is lost or more is gained compared to the other two times. Finally, the third time (over 24 months after surgery) is due to the fact that weight regain is more prevalent from that date onwards.⁸

The variables selected through a literature review for this study were: gender, age, skin color, education, marital status, average household income, systemic arterial hypertension (SAH), diabetes *Mellitus* (DM), hypercholesterolemia, emesis, hypoglycemia, alcohol consumption, BMI, hair loss and nail weakening after surgery and number of daily meals.

Result analysis and statistics

The data obtained were processed and analyzed using the Statistical Software (Stata), version 14.0 (StataCorp, Texas, USA). For the descriptive analysis of the data, distribution tables of absolute and relative frequencies of the variables were presented. After verifying the asymmetry for the continuous variables, the median and the interquartile interval (IQ) were used.

In order to verify the existence of an association between the variables of nutritional and clinical status and the time after surgery (up to 12 months, 12 to 24 months and greater than 24 months after surgery), Pearson’s chi-square test was used. Fisher’s exact test for categorical variables. And for continuous variables, the Kruskal-Wallis (three comparison groups) or Mann-Whitney (two comparison groups) tests were used. In the variables that presented statistical difference, analysis was performed with Bonferroni correction, in order to avoid type I errors derived from multiple comparisons. A significance level of 5% was considered for all analytical procedures.

For some variables, the sample number was different due to the loss of information collected. The sample detection power was also calculated using the OpenEpi statistical program, which allows estimating the ideal sample size to reliably detect a given effect considered relevant. The calculation result for the studied parameters indicated a power greater than 80%.

The analyzes are presented in a stratified manner according to gender, as they present different behaviors after surgery.¹²

Ethical aspects

The study was approved by the Research Ethics Committee of the *Universidade Federal de Minas Gerais* (CAAE 52657115.2.0000). As these were telephone interviews, the free and informed consent was replaced by verbal consent, obtained during telephone contacts with the interviewees, who were informed about the confidentiality and anonymity of the data and that they would be used only for the purpose of search. All interviewees were provided with a telephone number for clarification of questions.

RESULTS

The sample consisted mainly of women (87.20%). The median age of the participants was 39 years (IQ=33-44), most declared themselves to be brown (52.25%), studied up to high school (59.86%), lived with a partner (69.20%) and had an average household income of one to three minimum wages (56.00%) (Table 1).

The periods in which the questionnaires were applied corresponded to the times: up to 12 months after surgery, between 12 and 24 months after surgery and more than 24 months after surgery. At the time up to 12 months after surgery, there were only female participants, totaling 21 patients (5.75%), while at the time above 24 months, 75 people answered the questionnaires (data not shown). In the time above 24 months after bariatric surgery, the highest frequency of patients who underwent bariatric surgery and participated in the study was obtained, totaling 192 people (52.60%) (Table 2).

According to the post-surgical times, different results were obtained in relation to the variables of clinical and nutritional profile. Statistically significant associations were found in the female group, including the clinical profile of episodes of emesis. There was an increase in the proportion of the occurrence of emesis, gradually, over the postoperative period. In addition, alcohol consumption in the sample also increased gradually, with an important difference between times 1 and 2 of the surgery (p=0.018) (Table 2).

Table 1 - Sociodemographic characteristics of patients submitted to bariatric surgery, *Minas Gerais*

Variable	n (289)	%	95% IC*
Gender			
Male	37	12.80	09,40-17.20
Female	252	87.20	82.79-90.59
Age in years**	39 (33-44)		
Cor de pele autorreferida			
White	94	32.53	27.34-38.17
Black	44	15.22	11.50-19.87
Brown***	151	52.25	46.45-57.98
Education (in years)			
Higher Education	59	20.42	16.13-25.48
High School	173	59.86	54.06-65.39
Elementary School	31	10.73	07.62-14.87
Primary Education	26	9.00	06.18-12.91
Lives with the spouse			
Yes	200	69.20	63.63-74.28
No	89	30.80	25.71-36.39
Average income per household****			
No income or up to 1 minimin wage	28	10.18	07.10-14.38
1 to < 3 minimin wages	154	56.00	50.03-61.79
3 to 5 minimin wages	61	22.18	17.63-27.51
> 5 minimin wages	32	11.64	08.33-17.02

Notes: *95% Confidence Interval **Median (IQ). ***Include: parda/amarela/ indígena. ****Average income per household calculated based on the minimum wage: 788.00 BRL.

Table 2 - Clinical, nutritional, and aesthetic profile by gender and post-surgical time of patients undergoing bariatric surgery, Minas Gerais

	Post-surgery time						p-value
	Male n (%) [*]		p-value	Female n (%)			
Postoperative clinical profile	12 to 24 months	>24 months			Até 12 months	12 to 24 months	>24 months
Systemic Arterial Hypertension ^{**}			0.285				0.621
Yes	0	2(8.33)		1(4.76)	7(11.29)	14(8.33)	
No	13(100)	22(91.66)		20(95.23)	55(88.70)	154(91.66)	
Diabetes Mellitus^{**}			-				0.655
Yes	-	-		0	4(6.45)	9(5.35)	
No	13(100)	24(100)		21(100)	58(93.54)	159(94.64)	
Hypercholesterolemia ^{**}			-				0.067
Yes	-	-		2(9.52)	0	6(3.57)	
No	13(100)	24(100)		19(90.47)	62(100)	162(96.42)	
Hypoglycemia^{**}			0.140				0.740
Yes	5(38.46)	4(16.66)		6(28.57)	24(38.70)	67(40.11)	
No	8(61.53)	20(83.33)		15(71.42)	38(61.29)	100(59.88)	
Emesis ^{**}			0.276	AB	A	B	<0.001
Yes	0	4(16.66)		0	5(8.06)	46(27.38)	
No	13(100)	20(83.33)		21(100)	57(91.94)	122(72.62)	
Alcohol Consumption^{**}			0.734	AB	A	B	0.018
Yes	9(69.23)	15(62.50)		4(19.05)	16(25.81)	70(42.17)	
No	4(30.77)	9(37.50)		17(80.95)	46(74.19)	96(57.83)	
Post-operative BMI ^{***}	28.65 (27.27 - 31.42)	29.61 (27.76 - 31.55)	0.502 ^{****}	27.79 (25.04 - 31.03)	26.50 (24.85 - 28.42)	27.35 (24.34 - 29.72)	0.469 ^{*****}
Perfil nutricional Hair Loss after Surgery ^{**}			0.315				0.245
Yes	9(69.23)	12(50.00)		20(95.24)	55(88.71)	159(94.64)	
No	4(30.77)	12(50.00)		1(4.76)	7(11.29)	9(5.36)	
Nail weakening after surgery^{**}			0.140	AB	A	B	0.002
Yes	0	5(20.83)		12(57.14)	33(53.23)	128(76.19)	
No	13(100)	19(79.17)		9(42.86)	29(46.77)	40(23.81)	
Number of daily meals^{**}			0.280	A	AB	B	0.028
Up to 1 meal	1(7.69)	0		0	0	2(1.19)	
2 meals	4(30.76)	5(20.83)		11(52.38)	17(27.42)	35(20.83)	
3 meals	8(61.53)	19(79.16)		10(47.62)	45(72.58)	131(77.98)	

Notas: ^{*}there were no patients in the first year after surgery; ^{**} Pearson's chi-square or Fisher's exact test; ^{***} Median (IQ); ^{****}Mann-Whitney test; ^{*****}Kruskal-Wallis test.

The nutritional profile was that of female patients with a longer postoperative period (greater than 24 months) who had higher proportions in the number of meals (3 meals a day) compared to patients up to 12 months after surgery, with significant differences (p=0.028). There was an important difference in relation to nail weakening, according to the post-surgical time: nail weakening was observed in the female group after 24 months of bariatric surgery (p=0.002). In addition, there was an important tendency to hair loss after the surgical procedure, which remained high in the three postoperative periods, showing significant differences in females (Table 2).

DISCUSSION

Participants in this study were all adult patients undergoing bariatric surgery using the Roux-en-Y bypass surgical technique. This study showed that, in the female group, there was a statistically significant difference in relation to nutritional and clinical status (weakening of nails, emesis, alcohol consumption and number of daily meals), evidencing an increase in proportions in the period of 24 months after surgery. This aspect can be justified by the fact that in women there are important emotional components in relation to food¹³

and, in this sense, inadequate food consumption can persist in the postoperative period of bariatric surgery, contributing to the development of nutritional deficiencies and obesity recurrence.¹⁴

Over the years, after bariatric surgery, there is a tendency to hair loss and nail weakening, which gradually increases, since the anatomical and physiological changes resulting from bariatric surgery affect the nutrient absorption and digestion pathways. Food in the gastrointestinal tract, impairing these processes in the body and, consequently, causing macro and micronutrient deficiencies.^{10,15} This procedure with the Roux Y technique can cause a decrease in the absorption of nutrients, especially zinc, causing hair weakening and the deficit in the constitution of nails.¹⁶

Regarding the variables that reveal gastrointestinal symptoms such as emesis, in addition to those characteristic of hypoglycemia (weakness, sweating, tremors, etc.), these are suggestive of risk for dumping syndrome.¹⁷ This complication often occurs in patients after bariatric surgery, especially when the Roux-en-Y gastric bypass technique is used, revealing an incidence of up to 75.9%. This happens due to very accelerated gastric emptying, the ingestion of a greater amount of food than the current capacity of the stomach or in situations where, in addition to arriving quickly, nutrients come from foods rich in carbohydrates of the simple type, from foods rich in fat, have high glycemic indexes or are intolerable according to the particularity of each organism, for example.^{17,18}

Although statistically significant values for increased postoperative BMI were not observed in this study, research indicates that the maximum weight loss after gastric bypass occurs up to the second year. After this stagnation, there is weight regain after 24 months, in up to 50% of patients, which may be associated with pre-, but also post-surgical factors, such as body adaptations, hormonal adjustments, the resumption of inadequate eating habits and compulsions, alcohol consumption, physical inactivity, diseases of psychological origin, improved tolerance of consumption of greater amounts of food, among others.^{19,20}

Just after two years of bariatric surgery, only 14.93% of patients maintain regular attendance at nutritional consultations. This data corroborates the reality that changes in lifestyle, including mainly the reduction of caution with the food ingested, become a predisposition to the emergence of the dumping syndrome, and may, thus, explain the increase in symptoms of emesis and hypoglycemia over time from the second year after surgery.²¹

It is then observed, in a concrete way, the importance of awareness, counseling, monitoring and continuous nutritional and psychological guidance, pre- and post-surgical, in order to clarify and prepare the patient for the possible repercussions of the surgery, ensuring better adherence to the correct habits, to obtain success in the results of the surgical intervention, without compromises.^{22,23}

Also, as a result of this study, the addition of a greater number of meals per day was directly proportional to the increase in postoperative time. The food organization of a patient after bariatric surgery consists of both the selection of healthy and better tolerated foods, as well as the fractioning of meals. This division provides the individual with regular schedules throughout the day, for the practice of consumption of food in an ideal and satisfactory amount, preventing him from remaining for many hours without eating and, consequently, eating in an uncontrolled way to satiate himself/herself, ingesting food beyond what is necessary and selecting more caloric foods.¹⁴

There are neurohormonal mechanisms that are altered immediately after bariatric surgery, as the physiological and anatomical changes resulting from the surgical technique influence the production mainly of those responsible for the regulation of hunger, especially GLP-1 and ghrelin.^{20,24}

It is known that, over time, especially after the second year after gastric surgery, there is the development of adaptations in the body, including new hormonal changes, with an increase in hormones such as ghrelin, which stimulates the desire to feeding, and new anatomy configurations, determining the expansion of the gastric pouch, for example. These factors considerably interfere with the patient's tolerance for having more meals during the day. Therefore, the readjustment of the organic functioning with the advancement of time contributes to the increase of the individual's disposition for greater amounts of daily meals after bariatric surgery.²⁰⁻²⁴

It was shown that the frequency of individuals who reported consuming alcohol gradually increased over time. There is evidence that Roux-en-Y gastric bypass (RYGB) surgery increases the risk of developing alcohol use disorders. RYGB is associated with a higher peak blood alcohol concentration, which is reached more quickly compared to pre-surgery or control groups. Furthermore, there is also a reduction in dehydrogenase, which is mostly secreted by the stomach.²⁵

In the literature, authors show that there is a mechanism involved in transferring binge eating to the frequency of alcohol consumption.^{25,26} Another hypothesis is that the use of alcoholic beverages favors socialization, removing possible discomfort, shyness, or embarrassment, making interaction more relaxed and avoiding other inhibitory factors. Scholars also demonstrate an increase of approximately 2% in alcohol use in a period of two years after bariatric surgery, which corroborates the findings of the present study.²⁶

Study limitations

Some limitations can be recognized, including the lack of statistical significance for the other variables in this study, which may be related to the relatively small sample size, as it is notable that, in larger groups, the differences can be better evidenced. In the time up to 12 months after surgery, for example, there were only female participants. Added to the fact that the study was carried out in only one health service. The possibility of fragility in the follow-up of the groups is also highlighted, as studies suggest that, for some variables, the follow-up time should be up to 10 years and the minimum recommended by the American Society for Bariatric Surgery is five years. However, few studies to date have managed to perform follow-up for more than three years. The difficulty in monitoring patients after this time may be related to impaired adherence with regard to monitoring their health situation, when they are faced with positive results and stability regarding physiological changes.¹⁵ Finally, it should be mentioned that the clinical evaluation was performed based on self-reported data. Despite this potential limitation, self-reported information has been widely used in epidemiological studies as an acceptable and valid method for Brazilian adults.²⁷

Contributions to the field of Nursing

This study innovates and advances, therefore, by analyzing nutritional and clinical aspects of patients undergoing bariatric surgery, especially in specific places, such as private health institutions. It is expected that the result can improve holistic patient care before and after bariatric surgery. Understanding these aspects is essential for the development of strategies in order to minimize the negative impacts of this result on the health of individuals.

In addition, this scenario indicates the essentiality of continuous and regular professional follow-up, given the tendency of some patients to abandon consultations after quickly experiencing the long-awaited results, which promotes the risk of destabilizing the adequate and satisfactory evolution of the disease. surgery. It is known that time is an intrinsic factor in the effects of gastric bypass and there are critical milestones that require concentration of attention to minimize the negative aspects that can interfere in an unpleasant way with the patient's quality of life and their satisfaction with the surgery.

Therefore, the present study can encourage reflection on alternative measures and the possibility of health education based on the readjustment of habits even before surgery, in order to develop healthier habits. An efficient psychological and nutritional preparation, together with information related to the surgery and nutritional education for life, is essential since the individual may face challenges in the recovery path during the following years.

CONCLUSION

Este estudo analisou o estado clínico e nutricional de pacientes submetidos à cirurgia bariátrica segundo o tempo pós-cirúrgico e evidenciou que existem alterações no componente clínico e nutricional dos pacientes.

This study analyzed the clinical and nutritional status of patients undergoing bariatric surgery according to the time after surgery and showed that there are changes in the clinical and nutritional component of patients.

Regarding post-surgical times, statistically significant associations were observed in the female group, including changes in the clinical profile of greater episode of emesis and greater frequency of alcohol consumption. Regarding the nutritional profile, female patients had higher proportions in the number of meals over time, more weakening of the nails and more hair loss after the surgical procedure. Therefore, the importance of health education, monitoring and continuous nutritional and psychological guidance, pre- and post-surgical, is reinforced, in order to clarify and prepare the patient for the possible repercussions of the surgery, ensuring better adherence to correct habits. and minimizing the negative impacts of this result on the health of individuals.

REFERENCES

- Hsiung Y, Lee CF, Chi LK, Huang JP. "Moving for My Baby!" Motivators and Perceived Barriers to Facilitate Readiness for Physical Activity during Pregnancy among Obese and Overweight Women of Urban Areas in Northern Taiwan. *Int J Environ Res Public Health*. 2021[cited 2021 July 15];18(10). Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8156013/>
- Associação Brasileira para o Estudo da Obesidade e da Síndrome Metabólica (ABESO) Diretrizes brasileiras de obesidade 2016. 4ª ed. 2016[cited 2021 Feb 10]. Available from: <https://abeso.org.br/wp-content/uploads/2019/12/Diretrizes-Download-Diretrizes-Brasileiras-de-Obesidade-2016.pdf>
- Sociedade Brasileira de Cirurgia Bariátrica e Metabólica. Cirurgia bariátrica cresce 84,73% entre 2011 e 2018. 2019[cited 2021 June 21]. Available from: <https://www.sbcm.org.br/cirurgia-bariatrica-cresce-8473-entre-2011-e-2018/>
- Ministério da Saúde (BR). Vigitel Brasil 2019: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico: estimativas sobre frequência e distribuição sociodemográfica de fatores de risco e proteção para doenças crônicas nas capitais dos 26 estados. 2020[cited 2021 Mar 14]. Available from: <https://www.saude.gov.br/images/pdf/2020/Abril/27/vigitel-brasil-2019-vigilancia-fatores-risco.pdf>
- Gletsu-Miller N, Wright BN. Mineral Malnutrition Following Bariatric Surgery. *Adv Nutr*. 2013[cited 2021 Mar 14];4(5):506–17. Available from: <https://doi.org/10.3945/an.113.004341>
- Artero A, Martínez-Ibañez J, Civera M, Martínez-Valls JF, Ortega-Serrano J, Real JT, *et al*. Anthropometric parameters and permanent remission of comorbidities 10 years after open gastric bypass in a cohort with high prevalence of super-obesity. *Endocrinol Diab Nutr*. 2017[cited 2021 Mar 17];64(6):310-6. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S2530016417301258?via%3Dihub>
- Parrott JM, Craggs-Dino L, Faria SL, O’Kane M. The optimal nutritional programme for bariatric and metabolic surgery. *Curr Obes Rep*. 2020[cited 2021 July 15];9(3):326-38. Available from: <https://pubmed.ncbi.nlm.nih.gov/32451780/>
- Siqueira AC, Zanotti SV. Programa de cirurgia bariátrica e ganho de peso. *Psicol Saúde Doença*. 2017[cited 2021 July 15];18(1):157-69. Available from: www.sp-ps.com
- Rocha QDS, Mendonça SS, Fortes RC. Perda ponderal após gastroplastia em Y de Roux e importância do acompanhamento nutricional - uma revisão de literatura. *Comun Ciênc Saúde*. 2011[cited 2021 Mar 11];22(1):61-70. Available from: <https://pesquisa.bvsalud.org/portal/resource/pt/mis-33844>
- Ruiz-Tovar J, Oller I, Llaveró C, Zubiaga L, Díez M, Arroyo A, *et al*. Hair Loss in Females after Sleeve Gastrectomy: Predictive value of serum zinc and iron levels. *Am Surg*. 2014[cited 2021 Mar 11];80:466-71. Disponível em: <https://pubmed.ncbi.nlm.nih.gov/24887725/>
- Bužga M, Marešová P, Petřeková K, Holéczy P, Kuča K. The efficacy of selected bariatric surgery methods on lipid and glucose metabolism: a retrospective 12-month study. *Cent Eur J Public Health*. 2018[cited 2021 Mar 11];26(1):49-53. Available from: https://cejph.szu.cz/artkey/cjp-201801-0009_the-eficacy-of-selected-bariatric-surgery-methods-on-lipid-and-glucose-metabolism-a-retrospective-12-month-st.php
- Mahawar KK, Bhasker AG, Bindal V, Graham Y, Dudgey U, Lakdawala M, *et al*. Zinc deficiency after gastric bypass for morbid obesity: a systematic review. *Obes Surg*. 2017[cited 2021 Mar 11];27(2):522-9. Available from: <https://doi.org/10.1007/s11695-016-2474-8>
- Silva HBA, Rossoni CR, Oliveira TMS, Iannuzzi GC, Nakasu MVPN. Percepção da imagem corporal e tolerância alimentar de pacientes submetidos à cirurgia bariátrica e metabólica em um Hospital do Sul de Minas Gerais. *Semin Ciênc Biol Saúde*. 2020[cited 2021 Mar 11];41(2):123. Available from: <https://pesquisa.bvsalud.org/portal/resource/pt/biblio-1224208>
- Nóbrega MP, Cabral PC, Pinho CPS, Costa J, Lima DSC. Perfil alimentar e ganho de peso de pacientes submetidos à cirurgia bariátrica em um hospital universitário / food profile and weight regain of patients submitted to bariatric surgery in an university hospital. *Braz J Dev*. 2020[cited 2021 Mar 11];6(12):9477185. Available from: <https://www.brazilianjournals.com/index.php/BRJD/article/view/21061>
- Krzizek E-C, Brix JM, Stöckl A, Parzer V, Ludvik B. Prevalence of micronutrient deficiency after bariatric surgery. *Obes Facts*. 2021[cited 2021 Mar 11];14(2):197-204. Available from: <https://pubmed.ncbi.nlm.nih.gov/33794530>
- Soheilipour F, Ebrahimian M, Pishgahroudsari M, Hajian M, Amir-kashani D, Ordooei M, *et al*. The prevalence of zinc deficiency in morbidly obese patients before and after different types of bariatric surgery. *BMC Endocr Disord*. 2021[cited 2021 Mar 11];21(1):107. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8147400/>
- Chaves YS, Destefani AC. Pathophysiology, diagnosis and treatment of dumping syndrome and its relation to bariatric surgery - fisiopatologia, diagnóstico e tratamento da síndrome de dumping e sua relação com a cirurgia bariátrica. *ABCD Arq Bras Cir Dig (São Paulo)*. 2016[cited 2021 Mar 11];29:116-9. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-67202016000600116&lang=pt%0Ahttp://www.scielo.br/pdf/abcd/v29s1/0102-6720-abcd-29-s1-00116.pdf%0Ahttp://www.scielo.br/pdf/abcd/v29s1/pt_0102-6720-abcd-29-s1-00116.pdf
- Camargo AVL, Santos CCP, Ignácio GPO, Leal LQ, Machado LHA, Puls ML, *et al*. Pacientes com síndrome de Dumping pós-gastroplastia tipo bypass em Y-de-Roux: conhecimentos e práticas alimentares. *Rev Bras Multidiscip*. 2018[cited 2021 Mar 11];21(1):72-80. Available from: <https://revistarebram.com/index.php/revistauniara/article/view/470>
- Marchesini SD, Antunes MC. Fatores grupais e sociais que influenciam no ganho de peso, em pacientes submetidos à cirurgia bariátrica. *Bol - Acad Paul Psicol*. 2020[cited 2021 Mar 11];40(98):100-8. Available from: http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S1415-711X2020000100011&lng=pt&nrm=iso&tlng=pt
- Silva RF, Kelly EO. Ganho de peso após o segundo ano do Bypass gástrico em Y de Roux TT - Regained weight after the second year of the gastric Bypass and Y of Roux. *Comun Ciênc Saúde*. 2013[cited 2021 Mar 11];24(4):341-50. Available from: http://bvsms.saude.gov.br/bvs/artigos/ccs/reganho_peso_apos_segundo_ano.pdf

21. Menegotto ALS, Cruz MRR, Soares FL, Nunes MGJ, Branco-Filho AJ. Avaliação da frequência em consultas nutricionais dos pacientes após cirurgia bariátrica. *ABCD Arq Bras Cir Dig (São Paulo)*. 2013[cited 2021 Mar 11];26(2):117-9. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-67202013000200009&lng=pt&tlng=pt
 22. Rodrigues G, Precybelovicz T, Bettini SC, Farias G. Acompanhamento nutricional no pré-operatório de cirurgia bariátrica: tempo de seguimento versus redução de peso. *Rev PsicoFAE Plur Saúde Ment*. 2017[cited 2021 July 15];6(2):97-112. Available from: <https://revis-tapsicofae.fae.edu/psico/article/view/140>
 23. Bramming M, Hviid SS, Becker U, Jørgensen MB, Neermark S, Bisgaard T, *et al*. Changes in relationship status following bariatric surgery. *Int J Obes*. 2021[cited 2021 July 15];45(7):1599-606. Available from:<https://pubmed.ncbi.nlm.nih.gov/27317599/>.
 24. Rolim FFA, Cruz FS, Campos JM, Ferraz ÁAB. Repercussões em longo prazo da derivação gástrica em Y de Roux em população de baixa renda: avaliação após dez anos de cirurgia. *Rev Col Bras Cir*. 2018[cited 2021 July 15];45(4). Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0100-69912018000400155&lng=pt&tlng=pt
 25. King WC, Chen J-Y, Courcoulas AP, Dakin GF, Engel SG, Flum DR, *et al*. Alcohol and other substance use after bariatric surgery: prospective evidence from a U.S. multicenter cohort study. *Surg Obes Relat Dis Off J Am Soc Bariatr Surg*. 2017[cited 2021 July 15];13(8):1392-402. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5568472/>
 26. Porto DL, Antoniassi Junior G. A decorrência do uso do álcool em pacientes que submeteram à cirurgia bariátrica. *Psicol Saúde Debate*. 2017[cited 2021 July 15];3(Supl. 1):14-6. Available from: <http://psicodebate.dpgpsifpm.com.br/index.php/periodico/article/view/211>
 27. Carvalho AM, Piovezan LG, Selem SSC, Fisberg RM, Marchioni DML. Validation and calibration of self-reported weight and height from individuals in the city of São Paulo. *Rev Bras Epidemiol*. 2014[cited 2021 July 15];17(3):735-46. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1415-790X2014000300735&lng=en&tlng=en
-