





Clinical-epidemiological assessment of patients undergoing bariatric and metabolic surgery in a medium-complexity service in Maranhão, Brazil

Avaliação clínico-epidemiológica de pacientes submetidos à cirurgia bariátrica e metabólica em um serviço de média complexidade no Maranhão

LIVIO MELO BARBOSA ACBC-MA¹ ; BRUNA PEREIRA CARVALHO SIRQUEIRA¹ ; JOSÉ THIAGO OLIVEIRA DE CARVALHO¹ ; ALBERTO NÉLIO BANDEIRA BARROS² ; ANDERSON BENTES DE LIMA³ .

ABSTRACT

Introduction: the obesity is defined as the excessive accumulation of fat in different areas of the body, a condition that causes damage to health and is a critical risk factor for various comorbidities. Bariatric surgery is the therapeutic option with the best results. **Methods:** this is a retrospective descriptive study using data obtained from medical records from January 2018 to December 2020 on patients undergoing bariatric surgery. Statistical analysis used a significance level of $p < 0.05$. **Results:** 178 medical records were included, 77.5% of which were women. The average age was 35.7 years (± 9.5), 63.8% of the patients were from Imperatriz, 98.3% reported a sedentary lifestyle, 38.7% regular alcohol consumption and 13% smoking. The prevalence of Class III obesity ($BMI \geq 40 \text{ kg/m}^2$) was 53.3%. The most common comorbidities were hepatic steatosis (64.6%), type 2 diabetes mellitus (DM2) (40.5%) and hypertension (38.7%). The main type of surgery performed was Roux-en-Y gastric bypass (RYGB) (89.3%). There was an association between median BMI and gender ($p=0.008$), with women showing higher values [43.4 (IQR 39.1 - 48.8)]. The mean BMI of patients who underwent RYGB was significantly higher compared to those who underwent vertical gastrectomy (VG) ($p=0.009$). There was a statistical association between DM2 ($p=0.033$) and depression ($p=0.018$) and the type of surgery performed. **Conclusion:** the clinical and epidemiological profile found showed a higher prevalence of females and individuals with Class III obesity. RYGB was the most commonly performed procedure, establishing an association with BMI and some of the patients' comorbidities.

Keywords: Bariatric Surgery. Obesity. Comorbidity. Prevalence. Epidemiology.

INTRODUCTION

The World Health Organization (WHO) defines obesity as the excessive or abnormal accumulation of body fat, which causes damage to health and constitutes a critical risk factor for several comorbidities^{1,2}. According to 2020 data from the Brazilian Institute of Geography and Statistics (IBGE), obesity among adults in the country increased from 11.8% to 20.6% between 2006 and 2019, and overweight affects more than 55% of these individuals³⁻⁵.

The management of obesity is multidisciplinary and rigorous. Although lifestyle changes and pharmacological treatment contribute to weight loss and

control of comorbidities, most patients have difficulties in obtaining good long-term results⁶. In this context, bariatric and metabolic surgery is the therapeutic option with the greatest benefits for the management of morbidity and metabolic conditions associated with weight⁷⁻⁹. Its methods have been innovated over the years, ensuring an increasingly significant weight loss and control of metabolic parameters^{10,11}.

Every year the number of bariatric and metabolic surgeries grows. According to data from the Brazilian Society of Bariatric and Metabolic Surgery (SBCBM), in 2019 more than 68,500 procedures were performed, of which about 56,000 in the private sector and 12,500 in

1 - Universidade Federal do Maranhão, Curso de Medicina - Centro de Ciências de Imperatriz - Imperatriz - MA - Brasil 2 - Clínica de Saúde Nutrogastro - Centro De Cirurgia Geral, Digestiva e Obesidade - Imperatriz - MA - Brasil 3 - Universidade Estadual do Pará - Programa de Mestrado Profissional em Cirurgia e Pesquisa Experimental - Centro de Ciências da Saúde - Belém - PA - Brasil

the public network. However, these data do not reflect the total number of operations in the country, as there is no national database^{11,12}.

In the state of Maranhão, only the University Hospital of the Federal University of Maranhão (HU-UFMA), located in the city of São Luís, is accredited by the Ministry of Health and can perform this procedure free of charge¹³. In the city of Imperatriz, the second largest in Maranhão and the main center of the state's Southern Health Macro-region, which assists about 1.2 million individuals and serves as an interstate reference for the states of Tocantins and Pará, this service is exclusively private.

Although increasing, access to bariatric and metabolic surgery varies in the localities and little is known about the trend of the different profiles of patients undergoing it, especially in regions with reduced accessibility to the service. Access to the information is necessary to assess the quality of care and obtain data on the long-term outcomes of the procedure.

In this context, this research aimed to determine the clinical and epidemiological profile of patients who

underwent bariatric and metabolic surgery in a medium-complexity service in Imperatriz, MA.

METHODS

This is an observational, retrospective, and descriptive study involving patients in two medium-complexity services in the city of Imperatriz, state of Maranhão, Brazil, the Clínica Diagnóstica and the Clínica de Saúde Nutrogastro, references for the surgical treatment of obesity in Southern Maranhão, as well as in cities in the adjacent states of Tocantins and Pará. To this end, we used data obtained from the medical records of patients who underwent bariatric and metabolic surgery in the institutions, from January 2018 to December 2020.

The sample consisted of 180 medical records, corresponding to the number of patients treated during the period evaluated. Of these, two did not meet the study criteria. Therefore, the final analysis was based on data from 178 patients. The inclusion and exclusion criteria are described in Table 1.

Table 1 - Inclusion and exclusion criteria for the study.

Inclusion criteria	Exclusion Criteria
Patients aged ≥ 18 years, of both sexes, who underwent bariatric surgery between January 2018 and December 2020.	Patients with medical records with insufficient information to fill the research form.

Source: authors (2024).

For data collection, the authors prepared a form based on the literature, which was filled based on the information contained in the medical records. The data analyzed were as follows: Personal data: sex, age, marital status, and ethnicity; Clinical data: body mass index (BMI), degree of obesity, lifestyle habits (sedentary lifestyle, alcoholism, and smoking), associated comorbidities (hepatic steatosis, systemic arterial hypertension (SAH), diabetes mellitus (DM), dyslipidemia, sleep apnea, depression, osteoarthritis, gastroesophageal reflux disease (GERD), and the type of surgery performed (gastric bypass or sleeve gastrectomy)).

The data obtained were stored in Microsoft® Office Excel 2016 software. Subsequently, they were imported into the open-source software R Studio (R Core Team, 2022) for statistical analysis. Subsequently, they were organized in tables and presented in absolute and relative numbers. To compare the proportions between the groups, we used the Student's t-test and the Mann-Whitney U test based on the variables' distribution pattern, and we expressed the results as mean and standard deviation or median and 25%-75% interquartile range (IQR). To evaluate quantitative variables, we applied the Fisher's exact test. The level of significance was set at 0.05.

All data were collected in an exclusive room and access to medical records was restricted to researchers, who previously committed to the confidentiality of the information by signing the Data Use Commitment Term. The research was approved by the Human Research Ethics Committee of the University Hospital of the Federal University of Maranhão (HU-UFMA), under protocol number CAAE 56081821.0.0000.5086, opinion number: 5.314.867.

RESULTS

The analysis included 178 patients who underwent bariatric surgery from January 2018 to December 2020, of whom 77.5% (138) were female and 22.5% (40), male. The mean age was 35.7 years (\pm 9.5), ranging from 18 to 67.

Regarding marital status, 57.8% reported being married, 32% single, and 10.2% widowed. Of the total, 63.8% came from the municipality of Imperatriz and the others from other municipalities in the interior of Maranhão, Tocantins, and Pará, such as Balsas (MA), Porto Franco (MA), Açailândia (MA), Bom Jesus (TO), Rondon (PA), and Parauapebas (PA), among others. In addition, 98.3% reported a sedentary lifestyle, 13% smoked, and 38.7% reported frequent alcohol consumption. Table 2 shows patients' epidemiological profile.

Table 2 - Epidemiological profile of patients undergoing bariatric surgery.

Variables	n	%
Sex		
Male	40	22,5
Female	138	77,5
Marital status		
Single	57	32
Married	103	57,8
Divorced	18	10,2
Widowed	0	0
Origin		
Imperatriz	111	63,8
Another city	63	36,2
Sedentary lifestyle		
Yes	175	98,3
No	3	1,7

Variables	n	%
Alcoholism		
Yes	69	38,7
No	109	61,3
Smoking		
Yes	23	13
No	155	87

Source: authors (2024). Data presented as absolute (n) and relative (%) values.

All evaluated individuals reported some comorbidity. We observed hepatic steatosis in 64.6%, type-2 diabetes mellitus (T2DM) in 40.5%, (SAH) in 38.7%, and GERD in 28.7%, these being the most frequent conditions. Regarding the classification of obesity, 3.4% had grade I obesity, 43.3% grade II, and 53.3% grade III obesity, based on the Body Mass Index (BMI), as described in Table 3. The median BMI was 40.2kg/m² (IQR 37.2-44), ranging from 33.0kg/m² to 60.7kg/m².

Table 3 - Prevalence of comorbidities and type of surgery performed.

Variables	n	%
Degree of obesity		
Grade I	6	3,4
Grade II	77	43,3
Grade III	95	53,3
Systemic Arterial Hypertension		
Yes	69	38,7
No	109	61,3
Type-II Diabetes Mellitus		
Yes	72	40,5
No	106	59,5
Dyslipidemia		
Yes	45	25,3
No	133	74,7
Sleep Apnea		
Yes	3	1,7
No	175	98,3
Depression		
Yes	6	3,4
No	172	96,6
Hepatic Steatosis		
Yes	115	64,6
No	63	35,4

Variables	n	%
GERD		
Yes	51	28,7
No	127	71,3
Osteoarthritis		
Yes	42	23,6
No	136	76,4
RYGB [‡]	159	89,3
SG ^{‡‡}	19	10,7

RYGB: Roux-en-Y gastric bypass; SG: Sleeve Gastrectomy. Data presented as absolute (n) and relative (%) values.

Regarding the type of surgery performed, 89.3% of the patients underwent Roux-en-Y gastric bypass (RYGB), and 10.7%, sleeve gastrectomy (SG). When analyzing the differences between the mean BMI and the types of surgeries, we found a significant relationship

($p=0.009$), with the patients who underwent RYGB having higher mean BMI, as shown in Table 4.

When verifying possible associations between the analyzed variables and BMI, we found statistical significance for sex, women having higher median BMI than men, 43.3kg/m² (39.1-48.8) versus 39.9kg/m² (37-42.9), respectively ($p=0.008$). We could not find a statistically significant relationship when relating this parameter to the comorbidities analyzed, as can be seen in Table 5.

We observed statistically relevant relationships ($p<0.05$) between the degree of patients' obesity with the type of bariatric and metabolic surgery performed, so that most patients underwent RYGB, especially those with grade III obesity and with T2DM, depression, and osteoarthritis. All other variables did not show significant relevance when associated with the type of surgical technique, as shown in Table 6.

Table 4 - Difference between means and medians between types of surgeries.

Variables	SG	RYGB	p-value
Body Mass Index*	38,0 (3,38)	40,6 (5,37)	0,009
Age**	34,0 (18,0 - 32,5)	38,0 (35,0 - 42,0)	0,182

Source: authors (2024). SG: Sleeve Gastrectomy; RYGB: Roux-en-Y gastric bypass; *Student's t-test (normal distribution of the variable, represented by mean and standard deviation); **Mann-Whitney (non-normal distribution of the variable, represented by median and interquartile ranges).

Table 5 - BMI and categorical variables.

	Median BMI	IQR	p-value*
Sex			
Male	39,9	37,0 - 42,9	0,008
Female	43,4	39,1 - 48,8	
Systemic Arterial Hypertension			
Yes	40,4	37,1 - 45,7	0,399
No	40	37,4 - 43,0	
Type-2 Diabetes Mellitus			
Yes	39,9	37,5 - 43,9	0,82
No	40,4	37,1 - 44,0	
Dyslipidemia			
Yes	40	37,6 - 43,6	0,93
No	40,4	37,1 - 44,0	
Depression			
Yes	37,8	36,4 - 41,9	0,476
No	40,2	37,2 - 44,0	
Hepatic Steatosis			
Yes	40,4	36,6 - 44,0	0,813
No	40	37,5 - 43,8	
GERD			

Variables	n	%	p-valor
Yes	40,6	37,9 - 43,8	0,281
No	40	37,1 - 43,9	
Osteoarthritis			0,364
Yes	40,1	37,5 - 44,0	
No	40,1	36,2 - 43,1	

Source: authors (2024). *Mann-Whitney test (non-normal distribution of variables).

Table 6 - Clinical profile of patients undergoing RYGB and SG.

Variable	RYGB		SG		p-value*
	n	%	n	%	
Sex					
Male	39	25,0	1	25,0	0,079
Female	117	94,7	18	5,3	
Degree of obesity					
Grade I	4	2,5	1	5,3	0,031
Grade II	62	39	13	68,4	
Grade III	95	58,5	5	26,3	
Systemic Arterial Hypertension					
Yes	63	40,4	6	31,6	0,622
No	93	59,6	13	68,4	
Type-2 Diabetes Mellitus					
Yes	69	44,2	3	15,8	0,033
No	87	55,8	16	84,2	
Dyslipidemia					
Yes	41	26,3	4	16,1	0,830
No	115	73,7	15	78,9	
Depression					
Yes	3	1,9	3	15,8	0,018
No	153	98,1	16	84,2	
Osteoarthritis					
Yes	41	26,3	1	5,3	0,047
No	115	73,7	18	94,7	
Hepatic Steatosis					
Yes	104	66,7	9	47,4	0,160
No	52	33,3	10	52,6	
GERD					
Yes	46	29,5	3	15,8	0,325
No	110	70,5	16	84,2	

Source: authors (2024). *Fisher's exact test (proportions were $\leq 5\%$). Data presented as absolute (n) and relative (%) values. RYGB: Roux-en-Y gastric bypass; SG: Sleeve Gastrectomy.

DISCUSSION

From 2018 to 2020, 178 bariatric and metabolic surgeries were performed in the city of Imperatriz – MA, with a predominance of grade III

obesity (53.3%) associated with hepatic steatosis, T2DM, and SAH.

From this perspective, 77.5% of the patients undergoing the procedure were female, a fact also identified in other similar studies. According to IBGE

data, in 2019, obesity among women in the country increased from 14.5% to 30.2%, this condition being more prevalent in women⁵.

According to Ribeiro et al.¹⁴, the high stress to which women are exposed because of the double shift of work and domestic care makes them more likely to develop weight-related disorders, such as overweight and obesity. Moreover, the better perception of health and self-care, in addition to the concern for aesthetics, may also justify the greater search for the procedure by women^{15,16}.

Regarding the age group, most operated individuals had a mean age of 35.7 (± 9.5) years, similar to the findings of Palheta et al.¹⁷ and Junges et al.¹⁸. According to national data, in Brazil the age group between 35 and 44 years old was the one with the highest obesity rate between 2006 and 2018, with a prevalence of 84.2%^{5,19}.

Lifestyle is a determining aspect for health and the development of obesity^{3,20}. Most studied patients reported a sedentary lifestyle (98.3%), smoking (13%), and alcohol consumption (38.7%). In Brazil, in 2016, approximately 50% of the adult population did not exercise regularly²¹. On the other hand, Silva et al.²² examined the profile of preoperative patients for bariatric surgery in Santa Maria, Rio Grande do Sul, Brazil, and found a rate of 69% of regular physical activity. This suggests greater awareness among individuals in the region or, possibly, more effective care provided by the Health Service.

Regarding tobacco and alcohol consumption, the literature shows an association with overweight and obesity, considering that these substances are capable of altering several organic pathways due to their toxic potential, influencing body weight levels²³⁻²⁵. The data found corroborate the studies by Silva et al.²² and King et al.²⁶, with a prevalence of smoking (13%) and alcohol consumption (14.8%), respectively.

Obesity as a predictor of morbidity and mortality has several definitions, with BMI being the most used metric for anthropometric classification and an important criterion for indication of bariatric surgery^{27,28}. Studies have shown that cardiovascular risk almost doubles in individuals with grade III obesity compared with those with grade II²⁹. In this study, more than half of the patients had a BMI ≥ 40 kg/m² (53.3%), which is the main indication for the procedure. The results agree with those found by Arantes et al.³⁰ and Silva et al.²², who also identified this prevalence.

Regarding comorbidities, the most prevalent were hepatic steatosis (64.6%), T2DM (40.5%), and hypertension (38.7%). In addition, patients with higher BMI had a higher number of these associated health conditions. Arantes et al.³⁰ developed a study with a similar approach, finding that the main associated diseases were T2DM (89%), hypertension (74.8%), and hepatic steatosis (68.2%).

In this scenario, with a high BMI (grade III) associated with comorbidities, the therapy with the best results is bariatric surgery. The literature indicates that the most performed techniques are gastric bypass and sleeve gastrectomy^{37,38}. In this study, 89.3% of the performed procedures were RYGB and 10.7% were SG.

Currently, SG is the most performed bariatric and metabolic surgery technique in the world, as it is simpler and requires less operative time, representing more than 60% of all procedures³⁸. Despite this, a multicenter randomized clinical trial revealed greater weight loss in patients undergoing RYGB compared with SG, despite having a higher risk of complications, a factor that influences the choice of the most appropriate technique for each patient^{39,40}. According to surveys, in Brazil RYGB is the leader, corresponding to almost two-thirds of all these surgeries in the country, corroborating the findings of this study³⁸.

In this regard, in addition to the treatment of obesity, bariatric surgery can also be indicated for the control of weight-related metabolic comorbidities, such as T2DM, when it is called metabolic surgery⁴¹. It is estimated that T2DM currently affects about 360 million adults, and of these, almost half are obese, and bariatric and metabolic surgery are the most effective treatment to control these conditions, reducing or even preventing associated complications^{41,42}.

This study found a statistically significant relationship between obese patients with diabetes and the type of bariatric surgery performed, with RYGB being the procedure that was most often performed in these cases. Recent reports have shown that RYGB has a relative superiority in weight loss and long-term glycemic control^{42,43}. However, there is no consensus in the literature and SG is also indicated for the metabolic control of diabetes in obese patients. According to Mc Tigue et al.⁴⁴, RYGB ensures a longer time to remission of diabetes

than SG, with recurrence rates of uncontrolled glycemia for RYGB and SG of 33.1% and 41.6%, respectively.

The authors highlight some limitations in the study. The main one is the retrospective nature of the analysis. In addition, the sample is composed only of patients linked to two medium complexity health centers that undergo bariatric surgery and does not cover all the services that provide this service in the region. In addition, the research used data obtained from medical records, in which some did not follow a specific standardization, which may compromise the obtaining of some relevant data for the research objectives and, consequently, its analysis.

CONCLUSION

The clinical-epidemiological profile of patients who underwent bariatric surgery in the southern region

of Maranhão is compatible with the national scenario. The findings reflect an important perspective of the local reality and may serve as a pilot for the future development of larger studies and Health Policies, considering the local particularities observed. The characterization and analysis of the clinical-epidemiological profile of patients undergoing bariatric and metabolic surgery is relevant for the reduction of obesity and weight-related conditions, for the organization and expansion of access to this service, and for the future planning of new actions to improve the quality and expectancy of life in this group.

ACKNOWLEDGEMENTS

We would like to thank the technical directors of the Clínica Diagnóstica and the Clínica de Saúde Nutrogastro for authorizing the study to be carried out in the institutions.

R E S U M O

Introdução: a obesidade é definida pelo acúmulo excessivo de gordura em diferentes regiões corporais, condição que acarreta prejuízos à saúde e constitui fator de risco para diversas comorbidades. A cirurgia bariátrica é a opção terapêutica com melhores resultados para o seu tratamento. **Métodos:** estudo retrospectivo descritivo realizado com dados obtidos de prontuários médicos do período de janeiro/2018 a dezembro/2020, relacionados a pacientes submetidos à cirurgia bariátrica. As análises estatísticas realizadas adotaram nível de significância $p < 0,05$. **Resultados:** foram incluídos 178 prontuários, sendo 77,5% de mulheres. A média de idade foi de 35,7 anos ($\pm 9,5$), 63,8% dos pacientes eram procedentes de Imperatriz, 98,3% relataram sedentarismo, 38,7% consumo regular de álcool e 13% tabagismo. A prevalência de obesidade grau III ($IMC \geq 40 \text{ kg/m}^2$) foi de 53,3%. As comorbidades mais relacionadas foram esteatose hepática (64,6%), diabetes mellitus tipo 2 (DM2) (40,5%) e hipertensão arterial (38,7%). O principal tipo de cirurgia realizada foi o by-pass gástrico em Y de Roux (BGYR) (89,3%). Observou-se associação entre a mediana de IMC e o sexo ($p=0,008$), com as mulheres apresentando maiores valores [43,4 (IIQ 39,1 – 48,8)]. A média de IMC dos pacientes submetidos ao BGYR foi significativamente maior comparado aos que realizaram gastrectomia vertical (GV) ($p=0,009$). Houve associação estatística entre o DM2 ($p=0,033$) e a depressão ($p=0,018$) com o tipo de cirurgia realizada. **Conclusão:** o perfil clínico-epidemiológico encontrado evidenciou maior prevalência do sexo feminino e de indivíduos com obesidade grau III. O BGYR foi o procedimento mais realizado, estabelecendo associação com IMC e algumas comorbidades apresentadas pelos pacientes.

Palavras-chave: Cirurgia Bariátrica. Obesidade. Comorbidade. Prevalência. Epidemiologia.

REFERENCES

1. Park S, Lee S, Kim Y, Lee Y, Kang MW, Han K, et al. Altered risk for cardiovascular events with changes

in the metabolic syndrome status: a Nationwide population-based study of approximately 10 million persons. *Ann Intern Med.* 2019;171(12):875–84. doi: 10.7326/M19-0563.

2. Lacerda RMR, Castanha CR, Castanha AR, Campos JM, Ferraz ÁAB, Vilar L. Perception of body image by patients undergoing bariatric surgery. *Rev Col Bras Cir*. 2018;45(2):1–8. doi: 10.1590/0100-6991e-20181793.
3. Ferreira AP de S, Szwarcwald CL, Damacena GN. Prevalência e fatores associados da obesidade na população brasileira: estudo com dados aferidos da Pesquisa Nacional de Saúde, 2013. *Rev Bras Epidemiol*. 2019;22. doi: 10.1590/1980-549720190024.
4. Carvalho AS, Rosa RDS. Cirurgias bariátricas realizadas pelo Sistema Único de Saúde em residentes da Região Metropolitana de Porto Alegre, Rio Grande do Sul, 2010-2016. *Epidemiol Serv Saude*. 2018;27(2):1–10. doi: 10.5123/S1679-49742018000200008.
5. IBGE (Brasil). Pesquisa nacional de saúde 2019: atenção primária à saúde e informações antropométricas. Brasil / IBGE, Coordenação de Trabalho e Rendimento, DF: Ministério da Saúde, 2020. Disponível em: <https://biblioteca.ibge.gov.br/visualizacao/livros/liv101758.pdf>
6. Ruban A, Stoenchev K, Ashrafian H, Teare J. Current treatments for obesity. *Clin Med (Northfield Il)*. 2019;19(3):205–12. doi: 10.7861/clinmedicine.19-3-205.
7. Schauer PR, Kashyap SR, Wolshu K, Brethayer SA, Kirwan JP et al. Bariatric surgery versus intensive medical therapy in obese patients with diabetes. *N Engl J Med*. 2015;687–96. doi: 10.1056/NEJMoa1200225.
8. Ayoub JAS, Alonso PA, Guimarães LMV. Effects of bariatric surgery on the metabolic syndrome. *Arq Bras Cir Dig*. 2011;24(2):140-143. doi.org/10.1590/S0102-67202011000200010.
9. Wolfe BM, Kvach E, Eckel RH. Treatment of Obesity: Weight Loss and Bariatric Surgery. *Circ Res*. 2016;118(11):1844–55. doi: 10.1161/CIRCRESAHA.116.307591.
10. Barros F, Negrão MG, Negrão GG. Comparação da perda de peso após sleeve e bypass gástrico em Y de Roux: Revisão Sistemática. *Arq Bras Cir Dig*. 2019;32(4):8–11. doi: /10.1590/0102-672020190001e1474.
11. Arterburn DE, Courcoulas AP. Bariatric surgery for obesity and metabolic conditions in adults. *BMJ*. 2014;349:1–11. doi: 10.1136/bmj.g3961.
12. SBCBM divulga números e pede participação popular para cobertura da cirurgia metabólica pelos planos de saúde. Sociedade Brasileira de Cirurgia Bariátrica e Metabólica. 2020 .
13. Brasil M da S. Portaria no 492, de 31 de Agosto de 2007. *Diário Oficial da União* 2022;1–30.
14. Ribeiro GANA, Giapietro HB, Belarmino LB, Salgado-Junior W. Depressão, Ansiedade E Compulsão Alimentar Antes E Após Cirurgia Bariátrica: Problemas Que Persistem. *Arq Bras Cir Dig*. 2018;31(1):e1356. doi: 10.1590/0102-672020180001e1356.
15. Lopes ACS, Reyes ANL, Menezes MC, Santos LC, César CC. Fatores associados ao excesso de peso entre mulheres. *Esc Anna Nery*. 2012;16(3):451–8. doi: 10.1590/S1414-81452012000300004.
16. Almeida SS, Zanatta DP, Rezende FF. Imagem corporal, ansiedade e depressão em pacientes obesos submetidos à cirurgia bariátrica. *Estud Psicol*. 2012;17(1):153–60. doi: 10.1590/S1413-294X2012000100019.
17. Palheta R, Costa V, Brígida E, Dias J, Nogueira A, Figueira M. Avaliação da perda de peso e comorbidades em pacientes submetido à cirurgia bariátrica em uma clínica particular em Belém-PA. *RBONE - Rev Bras Obesidade, Nutr e Emagrecimento*. 2017;11(65):281–9.
18. Junges VM, Cavalheiro JMB, Fam EF, Closs VE, Gottlieb MG. Perfil do paciente obeso e portador de síndrome metabólica candidato à cirurgia bariátrica em uma clínica particular de Porto Alegre, Rio Grande do Sul. *Sci Med (Porto Alegre)*. 2016;26(3). doi: 10.15448/1980-6108.2016.3.22898.
19. Brasil M da S. *Vigitel Brasil 2018: Vigilância de fatores de risco e proteção para doenças crônicas por inquerito telefônico* [Internet]. G. Estatística e Informação em Saúde. 2019. 131 p. Available from: http://bvsmis.saude.gov.br/bvs/publicacoes/vigitel_brasil_2011_fatores_risco_doencas_cronicas.pdf
20. Flack KD, Uffholz K, Johnson L, Fitzgerald JS, Roemmich JN. Energy compensation in response to aerobic exercise training in overweight

- adults. *Am J Physiol - Regul Integr Comp Physiol.* 2018;315(4):R619–26. doi: 10.1152/ajpregu.00071.2018.
21. Guthold R, Stevens GA, Riley LM, Bull FC. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1•9 million participants. *Lancet Glob Heal.* 2018;6(10):e1077–86. doi.org/10.1016/S2214-109X(18)30357-7.
 22. Silva PT de, Patias LD, Alvarez G da C, Kirsten VR, Colpo E, Moraes CMB de. Perfil de pacientes que buscam a cirurgia bariátrica. *Arq Bras Cir Dir.* 2015;28(4):270–3. doi: 10.1590/S0102-6720201500040013.
 23. Souza LPSE, Hermsdorff HHM, Miranda AES, Bressan J, Pimenta AM. Alcohol consumption and overweight in brazilian adults – cume project. *Cienc e Saude Coletiva.* 2021;26:4835–48. doi: 10.1590/1413-812320212611.3.20192019.
 24. Torres GG, Siqueira JH, Martinez OGE, Pereira TSS, Meléndez JGV, Duncan BB, et al. Consumption of alcoholic beverages and abdominal obesity: cross-sectional analysis of ELSA-Brasil. *Cien Saude Colet.* 2022;27(2):737–46. doi: 10.1590/1413-81232022272.02282021.
 25. Janssen F, Trias-Llimós S, Kunst AE. The combined impact of smoking, obesity and alcohol on life-expectancy trends in Europe. *Int J Epidemiol.* 2021;50(3):931–41. doi: 10.1093/ije/dyaa273.
 26. King WC, Chen JY, Mitchell JE, Kalarchian MA, Steffen KJ, Engel SG, et al. Prevalence of alcohol use disorders before and after bariatric surgery. *JAMA.* 2012;307(23):2516–25. doi: 10.1001/jama.2012.6147.
 27. Nuttall FQ. Body Mass Index. *Nutr Today.* 2015;50(3):117–28. doi: 10.1097/NT.0000000000000092.
 28. OPAS/OMS Wannmacher L. Obesidade como fator de risco para morbidade e mortalidade: evidências sobre o manejo com medidas não medicamentosas. *OPAS/OMS – Represent Bras.* 2016;1(7):1–10.
 29. Castro-Porras L, Rojas-Russell M, Aguilar-Rodríguez MA, Giraldo-Rodríguez L, Agudelo-Botero M. Sociodemographic and Clinical Factors Associated with Severe Obesity in Adults. *Arch Med Res.* 2022;53(2):196–204.
 30. Arantes AJA, Cangussu IV, Cangussu VV. Perfil epidemiológico dos pacientes submetidos a cirurgia bariátrica em hospital de ensino. *HU Rev.* 2022;45(1):1–7. doi: 10.34019/1982-8047.2019.v45.16970.
 31. Nora C, Morais T, Nora M, Coutinho J, do Carmo I, Monteiro MP. Gastrectomia vertical e bypass gástrico no tratamento da síndrome metabólica. *Rev Port Endocrinol Diabetes e Metab.* 2016;11(1):23–9. doi: 10.1016/j.rpedm.2015.09.002.
 32. Welbourn R, Hollyman M, Kinsman R, Dixon J, Liem R, Ottosson J, et al. Bariatric surgery worldwide: baseline demographic description and one-year outcomes from the fourth IFSO global registry report 2018. *Obes Surg.* 2019;29:782–95. doi: 10.1007/s11695-018-3593-1.
 33. Grönroos S, Helmiö M, Juuti A, Tiisanen R, Hurme S, Löyttyniemi E, et al. Effect of Laparoscopic Sleeve Gastrectomy vs Roux-en-Y Gastric Bypass on Weight Loss and Quality of Life at 7 Years in Patients With Morbid Obesity. *JAMA Surg.* 2021;156(2):137–46. doi: 10.1001/jamasurg.2020.5666.
 34. Coleman KJ, Wellman R, Fitzpatrick SL, Conroy MB, Hlavin C, Lewis KH et al. Comparative Safety and Effectiveness of Roux-en-Y Gastric Bypass and Sleeve Gastrectomy for Weight Loss and Type 2 Diabetes Across Race and Ethnicity in the PCORnet Bariatric Study Cohort. *JAMA Surg.* 2022;157(10):897–906. doi: 10.1001/jamasurg.2022.3714.
 35. Arterburn D, Wellman R, Emiliano A, Smith SR, Odegaard AO, Murali S et al. Comparative Effectiveness and Safety of Bariatric Procedures for Weight Loss. *Ann Intern Med.* 2018;169(11):741–50. doi: 10.7326/M17-2786.
 36. Chen X, Kong X. Diabetes remission and relapse after metabolic surgery. *J Diabetes Investig.* 2018;9(6):1237–8. doi: 10.1111/jdi.12871.
 37. Lewis KH, Arterburn DE, Zhang F, Callaway K, Wallace J, Fernandez A. Comparative Effectiveness of Vertical Sleeve Gastrectomy vs. Roux en Y Gastric Bypass for Diabetes Treatment: A Claims-Based Cohort Study. *Ann Surg.* 2021;273(5):940–8. doi: 10.1097/SLA.0000000000003391.
 38. McTigue KM, Wellman R, Nauman E, Anau J,

Coley RY, Odor A, et al. Comparing the 5-year diabetes outcomes of sleeve gastrectomy and gastric bypass the national patient-centered clinical

research network (PCORNet) bariatric study. *JAMA Surg.* 2020;155(5):1–12. doi: 10.1001/jamasurg.2020.0087.

Received in: 08/12/2023

Accepted for publication: 02/05/2024

Conflict of interest: no.

Funding source: none.

Mailing address:

Livio Melo Barbosa

E-mail: liviomelomb@gmail.com

