

# Determinants of Adequate Response of Patient Undergoing Roux-en-y Gastric Bypass Surgery

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## Research

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# Abstract

**INTRODUCTION:** Roux-en-Y gastric bypass surgery (RYGB) is known to induce, on average, 60 to 75% excess body weight loss between 18 and 24 months post-surgery. However, several studies have shown weight regain after two years post-surgery, thus patients must have adequate follow-up in order to guarantee and/or maintain response to RYGB.

**AIM:** To evaluate the determinants of adequate response in patients who underwent RYGB.

**METHODS:** A longitudinal study with 193 adults who underwent RYGB between 2012 and 2014. Adequate response to RYGB was determined by Excess Weight Loss (%EWL). Logistic regression models were constructed to verify the degree of association between adequate response of patient after RYGB and determinants of variable risk based on estimate Odds Ratios (OR).

**RESULTS:** RYGB improves Systemic arterial hypertension (SAH), Diabetes Mellitus (DM) and body mass index (BMI). From the multivariate logistic regression model, being female and not having SAH and DM reduce the chance of inadequate RYGB response. Regarding preoperative BMI, an increase in one unit of  $\text{kg}/\text{m}^2$  was associated with increased odds of inadequate response after RYGB. And patients who did not receive follow-up care with a psychologist or psychiatrist in the postoperative period presented higher odds of inadequate response to RYGB.

**CONCLUSION:** The findings of this study contribute to the effective planning of interventions by multi-professional teams involved in RYGB, aimed at offering a better follow-up care focused mainly on post-surgery changes and adequate RYGB response.

## Introduction

Obesity is considered a metabolic and multifactorial disease. It is associated with genetic, endocrine or environmental factors[1]. Approximately 604 million adults worldwide are obese, and the prevalence of obesity doubled between 1980 and 2015 in more than 70 countries[2]. In Brazil, the prevalence of obese adults in 2015 was 18.9%[3]. Clinical and surgical treatments of obesity have intensified and improved in recent years[4][5]. Clinical treatment - which consists of diet therapy alone or diet therapy combined with psychosocial support and medication - has been shown to induce weight loss but not clinically significant in individuals with severe obesity (Body Mass Index (BMI)  $\geq 40 \text{ kg} / \text{m}^2$ )[6]. On the other hand, bariatric surgery (BS) is a reliable resource in situations where clinical treatment fails, thus it reduces mortality rates and improves clinical comorbidities [7].

BS does not cure obesity but controls the same, and can be associated with nutritional and clinical complications in the short and long term[5]. It is known that BS induces, on average, a 60 to 75% excess body weight loss between 18 and 24 months post-surgery [8]. However, several studies have shown weight regain after two years post-surgery, thus patients must have continuous postoperative treatments in order to guarantee and/or maintain adequate response to the surgery. Several factors such as age,

eating habits, insufficient physical activity and hormonal adaptations[9]predict adequate response to BS. Studies that assess weight loss after Roux-en-Y gastric bypass surgery (RYGB) present a limitation related to the follow-up period – which is usually not long, either one or two years post-surgery [10].

In this context, the role of the multi-professional team in the post-operative period is highlighted. The team can identify insufficient weight loss, excess weight and nutritional deficiencies thus, implement prompt interventions when necessary. The quality of life of patients is also assessed and options to improve the same are provided. Moreover, patients are encouraged to follow the guidelines for lifestyle changes such as healthy eating and physical activity practice. All these factors promote the success of the surgical approach to obesity treatment[5]. Therefore, the present study aimed to evaluate the determinants of adequate response in patients who underwent RYGB.

## Methods

### Study design, period and population

This study is a prospective longitudinal observational study conducted with patients who underwent RYGB between 2012 and 2014, in a general and private hospital in Contagem, Brazil. The study followed the STROBE guidelines. The sample consisted of 193 adults (18 years or older) who underwent RYGB and at more than 24 months post-surgery (Figure 1).

### *Selection Criteria*

Patients who presented a postoperative period of less than 24 months were excluded because a minimum of 24 months is ideal for the evaluation of adequate response in patients who underwent RYGB [7,10]. Figure 1 shows the flowchart of sample selection and follow-up process.

### Study Protocol

Data collection was performed by trained health professionals and comprised two phases: the first phase consisted of the completion of a semi-structured questionnaire prepared by the researchers and based on the medical records of patients who underwent bariatric surgery from 2012 to 2014.

In the second phase (held in the year 2016), data of the patients (in the second and third postoperative year) were collected through a telephone survey. Also, the patients completed an additional semi-structured questionnaire (created by the researchers and based on previously validated questionnaires) related to their follow-up. Data collected included sociodemographic variables (sex, age, race, level of education, marital status and income), clinical (related to comorbidities and hospitalization - Systemic Arterial Hypertension, Diabetes mellitus, follow-ups with nutritionist and/or psychologist and postoperative time), anthropometric (weight, BMI) and lifestyle (nutritional habits, physical activity practice and sedentary lifestyle).

### Analysis of results and statistics

The adequate response to RYGB was determined by this criterion: % Excess Weight Loss (%EWL); %EWL was calculated using pre-operative weight according to patient's record and current weight informed by participant on the telephone. The ideal weight (IW) of each participant was calculated, considering a BMI of 25 kg/m<sup>2</sup> based on the equation  $IW = 25 \times (\text{height})^2$ .

To determine excess weight, preoperative weight was subtracted from the ideal calculated weight. The %EWL was calculated following the equation:  $\%EWL = [\text{Excess weight (kg)} - \text{weight lost (kg)}] \times 100$  [11] [12]. Weight loss was obtained by subtracting preoperative weight from the postoperative weight reported by the participants on the telephone. A %EWL between 50 and 80% was classified as an adequate response to the surgery [7].

The data were processed and analyzed using Stata/SE, version 14.0. In order to evaluate the indicators of RYGB impact, intra group comparisons were conducted through the following statistical tests: McNemar, for categorical and dichotomous variables; and Wilcoxon signed-rank test, for non-parametric continuous numerical variables. The frequency distribution of the categorical variables was utilized for data analysis. The Pearson's Square test or Fisher's exact test allowed the comparison of the studied variables and adequate response to RYGB. Bonferroni correction was performed on the variables (with more than two categories) that presented statistical difference in the previous test.

For quantitative variables, their symmetry was verified by the Shapiro-Wilk test and described as median and interquartile range (IQ). The comparisons were done using the following tests: Mann-Whitney (2 independent samples) or Kruskal-Wallis (three independent samples). For numerical variables with more than 2 categories, the post-hoc test with Bonferroni correction was used.

To verify the magnitude of the association between the adequate response of patient after Roux-en-Y gastric bypass surgery and the determinants of risk, logistic regression models were constructed to estimate Odds Ratios (OR) with their respective Confidence Intervals (95% CI). For the logistic regression model, it is noteworthy that patients with %EWL >80% obtained adequate response after Roux-en-Y gastric bypass surgery [13].

For the multivariate regression model, the backward method was used to construct the model and it included all the variables (sex, BMI – pre-surgery, Systemic Arterial Hypertension – Post-surgery, Diabetes Mellitus – Post-surgery and Guidance of psychologist or psychiatrist – post-surgery) of interest related to a statistical significance lower than 20% in the bivariate analysis and theoretical criterion, being withdrawn one by one. To evaluate the adjustments of the final model, we used the Hosmer-Lemeshow model adhesion test.

A significance level of 5% ( $p < 0.05$ ) was adopted in all the analytical procedures, except for Bonferroni correction.

## Results

The study sample consisted of mostly women (87.56%), with a median age of 39 years (IQ = 33-44), self-reported brown/yellow skin color (54.40%), high school graduates (59.07%), lived with partner (68.91%) and had mean income per household of 1 to 3 minimum wages (56.67%) (Table 1).

Less than half of the participants reported being diagnosed with systemic arterial hypertension (SAH) and diabetes mellitus (DM) (43.52% and 27.08%, respectively) before the surgery, however after the surgery, the number of participants who reported having SAH and DM in the postoperative period reduced significantly, suggesting the remission of these conditions (Table 2).

In relation to physical activity practice, there was a significant increase after RYGB (32,53% preoperative to 74,88% postoperative). Regarding anthropometric indicators of excess weight, a significant reduction in body weight and, consequently, BMI after surgery was observed, as shown in Table 2, where the median monthly weight loss was 1.19 kg (IQ = 0.72 - 1.62) and after 36 months post-surgery this value was 36 kg (IQ = 30-42). The percentage of patients who obtained adequate response was 89.83% with EWL > 50%.

The patients were compared according to adequate response based on %EWL, and the results are presented in Table 3. Among patients with inadequate response (%EWL <50%), a higher proportion of weight gain was observed after surgery compared to those who reported %EWL > 80% ( $p = 0.037$ ). Median monthly weight loss was significantly higher in patients who had %EWL > 80% compared to those with a lower response rate based on this criterion ( $p \leq 0.001$ ). A higher proportion of patients guided by a nutritionist was observed in the %EWL > 80% group compared to the 50% to 80% EWL group ( $p = 0.012$ ) (Table 3).

Table 4 shows the unadjusted and adjusted models for inadequate response of patient to Roux-en-Y gastric bypass surgery. Being female reduces, on average, 0.06 (95% CI= 0.01 - 0.311;  $p=0.001$ ) times the chance of inadequate response compared to males. In addition, not having postoperative hypertension reduces, on average, 0.13 (95% CI=0.02 - 0.79;  $p=0.027$ ) times the chance of inadequate response to the surgery in relation to patients with SAH. Patients without Diabetes Mellitus in the postoperative period on average reduced the odds of inadequate response by 0.04 (95% CI= 0.01-0.41;  $p=0.007$ ) times compared to patients with Diabetes (Table 4).

Regarding preoperative BMI, an increase in one unit of  $\text{kg/m}^2$  increased, on average, 1.17 (95% CI= 1.04 - 1.31;  $p=0.005$ ) times the chance of inadequate response after surgery. And not having follow-up care with a psychologist or psychiatrist in the postoperative period increased, on average, 4.55 (95% CI= 1.01 - 20.51;  $p=0.048$ ) times the chance of inadequate response compared to patients who had follow-up care (Table 4).

## Discussion

The present study demonstrated that RYGB contributes to the remission of SAH and DM, and reduces BMI. According to the criteria used in evaluating RYGB adequate response, majority of the individuals

experienced a sufficient response to the surgical treatment. Having guidance of a nutritionist in the preoperative period was associated with greater %EWL loss. In addition, being female and not having SAH and DM reduce the chance of inadequate response to RYGB. Regarding preoperative BMI, an increase in one unit of  $\text{kg/m}^2$  increased the chance of inadequate response after surgery. And patients who did not receive follow-up care with a psychologist or psychiatrist in the postoperative period increased the chance of inadequate response to RYGB.

The multivariate analysis showed that being female reduces the chance of inadequate response to RYGB. Previous studies have shown that being male negatively influenced response after RYGB [13][14]. Although our study found a significant difference between sex and % EWL, studies in the literature have divergent findings on the impact of sex on RYGB response [15]. This may be due to the fact that participants of most RYGB studies are predominantly female[13].

In this study, not having SAH and DM reduced the chance of inadequate RYGB response. A previous research, conducted with 3193 patients in United States, demonstrated that individuals diagnosed with DM had less percentage of excess weight loss, compared with those without the disease. Also, the authors observed different results between groups of diabetic individuals after surgery, according to diet-control measures, use of oral hypoglycemics and insulin therapy. Patients on insulin had lower percentage of excess weight loss. Despite these differences, all diabetic patients had significant improvement in their glycemic levels after surgery[16]. Additionally, current evidence shows that bariatric surgery reduces the progression of diabetes complications, such as diabetic retinopathy and diabetic nephropathy[17][18].

In this study, RYGB proved to be an important step for the remission of morbidities associated with obesity, such as DM and SAH. RYGB has positive effects on glycemic control in the general population. It is known that RYGB contributes to significant remission and prevention of DM and also improves or contributes to the complete remission of other cardiovascular diseases, such as SAH[19].

It should be noted that the presence of comorbidities, such as insulin resistance, hypertriglyceridemia and hypertension prior to surgery, is also associated with other negative outcomes in the postoperative period, such as increase in the need of intensive care and longer hospital stay[20]. In general, preoperative care is an important particularity of BS, highlighting the influence of adequate care on the reduction of complications and improvement of surgery outcome.

From the multivariate analysis, we found that individuals presenting higher BMI at baseline were more likely to have inadequate response to bariatric surgery, compared to those with lower initial BMI. This finding is strongly emphasized in the literature. In a 2365-patient cohort, BMI was also inversely associated with excess weight loss in different phases of follow-up [21]. Morbidly obese individuals had less excess weight loss after the surgical procedure, especially when weight loss is measured in relative and not in absolute terms[22]. This emphasizes the need for an intense preoperative evaluation of patients and choice of appropriate treatments through an effective multidisciplinary team.

Regarding the professionals responsible for preoperative and postoperative care, the inclusion of psychologists and psychiatrists in the whole process is considered essential for improved outcomes. In our findings, we demonstrated that the absence of these professionals in the postoperative period is associated with inadequate response to BS. Adequate response was directly related to adherence to healthy lifestyles [23][24]. However, only a few patients continue to follow an adequate lifestyle. In general, non-adherence is related to multiple emotional factors [25]. According to literature review, the psychosocial monitoring of patients has positive impacts, and these interventions should begin after bariatric surgery [26].

We found no significant association between physical activity practice and inadequate response to RYGB. Evidence surrounding physical activity patterns after RYGB remains limited. In a recent meta-analysis, a tendency in the increase of exercises after surgery was demonstrated, however, the measures of physical activity were highly variable, and most of them were self-referenced. Seven studies reported changes in the practice of physical activity based on objective measures, such as the use of an accelerometer. Therefore, further studies on the role of physical activity in weight reduction and improvement in functional aspects of individuals in the BS postoperative period are necessary[27].

The study presents some limitations: the first being the use of self-reported data for the evaluation of postoperative weight loss. However, data collection through the self-report method has been widely used as an acceptable and valid method in epidemiological studies with Brazilian adults[28][29]. The second limitation refers to the non-assessment of compulsive eating in the preoperative period. Thus, we were unable to identify changes in this behavior before and after surgery. The strength of the study is the use of a large sample of patients undergoing follow-up after bariatric surgery, in specific health services, such as a private hospital.

## **Conclusion**

Weight loss differed according to the method used in evaluating bariatric surgery success, but in general, majority of the patients presented adequate response to surgery. Being female and not having SAH and DM reduce the chance of inadequate RYGB response. Additionally, an increase in one unit of kg/m<sup>2</sup> of patient's BMI increased the chance of inadequate response after surgery. Patients who did not receive follow-up from a psychologist or psychiatrist in the postoperative period presented an increased chance of inadequate response to RYGB. The findings of the study, without any doubt, are useful to multi-professional teams involved in bariatric surgery as regards the planning of effective interventions and adequate follow-up care of patients undergoing changes related to bariatric surgery, which consequently improves the success rates of RYGB.

## **Declarations**

### **Ethics approval and consent to participate**

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

The study was approved by the Research Ethics Committee of Universidade Federal de Minas Gerais, under number CAAE-52657115.2.0000.5149.

Participation of the adults was voluntary.

Since these are telephone interviews, free and informed consent was replaced by verbal consent, notifications by telephone contacts with the interviewees, which were clarified regarding the confidentiality and anonymity of the data and which they use only for research purposes. All respondents received a telephone number to answer questions.

### **Conflict of Interest**

The authors declare that they have no conflict of interest

### **Consent for publication**

All authors agree with the final version of the manuscript and the specified order of authorship.

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**Author Contribution statement:** Design and planning of the study: TPRS, FMS, LLM, ADMD'A, FPM. Data collection, analysis and interpretation: TPRS, FMS, LLM, ADMD'A, FPM. Drafting or proofreading of the manuscript: TPRS, FMS, LLM, ADMD'A, LPFA, IPM, SAFL, RGCA,FPM. Approval of the final version: TPRS, FMS, LLM, ADMD'A, LPFA, IPM, SAFL, RGCA,FPM. Public responsibility for the contents of the article: TPRS, FMS, LLM, ADMD'A, LPFA, IPM, SAFL, RGCA, FPM.

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## Tables

**Table 1-** Sociodemographic profile of patients who underwent Bariatric Surgery - Minas Gerais, 2016.

<b>Variable</b>	<b>n (%)</b>
<b>Race/Skin Color/self-reported Ethnicity</b>	
White	56(29.02)
Brown /Yellow	105(54.40)
Black	32(16.58)
<b>Level of Education</b>	
University	39(20.21)
High school	114(59.07)
Elementary education	40(20.73)
<b>Lives with partner</b>	
Yes	133(68.91)
No	60(31.09)
<b>Household per capita income<sup>b</sup></b>	
No income	21(11.67)
1 to 3 minimum salary	102(56.67)
3 to 5 minimum salary	39(21.67)
More than 5 minimum salary	18(10.00)
<b>Note:</b> <sup>a</sup> Median and Interquartile range.	
<sup>b</sup> Mean salary calculated per household and based on minimum salary: R\$788.00.	

<b>Table 2 - Clinical profile before and after Bariatric Surgery - Minas Gerais, 2016.</b>			
<b>Variable</b>	<b>N</b>	<b>%</b>	<b>p-value</b>
<b>Systemic Arterial Hypertension</b>			<b>&lt;0.001**</b>
Pre-surgery	84	43.52	
Post-surgery	16	8.29	
<b>Diabetes Mellitus</b>			<b>&lt;0.001**</b>
Pre-surgery	52	27.08	
Post-surgery	9	4.66	
<b>Guidance of Nutritionist</b>			<b>&lt;0.001**</b>
Pre-surgery	181	93.78	
Post-surgery	58	6.22	
<b>Physical activity practice</b>			<b>&lt;0.001**</b>
Pre-surgery	94	32.53	
Post-surgery	152	74.88	
<b>Weight*</b>			
Pre-surgery	115(105-127)		<b>&lt;0.001***</b>
Post-surgery	70(63-82)		
<b>BMI*</b>			<b>&lt;0.001***</b>
Pre-surgery	42.70(40.79 - 47.20)		
Post-surgery	27.63(24.45-30.06)		
<b>Note:</b> *Median and Interquartile range; ** McNemar test; ***Wilcoxon test.			
<b>Source:</b> Author.			

**Table 3:** Nutritional and lifestyle variables associated with the adequate response of Bariatric Surgery among individuals who underwent the surgery- Minas Gerais, 2016.

Variable	Inadequate response		Adequate response		p-value
	%EWL < 50%	%EWL 50 - 80%	%EWL >80%		
<b>Number of meals per day</b> <sup>1</sup>	5(4-6)*	4(4-6)*	5(4-6)*		0.293
<b>Eats breakfast</b> <sup>2</sup>					0.646
Yes	24(100)	40(95.24)	114(97.44)		
No	0	2(4.76)	3(2.56)		
<b>Eats lunch</b> <sup>2</sup>					1.000
Yes	24(100)	41(97.62)	115(98.29)		
No	0	1(2.38)	2(1.71)		
<b>Eats dinner</b> <sup>2</sup>					0.557
Yes	18(75.00)	36(85.71)	95(81.20)		
No	6(25.00)	6(14.29)	22(18.80)		
<b>Has snacks between meals</b> <sup>3</sup>					0.853
Yes	20(83.33)	37(88.10)	102(87.18)		
No	4(16.67)	5(11.90)	15(12.82)		
<b>Can eat any type of food</b> <sup>3</sup>					0.555
Yes	12(50.00)	26(61.90)	72(61.54)		
No	12(50.00)	16(38.10)	45(38.46)		
<b>Reported Compulsive eating</b> <sup>3</sup>					0.074
Yes	13(54.17)	12(28.57)	37(31.62)		
No	11(45.83)	30(71.43)	80(68.38)		
<b>Reported vomiting / regurgitation</b> <sup>3</sup>					0.560
Yes	8(33.33)	9(21.43)	32(27.35)		

No	16(66.67)	33(78.57)	85(72.65)	
<b>Consumes alcohol<sup>3</sup></b>				0.271
Yes	13(54.17)	22(53.66)	48(41.38)	
No	11(45.83)	19(46.34)	68(58.62)	
<b>Smoker<sup>2</sup></b>				0.153
Yes	-	5(12.20)	6(5.17)	
No	24(100)	36(87.80)	110(94.83)	
<b>Guidance of nutritionist</b>				
<b>Pre-surgery<sup>2</sup></b>	A	Bc	Cb	<b>0.037**</b>
Yes	22(91.67)	36(85.71)	113(96.58)	
No	2(8.33)	6(14.29)	4(3.42)	
<b>Post-surgery<sup>3</sup></b>				0.176
Yes	9(37.50)	16(38.10)	29(24.79)	
No	15(62.50)	26(61.90)	88(75.21)	
<b>Physical activity practice<sup>3</sup></b>				0.384
Yes	13(54.17)	25(59.52)	55(47.41)	
No	11(45.83)	17(40.48)	61(52.59)	
<b>Gained weight after surgery<sup>2</sup></b>	Ac	B	Ca	<b>0.037**</b>
Yes	17(70.83)	26(61.90)	54(46.15)	
No	7(29.17)	16(38.10)	63(53.85)	
<b>Time spent watching television<sup>2</sup></b>				0.126
< 1 hour	5(20.83)	8(19.05)	20(17.09)	
Between 1 and 4 hours	11(45.83)	24(57.14)	81(69.23)	
> 4 hours	8(33.33)	10(23.81)	16(13.68)	
<b>Monthly weight loss<sup>1</sup></b>	0.16(0.01 – 0.43)* <sup>Abc</sup>	0.78(0.61 – 1.24)* <sup>Bac</sup>	1.44 (1.10 – 1.88)* <sup>Cab</sup>	<b>&lt;0.001**</b>
<b>Months after surgery<sup>1</sup></b>	39(29.5 - 43)*	38 (31 - 43)*	35(30 - 41)*	0.332

**Note:** <sup>1</sup> Kruskal-Wallis Test. <sup>2</sup> Fisher exact test. <sup>3</sup> Pearson's Chi-Squared test \* Median and Interquartile range. **p < 0.05** in bold font. \*\* p < 0.05 (post hoc combined with Bonferroni correction). A priori, each category is presented in uppercase. Statistically significant differences between categories were represented in lowercase.

**Source:** Author.

**Table 4:** Sociodemographic, nutritional, clinical and lifestyle variables associated with the inadequate response of Bariatric Surgery among individuals who underwent the surgery- Minas Gerais, 2016.

Variable	Logistic regression models for adequate response of patient who underwent Roux-en-Y gastric bypass surgery.			
	Gross model		Adjusted model	
	OR(95% CI)	p-value	OR <sub>adj</sub> (95% CI)	p-value
<b>Sex</b>		<b>&lt;0.001</b>		<b>0.001</b>
Male	Ref.		Ref.	
Female	0.10(0.03 – 0.28)		0.06(0.01 – 0.311)	
<b>Age</b>	0.97(0.92 – 1.02)	0.303		
<b>Lives with partner</b>		0.822		
Yes	Ref.			
No	0.89(0.35 – 2.30)			
<b>Level of Education</b>		0.466		
University	Ref.			
High school	1.95(0.53 – 7.16)			
Elementary education	2.32(0.53 – 10.06)			
<b>BMI – pre-surgery</b>	1.18(1.09 – 1.27)	<b>&lt;0.001</b>	1.17(1.04 – 1.31)	<b>0.005</b>
<b>Systemic Arterial Hypertension – Post-surgery</b>		<b>0.003</b>		<b>0.027</b>
Yes	Ref.		Ref.	
No	0.18 (0.05 – 0.56)		0.13(0.02 – 0.79)	
<b>Diabetes Mellitus – Post-surgery</b>		<b>0.006</b>		<b>0.007</b>
Yes	Ref.		Ref.	
No	0.12 (0.02 – 0.55)		0.04(0.01 – 0.41)	
<b>Has snacks between meals</b>		0.582		
Yes	Ref.			
No	1.39 (0.43 – 4.48)			
<b>Can eat any type of food</b>		0.281		

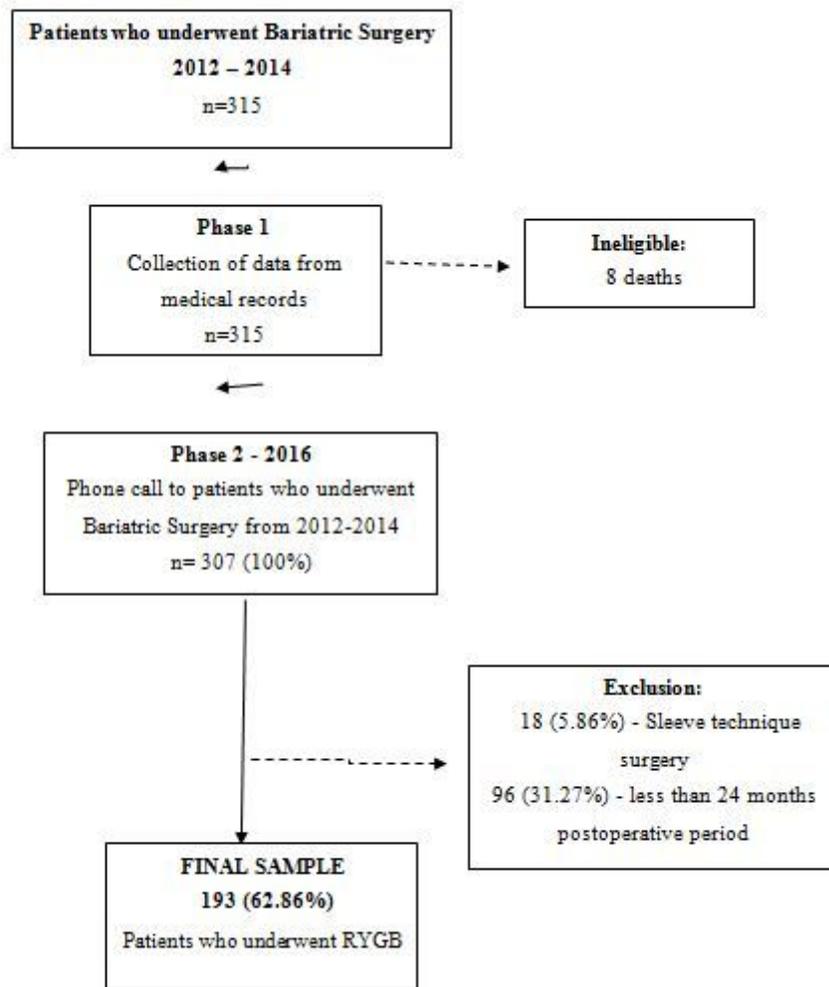
Yes	Ref.		
No	1.60(0.67 – 3.80)		
<b>Reported Compulsive eating</b>		<b>0.028</b>	
Yes	Ref.		
No	0.37(0.15 – 0.90)		
<b>Reported vomiting / regurgitation</b>		<b>0.438</b>	
Yes	Ref.		
No	0.69(0.27 – 1.74)		
<b>Consumes alcohol</b>		<b>0.382</b>	
Yes	Ref.		
No	0.68(0.28 – 1.61)		
<b>Guidance of nutritionist – post-surgery</b>		<b>0.359</b>	
Yes	Ref.		
No	0.65(0.26 – 1.61)		
<b>Guidance of psychologist or psychiatrist – post-surgery</b>		<b>0.200</b>	<b>0.048</b>
Yes	Ref.		Ref.
No	2.66(0.59 – 11.93)		4.55(1.01 – 20.51)
<b>Physical activity practice</b>		<b>0.747</b>	
Yes	Ref.		
No	0.86(0.36 – 2.05)		
<b>Gained weight after surgery</b>		<b>0.066</b>	
Yes	Ref.		
No	0.41(0.16 – 1.06)		
<b>Time spent watching television</b>		<b>0.150</b>	
< 1 hour	Ref.		
Between 1 and 4 hours	0.45(0.17 – 1.17)		

> 4 hours	1.23(0.32 – 4.66)	
<b>Months after surgery</b>	1.01 (0.95 – 1.08)	0.598

**Note:** Statistically significant were represented in lowercase.  
Hosmer-Lemeshow model adhesion test =0.9774  
OR<sub>adj</sub> = Odds Ratio adjusted. 95%CI - Confidence Intervals

**Source:** Author.

## Figures



**Figure 1**

Flowchart of sample selection and follow-up.

## Supplementary Files

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