



Obesity, bariatric surgery, and weight regain parameters: a concise systematic review

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Abstract

Introduction: Obesity, an easily diagnosed disease, is multifactorial, chronic, and difficult to manage. It has increased alarmingly and is now one of the main public health problems. It is associated with several comorbidities and poorer quality of life. Bariatric surgery is currently widely accepted and described in the literature as the most effective method for the treatment of obesity. Even though this is the best method, weight regain (WR) is also checked. In the literature, there are several parameters used to configure WR, and with that, several results are presented. **Objective:** This paper aims to review the parameters used to assess WR after bariatric surgery. **Method:** A bibliographic review of the last 5 years was carried out in the PubMed and Scielo virtual databases with the following keywords: bariatric surgery, obesity, and weight regain, in October and November 2019. **Result:** Lack of unanimity in the definition and parameters for WR is still a reason for further studies. And with that, the results are also presented in a varied way, depending on the parameter used. **Conclusion:** The subject is relatively new and there is a need for more studies to define and quantify the meaning of WR, to also improve the approach and management of the patient with weight regain. But there seems to be a tendency to adapt itself as a favorable response to surgical success when at least 50% excess weight loss (%EWL) and > 20% total weight loss is achieved, and that any regain should not be used. as a parameter to define it.

Keywords: Bariatric Surgery; Obesity; Weight regain.

Introduction

Obesity and overweight are defined as abnormal or

excessive accumulated fat that can harm your health. It is usually easy to detect on physical examination. A more quantitative assessment is made by calculating the Body Mass Index (BMI), adopted by the World Health Organization (WHO) since 2000 [1,2]. The index is calculated by dividing the patient's weight by his squared height (kg/m²). There are other ways to assess weight and body composition, but BMI is easy to obtain and low cost and is widely used in clinical practice. A BMI between 25 and 29.9 is considered overweight; class I obesity between 30 and 34.9; class II obesity between 35 and 39.9; and, class III obesity when greater than 40 [3]. For Asian countries, the cutoff points adopted are 23-27.5 for overweight and obesity >27.5. In Brazil, people aged 60 years or more are considered overweight >27 kg/m² [4-8].

Obesity is a universal disease, with increasing prevalence and that has been acquiring alarmingly epidemic proportions [1,9,10]. In 2016, more than 1.9 billion adults were overweight and of these, more than 650 million were obese. This means that in 2016, 39% of adults were overweight and 13% obese [11].

In Brazil, the latest VIGITEL survey (Surveillance of Risk Factors and Protection for Chronic Diseases by Telephone Survey) of 2018, released by the Ministry of Health, indicated that 41.6 million people or 19.8% of the population had a BMI above 30 and of these, 1/3 BMI above 35 [12]. Over the last 10 years, the obesity rate in Brazil has grown more than the rate in the United States of America (USA), the most serious worldwide and, if the situation persists, the prospect is that in the next 10 years Brazilians will be so obese as well as the North Americans [13].

It is a multifactorial syndrome with a chronic evolution. It usually requires continuous follow-up, which often means lifelong treatment. If treatment is

stopped, the disease returns [10]. The fundamental cause of obesity is an energy imbalance between consumed and expended calories [10,13]. Socioeconomic, geographic, political, and technological changes that have taken place in recent years have helped to change the population's health habits, with an increase in the consumption of high-calorie foods and a decrease in physical activity. In addition to inadequate nutrition and sedentary lifestyle, emotional factors, medications, genetic and endocrinological diseases can lead to the development of obesity [10,13].

Obesity increases the risk of morbidities such as hypertension, dyslipidemia, type 2 diabetes, coronary heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea, respiratory problems, and some cancers (esophagus, colon, prostate, breast, endometrium, ovary, liver and kidney). It is also associated with an increased risk of all-cause mortality from cardiovascular disease [1,9,10,14].

Treatment includes changes in lifestyle habits, dietary planning, physical activity, associated or not with medication, and other therapies. However, lifestyle changes such as food restriction and exercise have a limited effect on weight loss and maintenance. And the failure in clinical treatment has caused an increase in demand for bariatric surgery, combined with greater public confidence in the procedure and knowledge about the results obtained to improve quality of life [4,5,7,8].

Bariatric and Metabolic Surgery is indicated as a treatment not only for obesity but also against diseases associated and/or aggravated by excess weight. Brazil is already the second country that performs the most bariatric surgery, only behind the USA, but it could be the first. Between 2011 and 2018, the number of procedures increased by 84.73% [13].

The types of surgeries are classified as restrictive, disabsorptive, and mixed. Restrictive are procedures that reduce the amount of food that the stomach can receive, and induce the feeling of early satiety. Disabsorptives, which theoretically change little in the size and capacity of the stomach to receive food, drastically alter the absorption of food at the level of the small intestine, causing a reduction in transit time through the small intestine and decreasing the absorption of food. They are known as intestinal bypass surgeries or intestinal bypass surgeries, which are currently in disuse. And mixed techniques restrict the ability to receive food through the stomach associated with a short bowel bypass with mild malabsorption of food. It is known as gastric bypass surgery or Fobi-Capella surgery [13].

Studied since the 1960s, Roux-en-Y gastrojejunal

bypass (RYGB), is the most practiced bariatric technique in Brazil, corresponding to 75% of surgeries performed due to its safety and, mainly, its efficacy. Patients undergoing surgery lose 70% to 80% of their excess weight, with a low rate of complications [5,8,13].

Sleeve surgery or Sleeve Gastrectomy (SG), a procedure considered restrictive and metabolic, transforms the stomach into a tube, with a residual capacity of 80 to 100 milliliters. Procedure performed for over 20 years, currently, the number of surgeons who believe in the results of this technique, including for diabetes control, is growing a lot. However, many patients do not experience significant weight loss or regain weight after a period of surgery. The mechanism that triggers the recovery is complex and involves factors related to the patient (behavioral and biological) and surgical techniques [15]. Among these factors, inadequate eating habits, reduced physical activity, psychiatric eating disorders, hormonal and metabolic adaptations, and gastric pouch dilation may be involved [16].

Behavioral causes must initially undergo a multidisciplinary clinical evaluation and, later, technical causes, surgical evaluation [15,17]. Being considered an ideal multidisciplinary team composed of an endocrinologist, surgeon, nutritionist, psychiatrist, psychologist, physical trainer, physiotherapist, and other professionals that are necessary [18].

The existence of weight regains (WR) after bariatric surgery has been the subject of many studies. It is one of the most important long-term complications and can again lead to obesity, a resurgence of comorbidities, including type 2 diabetes, and impaired quality of life. This explains the importance of the subject, to have a more adequate management for the WR [8].

Lately, several parameters have been reported in the literature, which leads to the non-standardization of data. Several measures and definitions for successful weight loss and weight regain have been proposed and evaluated, but there is no consensus on the parameter that defines the success of the method. And with different parameters, the results also vary a lot. In addition to weight reduction, remission of comorbidities and quality of life are also used as criteria for evaluation. Therefore, the measures and definitions of weight loss and regained weight must be better understood so that the patient's management is adequate [7,8].

Therefore, the present study aimed to review the literature on weight regain and the parameters used to define successful weight loss and regain after bariatric surgery.

Methods

Study Design

The rules of the Systematic Review-PRISMA Platform (Transparent reporting of systematic reviews and meta-analysis-HTTP: [//www.prisma-statement.org/](http://www.prisma-statement.org/)) were followed [19].

Data sources and research strategy

The search strategies for this systematic review were based on the keywords (MeSH Terms): "Bariatric Surgery; Obesity; Weight regain". The research was carried out in the PubMed and Scielo, com referências de 2011 a 2021. Also, a combination of the keywords with the booleans "OR", "AND" and "NOT" were used to target the scientific articles of interest. The title and abstracts were examined under all conditions.

Study Quality and Bias Risk

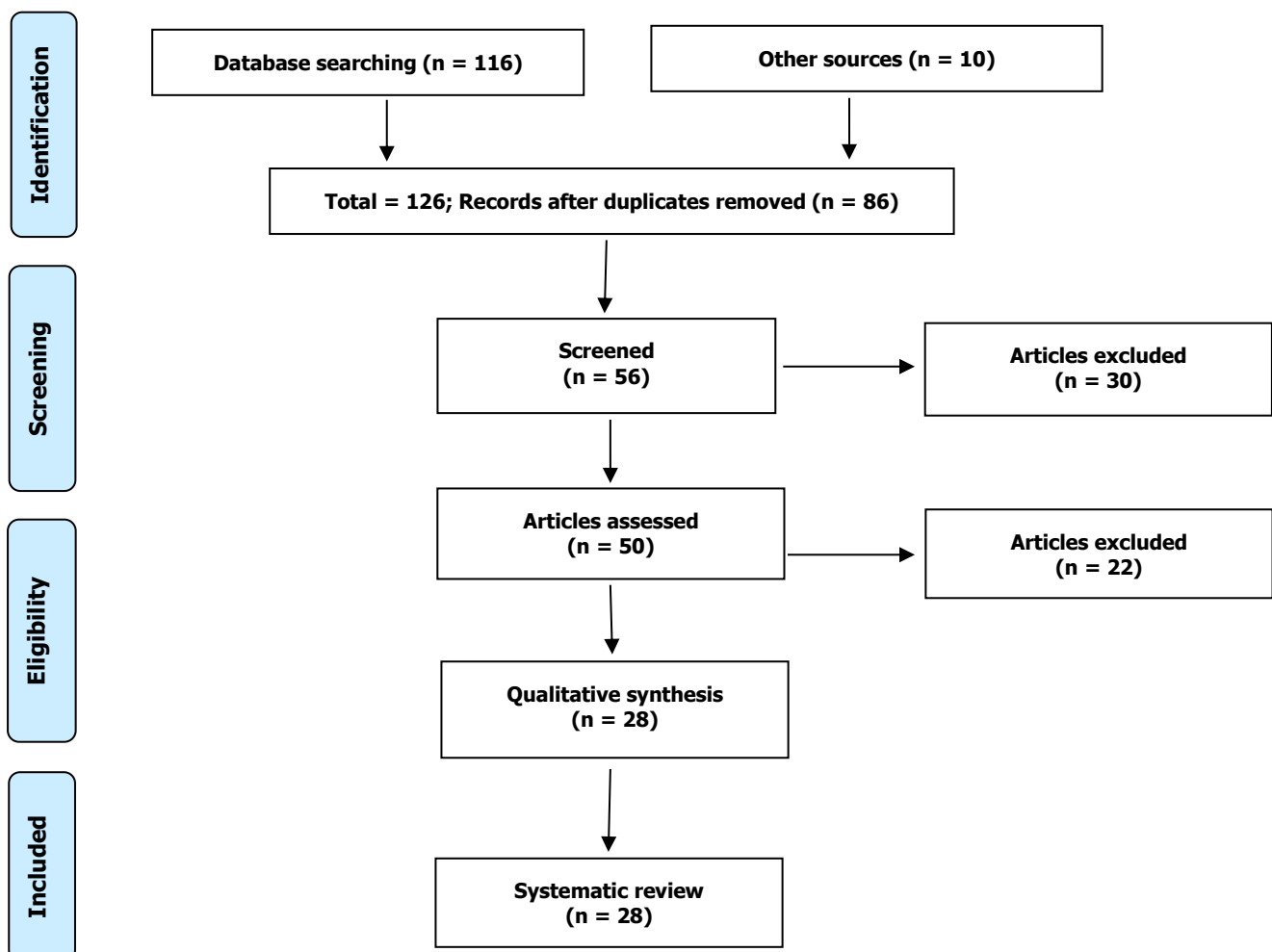
The quality of the studies was based on the GRADE instrument [20] and the risk of bias was analyzed according to the Cochrane instrument [21].

Results and Discussion

A total of 126 studies were found that were submitted to the eligibility analysis, and, after that, 28 studies of high to medium quality and with risks of bias were selected that do not compromise the scientific basis of the studies (Figure 1).

The concept of WR after bariatric surgery is not well defined [17,22,23], as the parameters are varied and, therefore, the comparison between studies also causes a large variation in the measures of prevalence and meaning [17,23,24]. In addition to weight, remission of comorbidities and quality of life are also parameters for evaluating surgical success. Thus, without unanimity, the same result can be considered favorable by one author, and unfavorable by another [25]. Weight loss is considered one of the main parameters to define the success of the surgery. If weight is considered as a single measure, the percentage of weight change to the nadir would be the most appropriate measure to compare patients and outcomes [17].

Figure 1. Study eligibility.



In 2015, to create a standard for success in bariatric surgery, the Brazilian Society of Bariatric and Metabolic Surgery (SBCBM) promoted a discussion forum involving surgeons, endocrinologists, cardiologists, nutritionists, psychiatrists, psychologists, nutritionists, and physical activity professionals, to define objective criteria for the classification of this theme. Being the weight, the control of metabolic diseases, and the quality of life, the outcomes to be achieved [18].

It has been defined that a long-term regain of up to 20% of lost weight can be expected. Controlled recurrence is an increase of 20 and 50% of the weight lost, and recurrence, a recovery of $\geq 50\%$, achieved in the long term, or recovery of 20% of weight associated with the reappearance of comorbidities. Regarding the criteria for success or failure of bariatric surgery, controlled obesity was defined as patients who achieved a total weight loss $>20\%$, partially controlled between 10 and 20%, and uncontrolled $<10\%$ weight loss in 6 months after bariatric surgery [18].

Corcelles et al. defined as a success a total weight loss $>20\%$, based on the evidence of improvement of comorbidities related to obesity and cardiovascular risk factors with the loss of 5 to 10% of weight [22]. Other measures that can also be evaluated are excess weight loss and the percentage of excess weight loss. Lately, the measure of the percentage of excess weight loss (%EWL) has been adopted as one of the main parameters to define surgical success. A successful favorable response has been proposed when reaching at least 50% EWL [2,16,23,24].

%WBS is defined as the percentage difference in weight loss to excess weight. As overweight is defined as the difference between pre-surgery weight and ideal weight. To calculate the IP, the BMI 25 kg/m² is considered. In a more simplified way, the calculation can be applied to the %EWL [23]. The literature reports an average loss of 60 to 75% of excess body weight, with a maximum in the period between 18 and 24 months after surgery, and that certain weight regain occurs after two years, in patients after RYGB [16].

In a review of 1460 patients, King et al. verified that the maximum weight lost was 37.4%, which occurred in an average of 2 years after RYGB. Of patients with WR, the highest rate occurred during the first year after reaching nadir weight [25]. Grover et al. in their work with 1,574 patients (1,355 post RYGB and 219 post SG) he found that 93% reached $\geq 50\%$ EWL within 1 to 2 years of surgery, and 61.8% maintained $\geq 50\%$ within 10 years. Similarly, 97% achieved $\geq 20\%$ total weight loss at 1 to 2 years and 70.3% maintained $\geq 20\%$ at 10 years. He concluded that a high percentage

of operated patients, over 90%, achieved results of $\geq 50\%$ excess weight loss and $\geq 20\%$ total weight loss within 2 years post-surgery. And he proposed a standardized definition to identify good responders who reach total weight loss $>20\%$, as this parameter would be less influenced by preoperative BMI [23].

Lauti et al., in a 5-year retrospective cohort analysis with 55 patients, applying 6 parameters for WR in a post-SG patient, resulted in 6 different rates ranging from 9 to 91%, depending on the parameter used. Patients with a higher preoperative BMI were associated with an increase in the percentage of total weight loss, but a decrease in the percentage of excess loss in 2 years postoperatively [26]. In this study, a post hoc analysis revealed a significant association between weight change and the Bariatric Analysis and Reporting Outcome System (BAROS) score in the patients' opinion.

The BAROS, to assess the quality of life, was developed to globally evaluate and try to standardize the reporting of results of bariatric surgeries. Although the encouragement of its use is broad, few studies report results with this instrument, and countless researchers mention flaws in its composition and find difficulties in its application, criticizing the methodology [27].

Maia et al. verified that 79% of patients reached %EWL above 50%, also considering this parameter as important in defining the success of the surgery. In this work, the BAROS questionnaire was also applied. The result showed that 27% of patients rated their quality of life as improved and 73% as greatly improved. No individual considered the quality of life unchanged or worsened by this parameter [27].

In a recent publication, Voorwinde et al. reviewed 868 patients up to 5 years after RYGB and SG, using 5 parameters from those used by Lauti et al [26], and added a sixth definition, the 15% increase in weight to the nadir. The six definitions were as follows: 1) an increase of > 10 kg nadir; 2) an increase of $> 25\%$ EWL from the nadir; 3) an increase in BMI of 5 kg/m² from the nadir; 4) weight regain for a BMI > 35 kg/m² after successful weight loss; 5) any regained weight, and 6) a $> 15\%$ increase in total weight lost from the nadir. It concluded that the prevalence ranged from 16 to 87% for PR, depending on the parameter, with the result being 87% for any regain and 16 to 37% for a significant regain [17]. It concluded that the standardization of a single category to define clinically significant WR is difficult, and that, to consider the success of the surgery, quality of life, and remission of comorbidities should also be taken into account.

In 2016, Nedelcu et al [28] published the result of a public forum, through a social network, evaluating the opinions of bariatric surgeons from the International

Bariatric Club (IBC), on what they believed to be the most appropriate definition for recovery of weight. The IBC brings together a group of bariatric surgeons interested in discussing issues related to bariatric surgery. But there was a great disparity in the opinions of specialists, suggesting a greater clarity in the definition of weight regains, to better guide the conduct towards WR. It concluded that the best definition for a positive outcome of weight loss after bariatric surgery should be a comprehensive tool that is easy to calculate and understand, and that conveys the definition of WR based on robust data. Because currently, each definition carries information with deficiencies and biases.

Conclusion

Bariatric surgery is already well established as the most effective method of weight reduction, but the cure for obesity is not limited to the surgical procedure. Weight regain is one of the main complications of bariatric surgery in the long term and has been the reason for numerous studies. The surgery marks a period of great change, which must be associated with the improvement of lifestyle habits, such as dietary re-education and physical activity. A set of measures is needed for success in weight loss, remission of comorbidities, and improvement in quality of life.

The patient's understanding that surgery should not be just a quick solution to their obesity problem and adherence to the recommendations is essential for a favorable outcome. Clear information on weight regain risk, determining factors, and critical timing for it to happen is important. A surgeon and a multidisciplinary team must be attentive to the follow-up of post-bariatric patients, evaluating behavioral, biological, and surgical changes to avoid weight regain, and when installed, that it is approached correctly.

But there is still a lack of a more uniform consensus on the definition and parameter for the weight regain. Current studies indicate a great variability of prevalence according to the parameter used, which can hinder the understanding of the significant weight regain, and consequently, inadequate management may occur. There seems to be a tendency to adapt itself as a favorable response to surgical success when a result of $\geq 50\%$ of EWL and $> 20\%$ of total weight loss is achieved in the long term. And, that any regain should not be used as a prevalence parameter. Finally, weight regain after bariatric surgery also reinforces the concept that obesity is a chronic, multifactorial disease that is difficult to manage and requires continuous monitoring by a multidisciplinary team.

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No additional data are available.

Conflict of interest

The authors declare no conflict of interest.

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