



Nutrological Management in Bariatric Surgery: A Narrative Review

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Abstract: Nutrology based on the analysis of benefits and harms generated by the ingestion of nutrients and assessing individual organic needs promotes the maintenance of health and the reduction of disease risk, as well as the treatment of manifestations of deficiency or excess. Obesity is defined by a body mass index greater than 30 kg/m². Its manifestation is the sum of genetic and environmental factors, this through sedentary lifestyle and caloric intake greater than energy consumption. There are many ways to deal with obesity, from behavioral changes such as a balanced diet and physical exercises, pharmacological and even surgical measures of different modalities, with Roux-en-Y gastric bypass surgery being the most used technique in Brazil. The most common postoperative nutritional deficiencies are iron, protein, calcium, folate, thiamine, zinc, copper, and vitamins D, B12, A, C, and K. In this case, we present the importance of nutrology in monitoring patients after bariatric surgery. This research made use of a bibliographic survey, giving priority to articles dated from the last 5 years, using the databases Lilacs, Medline, bireme, where articles, dissertations, and theses were consulted, in search of the following keywords, obesity, bariatric surgery, and nutritional deficiency, post-bariatric feeding.

Keywords: Nutrology, Bariatric surgery, Nutritional deficiencies, Obesity

1. Introduction

The World Health Organization (WHO) defines obesity as an excessive accumulation of fat that can harm an individual's health [1]. In Brazil, the number of obese individuals has been growing more and more, there are estimates that more than 50% of the population is overweight, that is, in the overweight and obesity range [2,3]. According to the WHO, the projection is that, in 2025, about 2.3 billion adults are overweight, and more than 700 million are obese [2].

Obesity is considered a serious public health problem, as it is an epidemic disease and mainly because of its relationship with the development of other chronic diseases, such as, for example, systemic arterial hypertension, diabetes, and cardiovascular diseases, being a risk factor relevant to their development [2].

Obesity is part of the group of chronic non-communicable diseases (CNCD), this group represents a serious public health problem, since they are among the main causes of deaths in the world [4]. Data from 2008 reveal CNCD as responsible for approximately 63% of deaths in the world, 80% of which occurred in low and middle-income countries. In Brazil, the total costs with procedures associated with overweight and

obesity cost about 2.1 billion dollars annually [5]. An unbalanced diet associated with a sedentary lifestyle is the main risk factor for obesity 2. The accelerated increase in the prevalence of overweight and obesity in the world population is partly justified by behavioral changes that have occurred in the last decades, in the post-industrial era [2,3].

Defining obesity by the same parameters, so that different populations can be assessed is still a challenge, but BMI is universally accepted, obtained using the ratio between the individual's weight and the square of height [6]. According to the classification of the World Health Organization Health, proposed in 1995, values greater than or equal to 25 kg/m² indicate overweight, and values greater than or equal to 30.0 kg/m² characterize obesity [6].

Surgical approaches are formally indicated in individuals who have a BMI greater than or equal to 50 kg/m², or greater than or equal to 40 kg/m², with or without comorbidities, but without success in the longitudinal clinical treatment performed for at least two years and who have followed clinical protocols, or for individuals with a BMI greater than 35 kg/m² and with comorbidities, such as people with high cardiovascular risk, diabetes mellitus and/or difficult to control systemic arterial hypertension, sleep apnea, degenerative joint

diseases, without success in longitudinal clinical treatment performed for at least two years and who have followed clinical protocols [5,6].

In the case of severe obesity, that is, when the Body Mass Index (BMI) exceeds 40 kilos per square meter in height, clinical treatment as an isolated method is more efficient and resolving, and it is already necessary to approach the patient and discuss other treatment modalities [5]. Based on data collected by the Risk and Protection Factors Surveillance System for Chronic Diseases in Brazil, by telephone survey, the number of people with obesity has grown by 60% in ten years and the prevalence of obesity is similar in men and women, and there are higher prevalence from 35 to 64 years [2,7]. However, in most cases that have a greater accumulation of visceral fat, the one present in Organs abdominal organs, with emphasis on the liver, is more prevalent in males [7].

The treatment of obesity must undergo a series of educational measures and changes in habits [2,6]. The basis of treatment comprises diet and physical exercise, in some cases, it may not be sufficient, even due to physical limitations that obesity itself causes in its most advanced stages [6]. Bariatric surgery alters the gastrointestinal tract, leading to a reduction in caloric capacity and reduced absorption, which may have consequences that interfere with food intakes, such as vitamin and mineral deficiency and dumping syndrome [7].

Nutritional deficiencies can be attributed to several factors such as pre-surgical deficiency, reduced food intake, inadequate supplementation, malabsorption of nutrients, and inadequate nutritional therapy, such as lack of monitoring or lack of follow-up PO [8]. Generally, obese patients took an inadequate diet throughout life, post-operative care and monitoring are indispensable and determine the success of the procedure, it is necessary to relearn how to eat [8].

It is important to highlight that the two most used methods in Brazil and the world, are vertical gastrectomy and gastric bypass, these need special care and a dietary reeducation of a cautious institution in the first months after surgery [2,3,5]. With reduced gastric volumetric capacity, the patient should be instructed to follow a diet in phases that evolve from liquid to normal [5]. Among the main benefits of surgical intervention, especially in patients with morbid obesity, are weight loss and maintenance, improvement of diseases associated with the cardiovascular and articular systems, increasing the quality of life, and prolonging life expectancy [9].

Therefore, the present study aimed to conduct a narrative and integrative literature review, to gather the main information about nutrients (deficiency and replacement) in bariatric patients.

2. Methods

2.1. Study Design

The present study followed a model of narrative and integrative literature review, to gather the main information about nutrients in bariatric patients.

2.2. Data sources and research strategy

The search strategies for this narrative review were based on the descriptors: "Nutrology. Bariatric surgery. Nutritional deficiencies. Obesity". The research was carried out from November 2018 to July 2019 and developed based on Google Scholar, Scopus, PubMed, Scielo, the website of WHO, and the Ministry of Health of Brazil. Also, a combination of the keywords with the "OR", AND and the operator "NOT" booleans were used to target the scientific articles of interest.

2.3. Study quality and risk of bias

The quality of the studies was based on the GRADE instrument [10], with randomized controlled clinical studies, controlled prospective clinical studies, and studies of systematic review and meta-analysis is listed as the most scientific evidence studies. The risk of bias was analyzed according to the Cochrane instrument [11].

3. Results and Discussion

After the selectivity of articles and literary findings through the following descriptors: nutrology, bariatric surgery, nutritional deficiencies, and obesity, a total of 78 studies were analyzed, with only 27 medium and high-quality studies selected, according to the rules of the GRADE, and with bias risks that do not compromise scientific development, based on the Cochrane instrument (Figure 1).

As a corollary to the exploration of the 27 studies, it was found that bariatric surgery (BS) is considered the most effective treatment to induce long-term weight loss, reducing comorbidities, and improving the quality of life of obese and superobese patients. Despite this, BS is associated with nutritional problems. In this regard, the nutritional management of the bariatric patient provides specific nutritional supplies.

Patients with severe obesity usually have micronutrient deficiencies when compared to normal-weight controls. The nutritional status must be verified in each patient and the correction of deficiencies must be attempted before surgery. Some studies suggest that a modest weight loss of 5-10% in the immediate preoperative period can facilitate surgery and reduce the risk of complications [12-14]. Low calorie and ketogenic diets are the most used methods for inducing preoperative weight loss. Nutritional deficits depend on the type of bariatric procedure [12].

In this sense, patients with severe obesity usually present micronutrient deficiencies when compared to controls. The authors analyzed the vitamin status of 110 patients affected by severe obesity compared to 58 normal-weight individuals. Obese patients had significantly lower concentrations of vitamins A, B6, C, 25-hydroxyvitamin D, and lipid-standardized vitamin E [13]. Still, other authors demonstrated in 200 patients affected by severe obesity that 38% of them had low serum iron, 24% had low serum folate, 11% had low serum vitamin B12 and 81% had hypovitaminosis D (severe deficiency of 55% with level < 30 nmol/L) [14]. Also, more authors demonstrated a deficiency of vitamin D (<20 ng/mL) and iron (<35 ug/dL for women and <50 ug / dL for men) in 71.4% and 36.2% of 58 candidates for BS [15].

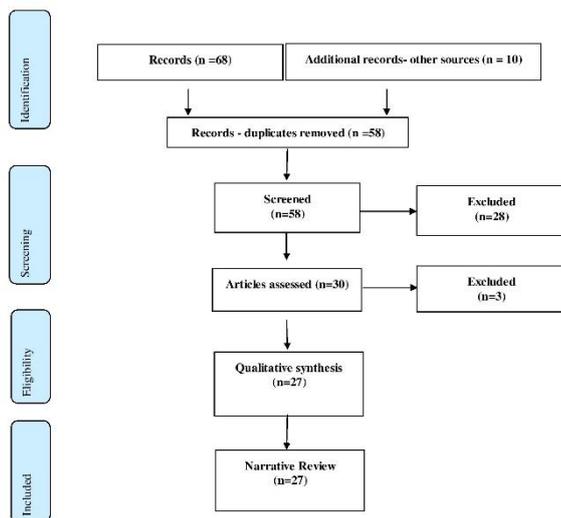


Figure 1. Scheme for selecting the studies.

In this context, the deficit of micronutrients in patients with severe obesity can be attributed to a low-quality diet. Thus, an excess of simple sugar, dairy products, or fats can lead to a vitamin B1 deficit [16]. In addition, the iron level can be affected by inflammation of adipose tissue and increased expression

of the systemic iron regulatory protein hepcidin [17]. In addition, the increase in adipose tissue can increase the amount of storage of lipophilic molecules, such as vitamin D, thus reducing the concentration of this vitamin in obese patients [18].

As shown before, most bariatric procedures include reducing the volume of the stomach and/or creating a small gastric pouch. Due to the small volume and the postoperative gastric edema, the intake of solid foods in the first postoperative days is very difficult or impossible. Therefore, to avoid or minimize regurgitation and vomiting, most postoperative nutritional protocols suggest a liquid or very soft diet in the first days after surgery and a very gradual increase in food consistency in the first postoperative weeks [19]. Typically, a diet of clear liquids with low sugar content is initiated within 24 hours after surgery, and patients are then instructed to gradually and progressively change the consistency of food, from clear liquids to soft or creamy foods and then to items solids to chew for 2–4 weeks [19-21]. Before discharge, patients should receive specific advice from an experienced bariatric nutritionist on the progression of postoperative meals [20,22].

After the end of the postoperative diet and thereafter, patients should receive periodic advice from an accredited nutritionist on long-term dietary changes to maximize the results of the bariatric procedure and reduce the risk of late weight recovery. The focus of dietary advice should be on adapting patients' eating behavior to the surgical procedure and the general qualitative aspects of a healthy nutrient-rich diet [19-22].

The nutritional management of patients selected for the surgical approach begins in the preoperative period, with anthropometric, biochemical, and dietary assessment. The dietary assessment seeks to understand the individual's food lives up to that point through a food history [2]. A low-calorie diet, initiated at least one month before the operation is expected to reduce the concentration of intrahepatic and visceral fat, which facilitates the process of video-laparoscopic surgery, which in general decreases the trans-operative time, reducing thus, the risk of complications in the intra and postoperative period, reducing the risk of infection, complications and the length of hospital stay [9].

Once these evaluations are carried out, it is possible to identify nutritional deficiencies and treat them, thereby reducing surgical risk. It also makes it possible to plan an individualized food program, with a low caloric content instituted since the preoperative

period, aiming to reduce liver and abdominal fat [9]. In patients with multidisciplinary and mainly poor nutritional follow-up, after the surgical approach, nutritional deficits arise, due to food restriction and malabsorption, resulting from gastroplasty, mainly of micronutrients, vitamins, and minerals [9,23]. Recent studies suggest that supplementation of vitamins and minerals is carried out, especially in the postoperative period of bariatric surgery, aiming at the preservation of nutritional status and weight loss [24].

It is necessary to consider the appearance of food intolerances after bariatric surgery, these may favor an increase in the consumption of carbohydrates, whose acceptance and digestibility are easier [24]. Intolerances are more common in the first year after surgery and the tendency is to decrease in the long term, thanks to physiological adaptations of the digestive process [23,24]. A common phenomenon observed in post-bariatric patients is a tendency to return to habitual unbalanced eating [25]. Although the quality of the food has improved in the first six postoperative months, there is a decline after this period, with gradual consumption of more caloric foods and avoidance of the basic diet [26]. There is an intolerance with large food portions, and in some cases, patients reach episodes of libation followed by intense malaise, with time there is a progressive gastric dilation, determining the failure of treatment and weight gain [26].

Regarding weight loss, the parameters through bariatrics vary between 20 to 40% of the initial weight or 60 to 80% of the excess body weight, with the maximum loss being better visualized after 18 months of surgery, but this is quite variable, depending on each surgical technique employed [5]. It is necessary to analyze the advantages and disadvantages of each one, to choose the best option based on data of the individual, such as age, the ideal amount of weight to be lost, life expectancy, comorbidities, previous surgical conditions, psychological factors, financial factors, among other variables [26].

After surgery, the individual must be physically and psychologically prepared for a new dietary routine, exchanging quantity of food for food quality, leaving behind the consumption of harmful products previously ingested in large quantities, for a minimum quantity of more nutritious foods, since that there is now a volumetric limitation of the digestive system and also an absorptive restriction [27,28]. The amount of food to be consumed at each meal is pre-defined by the type of surgery used, due to the volumetric decrease of the

stomach, leading to consequent satiety and early postprandial fullness [27]. Without follow-up, it is common for individuals to seek to reduce the amount ingested while maintaining the same nutritional quality as before surgery. This quantitative decrease, without professional monitoring, can lead to intense nutritional deficits, such as a reduction in iron, protein, calcium, vitamins, among others [9]. From this point onwards, behavioral problems will begin to appear more clearly in the patient, reflecting negatively on obtaining results [2].

The Food Guide used in bariatric patients until today is based on the bariatric pyramid, proposed by Violet Moizé in 2013 [28]. There is a consensus on the determination of nutritional phases in the postoperative period of bariatric surgery, these need to be followed step by step by a multidisciplinary team and by a trained professional focused on human nutrition, such as nutritionists and dietitians [24,25]. According to the Brazilian society of bariatric surgery, four stages of food progression after bariatric surgery are numbered, starting in the immediate postoperative period until the establishment of a regular diet that the person will carry for the rest of his life, so it is also phases of nutritional learning where follow-up and follow-up become essential. In general, this period lasts between 8 to 10 weeks [28].

It is worth mentioning how essential the need individualize on a case-by-case basis, and that ready-made models do not fully meet each patient, as there are different individual needs and different social, cultural, and economic conditions, which makes monitoring by a nutrologist interesting. There may also be variations in the nutritional phases according to the surgical technique used [25].

The first phase begins in the immediate postoperative period, in the first 24 to 48 hours, composed of clear liquids at room temperature, free from sugars, with the minimum possible caloric intake [9]. The volume must be calculated individually, but it is around 2 thousand milliliters per day. Examples include water, teas, gelatines, liquid protein supplements. The second phase is accompanied by an intense weight reduction, still composed of a liquid diet, it is more extensive than the first, lasting between 2 and 4 weeks, with an average volume of 2 liters per day, still free of sugars, containing liquidized and strained preparations, as well as low-fat yogurts, fruit juice, and liquid protein supplements, following restrictions and needs that vary from patient to patient, such as lactose intolerance [9,23].

The third phase brings a pasty diet, has the same duration as the previous one, and is an important transition period, in this phase masticatory movements are necessary. The relearning of slow chewing and swallowing are determining factors for good digestion, especially in bariatric patients [23]. Here, tied and pressed foods, fruit milk vitamins, scrambled eggs, fruits, and vegetables are introduced, preferring foods rich in proteins [9]. In this phase, the selection of foods is of fundamental importance since the quantities are eaten daily are limited, therefore, preference should be given to more nutritious foods, choosing protein sources and foods rich in iron, such as ground and shredded meats, calcium present in the food. milk and derivatives and fruit vitamins, also cooked vegetables This phase is followed by a fourth, with a mild diet, with foods that require a minimum of chewing, being a transition phase to the regular diet [9,23]. The regular diet will be the usual diet of that individual's life, requiring constant monitoring [9,23].

As we can see, the nutritional evolution must be slow and progressive, depending on individual tolerance, and can vary considerably from one patient to another [29]. There are countless variations and particularities, a wide range of possibilities opens the door for food errors [28]. The need for individual calculations of intake volume, caloric intake, the time between meals, types of macro and micronutrients are variables that require specialized monitoring [29].

In patients undergoing bariatric surgery, factors that corroborate a certain disabsorption justify the use of nutritional supplementation. Therefore, the daily use of multivitamins and minerals is a way to guarantee this contribution. This replacement is initiated in the first months, in most cases, by supplements in the form of lozenges, or water-soluble powders, because of an initial restriction to tablets and capsules. Some signs and symptoms lead to the suspicion of nutritional deficiency, among them we can list hair loss, brittle nails, anemia, weakness, tiredness, dry skin, paresthesias, and in severe cases even memory deficit. Hence the importance of simple preoperative attitudes such as assessing eating behavior, detecting eating disorders, and preferably correcting them before the procedure is taken into account, provides better long-term results [29].

4. Conclusion

After a thorough search in the most respected databases, as well as in books by renowned authors, we emphasize that we have not found abundant materials in the literature, whose main focus is on the behavioral change of bariatric patients and their relationship with food. No scientific methodology was found, as well as protocols for food and nutritional reeducation that, having already been applied and validated in individuals undergoing bariatric surgery, can be extrapolated to groups with a potential need for a surgical approach in the treatment of obesity. Therefore, we emphasize how fundamental it is, that new instruments of eating behavior be studied, so that, thus, a better quality of life can be guaranteed to the obese public. This is an urgent need, as we are facing an epidemic of cases and the prospect is that the numbers will increase more and more. The medicine that has advanced so much is not yet capable of complete solutions in the treatment of these patients when it acts in isolation, reiterating the need for nutrology professionals and their dedication to the tireless and incessant monitoring of these patients.

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Approval was sought and granted by the Departmental Ethics Committee.

Informed consent

Informed written consent obtained from the participant

Conflict of interest

The authors declare no conflict of interest.

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