



Impact on quality of life caused by vitamin D deficiency in bariatric patients: a literature review

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Abstract

Introduction: Bariatric surgery is a procedure performed to control obesity and its associated morbidities. Surgeries with malabsorptive and mixed techniques cause a deficit in the absorption of micronutrients, including vitamin D. **Objective:** The objective of this literature review was to investigate studies that verified the impact of vitamin D deficiency on the pre and postoperative quality of life of individuals undergoing bariatric surgery. **Methods:** The search strategy was carried out in the virtual databases PubMed, Scielo, LILACS, Scopus, Web of Science, Embase, and the Virtual Health Library, in addition to gray literature such as Google Scholar, OpenGrey, Ibict/BDTD (Brazilian digital library of theses and dissertations) and ProQuest using the Medical Subject Headings (MeSH) and Health Sciences Descriptors (DeCS) descriptors with Boolean logical operators (AND, OR and NOT). The studies considered potentially eligible were those that presented in the same article the levels of vitamin D in the pre and postoperative period of the individuals, as well as the effect generated on their quality of life from where the data collection and analysis of the main outcomes found were made. **Results:** The online search resulted in 197 studies located in the virtual bibliographic databases and 115 in the gray literature. After removing the duplicates, 235 articles remained that were read by title and abstract, and 12 articles were chosen for reading the full text, leaving 7 that met the inclusion criteria. In most of the included studies, vitamin D deficiency was higher preoperatively than postoperatively in bariatric individuals. Better levels

of 25(OH)D were correlated with reduced body weight, decreased BMI, and improved glycemic profile.

Conclusion: Combating obesity remains an important issue in Public Health, with bariatric surgery being a safe way to reduce overweight since vitamin D levels are lower in the postoperative period of bariatric individuals, however, it is suggested to choose the appropriate technique to maintain ideal vitamin indices.

Keywords: Bariatric surgery. Vitamin D deficiency. Quality of life.

Introduction

Bariatric surgery is a procedure performed to control obesity and its associated morbidities. Its growth, in Brazil, was 83.74% between 2011 and 2018 [1]. Relatedly, there was a 43% increase in obese individuals (BMI greater than 30 kg/m²) in the Brazilian population between 2006 and 2019, and the World Health Organization (WHO) estimated 700 million obese people in the world [2]. Obesity is thus consolidated as a serious public health problem, since the increase in its occurrence contributes to the growth in the incidence and prevalence of its associated morbidities, causing not only an overload to health care but also it also harms the quality of life of individuals with it [3-7].

Among the surgical techniques used in bariatric surgery, they are classified as restrictive, in which there is a reduction in the volume of the stomach; malabsorptive, where part of the intestinal transit is excluded, and mixed, in which the restrictive and malabsorptive component is used. Among them, the

mixed technique called Gastric Bypass (Roux-en-Y gastroplasty or Fobi-Capella) stands out, which corresponds to 75% of bariatric surgeries performed [3]. Now, the name metabolic surgery derives from the change in the release of hormones and intestinal incretins (signals) that help control comorbidities associated with obesity [4].

However, bariatric surgeries, especially malabsorptive and mixed techniques, cause a deficit in the absorption of micronutrients, including vitamin D. This vitamin, also considered a prohormone, can be obtained through the diet and synthesized with the interference of type B ultraviolet rays (UVB) [8-14]. Among its functions, it is involved in calcium metabolism, in the immune system, in the modulation of autoimmunity, in the control of blood pressure, and, even, in the regulatory effect on cell multiplication and differentiation (hence the anti-oncogenic effect) [15-20]. However, it may be in deficit in obese individuals [21-25], especially in individuals with criteria for bariatric surgery, in addition to being related to the genesis of obesity [25-31]. Therefore, a drop in vitamin D levels can predispose to situations that can impact an individual's quality of life [31-38].

This study, based on information about the growing prevalence of obesity and, concomitantly, the increase in bariatric surgery, given that a mixed surgical technique (restrictive and malabsorptive) is largely used, sought, through a review of literature (with components of a systematic review), answer the hypothesis whether there is an impact on the quality of life in individuals who underwent bariatric surgery since they are predisposed to vitamin D deficiency or insufficiency.

Therefore, the present study aimed to review the literature to verify the impact of vitamin D deficiency on the quality of life of individuals undergoing bariatric surgery, as well as to analyze whether unsatisfactory vitamin D values were higher pre- or postoperatively, and to verify whether there was an influence of the type of restrictive, malabsorptive or mixed surgical technique on the 25 (OH) levels in the blood of post-operated individuals.

Methods

This study dealt with a general literature review with components of a systematic review. It was carried out through qualitative and quantitative synthesis using parts of the protocol used in PRISMA (Preferred Items for Systematic Reviews and Meta-Analyses) systematic reviews.

Components of the Literature Review Eligibility Criteria

The eligibility criteria responded to the PICO structure (population, intervention, comparative, and outcome) being: (P) Obese population, (I) Bariatric surgery, (C) General population, (O) Vitamin-D deficiency and impact on the quality of life. Epidemiological studies were included (cross-sectional, case-control, cohort, and clinical trials) and studies that compared, in the same work, the impact of vitamin-D deficiency on quality of life with and without bariatric surgery between 2005 to 2022. Case report studies were excluded; letters to the editor; systematic, integrative, scoping reviews, narratives, and qualitative studies.

Information Sources

The databases used to search for studies were PubMed, Scielo, LILACS, Scopus, Web of Science, Embase, and Biblioteca Virtual em Saúde, in addition to exploring gray literature such as Google Scholar, OpenGrey, Ibict/BDTD (Brazilian digital library of theses and dissertations) and ProQuest.

Search Strategy

To search for works, the Medical Subject Headings (MeSH) and DeCS (Health Sciences Descriptors) descriptors and Boolean logical operators (AND, OR, and NOT) were used and were carried out by the research team of this study (F. P. M. R; R.C.P.M.). The EndNote Web bibliographic reference manager was used to remove duplicate studies, followed by manual deletion by the researchers.

Data Collection and Analysis

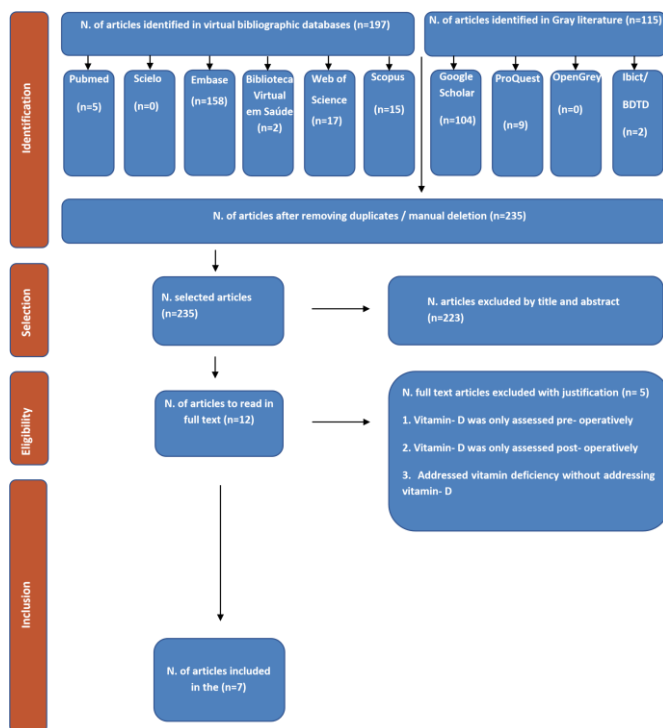
The data collected from the included studies were author, place and year of publication, type of study, number of participants, gender, age, and main outcomes found in each study. After data collection, the qualitative synthesis of the evidence found in the results of the included studies was carried out.

Results

The online search strategy resulted in a total of 312 studies, of which 197 articles were located in the virtual bibliographic databases and 115 in the gray literature. The distribution of studies in the databases was as follows: Pubmed database 5 articles; Embase database 158 articles; VHL database 2 articles; Web of Science database 17 articles; Scopus database 15 articles and no articles were found in the Scielo database. Of the literature not published in academic circles, 104 studies were found in the Google Scholar database; 9 studies in

the ProQuest database; 2 studies in the IbiCT/BDTD database, and no studies were found in the OpenGrey database. After using the EndNote bibliographic reference manager and also by manual exclusion, 235 articles remained that were continued for title and summary reading, of which 223 did not meet the eligibility criteria and 12 articles were continued for full-text reading. After analyzing the included studies, 05 did not proceed to the qualitative synthesis and data collection of the study authors' findings. The excluded articles and reasons for exclusion are detailed in the flowchart in Figure 1 and in Table 1, as well as the data collected from the studies are in Table 2.

Figure 1. Exclusion flowchart.



Source: Prepared by the author.

Table 1. Excluded articles and reason for exclusion.

Article	Reason for Exclusion *
Sá 2021.	1
Brorsson.	2
Souza,2017	3
Zuo, 2020	2
Ogle,2021	2

- * 1- Vitamin-D was only assessed preoperatively
- 2- Only assessed vitamin-D in the postoperative period
- 3- Addressed vitamin deficiency without addressing vitamin-D

Source: Prepared by the author.

Table 2. Details of the results found.

Authors and Location	Type of Study and Participants/Age	Results
Gudlaugsdottir, B. L., 2021. Iceland.	Retrospective 539 patients with a mean age of 41.1 years.	85% of individuals undergoing bariatric surgery showed an increase in the concentration of 25(OH)D within 18 months postoperatively, with the majority using adequate supplementation. A total of 1/3 of individuals undergoing bariatric surgery who had lower vitamin D levels at 18 months postoperatively also had vitamin D deficiency preoperatively (30.6 ± 16.3 nmol/L compared to 58.2 ± 32.9 nmol/L, p<0.001).
Machado, Fernanda Dapper.,2021. Brazil.	Cross-sectional study involving 821 patients. No age was given.	Individuals who underwent bariatric surgery had higher levels of 25(OH)D compared to obese individuals. And, also, lower levels of vitamin D were correlated with low sun exposure, higher body weight and higher BMI and blood glucose values both before and after bariatric surgery.
Kessler, Y.,2020. Israel.	Prospective cohort study with 86 patients over 18 years of age.	Low levels of vitamin D were found both pre- and postoperatively, with a better level postoperatively.
Liagre, A., 2020. France.	Prospective and retrospective study. 115 patients were analyzed. No age was given.	Patients undergoing bariatric bypass surgery showed higher rates of fat-soluble vitamin deficiency, including vitamin D, over 8 years of follow-up.
Santos, Eryka Maria dos., 2020. Brazil.	Retrospective study analyzing 646 patients with a mean age of 41.3 years.	There was an increase in the percentage of individuals with satisfactory levels of vitamin D after bariatric surgery (from 20.9% to 35%). After 12 months it rose to 36.7%. This was also observed when comparing the sleeve gastrectomy technique with the Bypass, being better in sleeve gastrectomy. Diabetes was also related to lower levels of vitamin D. Reduction in body weight was directly proportional to the improvement in 25 (OH)D while diabetics had lower levels of the vitamin.
Silva, Ana Carolina Bisinella da., 2019. Brazil.	Retrospective cohort study. A sample of 24 patients over 18 years of age was used.	The majority of patients undergoing bariatric surgery using the Bypass technique already had vitamin D deficiency preoperatively (79.2%) and maintained these unsatisfactory levels after surgery. Only 8.3% recovered ideal rates.
Barini, Bruno Finoti., 2018. Brazil.	Cross-sectional and analytical study. 24 patients were analyzed. No age was given.	Vitamin D levels were lower preoperatively (27.38 ± 6.44 ng/mL) when compared to postoperatively (36.73 ± 5.70 ng/mL) p=0.001 due to adherence to supplementation after the technique.

Source: Prepared by the author.

Sample Total

The studies included 2517 individuals undergoing bariatric surgery in various locations around the world who had their vitamin D levels measured before and after the respective surgical techniques, with the smallest sample being in China (n=20) and the largest sample in Brazil (n =821).

Countries

The studies were carried out in the following locations: 4 studies in Brazil (Machado, 2021; Santos, 2020; Silva, 2019; Barini, 2018), 1 study in Iceland (Gudlaugsdottir, 2021), 1 study in France (Liagre, 2020) and 1 study in Israel (Kessler, 2020).

Qualitative Synthesis of Evidence from Included Studies

The main findings of the included studies were that vitamin D deficiency was present in the pre-and postoperative periods of individuals undergoing bariatric surgery in the 7 included studies, of which 6 articles (Gudlaugsdottir, 2021; Machado, 2021; Kessler, 2020; Santos, 2020; Silva, 2019; Barini, 2018) presented the same conclusion that there was a predominance of better 25(OH)D rates in the postoperative period when compared to preoperative rates. 25(OH)D deficiency correlated with low sun exposure in 1 study (Machado, 2021) and with body weight in 2 studies (Machado, 2021 and Santos, 2020). Meanwhile, the improvement in 25(OH)D levels was related to the improvement in the glycemic profile in 2 studies (Machado, 2021 and Santos, 2020).

One study (Santos, 2020) compared the Vertical Gastrectomy technique with Roux-enY gastric bypass and better vitamin D levels were found when the first technique was used. Correct adherence to vitamin supplementation after bariatric surgery was also identified as a factor in improving serum 25(OH)D levels after the procedure in 2 studies (Barini, 2018 and Gudlaugsdottir, 2021).

Discussion

Obesity has been a serious public health problem in recent years and medical expenses due to this fact have increased significantly over time. Thus, directly proportional to the above fact, the performance of bariatric surgery has also been increasing [1]. From another perspective, when thinking about the nutritional reduction that may occur due to this surgical procedure, there is concern about vitamin D, which is a steroid hormone with biological effects that range from regulating bone metabolism to controlling the immune

system [4]. The objective of this work was to verify the impact of vitamin D deficiency on the quality of life of individuals undergoing bariatric surgery.

Vitamin D deficiency can influence the development of diseases, thus negatively impacting the quality of life of these individuals [37]. Its low levels may be related to low sun exposure, overweight, higher BMI, and blood glucose levels. This outcome was found in the included study by Machado, 2021 [21]. The scientific literature showed that the lack of 25(OH)D was already present in the preoperative period and, sometimes, it was also maintained in the postoperative period of patients undergoing bariatric surgery [25], but most of the studies included in this literature review showed better levels of the vitamin in the postoperative period [20-22,24-26]. Therefore, it is suggested that there are proven benefits of improving the metabolic profile with increasing vitamin D levels in the postoperative period.

It is noteworthy that nutritional deficiencies after bariatric surgery are also related to the surgical technique used. Bariatric surgery can be performed using techniques that involve purely restrictive components (sleeve gastrectomy), others that are purely malabsorptive (jejunoileal diversion), and even mixed components, which use both techniques (Bypass) [4]. Nutritional deficiencies are found less frequently after purely restrictive procedures since this technique does not involve malabsorptive components [31]. Comparing surgical techniques and vitamin-D deficiency, the study by Santos, 2020 found better levels of Vitamin-D in individuals undergoing sleeve gastrectomy when compared to those undergoing Bypass. The study by Liagre 2020 [23], also included in this review, is in line with the study by Santos, as it showed that individuals who underwent surgery using the Bypass technique had higher rates of deficiency of fat-soluble vitamins, including vitamin D, over 8 years of follow-up.

Maintaining adequate vitamin levels in patients undergoing bariatric surgery is related, in addition to the type of technique performed, also to adherence to vitamin supplementation, as suggested by Barini (2018) [26], Gudlaugsdottir (2021) [20] and Zuo (2020) [29], also for this literature review, to maintain organic balance and the consequent quality of life of the individual [37].

Conclusion

Vitamin D deficiency hurts individuals' quality of life, as it is associated with diseases that affect bones, muscles, the immune system, and obesity. This literature review showed that unsatisfactory serum

levels of 25(OH)D are more prevalent in the preoperative period compared to the postoperative period of individuals undergoing bariatric surgery, which can be explained by the reduction in body weight, reduction in BMI, improvement glycemic profile and correct adherence to vitamin supplementation. Also noteworthy is the relationship between the best levels of 25(OH)D depending on the technique used (best in sleeve gastrectomy). This justifies the importance of combating obesity, including the carrying out of surgical procedures, especially with the choice of the technique to be used.

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Ethical Approval

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Informed consent

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Data sharing statement

No additional data are available.

Conflict of interest

The authors declare no conflict of interest.

Similarity check

It was applied by Ithenticate@.

Peer review process

It was applied.

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