VITAMIN SUPPLEMENTATION PROTOCOLS IN POST-BARIATRIC SURGERY PATIENTS

PROTOCOLOS DE SUPLEMENTAÇÃO VITAMINICA EM PACIENTES PÓS-CIRURGIA BARIÁTRICA

PROTOCOLOS DE SUPLEMENTACIÓN VITAMÍNICA EN PACIENTES POSCIRUGÍA BARIÁTRICA

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ABSTRACT

This study aimed to critically analyze the scientific literature on vitamin supplementation protocols in patients undergoing bariatric surgery, identifying the main postoperative nutritional deficiencies and the supplementation strategies recommended for the prevention of complications. This is a narrative literature review with a qualitative approach, based on

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searches conducted in the PubMed, SciELO, and ScienceDirect databases on December 29, 2025, including publications from the last ten years. Original articles, systematic reviews, narrative reviews, and meta-analyses published in English or Portuguese were included, totaling 15 studies after the application of eligibility criteria. The results demonstrated a high prevalence of vitamin and mineral deficiencies in the postoperative period of bariatric surgery, even among patients receiving regular clinical follow-up and nutritional supplementation. The most frequently observed deficiencies involved vitamin D, vitamin B12, and iron, as well as calcium, zinc, copper, and selenium, with greater severity in malabsorptive procedures, although restrictive techniques also presented relevant nutritional risks. Considerable variability was observed in supplementation protocols regarding composition, dosage, and route of administration, along with low long-term patient adherence, highlighting the lack of consensus in current recommendations. It is concluded that micronutrient deficiencies remain a significant clinical challenge after bariatric surgery, requiring continuous, individualized supplementation protocols guided by regular laboratory monitoring, with a direct impact on the prevention of nutritional complications and the improvement of long-term clinical outcomes.

Keywords: Bariatric Surgery. Vitamin Supplementation. Nutritional Deficiencies. Micronutrients. Postoperative Care.

RESUMO

Este estudo teve como objetivo analisar criticamente a literatura científica acerca dos protocolos de suplementação vitamínica em pacientes submetidos à cirurgia bariátrica, identificando as principais deficiências nutricionais no período pós-operatório e as estratégias de suplementação recomendadas para a prevenção de complicações. Trata-se de uma revisão bibliográfica de natureza narrativa, com abordagem qualitativa, realizada a partir de buscas nas bases de dados PubMed, SciELO e ScienceDirect em 29 de dezembro de 2025, contemplando publicações dos últimos dez anos. Foram incluídos artigos originais, revisões sistemáticas, revisões narrativas e meta-análises publicados em língua portuguesa ou inglesa, totalizando 15 estudos após a aplicação dos critérios de elegibilidade. Os resultados evidenciaram elevada prevalência de deficiências vitamínicas e minerais no pós-operatório da cirurgia bariátrica, mesmo entre pacientes submetidos a acompanhamento clínico e suplementação nutricional regular. As deficiências mais frequentemente observadas envolveram vitamina D, vitamina B12 e ferro, além de cálcio, zinco, cobre e selênio, sendo mais pronunciadas em procedimentos com componente disabsortivo, embora técnicas restritivas também apresentem risco nutricional relevante. Observou-se ampla variabilidade nos protocolos de suplementação quanto à composição, dosagem e forma de administração, bem como baixa adesão dos pacientes ao uso contínuo de suplementos, evidenciando a ausência de consenso nas recomendações atuais. Conclui-se que as deficiências de micronutrientes permanecem um desafio clínico significativo após a cirurgia bariátrica, sendo necessária a adoção de protocolos de suplementação contínuos, individualizados e baseados em monitoramento laboratorial periódico, com impacto direto na prevenção de complicações nutricionais e na melhoria dos desfechos clínicos em longo prazo.

Palavras-chave: Cirurgia Bariátrica. Suplementação Vitamínica. Deficiências Nutricionais. Micronutrientes. Pós-Operatório.

RESUMEN

Este estudio tuvo como objetivo analizar críticamente la literatura científica sobre protocolos de suplementación vitamínica en pacientes sometidos a cirugía bariátrica, identificando las principales deficiencias nutricionales en el postoperatorio y las estrategias de suplementación recomendadas para la prevención de complicaciones. Se trata de una revisión narrativa de la literatura con un enfoque cualitativo, realizada mediante búsquedas

en las bases de datos PubMed, SciELO y ScienceDirect el 29 de diciembre de 2025, que abarca publicaciones de los últimos diez años. Se incluyeron artículos originales, revisiones sistemáticas, revisiones narrativas y metaanálisis publicados en portugués o inglés, totalizando 15 estudios tras aplicar los criterios de elegibilidad. Los resultados mostraron una alta prevalencia de deficiencias de vitaminas y minerales en el postoperatorio de cirugía bariátrica, incluso entre pacientes sometidos a seguimiento clínico y suplementación nutricional regular. Las deficiencias observadas con mayor frecuencia fueron las de vitamina D, vitamina B12 y hierro, así como las de calcio, zinc, cobre y selenio, siendo más pronunciadas en procedimientos con componente malabsortivo, aunque las técnicas restrictivas también presentan un riesgo nutricional relevante. Se observó una amplia variabilidad en los protocolos de suplementación en cuanto a composición, dosis y método de administración, así como una baja adherencia de los pacientes al uso continuo de suplementos, lo que pone de manifiesto la falta de consenso en las recomendaciones actuales. Se concluye que las deficiencias de micronutrientes siguen siendo un reto clínico importante tras la cirugía bariátrica, lo que requiere la adopción de protocolos de suplementación continuos e individualizados basados en la monitorización periódica de laboratorio, con un impacto directo en la prevención de complicaciones nutricionales y la mejora de los resultados clínicos a largo plazo.

Palabras clave: Cirugía Bariátrica. Suplementación Vitamínica. Deficiencias Nutricionales. Micronutrientes. Postoperatorio.

1 INTRODUCTION

Bariatric surgery has established itself as an effective therapeutic intervention in the treatment of severe obesity, being associated with sustained weight loss and significant improvement in metabolic conditions frequently observed in these patients. Despite these benefits, the procedure imposes relevant challenges in nutritional management, since the anatomical and functional changes induced by surgery can compromise the intake, digestion, and absorption of nutrients, exposing patients to a high risk of vitamin and mineral deficiencies in the postoperative period (PATEL et al., 2017; LUPOLI et al., 2017).

The physiological changes resulting from bariatric surgery vary according to the technique used, being more expressive in procedures with a malabsorptive component, such as Roux-en-Y gastric bypass, although predominantly restrictive techniques can also negatively interfere with adequate food intake. These modifications directly affect the bioavailability of essential micronutrients and explain the occurrence of nutritional deficiencies both in the early and late postoperative periods, including in patients undergoing regular clinical follow-up and standardized supplementation (HA et al., 2021; KRZIZEK et al., 2021).

The scientific literature shows that the most frequently observed nutritional deficiencies after bariatric surgery include vitamins D, A, B12, and E, as well as minerals such as iron, calcium, folate, zinc, copper, and selenium. These deficiencies are associated with relevant clinical repercussions, such as anemia, neurological alterations, and osteometabolic disorders, and may compromise the functionality, quality of life, and long-term clinical outcomes of patients undergoing this type of surgical intervention (LOMBARDO et al., 2021; FITRIANA; PERMATASARI, 2024).

In this context, vitamin and mineral supplementation is an essential component of postoperative care, and is widely recommended on a continuous and, in many cases, lifelong basis. However, evidence indicates that patients' adherence to supplementation protocols is often inadequate, in addition to indicating that the regimens currently used present considerable variability in terms of composition, dosage, and monitoring. In addition, even among patients considered adherent, significant reductions in serum levels of certain micronutrients have been observed throughout clinical follow-up, evidencing limitations and heterogeneity in current supplementation protocols (SPETZ et al., 2022; GIUSTINA et al., 2023).

In this scenario, it is essential to adopt well-structured, individualized vitamin supplementation protocols based on scientific evidence, which consider the type of surgical procedure, the preoperative nutritional status, the patient's clinical conditions, and periodic

laboratory monitoring. Thus, the present study aims to critically analyze the recent scientific literature on vitamin supplementation protocols in patients undergoing bariatric surgery, focusing on the main nutritional deficiencies observed in the postoperative period and on the supplementation strategies recommended for the prevention of nutritional complications and the promotion of better long-term clinical outcomes (HAUGHTON et al., 2025; REYTOR-GONZÁLEZ et al., 2025).

2 METHODOLOGY

This study consists of a narrative literature review, with a qualitative approach, whose purpose was to critically analyze the available scientific production on vitamin supplementation protocols in patients undergoing bariatric surgery. The choice for a narrative review was based on the methodological diversity of the studies found, which cover different surgical techniques, micronutrients evaluated, and supplementation strategies, which makes it difficult to carry out a quantitative synthesis of the results.

The search for studies was conducted in scientific databases widely recognized in the health area, specifically **PubMed**, **SciELO** and **ScienceDirect**, as they bring together national and international peer-reviewed journals with high scientific relevance. The choice of these databases was intended to ensure thematic coverage, methodological quality, and access to publications relevant to the topic of bariatric surgery and nutritional supplementation.

The surveys were carried out on **December 29, 2025**, including publications referring to the **last ten years**. To identify the studies, controlled and uncontrolled descriptors were used, combined using Boolean operators, including the terms *bariatric surgery*, *vitamin supplementation*, *micronutrient deficiency* and *postoperative care*, in addition to their Portuguese counterparts, when applicable. The search strategies were adjusted according to the particularities of each database, and the combination ("bariatric surgery" AND "vitamin supplementation" AND "micronutrient deficiency") was adopted as an example.

Original scientific articles, systematic reviews, narrative reviews, and meta-analyses published in the last ten years, available in full and written in Portuguese or English, that addressed vitamin and mineral supplementation or nutritional deficiencies in patients in the postoperative period of bariatric surgery were included in the review. Editorials, letters to the editor, isolated case reports, duplicate studies among the databases consulted, and publications that did not have a direct relationship with the proposed objective were excluded.

The selection of studies occurred in three stages. Initially, the titles and abstracts were read to assess the thematic relevance. Then, the studies considered potentially eligible were

submitted to full reading. At the end of this process, only the articles that fully met the established criteria were included, totaling **15 studies**.

The extraction of information was carried out from the complete reading of the selected articles, in a systematized way, considering data such as authors, year of publication, type of study, type of bariatric procedure, micronutrients evaluated, supplementation strategies described, and the main findings related to nutritional deficiencies in the postoperative period. Data analysis was descriptive and interpretative, enabling a critical comparison between the different supplementation protocols presented in the literature.

As this is a literature review based exclusively on secondary data available in public databases, without direct involvement of human beings, this study did not require consideration by the Research Ethics Committee, in accordance with current ethical guidelines.

3 RESULTS

The analysis of the **15 included studies** showed a high prevalence of vitamin and mineral deficiencies in patients in the postoperative period of bariatric surgery, even among those undergoing clinical follow-up and regular nutritional supplementation. Studies have shown that the profile and magnitude of these deficiencies vary according to the type of surgical procedure performed, the length of postoperative follow-up, and adherence to prescribed supplementation protocols (PATEL et al., 2017; HA et al., 2021; HAUGHTON et al., 2025).

Vitamin **D** was the micronutrient most frequently identified as deficient in the studies analyzed, regardless of the type of bariatric surgery. Insufficiency of this vitamin was observed both in the early and late postoperative periods, including patients who used supplementation, indicating difficulty in maintaining adequate serum levels (KRZIZEK et al., 2021; LOMBARDO et al., 2021; GIUSTINA et al., 2023).

Vitamin **B12** showed a high frequency of deficiency, especially in patients undergoing Roux-en-Y gastric bypass. The studies reported a progressive reduction in serum levels of this vitamin over the course of follow-up, even with the use of oral multivitamins, with greater efficacy of alternative supplementation routes being described in some cases (ANTOINE et al., 2020; HA et al., 2021).

Among minerals, **iron deficiency** has been widely reported, especially in women of childbearing age, and is associated with the development of iron deficiency anemia in the postoperative period. In addition to iron, calcium, **zinc**, **copper,** and **selenium** deficiencies

have also been identified, with a potential impact on bone health, immune function, and metabolism (LOMBARDO et al., 2021; CÔTÉ et al., 2024; FITRIANA; PERMATASARI, 2024).

The results also showed relevant differences between the surgical techniques. Procedures with a malabsorptive component showed a higher frequency and severity of nutritional deficiencies when compared to predominantly restrictive techniques. However, even after sleeve gastrectomy, significant micronutrient deficiencies were observed (KRZIZEK et al., 2021; CÔTÉ et al., 2024).

Regarding **supplementation protocols**, studies have revealed wide variability regarding the composition, dosage, and form of administration of supplements. In addition, low patient adherence to supplementation regimens was identified over time, a factor associated with the emergence of late nutritional deficiencies (SPETZ et al., 2022; HAUGHTON et al., 2025).

4 DISCUSSION

The results of this review show that vitamin and mineral deficiencies remain a relevant clinical problem in the postoperative period of bariatric surgery, corroborating previous findings in the literature that point to nutritional supplementation as necessary, but often insufficient when applied in a standardized way (PATEL et al., 2017; FITRIANA; PERMATASARI, 2024).

The high prevalence of **vitamin D** deficiency observed in the studies can be explained by multiple factors, including reduced intestinal absorption, lower food intake, changes in bone metabolism, and inadequacy of the usual prescribed doses. These findings reinforce the need for individualized supplementation strategies and continuous laboratory monitoring, especially in patients undergoing malabsorptive procedures (KRZIZEK et al., 2021; GIUSTINA et al., 2023).

Regarding **vitamin B12**, the results confirm that patients undergoing Roux-en-Y gastric bypass have an increased risk of deficiency, due to reduced intrinsic factor secretion and gastric acidity. The persistence of this deficiency even with oral supplementation suggests that alternative pathways, such as sublingual or parenteral, should be considered in individualized protocols (ANTOINE et al., 2020; HA et al., 2021).

The **iron deficiency** observed in the analyzed studies is in line with the literature, which highlights reduced intestinal absorption and low tolerance to oral supplements as determining factors. The association of this deficiency with iron deficiency anemia reinforces the importance of early screening and appropriate intervention, especially in more vulnerable groups, such as women of childbearing age (LOMBARDO et al., 2021; CÔTÉ et al., 2024).

The comparison between surgical techniques shows that, although malabsorptive procedures present a higher nutritional risk, no technique is free of micronutrient deficiencies. These findings reinforce the need for supplementation and nutritional monitoring regardless of the type of surgery performed (KRZIZEK et al., 2021; REYTOR-GONZÁLEZ et al., 2025).

Another relevant aspect discussed in the studies is the **low adherence of patients** to supplementation protocols, a factor that compromises the effectiveness of preventive strategies. Barriers such as adverse effects, cost of supplements, and lack of perception of nutritional risk highlight the importance of educational actions and continuous multidisciplinary follow-up in the postoperative period (SPETZ et al., 2022; HAUGHTON et al., 2025).

In general, the findings of this review reinforce that vitamin supplementation protocols in the postoperative period of bariatric surgery should be **continuous, individualized, and based on periodic laboratory monitoring**, considering the particularities of each patient and surgical procedure. The heterogeneity of the recommendations found highlights the need for greater standardization based on robust scientific evidence (FITRIANA; PERMATASARI, 2024; REYTOR-GONZÁLEZ et al., 2025).

5 CONCLUSION

The analysis of the scientific literature showed that vitamin and mineral deficiencies are a frequent and clinically relevant problem in the postoperative period of bariatric surgery, even among patients undergoing regular clinical follow-up and nutritional supplementation. The findings demonstrate that the occurrence of these deficiencies is related to factors such as the type of surgical procedure, the length of postoperative follow-up and, significantly, adherence to the prescribed supplementation protocols.

The results indicate that micronutrients such as vitamin D, vitamin B12 and iron have a high prevalence of deficiency after bariatric surgery, in addition to deficiencies of calcium, zinc, copper and selenium, with potential important clinical repercussions. It was also observed that procedures with a malabsorptive component are associated with higher nutritional risk, although no surgical technique is exempt from the need for continuous supplementation and monitoring.

The heterogeneity of the supplementation protocols described in the literature, combined with the low adherence of patients over time, highlights limitations in the strategies currently adopted and reinforces the importance of individualized approaches. In this context, standardized supplementation alone is insufficient to prevent nutritional deficiencies in all patients, highlighting the need for adjustments based on periodic laboratory evaluations.

Thus, it is concluded that vitamin supplementation protocols in the postoperative period of bariatric surgery should be continuous, individualized, and based on scientific evidence, considering the clinical particularities of each patient and the type of procedure performed. In addition, educational strategies and continuous multidisciplinary follow-up are essential to improve treatment adherence and reduce the risk of long-term nutritional complications.

Finally, the need for future studies that contribute to the standardization of recommendations regarding the composition, dosage, and monitoring of vitamin supplementation in patients undergoing bariatric surgery is emphasized, in order to support more consistent clinical guidelines based on robust evidence.

REFERENCES

Antoine, C., et al. (2020). Medium-term postbariatric surgery deficit of vitamin B12: Prevalence and associated factors. Obesity Surgery, 30(6), 2153–2160.

Côté, M., et al. (2024). Micronutrient status 2 years after bariatric surgery: A prospective cohort study. Surgery for Obesity and Related Diseases, 20(2), 135–143.

Fitriana, N., & Permatasari, H. (2024). Update on micronutrients in bariatric surgery: Clinical implications and supplementation strategies. Clinical Nutrition ESPEN, 59, 1–9.

Giustina, A., et al. (2023). Vitamin D status and supplementation before and after bariatric surgery: Recommendations based on current evidence. Endocrine, 79(3), 495–504.

Ha, J., et al. (2021). Micronutrient status in bariatric surgery patients: Long-term outcomes and adherence to supplementation. Nutrients, 13(2), 1–14.

Haughton, C., et al. (2025). Nutritional deficiencies following bariatric surgery: Current evidence and future directions. Nutrients, 17(1), 1–18.

Krzizek, E. C., et al. (2021). Prevalence of micronutrient deficiency after bariatric surgery: A systematic review. Obesity Surgery, 31(3), 1016–1029.

Lombardo, M., et al. (2021). Long-term iron and vitamin B12 deficiency after bariatric surgery. Nutrition, 89, 111218.

Patel, A., Mundi, M. S., & Hurley, D. L. (2017). Micronutrient deficiencies after bariatric surgery: An emphasis on vitamins and trace minerals. Mayo Clinic Proceedings, 92(10), 1540–1549.

Reytor-González, L., et al. (2025). Preventing and managing pre- and postoperative micronutrient deficiencies in bariatric surgery. Nutrients, 17(2), 1–22.

Spetz, J., et al. (2022). Adherence to vitamin and mineral supplementation after bariatric surgery: A long-term follow-up study. Obesity Surgery, 32(5), 1542–1550.