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REVIEW ARTICLE

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Major clinical considerations of nutrients and supplements in the treatment of periodontitis for dental implant success: a scoping review

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Abstract

Introduction: With Brånemark's concept of osseointegration in 1960, dental implants have seen significant advancements, particularly in the structural and functional connection between bone and the implant surface. One of the main predictors influencing osseointegration is bone quality fostered by nutrients and the absence of periodontitis. **Objective:** This study aimed to analyze the clinical considerations of nutrients and supplements in the treatment of periodontitis for dental implant success. **Methods:** The systematic review rules of the PRISMA Platform were followed. The search was conducted from March to April 2026 in the Web of Science, Scopus, Embase, PubMed, Science Direct, SciELO, and Google Scholar databases. The quality of the studies was based on the GRADE instrument, and the risk of bias was analyzed according to the Cochrane instrument. **Results and Conclusion:** According to the GRADE instrument, most studies presented homogeneity in their results, with X^2=83.5%>50%. A total of 101 articles were found and submitted for eligibility analysis, with 13 final studies selected to compose the results of this systematic review. Considering the Cochrane tool for risk of bias, the overall assessment resulted in 12 studies with a high risk of bias and 22 studies that did not meet GRADE and AMSTAR-2. It was concluded that probiotic and prebiotic nutraceuticals, polyunsaturated fatty acids, and vitamins A, B, C, D, and E are the most commonly used in dentistry. Evidence suggests a positive relationship between adequate vitamin D levels and early osseointegration of dental implants. Regarding marginal bone changes and peri-implant soft tissue outcomes, the findings were consistent but statistically heterogeneous, with several studies indicating greater bone loss, thinner gingival phenotypes, or a more pro-inflammatory peri-implant environment in the presence of vitamin D deficiency.

Keywords: Osseointegration. Dental implants. Bone quality. Periodontitis. Nutrients. Nutrology.

Introduction

With the concepts of osseointegration by Brånemark in 1960, dental implants have seen significant advances, mainly with the structural and functional connection between the bone and the load-bearing implant surface, reflecting the success of dental implants. One of the main predictors influencing osseointegration is bone quality fostered by nutrients and the absence of periodontitis, as well as being influenced by surgical techniques, implant material, and the overall health of patients **[1,2]**.

In this scenario, in the field of Nutrology, micronutrients and nutraceuticals can strongly influence the body's physiological regulatory processes

[3,4]. The skeletal system depends on several essential minerals and vitamins, including calcium, fluoride, potassium, magnesium, vitamin B6, vitamin D, and zinc for its regular functioning.

There is an important positive statistical significance between vitamin D levels and the success of dental implants **[5]**. Vitamin D supplementation has been shown to improve osseointegration in animals with systemic comorbidities, such as vitamin D deficiency, diabetes mellitus, osteoporosis, and chronic kidney disease **[6]**. In addition, the micronutrients calcium, phosphorus, magnesium, and zinc are also essential for bone formation and remodeling, while vitamin C contributes to collagen synthesis and soft tissue healing around implants **[7]**. Despite this, there is little evidence on how deficiency or supplementation of other micronutrients, such as boron, selenium, copper, or iron, influences osseointegration or the long-term survival and success of implants.

Therefore, it is necessary to evaluate the relationship between nutrients and the outcomes of dental implant treatment, including osseointegration, implant stability, marginal bone loss, peri-implant tissue health, and implant survival/success, as well as the incidence of failures. It is necessary to assess whether the deficiency of these nutrients can reduce implant survival and success.

Therefore, this scoping review study aimed to analyze the clinical considerations of nutrients and supplements in the treatment of periodontitis for dental implant success.

Methods

Study Design

This study followed the international systematic review model, following the PRISMA (preferred reporting items for systematic reviews and meta-analysis) rules. Available at: http://www.prisma-statement.org/?AspxAutoDetectCookieSupport=1. Accessed at: 03/10/2026. The AMSTAR 2 (Assessing the methodological quality of systematic reviews) methodological quality standards were also followed. Available at: https://amstar.ca/. Accessed at: 03/10/2026.

Search Strategy and Search Sources

The literature search process was carried out from March to April 2026 and developed based on Web of Science, Embase, Scopus, PubMed, Lilacs, Ebsco, Scielo, and Google Scholar, covering scientific articles from various periods to the present day. The following descriptors were used in health sciences (DeCS/MeSH terms): *"Osseointegration. Dental implants. Bone quality. Periodontitis. Nutrients. Nutrology",* and the Boolean "and" was used between the MeSH terms and "or" between the historical findings.

Study Quality and Risk of Bias

Quality was classified as high, moderate, low, or very low regarding the risk of bias, clarity of comparisons, precision, and consistency of analyses. The most evident emphasis was on systematic review articles or meta-analyses of randomized clinical trials, followed by randomized clinical trials. Low quality of evidence was attributed to case reports, editorials, and brief communications, according to the GRADE instrument. The risk of bias was analyzed according to the Cochrane instrument by analyzing the Funnel Plot graph (Sample size versus Effect size), using Cohen's test (d).

Summary of Findings

A total of 101 articles were found and submitted to eligibility analysis, with 13 final studies selected to compose the results of this systematic review. The listed studies were of medium to high quality (Figure 1), considering the level of scientific evidence of studies such as meta-analysis, consensus, randomized clinical, prospective, and observational. Biases did not compromise the scientific basis of the studies. According to the GRADE instrument, most studies presented homogeneity in their results, with X^2=83.5%>50%. Considering the Cochrane tool for risk of bias, the overall assessment resulted in 12 studies with a high risk of bias and 22 studies that did not meet GRADE and AMSTAR-2.

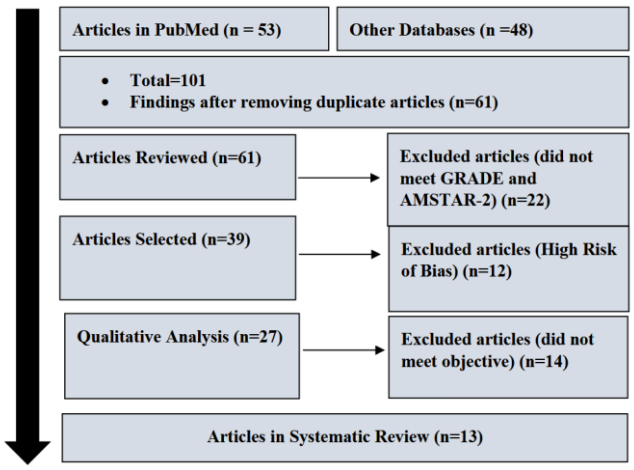

Figure 1. Flowchart showing the article selection process. Source: Own Authorship.

Figure 2 presents the results of the risk of bias of the studies using the Funnel Plot, showing the calculation of the Effect Size (Magnitude of the difference) using Cohen's Test (d). Precision (sample

size) was determined indirectly by the inverse of the standard error (1/Standard Error). This graph had a symmetrical behavior, not suggesting a significant risk of bias, both among studies with small sample sizes (lower precision) that are shown at the base of the graph and in studies with large sample sizes that are presented at the top.

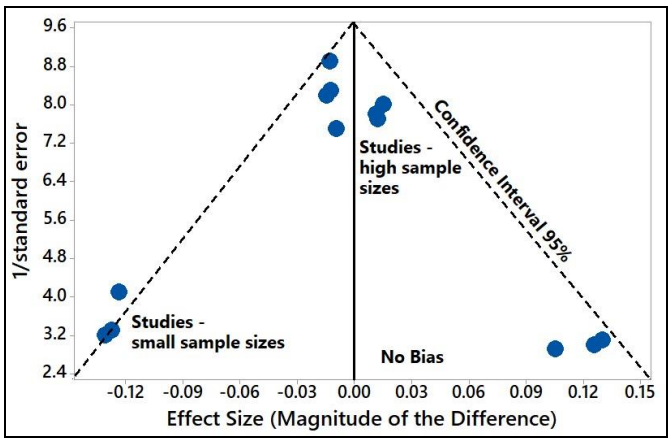

Figure 2. The symmetrical funnel plot suggests no risk of bias among the studies with small sample sizes that are shown at the bottom of the graph. High confidence and high recommendation studies are shown above the graph (n=13 studies). Source: Own Authorship.

Major Approaches and Clinical Results

Based on the literature findings on clinical considerations of nutrients and supplements in the treatment of periodontitis for dental implant success, the authors Sodnom-Ish et al. (2026) **[8]** showed through a review study that several authors analyzed vitamin D supplementation or deficiency more systematically, while evidence for other micronutrients was limited. Fifteen studies reported a positive association between vitamin D and implant osseointegration. Five studies did not report a significant association, while two studies that investigated vitamins B and C showed that vitamin B did not influence postoperative pain or paresthesia and that vitamin C improved soft tissue healing. Adequate vitamin D levels were associated with significantly higher implant stability quotient values, reduced early dental implant failure, and less marginal bone loss.

The authors Cenzato et al. (2023) **[9]** described that the use of nutraceuticals in implant dentistry is increasing. It is necessary to examine the effects of commercially available nutraceuticals. Clinical indications included oral leukoplakia, periodontitis, implant osseointegration, oral mucositis, cleft palates, and oral health. Probiotics, prebiotics, polyunsaturated fatty acids, and vitamins A, B, C, D, and E were the most commonly used nutraceuticals in dentistry.

In this context, most studies indicate that implant stability was the most frequently reported outcome and demonstrated a statistically significant positive association between vitamin D levels and implant stability. Toy et al. **[10]** reported a postoperative implant stability value of 82.02 ± 4.98 in the group with sufficient vitamin D levels versus 79.86 ± 5.86 in the group with insufficient levels ($p>0.05$). Diachkova et al. **[11]** compared patients who received implants after normalization of serum vitamin D levels with those who underwent implants during vitamin D supplementation and found no significant differences in implant stability.

Other studies have observed implant stability and reported a significant positive association with vitamin D levels **[12-16]**. Notably, Bhandage et al. **[16]** demonstrated that for each 1 ng/mL increase in serum vitamin D concentration, the implant stability value increased significantly by 0.48 units at 3 months and 0.62 units at 6 months ($p = 0.01$ and $p = 0.002$, respectively).

In addition, studies have reported the effects of micronutrients, including vitamins C and D, on peri-implant soft tissue outcomes, using clinical parameters, gingival phenotype measurements, peri-implant cervical fluid biomarkers, and wound healing indices **[7,13,17-19]**. These studies showed a significant statistical association between low serum vitamin D levels and less favorable peri-implant soft tissue conditions. Dulinska et al. **[17]** demonstrated that patients with vitamin D deficiency and thin gingival tissue (<3 mm) presented significantly greater peri-implant bone loss at implant exposure ($p=0.040$) and crown placement ($p<0.001$). Similarly, Ustaoglu et al. **[19]** found significantly lower serum vitamin D levels in patients with peri-implantitis compared to healthy peri-implant individuals ($p<0.05$).

Finally, a study that evaluated vitamin C supplementation reported significant improvement in early postoperative wound healing within 7 to 14 days compared with controls ($p<0.05$) **[7]**.

Limitations

Although clinical studies have shown that adequate vitamin D levels can promote osseointegration and implant stability, well-designed randomized clinical trials with standardized outcome measures, longer follow-up, and assessment of other micronutrients are needed.

Conclusion

It was concluded that probiotic and prebiotic nutraceuticals, polyunsaturated fatty acids, and vitamins A, B, C, D, and E are the most commonly used in dentistry. Evidence suggests a positive

relationship between adequate vitamin D levels and early osseointegration of dental implants. Regarding marginal bone changes and peri-implant soft tissue outcomes, the findings were consistent but statistically heterogeneous, with several studies indicating greater bone loss, thinner gingival phenotypes, or a more pro-inflammatory peri-implant environment in the presence of vitamin D deficiency.

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Author contributions: **Conceptualization-** All authors**; Investigation-** All authors; **Methodology-** All authors; **Project administration-** All authors; **Supervision-**Fabio Alarcon Idalgo, Alvaro José Cicareli, Fábio Renato Braga Marcato; **Writing - original draft-** All authors; **Writing-review & editing-** All authors.

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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[@].

Application of Artificial Intelligence (AI)

Not applicable.

Peer Review Process

It was performed.

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