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Main clinical studies on the impact of nutrition on oral and endodontic health: a systematic review

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Abstract

Introduction: In the context of endodontics, oral and periodontal diseases are predictors of various problems, primarily tooth loss in adults. Inflammatory processes are caused by bacteria, genetic factors, lifestyle, and nutrition. Periodontitis can cause alterations and severe damage to oral health and well-being. Numerous clinical and experimental studies highlight a strong association between periodontitis and certain systemic diseases. **Objective:** It was to conduct a systematic review presenting key clinical studies on the impact of nutrition on oral and endodontic health. **Methods:** The PRISMA guidelines for systematic reviews were followed. The search was conducted from February to May 2026 across the Scopus, PubMed, Science Direct, SciELO, and Google Scholar databases. Study quality was assessed using the GRADE instrument, and risk of bias was analysed according to the Cochrane tool. **Results and Conclusion:** A total of 135 articles were identified; 50 were evaluated in full, and 40 were included in this systematic review. Based on the Cochrane risk-of-bias tool, the overall assessment revealed 9 studies with a high risk of bias, while 5 studies failed to meet GRADE and AMSTAR-2 standards. Most studies lacked homogeneity in their results (X^2 = 75.2% > 50%). This review concluded that nutritional science is essential for oral and endodontic health. Nutrient deficiencies can affect oral health status. Nutritional science addresses nutritional needs and helps prevent diseases associated with a poor diet. A nutrient-deficient diet can accelerate the progression of oral cavity diseases by disrupting tissue homeostasis, reducing resistance to microbial biofilms, and impairing tissue healing, thereby compromising endodontic health and, consequently, systemic health.

Keywords: Nutrology. Nutrition. Periodontal diseases. Endodontics.

Introduction

In the context of endodontics, oral and periodontal diseases are predictors of various problems, primarily tooth loss in adults. Inflammatory processes are caused by bacteria, genetic factors, lifestyle, and nutrition. Periodontitis can cause alterations and severe damage to oral health and well-being. Numerous clinical and experimental studies highlight a strong association between periodontitis and certain systemic diseases **[1-4]**.

In this context, studies have shown that patients with oral impairment are at high risk of developing systemic comorbidities. The decline in oral function associated with aging has significant impacts on dysfunction and mortality risk. In the field of nutrology, recent research shows that, beyond preserving the number of teeth, maintaining or improving oral function, adopting a healthy diet, and preserving nutritional status are associated with general health **[2,4]**.

Thus, diet and nutrition are fundamental to maintaining the general and oral health of populations. Health status can be affected by nutrient deficiencies, and vice versa. Dietary guidelines have been

developed to provide evidence-based recommendations on food and beverages, aiming to promote a diet that meets nutritional needs and prevents diet-related diseases, such as dental caries and obesity. Nutrients are divided into two categories: macronutrients, which include proteins, carbohydrates, and fats, and micronutrients, comprising vitamins and minerals. Fats are the macronutrients with the highest energy density, whereas carbohydrates constitute, quantitatively, the primary source of dietary energy for most populations. Proteins are vital structural and functional components in all body cells, essential for growth, tissue repair, and the maintenance of health. Vitamins and minerals, found in small quantities in most foods, are essential for normal metabolic function **[5-7]**.

In light of this, the present study aimed to conduct a systematic review to present key clinical studies on the impact of nutritional factors on oral health promotion and endodontics.

Methods

Study Design

The present study followed the international systematic review model, following the rules of PRISMA (preferred reporting items for systematic reviews and meta-analysis). Available at: http://www.prisma-statement.org/?AspxAutoDetectCookieSupport=1. Accessed on: 05/22/2026. The methodological quality standards of AMSTAR-2 (Assessing the methodological quality of systematic reviews) were also followed. Available at: https://amstar.ca/. Accessed on: 05/22/2026.

Data sources and research strategy

The search strategies for this systematic review were based on the keywords (MeSH Terms*): "Nutrology. Nutrition. Periodontal diseases. Endodontics".* The research was carried out from February to May 2026 and developed based on Scopus, PubMed, Science Direct, Scielo, and Google Scholar, using scientific articles from 2005 to 2026. Also, the combination of the keywords with the booleans "OR", "AND", and the operator "NOT" were used to target the scientific articles of interest.

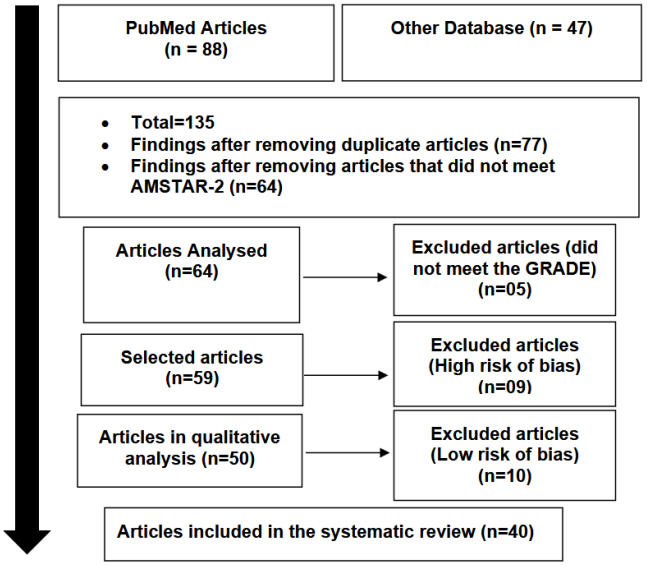
Study Quality and Bias Risk

Quality was classified as high, moderate, low, or very low in terms of 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. The 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 the Cohen test (d).

Results and Development

A total of 135 articles were found. Initially, duplication of articles was excluded. After this process, the abstracts were evaluated and a new exclusion was performed, removing the articles that did not address the theme of this article. In total, 50 articles were fully evaluated and 40 were included and evaluated in this systematic review (Figure 1). According to the GRADE instrument, most studies showed homogeneity in their results, with X^2=75.2%>50%. Considering the Cochrane tool for risk of bias, the overall assessment resulted in 09 studies with a high risk of bias and 05 studies that did not meet GRADE and AMSTAR-2.

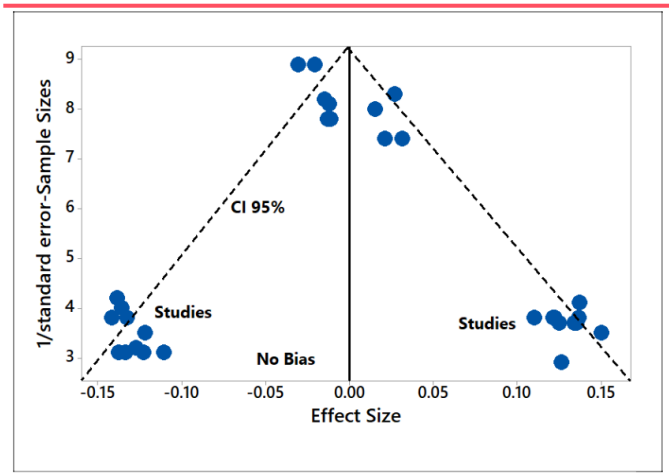
Figure 1. Flowchart of Study Eligibility (Systematic Review).



Source: Own authorship.

Figure 2 presents the results of the risk of bias in the studies using the Funnel Plot, through the calculation of the Effect Size (Cohen's Test). The sample size was determined indirectly by the inverse of the standard error. The number of clinical studies evaluated was n= 40. The graph showed symmetric behavior, not suggesting a significant risk of bias in studies with small sample sizes, which are shown at the bottom of the graph.

Figure 2. The symmetric funnel plot does not suggest a risk of bias between the small sample size studies that are shown at the bottom of the graph (N= 40 studies).



Major Clinical Results and Considerations

The authors Maraş et al. (2026) **[8]** compared high-performance athletes and nonathletes with respect to endodontic conditions and oral health parameters, considering nutritional and psychological factors. High-performance athletes (n=50) and non-athletes (n=50) aged 18 to 30 years were included. The clinical examination assessed endodontic and periapical condition, caries experience (DMFT index), non-carious tooth wear, and periodontal indices. Daily nutrient intake and potential renal acid load (PRAL) were calculated based on a one-year food frequency questionnaire. Athletes presented a greater number of teeth requiring endodontic treatment, higher periapical index scores, more decayed teeth, and higher periodontal index scores compared to non-athletes ($p < 0.05$). The values of PRAL, organic acids, vitamin D, B complex vitamins, meal frequency, and mental well-being were also higher in athletes ($p<0.05$). The intake of sucrose, carbohydrates, and vitamin C had significant effects on endodontic condition ($p<0.05$). The results revealed that athletes had a greater number of teeth requiring endodontic treatment, decayed teeth, and periodontal symptoms.

It was shown that malnutrition can significantly affect oral health and vice versa. A diet lacking in nutrients can lead to the progression of oral cavity disease by altering tissue homeostasis, reducing resistance to microbial biofilm, and decreasing tissue healing. It can also affect the development of the oral cavity. In the absence of contributing factors, healthcare providers should consider poor nutritional status with periodontitis, poor healing response to surgical procedures, or recurrent oral disease. There is an important role of nutrition in oral health and its effects on the immune system and inflammatory pathways. Oral manifestations can occur with nutritional deficiencies, the association of periodontitis with nutritional deficiencies in vitamins C and D, and the effect of vitamin D deficiency and tooth development **[9]**.

The nutritional transition from traditional diets to processed snacks and sugary drinks has contributed to a greater burden of childhood malnutrition, obesity, and tooth decay. Mothers' motivations for child nutrition and oral health practices need to be better understood. Thus, one study analyzed a convenience sample of 102 mothers in eight Salvadoran rural communities who participated in focus groups on child nutrition and oral health. Mothers noted overall improvements in oral hygiene awareness, but worse children's oral health, which they attributed to the widespread sale of unhealthy snacks and drinks near schools **[10]**.

A study carried out by Tsang et al. (2019) **[11]** assessed the nutrition and oral health of 836 children aged 6 months to 6 years and their families in rural and urban Nepal. Mothers were interviewed about oral health and maternal and child nutrition, and children received dental examinations and weight and height measurements. Most families lived within a 5-minute walk of a store that sold ultra-processed snacks and sugary drinks. While most mothers knew that sweets caused tooth decay, half of the children received sweets daily, and 58.2% of the children had tooth decay. Caries started in the first 2 years and increased in prevalence and severity until 6 years of age, when 74.3% had cavities, and 20% had mouth pain. Despite greater knowledge and health resources among urban mothers, urban children's greater access to junk food and frequency of consumption were associated with higher prevalence and severity of caries compared to rural children. Severe caries has been associated with malnutrition, especially in rural children.

Added to this, a study prepared by the authors van Meijeren-van Lunteren et al. (2021) **[12]** investigated the role of breastfeeding and bottle-feeding practices on dental caries during childhood, taking into account socioeconomic aspects, ethnic origin, and sugar intake. In total, 4,146 children were included in the analyses. The prevalence of dental caries at 6 years was 27.9% (n = 1,158). Prolonged breastfeeding (for > 12 months) was associated with dental caries (OR 1.35, 95% CI 1.04-1.74) and the number of teeth affected by caries (RR 1.27, 95% CI 1, 03-1.56). In addition, nighttime bottle feeding was associated with dental caries (OR 1.52, 95% CI 1.20-1.93). All associations were independent of SEP family, ethnic origin, and sugar intake. The results of this Dutch cohort study confirmed the previously observed associations between prolonged breastfeeding and nighttime bottle feeding and increased risk of childhood dental caries, even after adequate adjustments for indicators of SEP, ethnic origin, and

sugar intake.

In this scenario of oral diseases, periodontitis is a multifactorial disease in which environmental and genetic factors play a precise and controversial role in determining its appearance. The unbalanced oral microbiota, smoking, and diabetes have an important influence **[13-15]**. However, a series of genetic factors of the host can condition the individual's susceptibility to the onset of the disease, and determine its different clinical manifestations and the rate of progression **[16,17]**.

Unlike Mendelian genetic diseases, which are rare and caused by one or a few mutations, multifactorial diseases, such as periodontitis, are frequent and related to numerous environmental and genetic factors. Genetic factors are not actual mutations, but genetic polymorphisms also called susceptibility factors. Each of them is not necessary or sufficient to determine the disease, however, they are capable of modifying the risk of its appearance **[18-20]**.

In recent years, investigations on susceptibility factors for the development of periodontal diseases have focused mainly on the study of genes that encode factors involved in the modulation of the immune response, cell surface receptors, chemokines, enzymes, and proteins related to antigen recognition. Cytokines such as IL-1α, IL-1β, IL-10, and IL-6 are key factors that mediate the inflammatory process in periodontal disease. They play a role in the activation, proliferation, and differentiation of B cells, the main cells implicated in severe manifestations of periodontitis **[21-24]**. These genetic variations may therefore favor disease progression, causing the classic trend, characterized by repeated cycles of tissue inflammation, followed by spontaneous remissions (defined as a "pousses" trend) **[25,26]**.

Finally, since alveolar bone resorption is a key factor in periodontal disease, the vitamin D receptor (VDR) has been considered a susceptibility factor in disease progression. Data in the literature support the existence of an association between common polymorphisms that affect candidate genes and periodontal disease **[27-29]**. Lifestyle **[30]**, such as smoking, oral hygiene, orthodontic treatment **[31-34]**, and malocclusions **[35-40]**, are also highlighted, as they explain at the epidemiological level most cases of periodontitis and dental malocclusions **[41-47]**.

Conclusion

It was concluded that nutritional science is essential for oral and endodontic health. Oral health status can be affected by nutrient deficiencies. Nutritional science addresses nutritional needs and prevents diseases associated with a poor diet. A nutrient-deficient diet can accelerate the progression of oral cavity diseases by disrupting tissue homeostasis, reducing resistance to microbial biofilms, and impairing tissue healing, thereby compromising endodontic health and, consequently, systemic health.

CRediT

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Conflict of Interest

The authors declare no conflict of interest.

Similarity Check

It was applied by Ithenticate@.

Application of Artificial Intelligence (AI)

Not applicable.

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It was performed.

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