



Relationship between nutrology and oral health: a systematic review of major clinical findings

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Abstract

Introduction: Food and nutrition are fundamental in maintaining the general and oral health of populations. Health status can be affected by nutrient deficiency and vice versa. Dietary guidelines were developed to provide evidence-based food and beverage recommendations to populations to promote a diet that meets nutritional needs and prevents diet-related illness. **Objective:** Aimed to carry out a concise systematic review to elucidate through clinical studies the real relationship between nutrition and oral health. **Methods:** The rules of the Systematic Review-PRISMA Platform. The research was carried out from August to October 2022 and developed based on Scopus, PubMed, Science Direct, Scielo, and Google Scholar, using scientific articles from 2005 to 2022. 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:** A total of 125 articles were found. In total, 75 articles were fully evaluated and 35 were included and evaluated in this systematic review. It was concluded that food and nutrition are fundamental in maintaining the general and oral health of populations. Health status can be affected by nutrient deficiency and vice versa. Nutrology can promote a diet that meets nutritional needs and prevent diet-related diseases such as tooth decay. It was evidenced 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.

Keywords: Nutrology. Nutrition. Dietetic therapy. Oral health. Dental care.

Introduction

Oral and periodontal diseases can determine serious functional, phonatory, and aesthetic impairments and are the main cause of tooth loss in adults. In this sense, specific bacteria provoke an intense inflammatory response, even more for reasons related to genetics and lifestyles. They are more frequent in subjects who have difficulty accessing preventive and dental services. Some systemic diseases, such as uncontrolled diabetes, can increase your risk of development and progression. Also, periodontitis can cause serious changes and damage to oral health and well-being. Numerous clinical and experimental studies have highlighted the presence of a strong association between periodontitis and some systemic diseases, such as cardiovascular diseases, diabetes, lung diseases, and pregnancy complications [1].

In this context, oral frailty is defined as a decrease in oral function accompanied by a decrease in mental and physical functions. Studies show that people with oral frailty are at high risk for physical frailty, sarcopenia, and serious conditions. The increase in life expectancy and maintenance of teeth results in a decrease in the effect of the number of teeth. In contrast, a decrease in oral function as a result of aging has been suggested to have major effects on dysfunction and mortality risk. It is necessary to relate the number of teeth, dentures, and occlusion with health and longevity. Recent studies have shown that in addition to maintaining the number of teeth, trying to maintain or increase oral function,

having a good diet, and maintaining nutritional status are linked to general health. A decreased oral function is an important risk factor for the development of malnutrition and sarcopenia [2].

In this aspect, food and nutrition are fundamental in maintaining the general and oral health of populations. Health status can be affected by nutrient deficiency and vice versa. Dietary guidelines were developed to provide evidence-based food and beverage recommendations to populations, to promote a diet that meets nutritional needs, and to prevent diet-related diseases such as tooth decay and obesity. Nutrients are divided into 2 macronutrient categories consisting of proteins, carbohydrates, and fats; and micronutrients made up of vitamins and minerals. Fats are the most energy-dense macronutrient, while carbohydrates are quantitatively the most important dietary energy source for most populations. Proteins are vital structural and functional components within every cell in the body and are essential for growth, repair, and health maintenance. Vitamins and minerals, which are found in small amounts in most foods, are essential for normal metabolic function [3].

Therefore, the present study aimed to carry out a concise systematic review to elucidate through clinical studies the real relationship between nutrition and oral health.

Methods
Study Design

The rules of the Systematic Review-PRISMA Platform (Transparent reporting of systematic reviews and meta-analysis-[HTTP://www.prisma-statement.org/](http://www.prisma-statement.org/)) were followed.

Data sources and research strategy

The search strategies for this systematic review were based on the keywords (MeSH Terms): “Nutrology. Nutrition. Dietetic therapy. Oral health. Dental care”. The research was carried out from August to October 2022 and developed based on Scopus, PubMed, Science Direct, Scielo, and Google Scholar, using scientific articles from 2005 to 2022. 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

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 Discussion

A total of 125 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, 75 articles were fully evaluated and 35 were included and evaluated in this systematic review (Figure 1).

Figure 1. Flow Chart of Study Eligibility (Systematic Review).

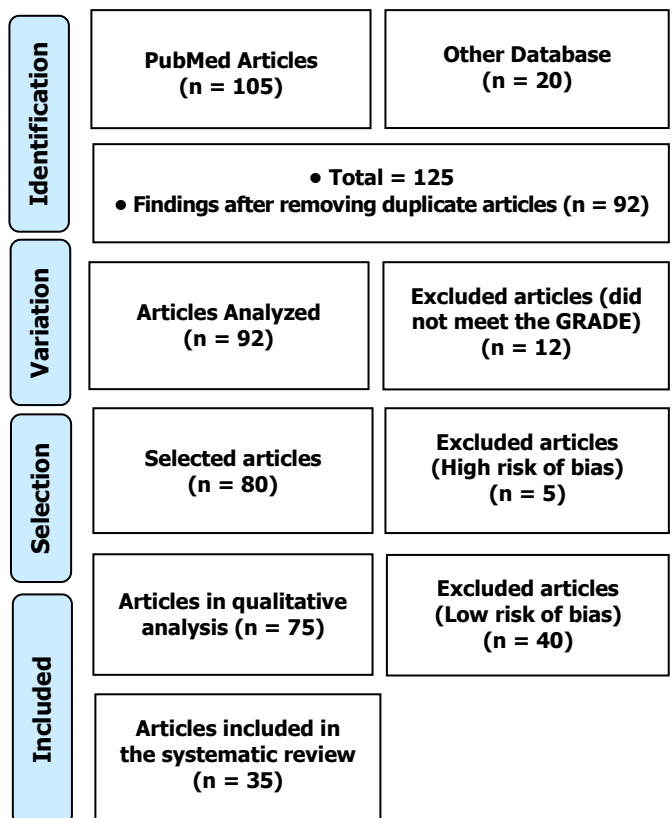
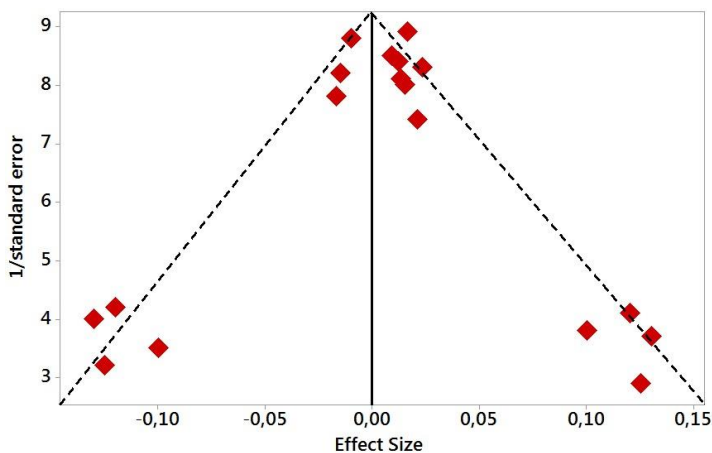


Figure 2 presents the results of the risk of bias in the studies using the Funnel Plot, through the calculation of the Effect Size (Cohen's Test). The sample size was determined indirectly by the inverse of the standard error. The number of clinical studies evaluated was n=35. The graph showed symmetric behavior, not suggesting a significant risk of bias in studies with small sample sizes, which are shown at the bottom of the graph.

Based on the literary findings, 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

Figure 2. that are shown at the bottom of the graph (N=35 studies).



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 [4].

Furthermore, 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 [5].

Furthermore, a study carried out by Tsang et al. 2019 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 caries 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 have been associated with malnutrition, especially in rural children [6].

Added to this, a study prepared by the authors van Meijeren-van Lunteren et al. 2021 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 [7].

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 [8-10]. 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 [11,12].

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 [13-15].

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-1A, IL-1B, 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 [16-19]. 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) [20,21].

Furthermore, since alveolar bone resorption is a key factor in periodontal disease, 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 [22-24]. Lifestyle [25] such as smoking, oral hygiene, orthodontic treatment [26-29], and malocclusions [30-35] are also highlighted, as they explain at the epidemiological level most cases of periodontitis and dental malocclusions [36-42].

Conclusion

It was concluded that food and nutrition are fundamental in maintaining the general and oral health of populations. Health status can be affected by nutrient deficiency and vice versa. Nutrology can promote a diet that meets nutritional needs and prevent diet-related diseases such as tooth decay. It was evidenced 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.

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Ethics approval

Not applicable.

Informed consent

Not applicable.

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Data sharing statement

No additional data are available.

Conflict of interest

The authors declare no conflict of interest.

Similarity check

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