

## REVIEW

# Nutrition, relationship with malocclusions?

## Nutrición, ¿relación con las maloclusiones?

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Cite as: Blanco Romero L, Figueredo Rigores A, Ortiz Figueroa AM. Nutrition, ¿relationship with malocclusions? Odontología (Montevideo). 2025; 3:174. <https://doi.org/10.62486/agodonto2025174>

Submitted: 01-03-2024

Revised: 24-07-2024

Accepted: 16-11-2024

Published: 01-01-2025

Editor: Lourdes Hernandez Cuetara 

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### ABSTRACT

Nutrition is part of people's lifestyle. Dentistry is related to different areas of health, in which nutrition can intervene positively or not. Constant scientific advances, studies and research show that some foods affect malocclusions and orthodontic treatments. The quality and quantity of nutrients that the subjects consume, as well as the way of ingesting them and the habits in which food is consumed, have effects on the growth and development of the human body and on the state of oral health of people, which leads the specialists of this branch to have knowledge of their effects in order to take them into account in the treatments, as well as in the prevention and promotion of oral health. The aim of this literature review is to analyze the relationship of nutritional supplements in dentistry, for the training of the stomatologist and his orientation towards an effective treatment. A systematic bibliographic review was carried out at the international and national level, using the following databases: Scientific Electronic Library Online (SciELO), Dialnet, Scopus, Redalyc, LILACS and Google Scholar, in original articles. A total of 67 articles were found, 21 of which were selected for this study.

**Keywords:** Orthodontics; Nutritional Diet; Eating Habits and Malocclusion.

### RESUMEN

La nutrición es parte del estilo de vida de las personas. La odontología está relacionada con diferentes áreas de la salud, en la que la nutrición puede intervenir de manera positiva o no. Los constantes avances científicos, los estudios e investigaciones evidencian que algunos alimentos afectan las maloclusiones y los tratamientos ortodóntico. La calidad y cantidad de nutrientes que los sujetos consumen, así como la forma de ingerirlos y los hábitos en que se efectúa la alimentación, tienen efectos en el crecimiento y desarrollo del cuerpo humano y en el estado de salud bucal de las personas, lo que lleva a que los especialistas de esta rama tengan conocimiento de sus efectos para tenerlos en cuenta en los tratamientos, así como en la prevención y promoción de la salud bucal. El objetivo de esta revisión bibliográfica es analizar la relación de los suplementos nutricionales en la odontología, para la formación del estomatólogo y su orientación hacia un tratamiento eficaz. Se realizó una revisión bibliográfica sistemática en el ámbito internacional y nacional de la problemática, mediante las bases de datos: Scientific Electronic Library Online (SciELO), Dialnet, Scopus, Redalyc, LILACS y Google académico, en artículos originales. Se encontraron un total de 67 artículos de los cuales 21 se seleccionaron para la elaboración del presente estudio.

**Palabras clave:** Ortodoncia; Dieta Nutricional; Hábitos Alimenticios y Maloclusión.

## INTRODUCTION

One of the main determinants of health is nutrition, which is responsible for food intake, energy release, waste elimination, and the synthesis processes essential for developing vital functions. Inadequate nutrition hurts growth, craniofacial dimensions, hypodontia, malformed teeth in the oral cavity, chronology, sequence of tooth eruption, and malocclusions during the early years of life.<sup>(1,2,3,4)</sup>

Nutrition is a basic human need, and its impairment leads to a state of health accompanied by various clinical manifestations and degrees of intensity. It affects the overall physical development of individuals and is essential for the proper development of the stomatognathic system, which is associated with malocclusions.<sup>(5,6)</sup>

Therefore, it is necessary to understand the effects of nutrition on the development of the oral apparatus. Nutrition at all stages of life is one of the fundamental pillars of health promotion and the prevention of numerous diseases, in this case, malocclusions.

This leads to the establishment of an adequate, nutritious diet, thus reducing the chances of developing dental diseases. This applies to any stage of life. In the case of children, the acquisition of eating habits is essential to prevent the onset of malocclusions.

The American Dental Association (ADA) reports that 85 % of Latin America's population suffers from malocclusion.<sup>(7)</sup> In this regard, the World Health Organization (WHO) considers it to be the third most prevalent condition, with most affected patients showing evidence of this pathology from childhood, and it may be associated with nutritional habits.<sup>(8,9,10,11)</sup>

Dental malocclusions are not specific to a geographical area; they are observed in any country and not only in those with lower socioeconomic levels. However, different studies agree that in most Latin American countries, there is a lack of preventive measures related to nutrition.<sup>(9)</sup>

Currently, the dietary factor in the etiology of malocclusions is downplayed. Some authors emphasize using calcium as a necessary mineral in this pathology. In children, the intake of these nutrients is fundamentally inadequate or insufficient, and it is, therefore, at this stage of dental development that nutritional habits become most important in preventing the onset of malocclusions.

Many diseases affect oral health. Problems can range from more serious to less serious pathologies. However, if all factors are not studied, they can have consequences, some very harmful to overall health. Considering the above, the purpose of this review is to consult the existing literature on the relationship between nutritional supplements and dentistry so that comprehensive training of stomatologists allows for effective treatment. Similarly, this review seeks to provide a detailed, selective, and critical selection on the subject.

## DEVELOPMENT

From the first months of life, breastfeeding is a food that offers advantages that no other feeding method can surpass.<sup>(12)</sup> There is a period of vulnerability in the first months of life, during which the mother provides her child with breast milk for the first 4 to 6 months, which is one of the fundamental pillars of preventing numerous diseases.<sup>(9)</sup> Food is a chemical mixture of organic and inorganic substances that provide the human body with the nutrients necessary to maintain, grow, and develop its functions. Minerals are currently considered a pillar of a balanced and healthy diet. Current consumption patterns of mineral-rich foods have profound effects on oral structure.

The first functional stimulus at birth is breathing, and breastfeeding is the second. During this practice, a complex muscle movement is created that the child must perform, and with the help of the bones, this contributes to the proper development of the jaws.<sup>(2)</sup>

Similarly, at other stages of development, an adequate diet is necessary for normal tooth formation. Socioeconomic, cultural, and educational factors are risk factors for developing malocclusions.

Therefore, any alteration, change in position, or movement not considered within normal limits is considered a malocclusion. The term dental occlusion refers to the contact relationships of the teeth in function and function. However, this term not only refers to the contact of the arches of an occlusal interface but also to all the factors involved in the development and stability of the masticatory system and the use of the teeth in oral motor behavior.<sup>(13,14)</sup>

Functional occlusion has been defined as the state in which the occlusal surfaces do not present obstacles or interference to mandibular movements and, in turn, where there is maximum intercuspation in centric occlusion.<sup>(15)</sup>

Malocclusions occur when the upper teeth come into abnormal contact with the lower teeth and, according to various studies, may be associated with bad habits known as repetitive and innate behaviors considered harmful, as they exert harmful forces that alter the stomatognathic system.

The reduction in the incidence and prevalence of malocclusions in many countries is primarily related to incorporating calcium-rich foods into the diet, so the importance of eating habits in the primary and secondary

prevention of malocclusions should be considered.

Some studies reveal the existence of predisposing factors for dental malocclusions related to eating habits, which begin in the first phase of life and whose conditions will be reflected in the dentition.

The etiology of malocclusions is multifactorial, and although factors mentioned in the articles reviewed play a role, to a lesser extent, diet is determined as a very important factor to take into account to reduce the risk of suffering from this pathology. Although the studies consulted do not show a direct relationship between malnutrition and malocclusions, they specify that vitamin (A, D), calcium, and phosphorus deficiencies can cause alterations in dental development.

However, there are many correlations between nutritional habits and the prevalence of malocclusions. On the other hand, several characteristics of foods, such as food combinations and the sequence and frequency of intake, can help reduce malocclusions.

Until the beginning of the century, minerals were little more than ashes, the residue left after burning the organic components that make up the tissues of living beings. In quantitative terms, mineral elements constitute a relatively small part of natural foods. However, mineral elements play essential roles in the body, and the diet must contain a certain proportion of minerals to maintain adequate nutritional status in humans and animals.

In the middle of the last century, Liebig was one of the first to take an interest in the role of minerals in nutrition. In 1869, Forster introduced the term “nutritive salts” to indicate that a normal diet must contain certain mineral elements. Schematically, the role of mineral elements in nutrition can be included in the mineral category; they are necessary for the formation of certain organic structures.

Foods contain various vitamins, minerals, and other essential nutrients that help keep the body healthy. Calcium and vitamin D need to be obtained in sufficient amounts to help keep bones strong. The body has many different minerals, such as iron and magnesium. Calcium is a mineral composed partly of calcium salts (mixtures of calcium with other minerals), especially calcium phosphate. This mineral hardens and strengthens bones.

According to the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), the human body does not produce calcium. It must be obtained from food and beverages and, if necessary, from supplements to strengthen and maintain healthy bones and teeth. Healthy bones are less likely to break if we fall. Calcium’s role goes beyond just enhancing bones; it also helps muscles, the heart, and nerves function properly.

If the human body does not get enough calcium in the diet, it will take the calcium it needs from the bones. Over time, this process weakens the bones and increases the risk of osteoporosis, a disease that causes bones to weaken and become fragile.

The oral structure, which is made up of bones, is also affected if you are not educated about consuming foods rich in this mineral in your diet, as this can lead to wear and tear on the jaws and, consequently, early tooth loss. In addition, tooth enamel is made up of calcium and phosphate in the form of crystals with a special structure called hydroxyapatite. These crystals give teeth their hardness, color, strength, and appearance, which influences people’s quality of life.

The mouth is in a constant mineral balance. Saliva, food, and dental tissues influence each other to increase or decrease the concentrations of acid produced by food and other daily processes. Thus, if the balance during this exchange is disrupted, the teeth lose minerals and weaken. From this point of view, the causes of calcium loss or deficiency in the teeth can be due to several factors, including diet in the following aspects:

- A diet high in sugars or acidic foods can lead to calcium and phosphate loss in the teeth.
- Lack of or insufficient calcium in our diet can also lead to mineral deficiency.

About this last point, it is essential to understand that teeth are formed thanks to the calcium available. First, when the fetus is in the womb, the primary or milk teeth are formed; then, in early childhood, the permanent teeth are formed, replacing the primary teeth and accompanying the individual for the rest of their life. During these stages of development, the body absorbs nutrients and minerals from the diet to form the body’s different tissues.

At this point, it is essential to note that if the amount of calcium available is not adequate at any of these stages, the dental tissues may form incorrectly, giving rise to the pathology in question, as well as to other dental disorders and conditions such as amelogenesis imperfecta or enamel hypoplasia, disorders that can lead to weaker teeth with malformed crystals, affecting the tooth structure and facilitating the appearance of caries and other dental problems.

The amount of calcium each person needs depends on their age and sex, so dentists must integrate different sciences to diagnose and treat patients correctly. However, after analyzing 12 articles, the table below summarizes the daily amount of calcium people need to maintain strong and healthy bones.<sup>(11,16)</sup>

**Table 1.** Source: Office of Dietary Supplements, National Institutes of Health (OSDINS)

Age	Daily calcium intake
Infants aged 0 to 6 months	200 milligrams (mg)
Infants aged 6 to 12 months	260 mg
Children aged 1 to 3 years	700 mg
Children aged 4 to 8 years	1,000 mg
Preteens, teens, and young adults aged 9 to 18 years	1,300 mg
Adults aged 19 to 50 years	1,000 mg
Women over 50 years and men over 70 years	1,200 mg
Men aged 51 to 70	1,000 mg
Pregnant and breastfeeding adolescents	1,300 mg
Pregnant and breastfeeding adult women	1,000 mg

In this regard, foods rich in calcium stand out: fish (such as salmon and tuna); green leafy vegetables (such as collard greens and turnip greens); small fish with edible bones (including sardines and canned salmon). A proper nutritional diet with these foods determines the rate of tooth remineralization. All these elements are analyzed through sociodemographic, behavioral, physical-environmental, and biological factors directly or indirectly related to malocclusions. However, it is essential to eat foods containing calcium and ensure adequate absorption, which is provided by vitamins D and E, which can be of great help.

According to experts on the subject, the most efficient way to prevent calcium deficiency in teeth and other hard tissues is to improve eating and hygiene habits. They also agree that a balanced diet rich in minerals, including calcium, phosphorus, and fluoride, should be followed, as this directly counteracts tooth demineralization and reduces the risk of tooth decay.<sup>(1,3,8,14)</sup>

In addition, poor oral hygiene leads to dental biofilm formation and increases bacterial acids, leading to the loss of minerals in the teeth. Maintaining proper oral hygiene reduces acids from oral bacteria by maintaining oral balance and preventing the weakening of dental tissues. Therefore, brushing with toothpaste, mouthwash, and dental floss is essential.

According to the authors consulted, when calcium loss or deficiency is due to oral factors, it can be reversed with relative ease if addressed at the right time,<sup>(14)</sup> for example, white spots are easily treatable in a single visit to the dentist through topical fluoride applications, restoring mineral balance and halting the carious process. Other treatment options for these initial lesions, such as fluoride varnishes and xylitol gum, are also especially useful in children.

However, if the problem lies in the shape and structure of the teeth as a result of a genetic or developmental disorder, treatments must be a little more aggressive. However, they generally focus on the aesthetics and function of the structures.

All of the above allows the authors to conclude that prevention is the best treatment for this oral problem. Maintaining a proper diet with adequate vitamin and mineral intake is essential to prevent malocclusions and ensure oral health with strong, healthy teeth. Similarly, proper oral hygiene habits and regular visits to the dentist keep demineralization at bay.

It should be noted that a healthy and balanced diet should be followed to prevent these and other oral problems. This will prevent disease and benefit oral and general health.

In addition to the foods listed in the study for their high calcium content, other foods are especially beneficial for oral health, such as dairy products like milk and cheese, fruits and vegetables rich in fiber, green tea, and all foods rich in vitamins.

It should be noted that there are groups of the population that should pay special attention to their diet, such as pregnant women, people with orthodontic appliances, or those who have recently had oral surgery.

In the literature review, several authors refer to the relationship between nutrition and malocclusions. The authors find it extremely interesting to highlight that all the functions performed in the oral cavity (breathing, sucking, swallowing, chewing, and phonation) stimulate the growth and development of the lower third of the face. Therefore, the type of diet and dysfunctional oral habits can influence the final morphology of the jaws and dental occlusion.<sup>(9)</sup> Both functional and muscular stimulation are essential during the first months or years of life, as the most significant increase in craniofacial growth occurs during this stage and leads to harmonious facial growth.<sup>(12)</sup>

Some authors, such as Quiñones, have reported that malocclusions, such as crowding and inadequate intermaxillary and dentomaxillary relationships, have a high impact on malnutrition.<sup>(13,14)</sup>

Other authors refer to the fact that malnutrition problems at an early age cause enamel alterations from

birth, such as dens in dente, agenesis, taurodontism, macrodontia, conical teeth, supernumerary teeth, microdontia, transpositions, fusions, mesiodens, retained teeth, and enamel hypoplasia.<sup>(10,11)</sup>

However, despite the existence of literature on the subject, more longitudinal studies are needed to describe oral anomalies, including detailed malocclusions and their relationship with nutrition, which would improve the scientific knowledge base on the subject and expand its applications in dental practice.

## CONCLUSIONS

The literature review found a broad relationship between nutritional habits and malocclusions, with a high incidence of mineral nutrient deficiencies such as calcium.

In general, the nutritional factor is currently downplayed in favor of promoting healthy eating habits for oral health.

To prevent this pathology, oral health must be protected through education and promotion of nutrition in the social sphere.

Most of the authors agreed that poor childhood nutrition can be a risk factor affecting the development of the stomatognathic system, including the teeth and their supporting structures. It can also directly or indirectly impact the presence of malocclusions.

## RECOMMENDATIONS

Further exploratory studies to determine risk factors associated with weight abnormalities and occlusal abnormalities would be very important.

Studies are needed to prevent occlusal abnormalities and thus promote treatment.

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#### **FINANCING**

None.

#### **CONFLICT OF INTEREST**

None.

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