

PHYSIOLOGICAL EFFECTS OF NUTRITIONAL FACTORS ON DENTAL HEALTH

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Abstract: Considering that, unlike bone tissue, teeth do not change their composition to a small extent after they have been definitively formed, special attention regarding the relationship between nutritional factors and dental development must be directed to the children. The primary dentition begins to develop after two months of intrauterine life, and the permanent dentition a few months before birth. Important nutritional deficiencies during pregnancy can induce malformations in the child and susceptibility to dental caries. In turn, children with chronic nutritional imbalances (deficiencies or excesses in some nutrients) may present with late tooth eruptions, compromising the integrity of the teeth and increasing the frequency of caries.

Keywords: nutritional factors, dental development, nutritional imbalances.

INTRODUCTION

The mineralization of the protein matrix of the teeth is a process that begins after the 4th month of embryonic life and continues in varying degrees throughout life [1]. Once the teeth have erupted, the quantity and quality of ingested trophins, the way of feeding, the kinetics of digestion, absorption and correct metabolism of food permanently influence the development and mineralization of the teeth, the development and strength of the enamel and the timing of tooth eruption you're still breaking out [2]. Malnutrition, for example, interferes with the formation of enamel, causing hypoplasia and

hypocalcification associated with a decrease in the capacity to resist caries.

Classic data as well as recent data published by specialists in oral hygiene include among the essential nutrients for the good development of teeth and the maintenance oral health, vitamins A, C, D and the minerals Calcium, Phosphorus and Fluorine [3]. The motivation for these recommendations is supported by the existence of the following interrelationships between dental morphophysiology and the roles of experimentally and clinically proven trophins:

- the synthesis of the family of collagen proteins (dentin proteins) is dependent on the presence of vitamin C

- the formation of keratin (protein from tooth enamel) requires the existence in normal concentrations of vitamin A

- the process of fixing calcium and phosphorus present in the protein matrix in the form of crystals in the hydroxyapatite complexes and which represent the pattern of the crystalline structure of bones and teeth is essentially catalyzed by vitamin D

- fluoride is incorporated into the pre-eruptive mineral structure of the teeth in association with calcium and phosphorus forming fluoroapatite, a compound with resistance to erosion much higher than that of hydroxyapatite.

It is good that the monitoring of fluoride administration in communities is carried out by a team consisting of a pediatrician, nutritionist, hygienist and dentist, helped by guides and the continuous education of parents in this regard, especially those from families with children under 6 years old.

NUTRITION, SISTEMIC DISEASES AND ORAL CAVITY

Observations made over time, both by dentists and by those of other medical specialties, have highlighted the existence of interrelationships between some primary diseases in the general pathology that are usually more frequent with advancing age and affecting the state of oral health [4,5]. There are thus associations between diabetes, HIV infection, oropharyngeal cancer and secondary oro-dental disorders.

Diabetes is a chronic metabolic disease with implications in oral health

regarding dental caries, periodontal diseases and tooth loss [6, 7]. Decreased salivary flow is associated with poorly controlled diabetes and the frequent possibility of developing neuropathy. Xerostomia, characterized by the severe reduction of salivary flow, is associated with altered oral sensitivities (gustatory, tactile, painful) [8, 9]. In poorly controlled diabetes, patients often correct their hypoglycemia with hard sweets, which increases the cariogenic risk and the occurrence of periodontal disease [10,11].

Infection with the acquired immunodeficiency virus (HIV) is frequently associated with oral infections, ulcers of the oral mucosa and severe dental problems, conditions that create disturbances and serious difficulties regarding nutrition (mastication, salivation of the food bowl, swallowing) the result being the limitation of food intake to avoid suffering, but which induces malnutrition precisely at the moment when nutrition is an essential problem for the body [12, 13]. Adequate nutrition (soft foods, nutritional supplements, selected foods, etc.) can help the patient, but if the oro-dental status is not treated prophylactically or from the first manifestation, the nutritional status deteriorates, the progression of the underlying disease is favored and at the same time, oral manifestations are accentuated [14,15]. Nutritional management will be associated with dental management, these two strategies will be complementary to the anti-HIV therapeutic plan from the first manifestations of this disease.

In turn, oropharyngeal cancer can have one of the most important favoring factors in the diet, such as the consumption of alcohol, but also a protective one, namely the

consumption of vegetables [16]. The use of a single type of nutrient in combating the development of oropharyngeal cancer does not have clear evidence of effectiveness, instead the association and interaction between food principles (eg vitamins, minerals, cellulosic fibers, phytotherapeutic principles) as found in food naturally , determines an effect of braking the neoplastic process [17]. Another aspect in this context is the risk of the appearance of important post-radiotherapy lesions in the oropharyngeal area, such as: stomatitis, xerostomia, fibrosis of the masticatory muscles, tooth loss [18]. In turn, these lesions significantly disturb the secretory and mechanical digestive acts of the oral cavity, contributing to the decrease of general/oral immunity and through malnutrition. Similar problems can also occur in the case of surgical interventions and reconstructions that take place in oropharyngeal cancers depending on the extent of the surgical intervention, causing changes in the ability to

perform mastication and swallowing and the creation of new mechano-functional stereotypical ways.

CONCLUSION

The existence of all these correlations induces the need for the detection and identification by the dentist of such symptoms that alter oral health to determine the referral of the patient to the nutritionist and the family doctor to check the nutritional deficiencies, the degree of risk and the necessary countermeasures, associated with those of specialized oral therapy. The periodontal surgery maneuvers will consider doubling the specialized therapy by ensuring an adequate and sufficient intake (even additional) of nutrients necessary for both healing and increasing immunological resistance, the intake of vitamin A, C, zinc, and proteins being essential to which that type of lunch with a soft or liquid consistency is added in conditions where the operative intervention makes it difficult to ingest, chew and swallow solid foods.

REFERENCES:

1. Collins, M. T., Marcucci, G., Anders, H. J., Beltrami, G., Cauley, J. A., Ebeling, P. R., ... & Thakker, R. V. (2022). Skeletal and extraskelatal disorders of biomineralization. *Nature Reviews Endocrinology*, 18(8), 473-489.
2. Deformities, D. (2022). Prevalence of Dentofacial Deformities, a Biologic Classification System, and Frequency of Orthognathic Surgery. *Orthognathic Surgery-2 Volume Set: Principles and Practice*, 65.
3. Wakeman, M. (2021). A literature review of the potential impact of medication on vitamin D status. *Risk management and healthcare policy*, 3357-3381.
4. Sedghi, L., DiMassa, V., Harrington, A., Lynch, S. V., & Kapila, Y. L. (2021). The oral microbiome: Role of key organisms and complex networks in oral health and disease. *Periodontology 2000*, 87(1), 107-131.
5. Issrani, R., Reddy, J., Dabah, T. H. E. M., Prabhu, N., Alruwaili, M. K., Munisekhar, M. S., ... & Alghumaiz, S. F. (2022). Exploring the Mechanisms and Association between Oral Microflora and Systemic Diseases. *Diagnostics*, 12(11), 2800.

6. Morze, J., Wittenbecher, C., Schwingshackl, L., Danielewicz, A., Rynkiewicz, A., Hu, F. B., & Guasch-Ferré, M. (2022). Metabolomics and type 2 diabetes risk: An updated systematic review and meta-analysis of prospective cohort studies. *Diabetes Care*, 45(4), 1013-1024.
7. Schulze, M. B., & Hu, F. B. (2022). Epidemiology of diabetes. In *Handbook of epidemiology* (pp. 1-49). New York, NY: Springer New York.
8. Kolkka-Palomaa, M., Jääskeläinen, S. K., Laine, M. A., Teerijoki-Oksa, T., Sandell, M., & Forssell, H. (2015). Pathophysiology of primary burning mouth syndrome with special focus on taste dysfunction: a review. *Oral diseases*, 21(8), 937-948.
9. Cicmil, S., Mladenović, I., Krunić, J., Ivanović, D., & Stojanović, N. (2018). Oral alterations in diabetes mellitus. *Balkan Journal of Dental Medicine*, 22(1), 7-14.
10. Awuchi, C. G., Igwe, V. S., & Amagwula, I. O. (2020). Nutritional diseases and nutrient toxicities: A systematic review of the diets and nutrition for prevention and treatment. *International Journal of Advanced Academic Research*, 6(1), 1-46.
11. Kiani, A. K., Dhuli, K., Donato, K., Aquilanti, B., Velluti, V., Matera, G., ... & Bertelli, M. (2022). Main nutritional deficiencies. *Journal of Preventive Medicine and Hygiene*, 63(2 Suppl 3), E93.
12. Gondivkar, S., Sarode, S. C., Gadbail, A. R., Yuwanati, M., Sarode, G. S., Gondivkar, R. S., ... & Awan, K. H. (2021). Oro-facial opportunistic infections and related pathologies in HIV patients: A comprehensive review. *Disease-a-Month*, 67(9), 101170.
13. Benslama, L. (2022). Oral and maxillofacial manifestations of human immunodeficiency virus infection. *Journal of Stomatology, Oral and Maxillofacial Surgery*.
14. Spodzieja, K., & Olczak-Kowalczyk, D. (2022). Premature loss of deciduous teeth as a symptom of systemic disease: A narrative literature review. *International Journal of Environmental Research and Public Health*, 19(6), 3386.
15. Gondivkar, S., Sarode, S. C., Gadbail, A. R., Yuwanati, M., Sarode, G. S., Gondivkar, R. S., ... & Awan, K. H. (2021). Oro-facial opportunistic infections and related pathologies in HIV patients: A comprehensive review. *Disease-a-Month*, 67(9), 101170.
16. Hora, S. S., & Patil, S. K. (2022). Oral Microflora in the Background of Oral Cancer: A Review. *Cureus*, 14(12).
17. Li, Z., Liu, Y., & Zhang, L. (2022). Role of the microbiome in oral cancer occurrence, progression and therapy. *Microbial Pathogenesis*, 105638.
18. Qi, X. Y., Sui, L., & Liu, W. Q. (2020). Dental Implant and Oral Diseases. *Dental Implant Treatment in Medically Compromised Patients*, 185-209.