

CORRELATIONS BETWEEN NUTRITIONAL FACTORS AND ORO-DENTAL HEALTH

Hurjui Loredana Liliana¹, Grădinaru Irina^{2*}, Hurjui Ion¹, Jipu Raluca¹, Balcoş Carina^{2*},
Armencia Oana Adina², Cristina Claudia Tărniceriu¹, Hurjui Ion Andrei¹,
Hârţan Ruxandra Maria¹, Şerban Ionela Lăcrămioara¹

1. „Grigore T.Popa” University of Medicine and Pharmacy, Iaşi, România, Faculty of Medicine,
Department of Morpho Functional Sciences II

2. „Grigore T.Popa” University of Medicine and Pharmacy, Iaşi, România, Faculty of Dentistry,
Department of Implantology, Removable Dentures, Technology

Correspondence author: *Grădinaru Irina email: irina.gradinaru@umfiasi.ro

* Balcoş Carina email: carinutza2005@yahoo.com

ABSTRACT

Diet and nutrition are significant influencers of oral health, and can affect the development and progression of oral diseases also conditions such as caries, periodontal disease, erosion, and others. Two notions are distinct but very well connected nutrition that is considered to be the micro- (vitamins and minerals) and macro- (carbohydrates, protein, and fat) nutrients as they relate to the body's dietary needs and diet refers to the specific foods consumed. A variety of dietary factors are hypothesized to influence the oral cavity, including macro- and micronutrients, vitamins, pH properties, as well as the behaviors associated with their consumption. Additionally, factors such as stage of development, specific medical conditions, and socioeconomic status may indicate particular diet and nutritional considerations. Some foods and food combinations influence the increased level of bacteria causing disease. The most common oral diseases of modern civilization, caries and periodontitis can be prevented by diet using. These diseases occur when teeth and other components of the oral cavity are destroyed by acidic products from bacteria. Even if poor nutrition does not directly cause periodontal disease, researchers believe the disease progresses faster and worsens in patients whose diet does not supply the necessary nutrients.

Key words: nutrition, oral health, caries, periodontal disease.

INTRODUCTION

Oral diseases pose a major health burden for many countries and affect people throughout their lifetime, causing pain, discomfort, disfigurement and even death. These diseases share common risk factors with other major non communicable diseases [1]. It

is estimated that oral diseases affect nearly 3.5 billion people [2]. Untreated dental caries (tooth decay) in permanent teeth is the most common health condition according to the Global Burden of Disease 2017 [1]. More than 530 million children suffer from dental caries of primary teeth (milk teeth). Severe periodontal disease, which may result in tooth

loss, is also very common, with almost 10% of the global population affected. Oral cancer (cancer of the lip or mouth) is one of the three most common cancers in some countries of Asia and the Pacific [3]. Treatment for oral health conditions is expensive and usually not part of universal health coverage (UHC). In most high-income countries, dental treatment averages 5% of total health expenditure and 20% of out-of-pocket health expenditure. Most low- and middle-income countries are unable to provide services to prevent and treat oral health conditions. Factors contributing to oral diseases are an unhealthy diet high in sugar, use of tobacco and harmful use of alcohol.

Most oral health conditions are largely preventable and can be treated in their early stages. The relationship that diet and nutrition have with oral health is bidirectional, as compromised integrity of the oral cavity can also influence an individual's functional ability to eat [4]. Clinical trials generally control for more factors, using a sample size calculated to be sufficient to detect a statistically significant change in the variable of interest [5]. With any study involving nutrient intake or dietary patterns, it can be challenging to follow participants for a meaningful length of time.

A variety of dietary factors are hypothesized to influence the oral cavity, including macro- and micronutrients, vitamins, pH properties, as well as the behaviors associated with their consumption. Additionally, factors such as stage of development, specific medical conditions, and socioeconomic status may indicate particular diet and nutritional considerations. Older patients, for example, may experience tooth loss, reduced masticatory ability, and decreased appetite, which may, in turn, influence their nutritional status [6]. A systematic review examined the association between food intake and oral health in elderly found that tooth loss in the older population was associated with changes in food intake and nutritional deficiency [7].

PHYSIOLOGICAL ASPECTS OF NUTRITION IN DENTAL DEVELOPMENT

Given that unlike the bone tissue, the teeth only slightly change their composition after they have formed permanently, the special attention regarding the relationship of nutrition factors - dental development must be focused especially on the children. The primary dentition begins to develop after two months of intrauterine life, and the permanent

one a few months before birth. Significant 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 trophies) may present late dental eruptions, compromise tooth integrity and increase the frequency of tooth decay.

Mineralization of the tooth matrix is a process that begins after the 4th month of embryonic life and continues to varying degrees throughout life. Once the teeth have erupted, the amount and quality of ingested trophins, the mode of feeding, the kinetics of digestion, absorption and proper metabolism of food permanently influence the development and mineralization of the tooth, the development and resistance of the enamel and the timing of the eruption of the teeth. we're still erupting. Malnutrition, for example, interferes with enamel formation, leading to hypoplasia and hypocalcification associated with decreased resistance to tooth decay. Classical as well [8] may include essential nutrients for proper tooth development and maintenance for oral health, vitamins A, C, D and minerals: calcium, phosphorus and fluor.

Particular attention has been paid in the last 5 decades to research on the interrelation of fluoride with development and

oral health. After the eruption, although fluoride is not systematically and permanently involved in tooth formation, however, the local effects of fluoride prove to be those of protection against dental caries by braking demineralization under the conditions of exposure of teeth to organic acids of bacterial or non-bacterial origin and stimulation rate of remineralization of areas eroded by dental plaque acids [9].

The same roles also appear to be evoked by salivary fluoride, with evidence of its interference with the production of acids by oral plaque bacteria, which has led to the emergence of many pharmaceutical formulations with topical application of fluoride containing certain limits (the excess being avoided as pests) in gels, toothpaste, chewing gum, in various food supplements or in fluoridated drinking water. Fluoride feeding is not supplemented during the first 6 months after birth, and between 6 months and 3 years of age under combined feeding conditions (breastfeeding + formulated feed), children only require fluoride supplementation if the drinking water is severely deficient in fluoride. Ingestion of foods that naturally contain fluoride (eg, tea) or fluoride-enriched liquids (eg, special baby formulas, juices) or unintentional use of fluoride products can sometimes result in excess fluoride intake in

children and would explain the appearance of dental fluorosis. It is good that the monitoring of fluoride administration in communities is carried out by a team of pediatricians, nutritionists, hygienists and dentists, assisted by guides and the continuous education of parents in this regard, especially those in families with children under 6 years.

NUTRITION, DENTAL CARIES AND DENTAL EROSION

World health organization (WHO) appreciates that research into possible causal or favorable associations between eating and oral-dental disorders, especially dental caries, has a greater scientific soundness in longitudinal and less cross-sectional studies that should be interpreted with caution. Longitudinal studies follow systematically the dynamics of time evolution of an indicator in the same sample or homogeneous population group (for example as an age group), because nutrients themselves are factors that act over time, and the dental-caries couple must be investigated / monitored permanently and simultaneously at the same individuals within a sufficient time frame [10].

However, there are also dietary factors that have a protective role against the appearance of caries. The cariostatic potential of cheeses has already been demonstrated in

many studies, both experimental [11], as well as in clinical observation or provided by various dental therapies [12]. The cariostatic nature of milk, in turn, has been demonstrated by numerous animal investigations [13,14], and human [15]. Milk contains significant amounts of calcium, phosphorus and casein, all of these trophins playing an important role in preventing tooth decay. Complete cereals such as forest hazelnuts through the stimulatory effect on mastication increase salivary flow, giving them an anti-caryogenic protective role. Animal research has revealed the karyostatic role of organic and inorganic phosphates present in unrefined plant foods, in humans data from such studies are not convincing [16]. A protective effect is described for black tea (containing polyphenols and antioxidants). whose consumption increases the concentration of fluoride in the dental plaque and plays a role in counteracting the cariogenic character of saccharine-rich diet [17]. A special remark is required for breastfeeding, which apart from the general beneficial aspect of the general health of the baby, has been shown by epidemiological studies performed in preschool children, the presence of a small number of caries in breastfed children, the suction in the bottle being associated with an increased karyogenic potential for temporary

dentition (for example, some children often stay long or fall asleep with those several times a sweet liquid is drained which sometimes cuts long durations in the oral cavity) [18].

Differentiated and interesting problems pose dental erosion as a process of progressive and irreversible loss of the hard dental substance due to the chemical action of the extrinsic and / or intrinsic acids and without the participation of the acids coming from the bacterial activity of the dental plate. Thus, extrinsic food acids such as: citric acid, phosphoric acid, ascorbic acid, malic acid, tartaric acid and carbonic acid found in fruits and acidic soft drinks, fruit juices, citrus liquids for sportsmen or soda and canned drinks prepared with vinegar, they can have such actions especially in the elderly if they are consuming such products [19]. Experimental clinical studies show that acidic drinks, even if consumed with lunch, also induce a marked decrease in the pH of oral secretion [20], which underlines the major risk of their frequent and exaggerated consumption. Exposure only time of one hour of the tooth enamel at Cola determines its softening compared to the reverse situation, in the case of exposure to milk, cheese or saliva. It is more destructive compared to the fruit [21].

NUTRITION AND PERIODONTAL DISEASE

Adequate nutrition represents, together with other factors present in the oral cavity, an important element of increasing resistance to the installation of periodontal disease, although many aspects of the nutrition-periodontal disease (PD) relationship remain unclear. The current model views PD as an infection that has certain risk and modifying factors. Risk factors are those that may predispose to the disease, and modifying factors are those that alter the progression of the disease. The main risk factor for PD is a family history of PD leading to early tooth loss but also bacterial, systemic diseases (diabetes mellitus), inflammatory factors. Poor nutrition may also be a risk factor for PD because several studies have shown that tooth loss and PD are more common in patients with nutritional deficiencies. Evidence already shows that improving nutrition will improve periodontal status. The Third Nutritional Health and Nutrition Examination has shown that people with the highest intake of calcium have PD [22]. Patients with higher antioxidant levels through supplementation have increased bone density [23], although that study did not address periodontal bone specifically.

Another link between nutrition and PD is achieved through the level of immunity. PD is easier to install on undernourished, malnourished or metabolic disorders on the one hand, and on the other hand also easier and faster on tissue with reduced immunological resistance in front of the bacterial plaque causing inflammatory disease. Oral health itself is a reflection of the event other nutritional deficiencies that can often be recognized in the case of deficiencies of some dietary principles, by the appearance of relevant symptoms in this regard such as: stomatitis, glossitis, painful sensations of itching or burning with localization in the oral mucosa, especially lingual, gingival bleeding, all this except for a cause related to the presence of an obvious periodontitis, already installed, or of a gingivitis, angular cheilosis or oral ulceration.

The existence of these correlations induces the need for the dentist to detect and identify such symptoms that alter the health. More of that, to determine the guidance of the

patient towards the nutritionist and the family doctor to check the nutritional deficiencies, the degree of risk and the necessary counter measures, associated with those of specialized oral therapy.

CONCLUSION

Oral health is important to consider in improving the status of nutrition. It can be clearly stated that one of the most important factors ensuring normal dental development and maintaining it is adequate nutrition (adapted to the age stage, physiological processes, demands, health or illness). Pregnant women, those in lactation, infants and young children, are target groups of population with a degree of risk in the attention of nutritionists, family doctors and dentists because of the critical sequences that appear during the development of the body, moments that they can later have profound implications on general and oral health especially in children.

REFERENCES

1. United Nations General Assembly. Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Noncommunicable Diseases. Resolution A/66/L1. 2011.
2. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet* 2018; 392: 1789–8583.
3. Ferlay J EM, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F.

- Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Published 2018. Accessed 14 September, 2018.
4. Touger-Decker R, Mobley C. Position of the Academy of Nutrition and Dietetics: oral health and nutrition. *J Acad Nutr Diet* 2013; 113(5):693-701.
 5. Library of Rush University Medical Center. *Clinical Nutrition: Types of Nutrition Studies.*, 2019.
 6. Najeeb S, Zafar MS, Khurshid Z, Zohaib S, Almas K. The role of nutrition in periodontal health: An update. *Nutrients* 2016; 8(9).
 7. Kazemi S, Savabi G, Khazaei S, et al. Association between food intake and oral health in elderly: SEPAHAN systematic review no. 8. *Dent Res J (Isfahan)*, 2011; 8(Suppl 1):S15-20.
 8. A.D.H.A. (American Dental Hygienist Association) (2002)- Rapport Series (http://www.adha.org/CE_course7/references.htm)
 9. S. Twetman, M.K. Keller. Fluoride rinses gels and foams: an update of controlled clinical trials. *Caries Res.*, 50 (Suppl 1), 2016, pp. S38-S44
 10. WHO, 2019. Guidelines for drinking-water quality, 4th edition, incorporating the 1st addendum. World Health Organization. https://www.who.int/water_sanitation_health/publications/drinking-water-quality-guidelines-4-including-1st-addendum/en/.
 11. Moynihan P.J., Ferrier S., Jenkins G.N. The cariostatic potential of cheese: cooked cheese – containing meals increase plaque calcium concentration, *British Dental Journal*, 1999, 187: 664-667.
 12. Gedalia et al. Dental caries protection with hard cheese consumption, *Am.Journ. of Dentistry*, 1994, nr.7, pg. 331-332.
 13. Reynolds EC, Cain CJ, Webber FL, Black CL, Riley PF, Johnson IH: Anticariogenicity of calcium phosphate complexes of tryptic casein phosphopeptides in the rat. *J Dent Res* 1995; 74:1272–1279.
 14. BOWEN, WILLIAM H. et al. ASSESSING THE CARIOGENIC POTENTIAL OF SOME INFANT FORMULAS, MILK AND SUGAR SOLUTIONS. *The Journal of the American Dental Association*, 1997, Volume 128, Issue 7, 865 – 871.
 15. Rugg-Gunn et al. Relationship between dietary habits and caries increment assessed over two years in 405 English adolescent school-children, *Archives of Oral Biology*, 1987, 29: 983-992.
 16. Craig G.C. The use of a calcium sucrose phosphates – calcium ortho-phosphate complex as a cariostatic agent, *British Dental Journ.*, 1975, 138:25-28.
 17. Lingstrom P., Wu C.D., Wefel J.S. In vivo effects of black tea infusion on dental plaque, *Journ. of Dental Research*, 2000, 79: 594.
 18. Silver D.H. A longitudinal study of infant feeding practice, diet and caries, related to social class in children aged 3 and 8-10 years, *British Dent. Journ.*, 1987, 163: 296-300.
 19. Walker A. et al. National Diet and Nutrition survey: young people aged 4 to 18 years, vol 2, Report of the oral health survey, 2000, London, The Stationery Office.
 20. Imfeld T.N. Identification of low caries risk dietary components in Vol.-“Monographs in Oral Science”, 1983, vol XI, Ed. Karger, Zürich.

21. Grenby T.H., Mistry M. Properties of maltodextrine and glucose syrups in experiments in vitro and in the diets of laboratory animals, relating to dental health, *British Journ. of Nutrition*, 2000, 84: 565-574.
22. M.S. Al-Zahrani Increased intake of dairy products is related to lower periodontitis prevalence *J Periodontol*, 77, 2006, pp. 289-294.
23. J.A. Pasco, M.J. Henry, L.K. Wilkinson, et al. Antioxidant vitamin supplements and markers of bone turnover in a community sample of nonsmoking women. *J Womens Health (Larchmt)*, 15, 2006, pp. 295-300.