

Nutrition and Oral Health - (Review)

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ABSTRACT

Nutrition and health of oral tissues have an interdependent relationship. The well-being of the oral tissues, the quantity and quality of saliva and the dimension of taste depend on the intake of nutrients. Oral health determines the type of food consumed and ultimately the nutritional level. This review of literature aims to outline this interdependent relationship between the health of oral tissues and the nutrition.

Ke y words: Nutrition, dental diseases, nutritional deficiency

INTRODUCTION

“Life is not merely being alive, but being well.”

Marcus Valerius Martialis

Nutrition affects the development of the teeth and the development and maintenance of the oral tissues. Often, the very early signs of suboptimum nutritional status are first seen in the mouth, which has been described as a “mirror of nutritional status.” Dental health professionals are therefore in a position to be the first to notice compromised nutrition, and a sound knowledge of the symptoms and signs will enable them to take the appropriate action.¹

Oral health is related to diet in many ways, for example, nutritional influences on craniofacial development, oral cancer and oral infectious diseases. Dental diseases impact considerably on self-esteem and quality of life and are expensive to treat. The objective of this paper is to review the evidence for an association between nutrition, diet and dental diseases and to present dietary recommendations for their prevention. Nutrition affects the teeth during development and malnutrition may exacerbate periodontal and oral

infectious diseases. However, the most significant effect of nutrition on teeth is the local action of diet in the mouth on the development of dental caries and enamel erosion.²

A nutritious diet, including adequate amounts of protein, vitamins, essential fatty acids and Micronutrients, can play an important role in the resistance to infectious conditions including periodontitis.^{3,4}

The burden of dental diseases

Dental diseases are a costly burden to health care services. The treatment of dental caries is expensive for governments of both developed and developing countries and costs between 5 and 10% of total health care expenditures in industrialised countries exceeding the cost of treating cardiovascular disease, cancer and osteoporosis. In most developing low-income countries, the prevalence rate of dental caries is high and more than 90% of caries is untreated.⁵

The impact of dental diseases on quality of life

Despite a low mortality rate associated with dental diseases, they have a considerable

impact on self-esteem, eating ability, nutrition and health both in childhood and older age.

Teeth are important in enabling consumption of a varied diet and in preparing the food for digestion. In Modern society, the most important role of teeth is to enhance appearance, facial appearance is very important in determining an individual's integration into society. Teeth also play an important role in speech and communication.⁵

The second International Collaborative Study of Oral Health Systems (ICSII) revealed that in all countries covered by the survey substantial numbers of children and adults reported impaired social Disease, such as avoiding laughing or smiling due to poor perceived appearance of teeth.⁵

Nutrition and oral infectious diseases

Malnutrition consistently impairs innate and adaptive defences of the host, including phagocytic function, cell mediated immunity, complement system, secretory antibody, and cytokine production and function. In PEM, there are marked changes in the oral microbial ecology resulting in a preponderance of pathogenic anaerobic organisms, increased propensity of bacteria to bind to oral mucosal cells, attenuation of acute phase protein response, and dysfunction of the cytokine system. Cellular depletion of antioxidant nutrients promotes immuno suppression, accelerated replication rate of ribonucleic acid viruses and increased disease progression. Therefore, malnutrition can intensify the severity of oral infections and may lead to their evolution into life-threatening diseases. The impact on oral health of malnutrition was recently reviewed by Enwonwu *et al.*⁷

Among the suspected causative factors are increased oral burden of free glucocorticoids and impaired host defense of saliva. No inflammatory oral lesions underscore the association between malnutrition and oral health as lucidly as acute necrotizing gingivitis (ANG) and noma (*cancrumoris*). ANG is a craterlike lesion involving the interproximal gingival papillae and predominantly affects impoverished young children

(3–10 years of age) who are generally immune compromised by malnutrition and common tropical infections. If not promptly treated, ANG and other oral inflammatory lesions in malnourished children may evolve into noma (*cancrumoris*).⁵ This is a dehumanizing orofacial gangrene that destroys the soft and hard tissues of the oral and Para oral structures.⁵

To summarize the main issues in this review

1. Dental structures are influenced by nutritional status only during the period of tooth formation. Thereafter, deficient nutrition has no direct influence on tooth structure (but may influence the supporting structures of the teeth and the oral mucosa).
2. Adequate early feeding programs in developing countries are important in avoiding enamel defects and compromised salivary secretion, both of which may increase susceptibility to dental caries, the latter having more widespread oral consequences.
3. The early signs of nutritional deficiencies are seen in the oral soft tissues and include thinning, inflammation, and ulceration. Malnutrition also impairs immune responses and may predispose to life-threatening diseases of the oral soft tissues such as noma.
4. Oral cancer is the fifth most common cancer worldwide, and there is good evidence that vitamin C is protective, but evidence for other vitamins is less consistent. However, vitamin C may serve as a proxy for other bioactive components in fruits and vegetables; there is an increasing body of evidence that suggests that diets high in fruits and some vegetables protect against oral cancer.
5. An optimal nutritional status is important in reducing the origin and severity of periodontal disease but is likely to be of limited value if the stimuli from dental plaque are not removed. Further research is needed in order to identify to what extent dietary modification And /or supplementation will modulate periodontal disease and tooth loss.
6. Nutritional status and oral health are reciprocally related, and each one affects the other—a downturn in nutrition impairs

Table 1: Effect of nutritional deficiency on oral health ^{6,7}

Nutrient	Dietary Source	Function	Oral sign of deficiency
Vitamin A	Carotenoids (found in dark-green and yellow. Wheat flour and breakfast cereals, eggs.	Epithelial differentiation.	Gingivitis, Periodontitis Hyperplasia of the gingiva.
Thiamin (B1)	Dairy products and eggs whole grains.	Coenzyme thiamine pyrophosphate	Cracked lips A satin looking gingiva and tongue , Angular cheilosis
Riboflavin (B2)	Dairy products, liver, meat, eggs, yeast.	Flavoproteins coenzymes involved energymetabolism.	Inflammation of the tongue
Niacin (B3)	Dairy products, liver, meat, eggs, yeast.	Nucleotide coenzyme involved in energy metabolism;	Fiery red inflammation of the tongue Angular cheilosis
Vitamin B12	Meat, fish, eggs, dairy products	Purine and pyrimidine synthesis	Ulcerative gingivitis Angular cheilosis Halitosis Bone loss Hemorrhagic gingivitis Detachment of periodontal fibers Painful ulcers in the mouth
Vitamin B6	Liver, meat, fish, whole grains, milk,	Coenzyme involved in amino acid metabolism;	Teeth or bone decay Periodontal disease. Anemia
folate	Liver, kidney, green leafyvegetables, oranges fortified breakfast cereals	Purine and pyrimidine synthesis.	Sore tongue Burning sensation in the oral cavity.
Vitamin C	Citrus fruits, berries, potatoes, green vegetables	Antioxidant involved in redox reactions;	Glossitis; Stomatosis; Recurrent apthae; Angular cheilitis; Candidiasis
Vitamin D	Oily fish, fortified margarine, eggs, sunlight	Calcium homeostasis	Bleeding gums, Mobile teeth, Delayed wound healing.
Vitamin E	Vegetable oils, sunflower seeds, whole grains, eggs	An antioxidant	Hypoplasia if deficiency occurs during tooth Mineralization. Absence of lamina dura. Abnormal alveolar bone patterns
Vitamin K	Vegetables, pulses, liver	Formation of clotting factors	None
Iron	Meat, fish, dark-green vegetables, pulses cocoa,	hemoglobin and myoglobin formation enzyme component fortified cereals breakfast.	Gingival bleeding; Post extraction hemorrhage Very red, painful tongue with a burning sensation
Zinc	Shellfish, fish, meat, poultry, dairyproduct	A component of >70 enzymes	Dysphagia Angular cheilosis. Mucosal atrophy increases susceptibility to carcinoma) Candidosis
selenium	Richest source is animal products	Enzyme component in glutathione peroxidase.	Taste disturbances May be protective against oral cancer (high levels protects promote caries

oral function, and this in turn compromises nutritional well-being.

CONCLUSION

Malnutrition can cause poor oral health and poor oral health can indirectly cause malnutrition. To break this vicious circle, good nutritional habits must be imbibed. Dentists should be responsible for counseling patients on diet as it

relates to oral health. Nutritional risk evaluation should be done during initial and periodic dental examination. Monitoring and follow-up should include periodic diet recall to evaluate Counseling outcome. To achieve the overall health of an individual, oral health guidelines and questions about oral health problems and the use of dental prostheses should be incorporated into nutritional assessment protocol.

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