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MICRONUTRIENTS AND ORAL HEALTH AN OPPORTUNITY TO PREVENT ORAL DISEASES

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Abstract

Nutrition plays an important role in oral health as it affects the growth of craniofacial, dental and periodontal structures. When adequate food is not unavailable, oral health may be impaired, and even overexposure to the diet may also inversely affect. Therefore, there is interdependency between nutrition and oral health. The importance of Micronutrients in normal function is becoming increasingly apparent and insufficient micronutrient intake has both short term and long-term consequences. Micronutrient assessment of suspected individual and appropriate supplement therapy may assist in dental disease prevention.

key words: *nutrition, micronutrients, oral health*

Introduction

Sound dietary status and adequate supply of essential vitamins and minerals play an important role in maintaining oral health and are vital for an immune response [1]. The importance of a balanced diet consisting of micronutrient and antioxidants in the prevention of oral diseases is well established [2-4]. Nutrition plays an important role in oral health as it affects the growth of craniofacial, dental and periodontal structures. Dental illnesses also affect the quality of life and adversely affect self-esteem and eating skills [5]. Tooth loss or dental disease reduces one's ability to eat nutritious food [6] and thus reduces the nutritional status of an individual and thereby nutrition influences the oral health and thereby alters individual's nutritional status [7].

Like all other tissues in the body, oral tissues like Gingiva, teeth and oral mucosa requires adequate nutrition. When adequate food is not unavailable, oral health may be impaired, and even overexposure to the diet may also inversely affect. Therefore, there is interdependency between nutrition and oral health. The well being of oral tissues, the quality and quantity of saliva depend on the intake of nutrients. The type of food and its nutritional level determine oral

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health; hence, sound nutrition can prevent many commonly occurring oral problems [7].

Oral health is related to many nutritional factors, including sugar. Several studies support the concept of the close association between malnutrition, infection and immune system [7,8]. A nutritional diet involving adequate diet with adequate quantity of vitamins proteins, fatty acids and micronutrients contribute a major aspect in the prevention of infections [7]. Nutrients have a major contribution in preserving the health of the human body and all metabolically active tissues and play an essential role in the regenerative process, coping with oxidative stress and for adequate immunity [3].

Micro nutrients are substances that allow the body to generate vital enzymes, hormones and other elements for excellent health. The importance of these compounds in normal function is becoming increasingly apparent. Insufficient micronutrient intake has both short term and long-term consequences.

Nutritional deficiency can significantly influence the function of the oral cavity including the production of saliva; thereby interfering mastication and deglutition thus can result in malnutrition either because of difficulty in eating or lack of desire to have food.

Micronutrients and oral health

It is said that micronutrients play a key role in metabolism and tissue function. Multiple factors influence the status of micronutrients. It is also recognized that various micronutrient subclinical deficiencies are often harder to acknowledge and evaluate in the laboratory and are often complicated by the acute phase response [9].

Zinc (Zn), copper (Cu) and iron (Fe) are important minerals required to maintain the normal structure, function, and proliferation of cells [10] and immune functions [11]. Copper complexes were used as antimicrobial anti-inflammatory and enzyme inhibitor agents [12]. These metals, particularly in certain genetic disorders, can be poisonous in excessive quantities. These trace elements ' homeostasis results from a tightly coordinated regulation of various proteins engaged in their uptake, excretion, and intracellular storage/trafficking. Abnormal metabolism of Zn, Cu and Fe can lead to several chronic pathogenic conditions which appear to be prevalent in Zn and Cu deficiency, as well as Cu and Fe overload [13].

Studies also suspected that the deficiency of magnesium triggers apoptosis. Magnesium's physiological function is primarily associated with enzyme activity, and about 300 enzyme structures depend on this cation's existence. [14]. Disruption of calcium, magnesium homeostasis decreases extracellular magnesium, which is a determining factor in apoptosis [15]. After acute exposure to severe magnesium deficiency, altered cell physiology was also proved [16].

Malnutrition in children has the number of effects on the dentition; studies have shown that malnutrition delayed tooth development and resulted in a high incidence of dental caries in deciduous dentition. Researchers postulate that reduced zinc, iron copper, and selenium and strontium levels can be a risk factor for dental caries. And fluoride is widely recognized for its dental caries protective factor. Fluoride improves mineralization and demineralization. S studies have shown that there is an important link between magnesium consumption and dental caries [17]. It is stated that elevated copper/Iron ratio is strongly indicative of chronic infection, and the most common source of chronic infection has been dental abscess often present without the patient’s knowledge [18].

Functions of the micronutrient include cofactor in metabolism by modulating the enzyme activity genetic control and also as an

antioxidant. classic nutritional deficiency generally results in a complicated syndrome of typical signs and symptoms, fully characterized for each of the vitamins and trace components there are many lines of in vitro proof that have demonstrated the vital impact of trace elements and vitamins on all aspects of immune function and presumed that those with a subclinical deficiency of trace elements and vitamins might be at danger of impaired immune function, thereby increasing the risk of infection. [9]. It is also suggested that the supplements would particularly benefit elderly individuals who often have bad micronutrient declining immune function.

Zinc, copper and magnesium also play a significant role in bone health because they are known to be an essential metabolic cofactor for enzymes engaged in the synthesis of different components of the bone matrix [19].

Experiments done with Long term consumption of fruit and vegetable nutrients may be essential for bone health, and also the role of micronutrient was considered crucial in pre and post menopausal bone loss. The relationship between zinc, copper, iron to iron deficiency anemia is well established [20]. Iron in the body acts as an oxygen carrier to the tissues. Iron deficiency can influence the growth of teeth and caries, but yet human data are lacking. In contrast, an iron deficiency anemia often seen in young women seems to have little influence on dental hard tissues [21]. Excess iron in drinking water is associated with dental extrinsic stains

Iron in the body is used by red blood cell haemoglobin as a carrier of oxygen to the tissues in the lungs, as a means of transporting electrons in cells and as an essential component of significant enzyme processes in different tissues.

Geriatric patients with mucosal pathology were shown to have significantly lower serum iron concentration than those without this oral disease. Non-denture wearing complete edentulous patients had a higher incidence of malnutrition [22].

Copper is a vital mineral trace. For ordinary metabolic function, all the body's tissues need it. Copper is a component of many of the human body's proteins, including enzymes that contain copper (e.g., amino oxidase, ferroxidase, cytochrome, superoxide dismutase) copper binding proteins and low molecular weight ligands. Its general main physiological functions related to connective tissue formation, iron metabolism, nervous system, cholesterol metabolism and immune function. Copper has been shown to inhibit S-H containing enzymes and may inhibit acid production in dental plaque and carries on rodents. Copper is also considered as toxic to Streptococcus mutants acidogenic bacteria [23]. As the body cannot synthesize copper, the human diet must supply the regular amount of copper for metabolism.

Copper is known for its role in reducing inflammation. Excess copper is normally excreted with the bile. Prolonged cortisone treatment has been shown to increase the body excretion of copper and may lead to copper deficiency. Copper deficiency has been associated with anemia arthritis, free radicals damage, immune dysfunction and inflammatory disease. Copper-Zinc enzyme superoxide dismutase Is one of the biggest antioxidants and inflammation mostly produced in the body to protect cells and biomolecules from oxidative damage [24].

However, some studies reported that copper-containing plasma protein might act as either antioxidant or pro-oxidant, depending on the conditions [25]. BO Sinaro et al. stated that more than half of our population consumed less than the recommended daily copper intake based on their study and review. Iron deficiency anemia is associated with copper deficiency, in reducing

the heme synthesis — inflammation/ infection known to affect mineral metabolism and alter its requirements. Elevated iron/ copper level in the tissue is a strong indicator of chronic inflammation serum copper in various inflammatory condition humans and lab animals.

Vitamin C and copper deficiency presence similarly and may sometimes difficult to distinguish. However, vitamin C is known to affect copper antagonistically Serum copper concentrations in different inflammatory diseases in humans are greater than usual. Higher ceruloplasmin concentrations in the previous situation are responsible for the enhanced serum copper. Zinc is an essential trace element and is present in all tissues and fluids of the body. Zinc works in catalyzing different enzymes, maintaining protein structural integrity and regulating gene expression. Clinical manifestation of zinc deficiency has been described; including delayed healing of wounds, burns and decubitus ulcers. This was ascribed to a reduced epithelialization rate, reduced wound strength and reduced synthesis of collagen [27].

In circumstances influencing the mouth, the overall wound healing characteristics of zinc were also specifically recorded. It has been shown that the concentration of zinc in main human teeth varies considerably with caries status, tooth type and length of the root. Zinc deficiency is associated with several oral health issues. Rat research showed that zinc deficiency might be a potential risk factor for oral and periodontal illnesses.

Zinc acts as a biological antioxidant by decreasing lipid peroxidation and stabilizing the membrane. Thus, trace elements may play a vital role resulting in either harmful or beneficial effects by damaging or protecting the tissues and altering the lipid profile Since the early 1900s, zinc has been acknowledged as an essential nutrient and is a co-factor for more than 300 distinct enzymes. It is an important cofactor for Cu and SOD in terms of the role of zinc as an antioxidant.

Zinc is engaged in taste function physiology and plays a significant part in the perception of taste. Zinc is discovered in a multitude of foods, but it has an extremely variable bioavailability from various ingredients. Zinc is more easily adsorbed in animal products than in plant foods.

Zinc deficiency in young rats ' dental caries had a predominant effect on the molars ' soft surf ace. Dietary zinc may be a significant trace elem ent in the enamel mineralization post-
eruption phase and may decrease the susceptibili ty of teeth to caries.

Many authors consider Zinc deficiency has an association with dental caries [28]. Caries susceptibility was on few other authors considered zinc as to be a doubtful element among trace minerals that inhibit caries development. Animal studies in vivo and vitro responses to inflammatory stimuli are influenced by dietary intake of copper, zinc and suggested impaired antioxidant defences may contribute to decreased progression after infection [29].

Conclusion

It is essential to eat a well-balanced diet to maintain good oral health. Wide variety of dietary components including micronutrient and antioxidants are an integral part for optimum oral health and potential to accelerate wound healing after appropriate dental treatment. Micronutrient assessment of suspected individual and appropriate supplement therapy may assist in dental disease prevention.

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