Effects of Nutrition on Oral Health

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SUMMARY

Nutrition represents a summation of intake, absorption, storage and utilization of foods by the tissues. Oral tissues are one of the most sensitive indicators of nutritional state of the body. Nutritional deficiencies are associated with changes in the integrity (health and appearance) of the oral structures/ tissues and these changes are frequently the first clinical signs of deficiency.

Nutrition affects oral health and oral health affects nutrition. The effects of malnutrition can be seen in the oral structures in all stages of human growth and development from conception to old age. The consequence of certain oral diseases may compromise the nutrition by affecting the intake and mastication particularly in some vulnerable groups like people with severe caries, severe oral ulceration, advanced periodontal disease and the resulting edentulousness. The HIV pandemic has added another dimension to the issue of nutrition and oral health. Oral lesions are some of the earliest lesions seen in HIV/AIDS and 90% of HIV/AIDS patients will have oral lesions at a point in the course of the disease. These oral lesions are painful; disturb food intake and mastication thereby further compromising the nutrition of the affected individuals. In Africa, particularly the Sub-Saharan Africa, the burden of poverty, economic downturn and the HIV pandemic have added another dimension to the issue of food availability and nutrition. Malnutrition is a real problem in this area. This paper will examine the effects of compromised nutrition on oral health and the reverse.

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INTRODUCTION

A balanced diet is composed of adequate quantities of carbohydrates, proteins, fats and oils, vitamins and minerals. The proteins must also include the essential amino acids and the fats must include the saturated free fatty acids which the body cannot produce. The intake of a balanced diet is not enough to ensure adequate nutrition, the body must be able to break down these food components to the basic units, absorb and utilize it for proper body functions to be maintained. A healthy mouth is essential for this to be achieved. The oral tissues are very sensitive indicators of the nutritional state of the body and they are the first indicators of latent and overt deficiencies. The effects of malnutrition can be seen in the oral tissues in all stages of human growth and development from conception to old age. Malnutrition affects craniofacial development and mineralization of the teeth.

Malnutrition in the African child may have its origin in pre-natal life. The prevalence of low birth-weight in Sub-Saharan communities is as high as 20 30% and this is attributable mainly to intra- uterine growth retardation (IUGR) rather than pre-maturity.1 IUGR results from maternal factors such as low pre-pregnancy body weight, young age, malnutrition especially micronutrient deficiency, anaemia, infections (particularly malaria and others. IUGR compromises early immune function especially cell-mediated immunity. [1]

Malnutrition accounts for about 60% of child mortality in Sub-Saharan Africa.[2] Malnutrition affects the host-defence system thereby influencing the vulnerability of the oral tissues to hostile pathogens. Optimal nutrition is required for bringing about optimal calcification, development and growth in the primary and permanent dentition. Periodontal diseases are among the most common chronic inflammatory conditions seen in malnourished children in resource-poor countries. Inflammatory periodontal diseases are excercebated by risk-factors like malnutrition, diabetes, genetics, viral infections and smoking. Periodontal disease has been identified as precursor of systemic diseases like heart diseases. [3] The inflammation in periodontal disease increases the body's need for nutrients and micronutrients required for antioxidant defences like Zinc, Cupper, Selenium and Vitamin A. Necrotizing Ulcerative Gingivitis (NUG) which may lead to NOMA / cancrum oris is usually seen in malnourished children with weakened immunity from low socioeconomic groups with poor oral health. NOMA is associated with high morbidity and mortality. It usually affects children under 10years (peak age 2-6years). WHO estimates that 500,000 children are affected with the disease every year.4

ANAEMIA

About 25% of women of child-bearing age are anaemic, malnourished children also tend to be anaemic. Anaemia compromises the host defence system thereby influencing the vulnerability of the of the tissues to disease and oral pathogens leading to cracks and fissures at the angles of the mouth, atrophy of the oral mucosa, loss of tongue papillae leading to smooth sore tongue, shallow ulceration of the tongue, intermittent

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burning sensation, loss of taste and dysphagia due to oesophageal stricture. These oral lesions in turn compromise eating thereby leading to a vicious circle.

Mi Cronutrient Deficiency

Micronutrients are chemical substances found in small quantities in foods and are required in small quantities but their deficiency result in severe impairment of human health. They have synergistic effect with macronutrients.

- Examples of micronutrients are Vitamins: A, B1, B2, B6, niacin, B12, folic acid, Vitamin C, D, E and K.
- Minerals: Fluoride, zinc, iron, selenium, calcium, phosphorus magnesium, manganese, iodine, cupper, sulphur, sodium chlorine and cobalt.

The oral tissues are very sensitive to micronutrient deficiency. The effects of the deficiency of the different micronutrients are as follows:

Vitamin	Effects on Oral Mucosa
B2	Pellagrous Stomatitis Angular stomatitis Stomatitis mucosa becomes fiery red and very painful. Glossitis (tongue is fiery red and usually depapillated). Ulcerations on dorsum and lateral margins of the tongue. Painful tongue Gingival margins are red swollen & ulcerated. 20 ulceronecrotic gingivitis Oral candidiasis
Folic Acid	Angular chelitis Stomatitis Glossitis Pharyngitis Oral ulcers
Vit B12	Painful glossitis
Vit.C	Enlarged, spongy blush-red gingiva Bleeding gums Loosening and exfoliation of teeth 20 fuso-spirochaetal infection. Foul mouth odour(Halitosis)
Vit D	Vit D is essential for the absorption and metabolism of calcium and phosphorus. Deficiency during the period of growth causes rickets. In rickets there is defective calcification and development of the skeleton. There may be hypocalcification of the teeth in severe rickets. Tooth eruption may be delayed.
Iron	Anaemia Pallor of oral mucosa Oral ulcers
Calcium & P	Calcium & P are essential for mineralization of the teeth
Fluoride	Fluoride ions get incorporated into the enamel of teeth during development Fluoride acts after eruption to make the teeth stronger and more resistant to acids produced during the demineralization process. It promotes remineralization of enamel It inhibits bacterial plaque enzyme thereby reducing acid generation in plaque. Excess fluoride causes mottling of the enamel

Effect of micronutrients on dental tissues

A developing foetus gets all its nutritional requirements from the mother. If the mother's diet is compromised, the foetus does not get adequate nutrition and its dental development is compromised. Optimal maternal nutrition is therefore required for optimal odontogenesis and calcification of the deciduous teeth in the foetus. Odontogenesis (tooth development) commences at about the 6th week of intrauterine life and mineralization of the teeth starts at about the 4th month of intrauterine life. Mineralization of the teeth starts at birth. Ameloblasts are sensitive to nutritional deficiencies and infections. Enamel hypoplasia/ hypocalcification may result from neonatal infections, Vitamin A, D and calcium deficiency.

Nutrition and Dental Caries

Although dental caries is a disease of affluence, its prevalence is on the increase in resource-poor countries due to the effect of urbanization, increased availability and consumption of refined sugars and low exposure to dietary fluorides. A dramatic increase in the prevalence of caries is noted as the annual sugar intake per person increases from about 15-35kg even in the presence of adequate fluoride utilization [5]

Dental caries is produced when cariogenic oral bacteria ferment refined carbohydrates (substrate) to produce acids which demineralise the teeth. It is a dynamic lesion with cycles of demineralization when substrate are present and remineralization when adequate fluoride ions are present and substrate is not available.

Diets with adequate fluoride confer protection on the teeth. Fluoride is added to drinking water to a level of 1part per million in areas with low natural fluoride to protect the teeth. Lack of portable water robs people of this protection. Fluoridated toothpastes also confer the same protection but not many people can afford this in resource poor settings. Excess fluorides intake causes Fluorosis with mottling.

Refined sugars on the other hand are easily available, cheap and are accessible even to the children of the poor; the cheapest snack a child can buy in Nigeria today is the sweet. As a result of this the prevalence of dental caries is on the upsurge. In Nigeria the DMFT of 12year old Nigerian Children is 0.46 with 24.6% caries prevalence[6]. This apparently low level of caries reported masks the experience of certain deprived communities where caries has increased in prevalence and severity. The level of untreated caries is very high and is cause for concern because of the resultant morbidity, most treatments are limited to extractions and the level of restorative care is very low. This means that many teeth will be lost due to caries resulting in loss of masticatory function thus compromising the nutrition of affected individuals. Most African countries (including Nigeria) have a shortage of oral health personnel and facilities (Ratio of dentists to population is 1:150,000 compared to 1:2,000 in industrialized countries). The capacity treatment is often limited to extractions and emergency care[7].

Baby bottle caries (nursing bottle caries) has been on the increase in middle income families. Young children develop this type of caries when they are continuously fed sugar containing drinks, milk or fruit juices put in baby bottles. These caries affect

several teeth at a time and rapidly involve the pulp causing pain and eventual tooth loss thus compromising food intake and the nutrition of affected children.

Malnutrition in the elderly

Chronic periodontitis in the elderly results in tooth mobility and tooth loss which may result in edentulousness. This combined with the problem of ill-fitting dentures will impair masticatory ability and impair their diets. Oral mucosal problems like xerostomia, oral ulcerations, burning mouth, and oral cancer will also have the same effect.

HIV/AIDS

The HIV/AIDS pandemic has added another dimension to the issue of malnutrition in Sub-Saharan Africa. HIV/AIDS ravages the youths who constitute the workforce either in farming or in engaging in other jobs to provide for their families. HIV/AIDS removes these people leaving many HIV orphans and families without a breadwinner. In addition, much time, energy and resources are expended on the care of sick coupled with funeral expenses result in poverty which worsens malnutrition. 90% of HIV/AIDS patients will have oral lesions at a point in the course of their disease. These oral lesions are mainly ulcerative, affect the periodontium are very painful (oral ulcers, necrotizing ulcerative periodontitis, Herpes simplex virus ulcers etc) and impairs mastication and nutrition.[8] In HIV/AIDS, the energy/nutritional requirements of the body are increased and these requirements cannot be met either because of inability to eat due to oral pain or unavailability of good food leading to a worsening of the malnutrition and leading to early deterioration of immune status, morbidity and early mortality.

Certain micronutrients like Zinc, selenium and vitamin K have been identified as affecting the progression of HIV/AIDS, therefore in HIV treatment, apart from antiretrovirals, nutritional support is also needed to prevent further immune deterioration[9]

CONCLUSION

There is a reciprocal relationship between nutrition and oral health; adequate attention must be paid to both in order to ensure a good balance between the two to maintain good health.

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