

Nutrition and Types of Food: Effects on Pediatric Oral Health

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ABSTRACT

Diet and nutrition have a two-way relationship with oral health. Sugar and acid in the foods can contribute to tooth decay and gum disease. On the other hand, nutrient-dense foods with vitamins and minerals strengthen gums and teeth and prevent dental problems. Obese children are more likely to experience dental problems like tooth decay, dental caries, gum, periodontal disease, and malocclusion due to a higher likelihood of consuming sugary foods and drinks, which are major contributing factors to poor oral health. Obesity and dental issues have common risk factors, which are related to poor eating habits, no physical activities, and overall sedentary lifestyle measures. Undernutrition can negatively affect dental health. When the body does not get enough nutrients, it prioritizes other functions over oral health, making the mouth more susceptible to infections and damage. As all other organs in the body need balanced nutrition for optimum growth, development, and function, ideal oral health depends on a nutrient-dense diet. This article provides an overview of the importance of healthy nutritional food for optimum functioning of oral health. It draws the attention of dentists and pediatricians to educate patients about nutrient-dense diet options.

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1. INTRODUCTION

Poor nutrition and oral health are dependent on each other. Oral issues cause poor oral intake, leading to malnutrition and worsening the interrelationship. Inadequate nutrition can weaken the mouth's defences, slow tissue healing, and even affect oral development. When the body lacks enough protein and energy, it can lead to problems like weakened tooth enamel, dry mouth, and changes in saliva that increase the risk of cavities. Malnutrition can also delay tooth eruption. Severe malnutrition and poor oral hygiene can lead to cancrum oris [1].

The other spectrum of oral health problems is related to overfeeding, overweight, and obesity. One study found that children with obesity had significantly more erupted teeth at an earlier age than children of normal weight when adjusted for age and sex. They were found to have more malocclusion and dental caries due to a more extended period of exposure of teeth to sugars in the oral cavity [2].

This article discusses the relationship between food quantity, quality, and oral health. It emphasizes the need to

educate patients, and parents of children, and coordination of dentists and pediatricians.

2. DISCUSSION

Oral health plays a major role in the overall well-being of children. It can affect their physical and psychological development. The growth of healthy gums and teeth depends on a balanced diet. Both undernutrition and overfeeding can significantly affect a child's oral health. The exact mechanism by which obesity causes oral and dental problems is not fully understood. In children with obesity, excess body fat induces an inflammatory reaction that affects the body, including the oral cavity. Obesity can damage the tissues supporting teeth, leading to gum and tooth disease. People who are overweight or obese tend to eat more sugary foods, which can lead to bacterial growth in the mouth. Obesity can also cause tooth decay due to dry mouth caused by decreased saliva production [3]. Balanced nutrition, along with personal care and attention, is an integral part of oral health. Undernutrition, which lacks



TABLE I: NUTRIENT DEFICIENCY AND RELATED DENTAL AND ORAL HEALTH PROBLEMS

Nutrient deficiency	Dental and oral health problems
Protein/calorie malnutrition	Salivary issues, slower delayed teeth development, smaller teeth formation
Vitamin A	Delayed oral tissue development, impaired tooth formation, and insufficient enamel
Vitamin D, K1, and Calcium	Impaired tooth mineralization, tooth eruption, and underdeveloped jaw
Vitamin C	Impaired dentin development, low collagen levels, delayed wound healing, and bleeding gums
Vitamin B1	Affecting the health of the soft tissues in the mouth rather than the teeth themselves
Vitamin B2, B3	Tongue inflammation, cracked mouth corners, and difficulty maintaining oral health increase gum infection risk
Vitamin B6	Gum disease (periodontitis), a pale tongue, and oral discomfort and irritation
Vitamin B12	Bad breath, mouth ulcers, detachment of connective tissues supporting teeth
Iron	Reduced salivary secretion, increased risk of tooth decay

essential nutrients, especially calcium, vitamin D, protein, and phosphorus, weakens the structure of teeth and bone. Some oral health issues can persist even after nutritional status is corrected.

As Table I discusses, various nutrient deficiencies are known to cause oral health problems [4].

Undernutrition can delay the timing of both primary and permanent teeth development, contributing to enamel hypoplasia and defective enamel formation, leading to an increased risk of tooth decay and cavities. Studies have shown that children with protein-energy malnutrition tend to have delayed teeth eruption compared to well-nourished children. Delays in teeth eruption can result in misalignment and interfere with normal speech and eating functions. Furthermore, malnutrition can affect salivary flow and the composition of saliva, reducing its ability to neutralize acids and protect the teeth from decay [5]. Lack of nutrition, especially vitamin C deficiency, can lead to gingival inflammation, and gingivitis. Severe cases can progress to periodontal disease, resulting in tooth loss. Poor nutrition weakens the immune system, which impairs the body’s ability to fight off infections affecting mouth soft tissues and gums [6]. Undernutrition during pregnancy can reflect as congenital oral malformations, such as cleft lip and palate in children. Antenatal folic acid and vitamin A have been associated with an increased risk of these conditions, often requiring complex dental and medical interventions in childhood [7].

Overfeeding, especially with sugars, feeds the mouth’s bacteria, leading to acid production that erodes the enamel and causes cavities. Additionally, obesity may be linked to an increased risk of mouth breathing and obstructive sleep apnea, which can exacerbate oral health problems such as malocclusion and dental erosion. Overfeeding with prolonged use of a bottle and use of a pacifier affects the natural development of the jaw and teeth [8].

Children are particularly susceptible to the effects of diet on oral health because their teeth and gums are still developing. Along with the quantity of food, the quality also matters to maintaining good oral health. Frequent consumption of sugary or acidic foods, especially between meals, can create a persistent acidic calorigenic environment in the mouth, feeding the bacteria. The oral cavity contains all varieties of microorganisms, including bacteria, fungi, viruses, and protozoa. This oral microbiota helps maintain oral health and can influence the development of oral diseases and halitosis. Oral microbiota

organism composition is affected by numerous factors, one of the most influential being food. Food acts as a fuel for the microorganisms in the mouth. Different types of food affect the microbial content of the oral cavity in children and the subsequent impact on their oral health [9].

Dietary habits control the composition of the oral microbiome. Sugar serves as a primary food source for oral bacteria, particularly *Streptococcus mutans*, one of the key bacteria responsible for developing dental caries (tooth decay). When sugar is consumed, these bacteria metabolize it to produce acids, which can demineralize tooth enamel, leading to cavities. In children, frequent consumption of sugary foods, such as candy, soft drinks, and even fruit juices, increases acid production and disrupts the pH balance in the mouth, which fosters the growth of cariogenic bacteria that cause cavities and plaque formation [9].

Acidic foods also tend to lower the oral pH to a level that disrupts the balance of the microbiome. Acidic foods cause dental erosion, weakening the tooth enamel and making it more susceptible to bacterial attack. While some bacteria are adapted to thrive in low pH, the overall shift toward a more pathogenic microbial community increases the risk of dental decay and gum disease in children. Moreover, these foods’ acid environment favors the growth of acidophilic (acid-loving) bacteria, which are also involved in demineralization. Yogurt, cheese, and dairy products can have a protective effect on the oral microbiome. These foods contain calcium, phosphorus, and vitamins for strengthening teeth and bones. Calcium helps to neutralize acids in the mouth. At the same time, casein, a protein found in dairy products, forms a protective layer on teeth, reducing the ability of bacteria to adhere to the enamel. As a probiotic, yogurt can help maintain a healthy balance of the oral microbiome. Studies suggest that probiotics may suppress the growth of harmful bacteria like *S. mutans* and increase *Lactobacillus* species, which can positively affect oral health [10].

Vegetables and fruits provide nutrients such as vitamin C found in citrus fruits and are crucial for maintaining healthy gums and preventing gingivitis. Fruits and vegetables promote saliva production, neutralizing acids and removing food particles and bacteria from the oral cavity. Apples, carrots, and celery are also natural “cleansing” foods. Their fibrous texture helps mechanically remove plaque from teeth, promoting oral hygiene. The increase in saliva flow resulting from chewing these foods also supports the maintenance of a healthy oral microbiome

by providing antimicrobial peptides and enzymes that help combat harmful bacteria [11].

Junk and processed foods are usually high in preservatives, sugar and unhealthy fats, which can significantly alter the oral microbiome, leading to gingivitis and periodontal disease. Saliva composition and function are affected by which is an essential component of oral health. Saliva serves as a buffer, neutralizing acids and maintaining a healthy pH balance in the oral cavity. Foods that promote saliva production—such as high-fiber fruits and vegetables—help maintain this balance, promoting a healthy oral microbiome. However, diets rich in sugars and acids can overwhelm the buffering capacity of saliva, leading to prolonged acidic conditions in the mouth [12].

Obesity and oral health problems have shared risk factors, so it is recommended that patients should focus on weight management and oral health with modification of those risk factors. Advise patients about good oral hygiene, such as appropriate use of fluoride, brushing teeth twice daily, flossing every night, and limiting candies, chocolates, juice, soda, and other sugary foods. Discuss to reduce a sedentary lifestyle, intake of juice, sugar-sweet beverages, screen time, and counsel on age-appropriate recommended daily physical activities. Parents should be taught to follow responsive feeding and avoid pressure feeding. Discuss nutrient-dense foods that are good for overall health, including oral health. Suggest parents schedule regular checkups and dental cleanings with their dentists. Dentists and pediatricians can work as one team, educating patients during each visit. Pediatricians can emphasize the importance of dental health and regular appointments with dentists, and dentists can endorse healthy lifestyle measures and follow-ups with a pediatrician [13].

One study found that dental health professionals were ready to do obesity screening and management in their routine practice. However, they experienced barriers such as limited time, knowledge, and referral information. The study suggested a strategy to provide resources and arrange training programs for dentists to promote healthy weight in children [14].

Available evidence shows that a low total sugar intake, a less frequent daily intake of sugars, and optimum fluoride can help reduce dental issues. Policymakers and health authorities may be involved in implementing these measures on a large scale [15].

3. CONCLUSION

Good quality, nutrient-dense food in an appropriate quantity signifies perfect oral cavity growth and functioning. Undernutrition, in the form of lower quality food, lesser amounts, and overeating calorie-dense foods, leads to various dental and oral cavity issues and long-lasting effects. While undernutrition leads to developmental delays, enamel defects, and an increased risk of infections, overfeeding contributes to tooth decay and malocclusion. An integrated dentist and pediatrician's approach focusing on healthy feeding practices and regular dental care can help ensure that children maintain optimal oral health, contributing to their overall well-being. This article suggests further research to educate pediatric patients about

the best dietary options for maintaining optimal oral cavity health.

CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

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