

The Association of Nutrition with Oral Health in Children

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Abstract

If parents want to prevent the decay of their children's teeth, they should also take into account the number of eating times that they eat. Eating confectionery with dinner will damage the teeth of children less than eating that as an afternoon snack. Of course, inappropriate and inadequate nutrients uptake and Avitaminosis can also endanger children's oral health in the long term. Learning how foods affect children's teeth and gums are the first steps toward healthy eating to maintain oral hygiene. The health of the tooth is a very important point that requires having healthy care from the beginning of childhood. Preserving dental health in children has simple ways which to be done only repeatedly. In this article, we will review them.

Keywords: *Decay; Avitaminosis; Confectionery; Inappropriate Nutrition; Oral Health; Oral Hygiene*

Introduction

The proper health of the teeth is important for oral and dental health, but it may not be the only way to prevent gum disease and tooth decay. Diets often do not contain enough nutrients to protect teeth and gums. Excessive consumption of fruits and vegetables and avoiding refined carbohydrates, caffeine and excess sugar are beneficial for the health of teeth and gums. Supplements containing vitamin can also help tooth health and prevent tooth decay.

Nutrition helps to improve oral and dental health. Avoid using sweets and sticky candies and chocolates, as well as the high consumption of snacks among the main foods, causing an increased acidic environment and consequently, damage to the teeth. The form and types of food and its stability play an important role in the level of decay and decrease in PH. Liquids are washed promptly from the mouth and have less adhesion and, on the contrary, sticky and sweet foods increase the time of oral contact with sugar.

Periodontitis is a serious gingival infection caused by the accumulation of plaque and bacteria below the gum line. If left untreated, the infection can cause gum and bone tissue loss, which ultimately results in tooth loss. Although poor oral health plays an important role in the development of periodontal disease, poor nutrition can also be the cause of the disease. Because a deficiency of certain vitamins is associated with gum disease, removing these deficiencies should be an integral and inseparable part of treatment.

Immediate food effects

As soon as children start eating, environmental changes are caused in the mouth. The bacteria in the mouth make the dental plaques feel more acidic [1], consequently, this acid begins to damage the tooth and cause tooth decay in the period of time if the oral hygiene is neglected.

All foods that contain carbohydrates will eventually turn their carbohydrates into simple sugars such as glucose, fructose, maltose, and lactose. Some foods that have fermentable carbohydrates are broken in the mouth [2,3], while carbohydrates of some foods break down in the gastrointestinal tract.

Fermentable carbohydrates work with oral bacteria and eventually destroy the teeth structures [2,3]. These foods include obvious sugars like sweets, cakes, soft drinks, chocolate and hidden sugary foods such as bread, chips, bananas and cereal grains. Some bacteria that are on the teeth use these sugars and produce acid. These acids dissolve the minerals of the enamel [4]. Of course, the teeth are re-stored during the process of mineralization. Saliva, fluoride, and some foods help the process. Tooth decay begins when the rate of loss of minerals is greater than that of is gained.

The longer the food stays on the tooth in the vicinity of the bacteria, the more acid is produced. Therefore, sticky carbohydrates cause more damage to the teeth. Hence, foods that accumulate in the dental grooves will result in tooth caries.

Foods that are not suitable for teeth do not produce acid during eating but surround the teeth half an hour later. In another word, those who have a frequent intake of acidic foods and beverages and citrus products, including citrus fruit, juices, and soft drinks likely have tooth erosion [5] while others who drink sweet coffee during the day, or take small sweets and snacks containing high levels of carbohydrates, almost permanently provide a source of sugars to bacteria.

Studies have shown that those consuming sweets as a snack between their main meals are more prone to dental caries than those who eat the same amount of sweets with their main meals [6].

The role of nutrition in the development of teeth

Evolution of the teeth begins in the second and third months of the embryonic, and their mineralization continues from the fourth month of embryonic life until the first decade of life [7]. The food that the fetus receives from the mother's body plays an important role in the formation and development of the tooth structure in the pre-emergence stage.

The formation of teeth is associated with the mineralization of their protein matrix. In dentin, protein is as a collagen fiber that vitamin C is essential for the production of that. Vitamin D is an essential component for the formation of hydroxyapatite crystals of calcium and phosphorus.

Fluoride also by adding the hydroxyapatite crystals on the surfaces of the teeth creates a resistant layer to the teeth decay. Nutrition and diet are effective at all stages of the development, growth, and survival of the tooth. After teething, nutrition plays an effective and continuous role in the evolution, strengthening and mineralization of the enamel, and the rest of the tooth components.

Vitamins and important minerals in oral health

Why are some Minerals and Vitamins important for children oral health? Without these essential nutrients, children are more prone to developing common oral health problems like gingivitis and periodontitis. Overall, the children oral health will depend on certain nutrients. Hence, taking them on a daily basis can warranty the children's oral health.

Vitamin C

This is a vital vitamin that is essential for the health of the mouth, and the growth and repair of all tissues. Vitamin C is an antioxidant which protects the body from damage to free radicals [8]. Due to antioxidant activity feature of vitamin C in the body, it helps to improve the formation of connective tissue in the gums [9,10]. Inflammation and bleeding of the gum are one of the symptoms of vitamin C deficiency [11]. Deficiency of vitamin C in humans causes a disease which is called scurvy. However, a serious shortage of vitamin C is rare in industrialized countries. Smokers are at higher risk for vitamin C deficiency because smoking causes the body to lose this vitamin.

The intake of vitamin C should be on a daily basis because this water-soluble vitamin will not be stored in the body. The sources of this vitamin include citrus, watermelon, pineapple, cantaloupe, kiwi, tomatoes, strawberry, blueberry, raspberry, and cranberry. Vitamin C is also found in many vegetables including broccoli, cauliflower, Brussels sprouts, cabbage, potatoes, sweet peppers, and green leafy vegetables, including beet leaves and spinach [12,13]. Also, the consumption of fruits and vegetables is preferable to be raw, because heat will destroy the vitamin C [14,15].

Vitamin C is also necessary to help maintain oral health to improve bleeding in the gums; is effective in preventing gum inflammation. Bioflavonoids found in natural pigments of fruits and vegetables [16] help prevent the formation of plaque around the teeth, stain formation, and cavity.

Vitamin D

A good amount of vitamin D can help to protect children's teeth and prevent inflammation of the gums. This vitamin is also useful for absorbing calcium, which is essential for the growth and preserving of teeth. Vitamin D deficiency is responsible for many diseases, including periodontitis. The Vitamin D Council places the ideal level of 40 - 80 ng/mL, but levels below the 20 ng/mL are deficient [17]. This vitamin is made by exposing the skin to ultraviolet rays of the sun in the body, and then it becomes an active form. This vitamin can also be obtained through certain foods including fatty fish, enriched dairy products, beef liver, egg yolk and supplements [18,19].

Vitamin K and A

These two vitamins play an important role in the maintenance of both dental and oral health.

Vitamin A plays a role in the treatment of inflamed tissues of the gums. This vitamin is responsible for maintaining the mucous membrane and soft tissues of the gums. Lack of this vitamin can also reduce the resistance to infections. Vitamin A deficiency has an effect on oral health which may lead to the following conditions, Xerostomia, gingivitis, periodontitis, tooth morphogenesis defects, decreased odontoblast differentiation, and enamel hypoplasia [20].

Deficiency of Vit K can be the main result of hemorrhage from the oral cavity and gingival bleeding. Avitaminosis may be the cause of excessive gingival bleeding after tooth brushing. The bleeding sometimes may happen spontaneously. Furthermore, deficiency of this vitamin may be along with symptoms such as petechiae, ecchymosis, and hematomas on the oral mucosa. In a severe case, a slow constant, mild hemorrhage occurs from the gums [20].

These two vitamins are present in Green vegetables, and egg yolk. Vitamin A is also available through orange color fruits and vegetables, including carrots, sweet potatoes, cantaloupe, squash, apricots, pumpkins, papaya and mangos. Beef, liver, milk, yoghurt and cheese are the other good sources of vitamin A [21]. The use of this vitamin is better with food because fat helps to absorb vitamin A in the body.

Foods high in vitamin K include leafy green vegetables (cooked and raw), broccoli, Brussels sprouts, cabbage, cucumber, asparagus, kiwifruit, okra, green beans, and lettuce, certain plant oils such as soybean, canola oils, margarine and salad dressings made from them [22].

Vitamin E

The most important factor in teeth loss in adults is the periodontal disease. Vitamin E plays an important role in enhancing the immune system's ability to help eliminate viruses and bacteria. Dental plaque is formed when the nutrients, bacteria, and mucus spread on the teeth surfaces. If the dental plaque is not eliminated by proper oral hygiene, it will be accumulated, cause inflammation and burning sensation on the gums which leading to gingivitis. In the absence of treatment for gingivitis, periodontal disease occurs. Inflammation and infection from the gums spread to the ligaments and bones that support the teeth. Consequently, the tooth will be damaged due to the lack of structure and lack of support, which may eventually lead to tooth loss [23].

Some studies show the role of antioxidant (vitamin-E) in the treatment of oral mucosal lesions which include oral leukoplakia, oral lichen planus, oral submucous fibrosis, and oral cancer [24-29].

Vitamin E is a potent antioxidant used to repair tissues and relieve gum pain during teething. Vitamin E is available in foods such as spinach, tomato, avocados, broccoli, almonds, peanuts, hazelnuts, sunflower seeds, corn oil, soybean oil, and wheat sprout [30].

B vitamins

Vitamin B Complex contains eight vitamins of thiamine, riboflavin, niacin, pantothenic acid, pyridoxine, biotin, folic acid, and vitamin B12. According to the American Oral Health Association, B vitamins are important for oral and dental health. These vitamins are needed for cellular growth and blood health, all of which relate to the health of the gum tissues.

Good sources of thiamin (B1) include whole meal cereal grains, seeds (especially sesame seeds), legumes, wheat germ, nuts, yeast, and pork [31]. An investigation shows the effect of chronic Thiamine deficiency on oral carcinogenesis [32].

Riboflavin (B2) is available in foods such as milk, yogurt, cottage cheese, wholegrain bread and cereals, egg white, leafy green vegetables, meat, yeast, liver, and kidney [33].

Symptoms and signs related to deficiency of B2 include an inflamed tongue (Glossitis) and corners of the mouth, sore throat, lesions of the lips and mucosa of the mouth, and normochromic-normocytic anemia [34,35].

The food sources of niacin (B3) include meats, fish, poultry, milk, eggs, wholegrain bread and cereals, nuts, mushrooms, and all protein-containing foods. From the point of oral health, the symptoms of its deficiency include an inflamed and swollen tongue [35].

Good sources of pantothenic acid (B5) are widespread and found in a range of foods, but some good sources include liver, meats, milk, kidneys, eggs, yeast, peanuts and legumes [35].

Good sources of pyridoxine (B6) include cereal grains and legumes, green and leafy vegetables, fish and shellfish, meat and poultry, nuts, liver, and fruit. The main oral symptoms include a smooth tongue, cracked corners of the mouth and anemia [35].

Biotin (B7) has found in cauliflower, egg yolks, peanuts, liver, chicken, yeast and mushrooms. Cracked sore tongue is the associated symptoms with B7 deficiency [35].

Folate is known as folic acid, Folacin, and vitamin B9. Green leafy vegetables, legumes, seeds, liver, poultry, eggs, cereals, and citrus fruits are enriched from Folic acid. A distinctive symptom of its deficiency is megaloblastic anemia [35].

The foods that we find good sources of Vit B12 include liver, meat, milk, cheese and eggs, almost anything of animal origin [35]. Studies reveal that a swollen and inflamed tongue with long straight lesions on it could be an early sign of vitamin B12 deficiency. Additionally, some with Avitaminosis of B12 may experience other oral symptoms, such as mouth ulcers, a burning and itching sensation in the mouth. Pernicious anemia is the other distinctive signs and symptoms [36,37].

Calcium

Teeth need calcium to grow and stay safe from decay. Calcium plays a role in making the jaw bones healthy and strong to hold the teeth in place. However, calcium needs phosphorus to maximize its bone strengthening benefits. Children's teeth need adequate calcium and phosphorus to form a hard structure during growth. Most people can receive the recommended daily calcium intake through a balanced diet containing dairy products, fish, cereals and green leafy vegetables.

Calcium deficiency symptoms may not be easy to detect at first, however, symptoms may include: numbness around the mouth and tooth decay. Osteoporosis can affect the jawbone (alveolar bone) and cause the symptoms mentioned above such as tooth mobility and possibly tooth loss [38,39]. Disturbances in calcium and phosphorus absorption and metabolism including vitamin D deficiency or excess might influence the calcification of enamel, dentin, cementum, and alveolar bone [39].

Calcium-rich foods like low-fat or non-fat milk, yogurt and cheese, lactic acid and tofu, salmon, almonds and dark green leafy vegetables help to improve oral and dental health and bones [39].

Phosphorus

Phosphorus after calcium is the second most abundant mineral in the body so that 85% of phosphorus is stored in the teeth and bones [40]. Not enough phosphorus is available in children with inadequate teeth growth. A balanced diet usually provides the recommended amount of phosphorus for the body.

Children may experience a number of bone-related symptoms if they suffer from a phosphorus deficiency. In addition, children who don't have enough phosphorus in their bodies may experience poor growth patterns or issues with bone and tooth development [41]. Phosphorous deficiency leads to chipping and breaking of teeth in children and adults.

The foods containing this mineral include dairy products, cereals, wheat germ, soya beans, almonds and other nuts, meat, poultry, fish, eggs, grapes, citrus fruit, cucumbers, tomatoes [39].

Fluoride

Fluoride helps to build toughened enamel that can further resist tooth caries. Its deficiency may cause increased dental caries, and possibly osteoporosis [42]. This anion is naturally found in foods and drinks such as tea, coffee, shellfish, grapes (raisins, grape juice), artificial sweeteners, sodas, potatoes, flavored popsicles, baby foods, broths, stews, and hot cereals made with tap water [43]. Of these, water, tea, coffee, shellfish, potatoes, and grapes can be considered healthy and the sugary or carbonated drinks should be avoided, although most people receive enough of this mineral through toothpaste. Sometimes a dentist may prescribe fluoride-containing supplements for children over the age of 3 years. The American Dental Association (ADA) is recommended fluoride therapy and its supplements for preventing tooth decay in most children who are prone to dental caries [44].

An appropriate diet for protecting children's teeth

Apart from the main meals, snacks can play an important role in the health or illness of the child's teeth. Although it is not possible to prevent children from eating snacks, with proper regulation of their use and proper hygiene, dental caries can be prevented. Parents should minimize the numbers of snacks for their children during the day. If the kids are willing to have snacks, parents should not choose foods that are fermentable carbohydrates. Choosing the type of snack for kids is very important in maintaining the health of their teeth.

Good choices: Best choices, cheese, chicken or other meat, nuts or milk. These foods can also help calcium and phosphorus regenerate the tooth minerals and provide good protection for the enamel.

Acceptable choices: Hard fruits like apples, pears, and vegetables can be the next selection. Although the fruits contain natural sugars, they also contain a lot of water that dilute the sugar and stimulate saliva secretion. Saliva prevents tooth decay because of its antibacterial properties. Vegetables do not have enough carbohydrates to be dangerous.

The worst choices: chocolate, sweets, cakes, chips, puffs, bread, muffins (fritters), fries, pretzels, bananas, raisins, and other preserved dried fruits. These foods provide the necessary sugar source for bacteria to produce acid. If these foods stick to the tooth surfaces, they will be more dangerous.

Conclusion

Diets and nutrients also play a significant role in the development and maintenance of dental health. The health of teeth, like other parts of the body, is linked to our nutrition. In fact, our mouth is very sensitive to inadequate nutrition, which results in early teeth loss, gum problems, and bad breath. Many nutritional problems affect our mouth much earlier than other parts of the body because the cells that make up the inner layer of the mouth are constantly being destroyed and regenerated.

According to the World Health Organization, a healthy diet rich in vitamins and minerals can be used to maintain oral and dental health and to prevent diseases such as caries, teeth erosion and growth defects.

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