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## THE ROLE OF RATIONAL NUTRITION IN CARIES PREVENTION

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### Annotation

This article explores the critical role of sugar consumption in the development of dental caries, emphasizing the interaction between cariogenic bacteria, particularly *Streptococcus mutans*, and dietary fermentable carbohydrates like sucrose. It highlights that frequent intake of simple sugars contributes to enamel demineralization by lowering the oral pH below the critical level of 5.5. The article also outlines dietary strategies for expecting mothers, underlining the importance of proper nutrition and oral hygiene during pregnancy. It stresses that poor maternal nutrition can lead to enamel hypoplasia in infants, significantly increasing their risk for early childhood caries. Consequently, health professionals should educate pregnant women on healthy eating, limiting sugar intake, and adhering to vitamin and mineral guidelines to promote long-term oral health in children.

**Keywords:** Dental caries, Sugar consumption, *Streptococcus mutans*, Sucrose, Enamel demineralization, Oral pH, Prenatal nutrition, Enamel hypoplasia, Early childhood caries

Dental caries is a dynamic process that involves susceptible tooth surfaces, cariogenic bacteria, mainly *Streptococcus mutans*, and a fermentable carbohydrate source. Sucrose is the most common dietary sugar and is considered the most cariogenic carbohydrate.[1][2] Frequent consumption of carbohydrates in the form of simple sugars increases the risk of dental caries.[3][4]

Other factors, including poor oral hygiene, salivary gland hypofunction, socioeconomic status, parenting practices, and genetics, also play a significant role. This article discusses the role of sugar in developing dental caries and provides concise dietary guidelines for expecting mothers, children, and adults.



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## **The Role Of Sugar In Dental Caries**

Dental caries occur when the demineralization of the enamel exceeds its demineralization capacity.[4] Bacteria in the dental plaque metabolize fermentable carbohydrates from the diet, particularly sucrose. As a result of this process, organic acids are produced, causing a drop in the pH. It has been hypothesized that when the pH is lower than 5.5, demineralization of the enamel occurs, known as the critical pH. This process occurs every time fermentable carbohydrates are consumed. Caries development necessitates sugar to occur; health care professionals should be well informed regarding dietary strategies to prevent this disease.[4]

## **The Prenatal Stage**

Mothers and caregivers influence their children's diet and oral hygiene. Pregnant women have a unique opportunity to receive appropriate information about healthy dietary habits and general oral hygiene to prevent early childhood caries in their children. Furthermore, maintaining good oral hygiene must be emphasized, as mothers and caregivers are the sources of cariogenic bacteria in their children. Mothers should also be advised to limit sugar consumption and snacking on sugary products between meals.

Poor nutrition in pregnant women may result in developmental anomalies in the infants' teeth. Enamel hypoplasia has been associated with poor prenatal nutrition and increased caries risk. Infants with enamel hypoplasia are at a 2.5 times higher risk of developing dental caries than children with sound enamel. Therefore, expecting mothers should be informed of the importance of following the healthy eating pyramid recommendations and their physician's advice regarding vitamin and mineral supplements. Dietary recommendations for pregnant women to prevent dental caries in their children include the following:

Following the healthy eating pyramid.

Reduce the consumption of cariogenic food, particularly between meals.

Taking prenatal supplements containing vitamins and minerals as prescribed by their general physician.[5]



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## **From Birth to the First Year of Age**

The first few years after birth are critical since there is a massive dietary shift from exclusive milk and liquid diet to a modified adult diet. Breastfeeding is strongly recommended in the first year of life because of its nutritional and immunological benefits. Breast milk is insignificant in the development of early childhood caries as compared to night-time bottle feeding, which should be discouraged. Breast milk is low in fluoride. Systemic fluoride supplementation can be indicated for infants more than six months of age if the fluoride levels are insufficient in the area where they live. However, clinicians must corroborate that the fluoride levels are low in the local drinking water before supplementing a child because of the risk of dental fluorosis. Parenting plays an important role in the transition from milk to solid foods. Parents influence what the child likes or dislikes, the quality of diet, and overall weight status. Dietary recommendations to prevent dental caries for children at this age include the following:

Ensuring optimal nutrition.

Decreasing the consumption of drinks other than breast milk, formula, and water.

Avoiding putting the child to bed with a bottle.

Prohibiting dipping pacifiers in foods with high concentrations of sugars, like honey or syrup.

Dissuading constant sipping of drinks from a bottle.

## **First and Second Year of Age**

Establishing a healthy eating pattern at a young age benefits oral and general health. Parents should make careful choices regarding types of snacks; low-cariogenic food such as fruits and cheese must be encouraged. Children may reject new food initially, but parents should persist in offering them and making them available. Dietary recommendations to prevent dental caries in this age group include the following:

Continuing to discourage constant drinking from a bottle and putting the child to bed with a bottle.

Establishing a routine eating pattern.

Offering non-cariogenic snacks, like cheese.

Limiting the consumption of cariogenic food to mealtimes.



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Restricting the consumption of sugary drinks to 120 ml (4 oz) per day. First and Second Year of Age

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Establishing a routine eating pattern.

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Limiting the consumption of cariogenic food to mealtimes.

Restricting the consumption of sugary drinks to 120 ml (4 oz) per day.

### From Two to Five Years of Age

Children would prefer foods high in sugar and calories if exposed to repeated consumption of such foods early in infancy. Parents must make sure that regular eating patterns are already inculcated by this age and continue to encourage them. During this period, children begin to be more independent, make their own food choices, and increase food snacking between meals. Non-cariogenic or low-cariogenic snacks must be available at home and provided in school lunchboxes, e.g., cheese, plain milk, vegetables, fruits, and whole grain products. Sugary snacks that tend to be retained in the mouth for extended periods should be discouraged, like candies and lollipops. Dietary recommendations to prevent dental caries at this age include:

Continuing to promote regular eating patterns.

Promoting eating cariogenic foods only with meals.

Offering non-cariogenic or low-cariogenic snacks, like cheese and fruits.

Avoiding sugar-containing foods that are sticky or slowly eaten.<sup>[5]</sup>

### Cariogenic Foods

Oral health is largely determined by the amount and frequency of cariogenic substances supplied with the diet. Caries-inducing substances include easily



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fermentable carbohydrates, particularly non-dairy free sugars, which are the substrate for the metabolic processes of carious bacteria, the products of which are acids responsible for the demineralisation of enamel. These sugars include sucrose, glucose, and fructose, which are found in large quantities in all kinds of sweets, sugar, honey, syrups, sweetened drinks, most often carbonated drinks, and fruit juices [6,7]. Gelatinised starch, i.e., starch that has undergone heat treatment, is also a food ingredient that induces cariogenesis [8]. Enamel demineralisation occurs when the pH of plaque drops to around 5.5. Acidic products such as citrus fruits, fermented or pickled vegetables, vinegar, vinaigrette-type dressing, and sweetened beverages, which include malic, citric, carbonic, and phosphoric acid as acidity regulators, and most of which have a pH value of less than 4, are responsible for lowering the pH in the mouth [9]. Another predisposing factor for the development of a carious cavity are foods with a sticky or mushy texture. Toffee-type sweets, fudge, crackers, or crisps have a high saccharide content, and their texture is conducive to sticking to the tooth surface. This combination creates optimal conditions for caries development [6,8]. Other Pillars of Caries Prevention

In addition to diet, as discussed in the previous chapter, caries prevention consists of proper oral hygiene, meaning regular cleaning of the teeth, the spaces between them, and also the tongue, in addition to the supply, most often via oral hygiene products, of fluoride compounds, which are responsible for mineralisation of the hard tissues of the human body [10]. It is recommended to brush the teeth at least twice a day. After the second brushing, one should refrain from eating and drinking, with the exception of mineral water, due to the reduced natural cleansing process of the oral cavity by the tongue and facial muscles and reduced saliva production during the night. Too frequent brushing, improper technique, and an incorrect softness of the bristles of the toothbrush can contribute to damage to the enamel or gums. Proper tooth brushing should last approximately 2 min, as this length of time ensures that all surfaces of each tooth are cleaned and the action of fluoride ions is activated [11]. In addition to brushing, it is worthwhile to include additional cleaning of interdental spaces that may be missed by brushing in the daily oral hygiene process. This can be achieved with dental floss, an interdental brush, or an irrigator [12,13,14]. Additionally, oral rinses can be used to extend caries prevention. These rinses



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contain, among other ingredients, chlorhexidine and fluoride in varying concentrations. Chlorhexidine has antibacterial properties, which consist of its ability to damage the wall of Gram-positive bacteria, which include the *Streptococcus mutans* species. The presence of fluoride ensures the maintenance of its appropriate concentration in the saliva and on the dental plaque, which affects the quality of the hard tissue and limits the conditions for the growth of harmful bacteria [10,15]

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