

## Review

# The Efficacy and Safety of Dietary Counseling in Prevention and Treatment of Dental Caries in Children

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## Abstract

Dental caries is a multifactorial disease influenced by various factors, including diet, oral hygiene practices, and genetic predisposition. Preventive strategies are crucial in the pediatric population. Early intervention and prevention are key to mitigating the burden of dental caries. Energy needs are higher in early childhood, necessitating more frequent meals. Dietary counseling aims to modify behaviors and promote healthy choices to reduce caries risk. The United States Dietary Guidelines provide recommendations for promoting health and preventing disease. Dietary Reference Intakes specify nutrient requirements based on age and gender. Dietary counseling plays a valuable role in promoting oral health and preventing dental caries. Studies show a clear link between sugar intake and tooth decay. Dietary modifications, such as reducing sugary beverage consumption, can be implemented gradually to ensure compliance. Effective counseling interventions have shown reductions in early childhood caries incidence. However, challenges remain in encouraging healthy eating habits. Preventive educational initiatives for new mothers have been successful in reducing caries prevalence. The prenatal period is critical for oral health, and pregnant women should be educated about a healthy diet. Adequate nutrition in the first year of life is essential, and breastfeeding is encouraged. Introducing sugar early can lead to a preference for high-sugar foods. Caregivers should promote healthy meal and snack patterns. From ages one to five, nutritious foods should be provided, and high-sugar foods limited to mealtimes. By addressing these considerations, dental professionals can contribute to preventing dental caries in children.

**Keywords:** caries prevention, pediatric, dietary counseling, nutritional guidelines

**Introduction**

Dental caries is a multifactorial disease influenced by various factors, including diet, oral hygiene practices, and genetic predisposition. It is a prevalent oral health concern in the pediatric population, necessitating effective preventive strategies. In children, early intervention and prevention are critical to mitigating the burden of dental caries. In early childhood, energy needs are greater in proportion than that in later years, and stomach capacities are lower (1). More frequent meals are needed for young children in order for them to ingest enough energy and nutrients. Additionally, food security and a positive relationship with food are linked with consistent consumption of meals and snacks during childhood at optimal periods (2). Dietary counseling, as an integral component of preventive care, aims to modify dietary behaviors and promote healthy dietary choices to reduce the risk of caries development. Dietary recommendations, such as the United States Dietary Guidelines (USDG), provide suggestions for promoting health and preventing disease (3). The basic goals of nutritional guidelines are to determine which nutrients required for growth, maintenance, and repair, to suggest the kinds and serving sizes of meals that will supply those nutrients, and to determine non-nutrient components or foods that should be avoided in order to prevent chronic illness. Dietary Reference Intakes (DRIs) specify recommended nutritional intakes based on age and gender (4). To meet their specific nutrient needs while still meeting their energy needs, people should ideally choose foods that are high in nutrients. Except for the vitamins B12 and folate, nutrients found in food possess greater bioavailability than those found in supplements (5). Among these, dietary counseling has emerged as a valuable intervention to promote oral health and prevent dental caries. This comprehensive review examines the various aspects and considerations of dietary counseling in preventing dental caries in children. It explores the role of diet in caries etiology, discusses the principles of effective dietary counseling, highlights cultural and socioeconomic

considerations, and identifies challenges and future directions in this field.

**Methodology**

This study is based on a comprehensive literature search conducted on June 8, 2023, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the efficacy and safety of dietary counseling in prevention and treatment of dental caries in children. There were no restrictions on date, language, participant age, or type of publication.

**Discussion**

Studies conducted before the advent of fluoride toothpastes, the usage of which has been strongly proven to make the largest contribution to the caries prevalence reduction over the previous half century, show a clear link between the intake of sugar and tooth decay (6-8). The first step in controlling caries is raising awareness of the dangers of overprocessed meals with sugar additions and regular and/or extended eating events. Obesity and chronic disorders linked to obesity are linked to food preferences and eating habits that increase the risk of caries (9). In order to further justify behavioral change, it may be helpful to inform patients about the systemic health implications of their food choices in addition to the risk of tooth decay. Following dietary assessment and evaluation, problematic food preferences and consumption habits should be noted. The patient's motivation for behavior modification and interest in improving dental and/or overall wellness should both be evaluated. For instance, to decrease consumption of sugary beverages, children may be provided a sugar-free version of the drink from the same or a completely different brand altogether (10). If switching is not easy, then the caregivers can mix the sugary and sugar-free version of the beverage, decreasing the quantity of the sugar-rich version till

the child adapts to the sugar-free version. Slow change might be more acceptable as time passes. In case of prolonged intake, further progress can be achieved by restricting consumption of sugary drinks to mealtimes. Due to such a dietary modification, two main concerns can arise. Firstly, there may be occurrence of a significant energy decrease with reduced consumption. To resolve this issue, the caregivers should be educated to motivate the child to consume minimally processed food items at established mealtimes. Secondly, as many sugary beverages are caffeinated, sudden decrease or stoppage of intake may cause headaches and reduced compliance to the dietary modification. For this, the caregivers should be encouraged to reduce intake gradually or introduce a caffeinated sugar-free version or a different caffeine source in the child's diet (1).

In a randomized trial conducted by Feldens *et al.* to study the long-term effectiveness of a dietary counseling intervention in decreasing early childhood caries (ECC), nutritional guidance was provided to infants' mothers via home visits starting from within 10 days after birth (11). The instructions consisted of practicing exclusive breastfeeding for up to six months, after which foods were to be gradually introduced in continuation with breastfeeding. The mothers were advised to compliment food with breastmilk thrice daily if the mother was breastfeeding and five times daily, if not. Further, they were advised on gradually administering foods of thicker consistency until the child was comfortable with consuming regular family meal food items. The mothers were also instructed against using breastfeeding/bottle-feeding for pacifying and encouraged to pay heed to the child's appetite and maintain feasible gaps between mealtimes. They were also educated on the importance of fruit and vegetable intake, and on refraining from adding sugars including natural sweeteners like honey in food and beverages as well as giving the child commercial sugar-sweetened beverages and snacks. The investigators reported that the nutritional program decreased the incidence of ECC and severe ECC by 22% and 32% respectively, which resulted in mean reduction of

one caries-afflicted tooth per infant at four years of age. As these factors are highly correlated with dental decay in children (12-16) and sugar intake habits developed as an infant are inclined to be preserved through the initial period of life (17), it is probable that such observations can be explained by reduced and postponed intake of items with elevated sugar density and a fewer number of meals and snacks at 1 year. By deferring the first consumption of sugar-rich foods, the larger percentage of sole breastfeeding may have had an indirect impact on the results. However, despite the achievement, a substantial percentage of infants in the intervention arm had ECC and severe ECC. These findings in addition to the observation that certain targeted feeding techniques were similar across groups suggest that there is still much to be discovered about the most effective ways to encourage healthy eating habits. Evaluation of the nutritional habits revealed increased compliance with the more objective recommendations, which may be easier for mothers and infants to grasp and adhere to, such as deferring the introduction of sugar, limiting confections, and maintaining suitable intervals between mealtimes. The intervention did not succeed in increasing the intake of fruits and vegetables or in decreasing complicated behaviors that are ingrained in the psychological dynamics of mother-child relationships, such as bottle-feeding at night or consumption of sugar-sweetened beverages (11).

The impact of preventive educational initiatives for new mothers on eventual caries development in their experience has been examined in two Swedish investigations. At 6, 12, and 24 months of age, one trial gave the test cohort counseling on food and dental hygiene in addition to fluoride supplementation. In comparison to the control group, the 4-year-olds of mothers who were counseled experienced caries at a rate that was 65 percent less (18). After four years, a separate study using a comparable approach discovered a 42% decline in caries prevalence (19). According to some analyses, dietary recommendations alone may be useful for those with an elevated caries susceptibility. Effective dietary

counseling decreased the caries progression by 85% and 60% according to two investigations on patients with active caries (20, 21).

Weinstein et al. discovered that children between the ages of 6 and 18 months whose caregivers had received guidance on proper feeding and hygiene habits as well as recommendations to seek professional aid with fluoride use had a decreased prevalence of ECC (22). Plutzer & Spencer observed that an intervention based on anticipatory guidance about dental hygiene and diet throughout the index pregnancy and additional counseling when the infant reached 6 and 12 months of age significantly decreased the prevalence of severe ECC (23). Given that feeding behaviors were only one component of the intervention bundles, it is challenging to determine the precise contribution of dietary modification to the favorable outcomes attained in each of these programs.

The prenatal period is highlighted by clinicians and researchers as a critical time for oral health, as poor prenatal nutrition can lead to enamel hypoplasia and increase the risk of dental caries (24-26). Additionally, mothers with active caries can transmit cariogenic bacteria to their children (27). Pregnant women should be educated on the importance of a healthy diet and minimizing the consumption of sweets and low-nutrient foods (28, 29).

During the first year of life, adequate nutrition is essential for tooth development. Malnutrition during this period can lead to enamel hypoplasia and an increased risk of caries (30). Breastfeeding is encouraged due to its general health benefits, and the supplementation of infant diets with vitamins can reduce enamel hypoplasia (31). The introduction of sugar early in life can lead to a preference for high-sugar foods, increasing the risk of dental caries in toddlers. Infants are at high risk for early childhood caries if exposed to sweetened drinks or frequent sugar exposures (32, 33). Therefore, mothers are advised to wean infants from bottles to cups by one year and limit the use of beverages other than breast milk, formula, or water.

Between the ages of one and two, as toddlers are introduced to a variety of new foods, caregivers should instill healthful meal and snack patterns (34). High-sugar intake at this age is a concern for both oral and general health, as sugary foods often lack essential nutrients (35). Finger foods such as cheese and fruit should be offered as snacks, while cariogenic foods should be limited to mealtimes and followed by oral clearance through brushing or the consumption of protective foods (36). From two to five years of age, caregivers should ensure good dietary habits and regular meal patterns. Repeated experiences with high-sugar foods can increase a child's preference for them (37). Caregivers are advised to provide nutritious, non-cariogenic foods for meals and snacks, discourage the consumption of slowly eaten, sugar-containing foods, and promote the majority of food consumption at regular mealtimes. Overall, these guidelines emphasize the importance of a healthy diet, limiting sugar consumption, and promoting good oral hygiene practices to prevent dental caries in children at different stages of development.

## **Conclusion**

Dietary counseling plays a crucial role in preventing dental caries in the pediatric population. Addressing diet from the prenatal period and throughout early childhood is essential. Educating pregnant women about healthy nutrition and limiting sugary foods is important. During the first year, adequate nutrition and the introduction of non-cariogenic foods are crucial. From ages one to five, promoting nutritious meals and snacks while limiting high-sugar foods is recommended. Dietary counseling interventions have shown promise in reducing caries incidence. However, further research is needed to determine the most effective strategies for promoting healthy eating habits. By addressing diet, dental professionals can contribute to preventing dental caries and promoting oral health in children.

## **Disclosure**

### ***Conflict of interest***

There is no conflict of interest



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**Ethical consideration**

Non applicable

**Data availability**

Data that support the findings of this study are embedded within the manuscript.

**Author contribution**

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

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