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The Impact of Diet and Oral Hygiene Practices on Early Childhood Caries: Prevention Strategies

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Abstract

Early Childhood Caries (ECC), also known as baby bottle tooth decay, is a prevalent and serious dental issue affecting children under the age of 6. It primarily impacts primary teeth and, if left untreated, can lead to significant complications including tooth loss, infections, and developmental complications in permanent teeth. ECC can severely impact a child's nutrition, speech development, and overall well-being. The main contributing factors to ECC are poor dietary habits and insufficient oral hygiene practices. This article explores the role of diet and oral hygiene in the development and prevention of ECC, focusing on effective strategies to reduce the risk. Diet, particularly the frequent consumption of sugary foods and beverages, is a major risk factor for ECC. Sugary liquids including milk, juice, and sugary drinks, along with sticky foods, provide a constant fuel source for harmful bacteria, promoting the formation of acids that erode tooth enamel. Moreover, acidic foods and beverages can further compromise enamel integrity, making teeth more susceptible to decay. In parallel, poor oral hygiene practices, such as irregular brushing and neglecting flossing, contribute to plaque accumulation, which encourages bacterial growth and accelerates the decay process. Preventive measures include limiting sugar and acidic food intake, promoting regular brushing with fluoride toothpaste, and fostering healthy snacking habits. Parents should initiate oral hygiene routines early, supervising brushing until children are capable of brushing effectively on their own.

Furthermore, regular dental checkups starting at age one are essential for early identification and management of ECC. This article emphasizes the importance of early intervention, parental education, and establishment of good oral health habits in decreasing the incidence of ECC, ultimately promoting good oral health outcomes for children.

Keywords: Diet and Oral Hygiene, Early Childhood Caries (ECC), Oral Hygiene Practices, Preventive Dentistry.

Introduction

Early childhood caries (ECC), which is defined as one or more decaying, missing (caused by caries)[1,2] , or filled teeth in the primary dentition in children up to 71 months of age, is the occurrence of dental caries in the primary dentition of young children. [3] Early Childhood Caries (ECC), also referred to as baby bottle tooth decay, is a severe kind of dental decay that usually affects the primary teeth and mostly affects children under the age of six. Approximately 1.76 billion children with deciduous teeth are affected by early childhood caries (ECC), one of the most common illnesses in children globally.[4] . ECC is a considerable public health concern globally, as it can lead to tooth loss, pain, infections, and hinder the proper development of permanent teeth. Additionally, if left untreated, ECC can adversely impact a child's nutrition, speech development, and overall quality of life. The two primary contributing factors to ECC are dietary habits and oral hygiene practices, both of which essentially play a crucial role in either worsening or preventing the condition. This article explores the impact of diet and oral hygiene practices on early childhood caries and offers strategies for preventing its onset. The concept of oral health correlated to quality of life stems from the definition of health that the WHO gave in 1946. [5]

The Role of Diet in Early Childhood Caries

Diet significantly influences the role in the development of ECC. Sugary foods and beverages serve as a primary fuel for the bacteria in the mouth that cause dental decay. The frequency, type, and quantity of sugar consumed directly influence the likelihood of developing ECC. Various dietary factors can impact the risk of ECC.

1. **Frequent Sugar Consumption**: One of the most significant risk factors for ECC is the frequent consumption of sugars. Sugars, particularly those in sugary beverages and snacks, offer a continuous food source for the harmful bacteria in the mouth. In relation to sugar intake, eating patterns in childhood, characterized by a greater number of highly sweetened foods and beverages in the first year of age, are strongly associated with the incidence of childhood caries in subsequent years [10]. The bacteria metabolise sugar into acids that attack tooth enamel. When sugary foods or drinks are consumed repeatedly throughout the day, the risk of decay increases as the enamel remains exposed to acid for extended periods, giving bacteria more opportunity to cause harm.
2. **High-Contamination beverages (Milk and Juice):** Many parents mistakenly believe that milk or fruit juices are harmless to their child's dental health. While milk is vital for the development of bone and teeth, the constant exposure to milk (particularly in bottles at night) can lead to tooth decay. Erosion is due to the loss of the outermost surface of enamel and occurs when the surface pH falls below 5.5 . Milk contains lactose, a type of sugar that bacteria can also break down into acid. Likewise, fruit juices are rich in sugar and acid, both of which can contribute to enamel erosion if consumed frequently.

3. **Sticky Foods**: Sticky foods such as candies, raisins, and certain granola bars can cling to the teeth, increasing the risk of decay. These foods tend to stay on the teeth for longer periods, providing a continuous source of sugar for bacteria to feed on. The longer the food remains on the teeth, the greater the risk of enamel erosion.
4. **Systemic Diseases and Medications:** Children diagnosed with juvenile diabetes mellitus, resulting from elevated blood sugar levels, as well as those with special needs who may experience challenges in maintaining proper oral hygiene, are at an increased risk for dental caries. Additionally, cancer patients receiving radiotherapy often utilize sugary lozenges to stimulate saliva production, which further heightens their vulnerability to caries. [11]
5. **Socioeconomic Factors**: The relationship between early childhood caries (ECC) and socioeconomic status (SES) has been extensively documented. Research indicates that ECC is more prevalent among children living in poverty or adverse economic conditions, as well as those belonging to ethnic and racial minority groups. Additionally, children born to single mothers and those whose parents possess low educational attainment, particularly mothers who are illiterate, are at a higher risk. In these demographics, factors such as prenatal and perinatal malnutrition or undernourishment contribute to an increased likelihood of enamel hypoplasia, while exposure to fluoride may be inadequate. Furthermore, there tends to be a heightened preference for sugary foods within these populations. [12]
6. **Acidic Foods and Beverages**: Acidic foods and beverages, such as citrus fruits, carbonated sodas, and sour candies, can heightened the risk of dental decay. In combination with a high-sugar diet, acidic foods can exacerbate the development of ECC by weakening the enamel, making it more susceptible to decay.
7. **Lack of Nutritious Foods**: A diet lacking in essential nutrients, such as calcium and phosphorus, can contribute to weaker tooth structure and enamel. Healthy, balanced diets, rich in vegetables, fruits, and dairy products, help strengthen tooth enamel, making teeth more resistant to the acids produced by bacteria. The main findings of the cross-sectional study done were that those with ECC and S-ECC had a significantly higher degree of excessive dietary intake, dietary imbalance, and grains intake as well as a significantly lower degree of food diversity and vegetable intake than caries-free subjects. [13]

Oral Hygiene Practices and Its Role in Preventing ECC

Oral hygiene practices is an inversely important factor in the development and prevention of ECC. Proper oral hygiene practices can help remove food particles and plaque (a sticky film of bacteria-filled substance) from the teeth, preventing bacterial growth and acid production. On the other hand, poor oral hygiene allows plaque to build up, creating an environment where harmful bacteria can thrive and can lead to decay. Children are dependent on their caretakers for oral hygiene maintenance. [14] To enhance oral health outcomes, it is essential to comprehend the knowledge, attitudes, and practices of parents. [15]

The following practices are essential in reducing ECC risk:

a) **Brushing with Flouride Toothpaste**

Brushing Frequency and Technique Brushing the teeth twice daily with a fluoride toothpaste is one of the most effective ways to prevent ECC. The practice of children

brushing their teeth twice daily with fluoridated toothpaste demonstrated a notable correlation with socioeconomic factors, knowledge of fluoride, and attitudes towards routine dental examinations, after controlling for age, gender, and registered residence. [16] Fluoride strengthens tooth enamel by promoting remineralization, making it more resistant to decay. However, children's ability to properly brush their teeth often develops over time. Parents must supervise and assist with brushing until children can adequately perform the task on their own, usually around the age of 6 or 7. Teeth should be brushed twice a day, once in the morning and once before bed. The American Dental Association (ADA) recommends that children use a smear of toothpaste (about the size of a grain of rice) until they are able to spit it out safely. The determination of suitable fluoride concentrations in toothpaste necessitates an assessment of their potential impact on both fluorosis and dental caries in young children. [17]

b) **Flossing**

Dental floss is one instrument used to control plaque. [18] Flossing while brushing is essential for cleaning the surfaces of the teeth, it does not effectively clean between the teeth, where plaque often accumulates. Flossing is necessary to remove plaque and food particles from between the teeth, helping to prevent the development of cavities in these hard-to-reach areas. Although flossing may be difficult for young children, parents should begin flossing their child's teeth once the child has two teeth that touch.

c) **Timing of Brushing**

The timing of brushing can be crucial in the prevention of ECC. Children should avoid brushing immediately after consuming acidic or sugary foods, as the enamel becomes softer and more susceptible to abrasion. Extending the duration of brushing led to a greater reduction in plaque over the time span of 30 seconds to 3 minutes, contingent upon the length of time spent brushing. [19] It is recommended to wait at least 30 minutes after eating before brushing to allow the enamel to re-mineralize.

d) **Use of Fluoride**

Fluoride is a mineral that strengthens tooth enamel by remineralising it which makes it more resistant to decay. It enhances the mineralization of teeth and the density of bone; exhibits bactericidal properties against cariogenic bacteria; and slows down demineralization while facilitating the remineralization of enamel when found in dental plaque and saliva. [20] Using a fluoride toothpaste or mouth rinse can help prevent ECC. For children under the age of 3, a small smear of fluoride toothpaste is sufficient, while children over the age of 3 can use a pea-sized amount. Fluoride varnish and resin-based fissure sealants have both demonstrated efficacy in preventing occlusal caries in the first permanent molars; however, a definitive conclusion regarding the superiority of one treatment over the other could not be established. The administration of fluoride varnish should be determined by a thorough risk assessment, with recommendations suggesting its application two to four times annually. [21]

e) Regular Dental Check-ups

Regular dental check-ups starting at age one or within six months of the eruption of the first tooth are crucial for early detection of dental caries, including ECC. During dental visits, professionals can assess the child's risk for ECC, provide fluoride treatments, offer guidance on appropriate oral hygiene practices to remove plaque and tartar.

Prevention Strategies for Early Childhood Caries

Prevention of ECC involves a combination of dietary modifications, good oral hygiene practices, and regular dental visits. To effectively prevent ECC, caregivers,

healthcare providers, and policymakers must collaborate to promote both dietary and oral hygiene modification. The prevention of ECC should not be based on one approach because there is no scientific evidence to favor one approach over another. [22] The following strategies can significantly reduce the risk of ECC in young children:

a) Encourage a Balance Diet

Limiting Sugar and Acidic Foods One of the most effective strategies in preventing ECC is to limit the consumption of sugary and acidic foods and drinks. Parents should aim to provide a balanced diet like fruits, vegetables, and whole grains, while limiting sugary treats like candy, cookies, and juice. It is essential to have non-cariogenic or low-cariogenic snacks readily available at home and included in school lunchboxes. Examples of such snacks include cheese, plain milk, vegetables, fruits, and whole grain products. [23] It is essential to avoid giving children sugary drinks, such as soda or juice, in bottles or sippy cups, especially at night. Instead, encourage water as the primary beverage, which can help protect teeth.

b) Establish Healthy Feeding Habits

Transition to cup drinking by age1 and avoid putting a child to bed with a bottle of milk or formula. Dietary guidelines aimed at preventing dental caries in children of this age group encompass the following measures: Ensuring a balanced and nutritious diet. Limiting the intake of beverages beyond breast milk, formula, and water. Refraining from allowing the child to sleep with a bottle. Preventing the practice of dipping pacifiers in sugary substances, such as honey or syrup. [23] Discouraging the habitual sipping of liquids from a bottle. Early weaning off the bottle and pacifiers is recommended to establish healthier eating and drinking patterns.

c) Promote Early Oral Hygiene

Early Introduction of Good Oral Hygiene Habits Teaching children to brush and floss their teeth from an early age is key to preventing ECC. Parents should supervise brushing until children develop proper techniques and make sure they brush their teeth at least twice a day with fluoride toothpaste. Flossing should begin as soon as two teeth come into contact with each other. In addition, parents can model good oral hygiene practices by brushing their own teeth alongside their children. Parents play a crucial role in a child's development; however, the contributions of pediatricians and pediatric dentists should not be overlooked. Educational institutions are responsible for assisting these professionals in the child's growth journey by implementing initiatives that enhance and expand children's understanding of oral health. Additionally, it is essential to regularly reinforce educational programs to sustain the motivation of both children and their parents.[24]

d) Fluoride Use

The use of fluoride toothpaste, fluoride varnishes, and drinking fluoridated water are effective ways to prevent ECC. Fluoride helps remineralize and strengthen enamel, making it more resistant to acid attacks. Parents should ensure that their children receive the appropriate fluoride treatment, based on the child’s age and risk level for ECC. The intake of fluoride supplements in early childhood, combined with a fluoride concentration of 0.7 ppm in drinking water, is associated with the possible onset of dental fluorosis. This condition can range in severity from mild to severe, with the latter resulting in considerable aesthetic concerns. Additionally, dental fluorosis has been linked to the application of topical fluoride treatments. Initiating tooth brushing after the age of 12 months is correlated with a notable decrease in the

incidence of dental fluorosis; however, the results were inconsistent when comparing the initiation of tooth brushing before and after 24 months of age, as indicated by observational study data. [20]

e) Routine Dental Check-Ups

Regular dental check-ups, ideally starting at age 1, are essential for the early detection of ECC. During these visits, the dentist can apply fluoride treatments, offer advice on improving oral hygiene, and monitor the development of the teeth to prevent any signs of decay. Early intervention can often prevent the need for extensive restorative treatments in the future.

Conclusion

Early Childhood Caries (ECC) remains a major public health concern that requires a multifaceted approach to prevention. Diet and oral hygiene practices are the two most significant factors contributing to the development of ECC. Limiting sugar consumption, avoiding sugary beverages, ensuring proper oral hygiene, and regularly visiting a dentist are key to preventing tooth decay. Early intervention is critical, as it can reduce the risk of severe decay, improve oral health outcomes, and promote a lifetime of good dental practices. Educating parents and caregivers about the importance of balanced diet and oral hygiene, along with providing accessible dental treatment, will contribute to the overall reduction in ECC and the improvement of children's oral health worldwide.

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