



Original Article

A Public Health Strategy for Preventing Early Childhood Caries

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ABSTRACT

Early childhood caries (ECC) is a type of dental decay that affects the primary teeth of infants and preschool-aged children under the age of 6 years. Recognized as one of the most common oral health concerns among children worldwide, ECC can spread rapidly once it develops, often involving multiple teeth. In developing countries, more than 70% of children under the age of 6 years are commonly affected by dental caries, frequently resulting in pain and infection. Given the severity of this issue, it is essential to develop preventive strategies from an early stage of life. This paper aims to explore various public health measures at the community level to prevent ECC, ensuring that a larger number of children can avoid this significant oral health challenge.

Keywords: Oral health, Dental caries, Dietary habits, Early childhood caries, Fluoride varnishes

Introduction

Early childhood caries (ECC) has emerged as a widespread oral health concern, particularly among children from lower socio-economic backgrounds. It is diagnosed when one or more decayed, missing, or filled tooth surfaces are present in the primary dentition of children under six years old. Once ECC begins, it can advance swiftly, affecting multiple teeth, even those that are typically less susceptible to decay. Several terms, including rampant caries, nursing bottle caries, milk bottle syndrome, baby bottle tooth decay, and prolonged nursing habit caries, are used to describe these lesions. The development of ECC is influenced by various factors such as oral micro-organisms, diet, tooth structure, and broader social determinants of health [1-4].

If left untreated, ECC can progress into a more aggressive form, potentially resulting in malocclusions, abscess formation, and significant pain. While primary teeth are eventually replaced by permanent teeth, research suggests that ECC may increase the likelihood of caries in permanent dentition [5, 6]. Severe cases of ECC can also negatively impact a child's nutritional status, overall growth, and oral health-related quality of life. Studies indicate that children in remote and underserved areas, where access to dental care is limited, are disproportionately affected compared to those in urban settings with better healthcare facilities and fewer financial restrictions. Given the significance of ECC in early childhood, understanding its prevalence, causes, treatment options, and preventive measures is essential for effectively controlling the disease [7-10].

This paper aims to explore various public health measures at the community level to prevent ECC, ensuring that a larger number of children can avoid this significant oral health challenge.

Results and Discussion

Prevalence of ECC

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ECC remains a major oral health concern among preschool children in both developed and developing nations. Several factors, including ethnicity, cultural background, lifestyle patterns, oral hygiene practices, dietary habits, and socio-economic status, contribute to variations in its prevalence. Research indicates that in many developed countries, ECC affects approximately 1-12% of children, whereas in developing nations, the prevalence is significantly higher, reaching nearly 70%. Children from economically disadvantaged families, who may lack access to proper oral hygiene care, are at a greater risk of developing ECC [7, 9].

Reports suggest that certain Middle Eastern countries, such as Palestine and the United Arab Emirates, experience ECC prevalence rates between 70% and 80%. Studies in India have estimated that around 49.6% of children are affected, with regional variations; Andhra Pradesh records the highest prevalence at approximately 63%, while Sikkim reports the lowest, around 41.92% [7-9].

Aetiology of ECC

Four primary factors contribute to the development of ECC:

1. Diet
2. Oral microorganism
3. Environmental factors
4. Tooth or host

In addition to these primary factors, several other contributing elements increase the risk of ECC. These include lower economic status, malnourished children, insufficient awareness about oral hygiene practices, irregular tooth brushing, improper infant feeding habits, prolonged bottle feeding, particularly at night, and limited fluoride exposure [10-12].

Diet

The progression and development of ECC are closely linked to dietary habits and food composition. A diet high in fermentable carbohydrates and sugar significantly increases the risk of caries in children. Factors such as bottle feeding during sleep, prolonged breastfeeding, and frequent exposure to sugary liquids contribute to the onset and advancement of ECC. Additionally, the mother's oral hygiene, caries status, and high microbial load play a crucial role in transmitting caries-causing bacteria to the child [13, 14].

Oral microorganism

Various microbial species present in the oral cavity contribute to the initiation and progression of ECC. The primary bacteria responsible for triggering ECC are *Streptococcus mutans* and *Streptococcus sobrinus*, while Lactobacilli play a key role in caries progression. Other microorganisms, including *Actinomyces gerencseriae*, *Bifidobacterium*, and certain non-mutants Streptococci, are also associated with the advancement of dental caries. *Streptococcus mutans*, the main bacteria linked to caries formation, metabolizes sugar to produce acids, leading to tooth structure loss and accelerating the demineralization process. A high count of *Streptococcus mutans* in a mother's oral cavity can be transmitted to her child, particularly within the first 12-24 months. Preschool children with elevated *Streptococcus mutans* levels are at greater risk of developing ECC [13-16].

Environmental factors

Limited awareness and inadequate knowledge about oral hygiene practices, along with improper brushing habits, contribute to the occurrence of ECC. Oral hygiene care should begin after the eruption of the first deciduous molar to reduce the risk of caries. Additionally, factors such as race, ethnicity, and socio-economic status play a role in ECC prevalence. Children from economically disadvantaged backgrounds are twice as likely to develop ECC compared to those from higher-income families. Barriers such as poverty and low maternal education further hinder proper oral health maintenance. Premature birth, malnutrition, and chronic illnesses are also associated with an increased risk of ECC [17, 18].

Tooth or host

ECC primarily affects the primary teeth of preschool-aged children. While certain tooth surfaces are typically less susceptible to caries, ECC often targets the labial surfaces of upper incisors as well as the buccal and lingual surfaces of both upper and lower molars. It initially presents as dull white or brown discoloration on the upper incisors, which gradually worsens, leading to complete crown destruction. Upper molars are generally affected to

a moderate extent before the decay progresses further, ultimately causing severe damage to the lower molars. As ECC advances, children may experience pain, speech difficulties, and challenges with eating. Additional contributing factors include insufficient fluoride exposure, financial constraints preventing adequate oral care, and high debris accumulation [17, 19, 20].

Management of ECC

Effective management of ECC requires identifying the primary etiological factors contributing to its development and implementing targeted treatment strategies. Restoration is the preferred approach for treating affected teeth, while those that are extensively decayed and beyond repair require surgical extraction. Various restorative options include acid-etched composite and glass ionomer cement restorations, as well as pedo strip crowns and stainless-steel crowns. When pulp involvement occurs, procedures such as pulpotomy and pulpectomy are indicated. In cases where the tooth is deemed non-restorable, surgical removal becomes necessary [17, 18].

Preventive measures for ECC

Various strategies are employed to prevent ECC, including community-based initiatives, professional interventions, and comprehensive home care guidelines [17-19].

Community-level interventions

Oral health education

Educating the public about proper oral hygiene is a fundamental step in preventing ECC. The primary objective is to promote awareness and encourage correct oral care practices. Mothers should be informed about the significance of maintaining their oral health, as maternal oral hygiene plays a crucial role in preventing the transmission of microorganisms to infants. Parents must also be made aware of the potential risks associated with prolonged breastfeeding, pacifier use, and bottle-feeding during bedtime. Emphasizing the importance of prenatal and postnatal oral health care can help reduce the likelihood of ECC development [17-19].

To enhance accessibility to dental care, primary health centers—particularly in remote areas—should integrate oral health services. These centers should be staffed with public health nurses, dentists, and dental hygienists to ensure that expectant and nursing mothers, as well as young children, receive proper dental care. Additionally, public health workers, including ASHA and Anganwadi staff, should be encouraged to organize screening and treatment camps. Such initiatives would allow a larger number of children and their parents to receive necessary dental care while also disseminating information about ECC prevention through direct counseling, pamphlets, and interactive learning sessions [18, 20].

Combining these activities with existing healthcare programs, particularly vaccination campaigns, can further increase accessibility to oral health services for infants and young children. Integrating dental care with routine medical check-ups can facilitate early identification and management of ECC, thereby reducing its prevalence [17, 21].

Water fluoridation

While fluoride is naturally present in water, it may not always be in sufficient quantities to prevent dental caries effectively. To enhance its protective benefits, fluoride must be added to the public water supply at optimal levels, benefiting all individuals, particularly children, in preventing tooth decay. Water fluoridation is one of the most effective and affordable ways to ensure that fluoride reaches everyone in a community, irrespective of age, income, or educational background [17, 21, 22].

Community and personal development

Oral health programs should be organized in areas where large-scale screenings are possible and resources are readily available. Health professionals, including oral health specialists and nurses, can conduct door-to-door visits to educate families, particularly mothers, about the importance of oral care for both themselves and their children to prevent dental decay. Low-cost interventions using minimal materials and equipment can ensure that a larger number of people benefit from these efforts. Fluoride varnish applications during screening sessions can also be used to prevent further dental decay and ECC in children. It is important to create more opportunities for community-based initiatives to expand access to preventive dental care [16, 19, 20].

Professional care

Early detection of caries

Identifying caries at an early stage is crucial for preventing further decay. When caries are detected early and referred to a dentist, they can be treated promptly, reducing the risk of progression. Dentists can apply fluoride varnish to the affected tooth surfaces, which helps in preventing further demineralization and decay. ECC typically begins with the upper incisors, and if not managed early, it can lead to severe cavitation. Therefore, early caries detection is key to preventing the spread and severity of ECC [17-20].

Dietary management

Diet plays a significant role in the development of ECC, with sugar being the primary contributor. Healthcare providers, including physicians and dental professionals, must emphasize the importance of proper diet and feeding habits. Parents, especially mothers, should be educated on maintaining a healthy diet for their children and avoiding excessive consumption of sugary and starchy foods, as well as snacks and drinks that contain fermentable carbohydrates. These foods fuel the microorganisms in the mouth, which produce acids that erode tooth enamel, leading to decay. Prolonged breastfeeding, bottle-feeding, and pacifier use during bedtime should also be discouraged. Dentists should clearly explain the goals of dietary counseling to parents, highlighting the consequences of poor dietary choices on both oral and overall health, and guide them on providing a balanced diet to support their child's dental health [20-22].

Fluoride treatment

Topical fluoride application is an effective method to prevent the progression of caries, especially in children who use pacifiers or exhibit white spot lesions and early signs of decay on their upper front teeth. Fluoride treatments, including professionally applied fluoride and fluoride mouth rinses, are known to be beneficial in preventing ECC. Fluoride can lower the risk of caries by thirty to seventy percent. Additionally, antimicrobial agents like povidone-iodine and chlorhexidine varnish can be applied to help control and prevent further decay [20, 21].

Pit and fissure sealants

Pit and fissure sealants are one of the most economical preventive options for children who are at high risk for developing caries. These sealants are applied to the grooves and pits of the teeth, which are more prone to decay, depending on the child's caries risk and the anatomy of their tooth surfaces. The use of sealants is an effective preventive approach to halting the progression of ECC [20, 21, 23].

Through home care

Dietary practices

Healthy feeding habits and a well-balanced diet are essential for overall well-being and maintaining good oral health. To prevent ECC, it is crucial to limit sugary foods and snacks between meals. Additionally, pacifiers and bottle-feeding during bedtime should be avoided. Encouraging the consumption of vegetables and fruits, as well as transitioning from bottle-feeding to using a cup of milk after the first year, can significantly reduce the risk of caries [20, 22].

Fluoridated toothpaste and brushing techniques

Using fluoridated toothpaste consistently is one of the most effective ways to reduce the risk of caries and is considered a fundamental aspect of a child's oral health. Since children tend to swallow about 30% of toothpaste, a small amount, about the size of a rice grain for infants aged 6-12 months, should be used. Oral health professionals should educate parents on proper brushing techniques during health programs or personal visits, demonstrating the correct way to brush for both adults and children, which is key in preventing ECC [21-24].

Conclusion

ECC is one of the most prevalent dental issues in young children, making its prevention crucial from the earliest stages of life to ensure optimal oral health. Caries prevention strategies should be incorporated into insurance programs to make these services accessible to everyone, regardless of socioeconomic status. Dentists should be incentivized through insurance reimbursements for promoting prevention efforts, rather than only treating existing decay. Through oral health education initiatives, screening, and treatment camps, it is essential to educate parents

and caregivers about the importance of maintaining oral health, especially for children, as well as providing comprehensive information on the causes, prevention, and management of ECC.

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