

Early Childhood Caries: A Review

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ABSTRACT

Aim: To review and update the current knowledge about early childhood caries (ECC) and its etiology, prevalence, risk factors, management, and preventive strategies.

Background: Early childhood caries is a disease affecting significantly both well-developed and industrial nations. The ECC can significantly affect the child's quality of life, as it may lead to infection, swelling, pain, and other symptoms. The ECC affects children after eruption of primary teeth until age of around 5 years.

Review results: The ECC affects all parts of the tooth including the smooth surface. Upper anterior teeth and primary molars are usually affected. The lower anterior teeth are less likely affected. The risk factors for ECC are diet, bacteria, and host susceptibility. The additional factors, such as presence of enamel defect and the feeding practices also contribute to the initiation and progress of ECC.

Conclusion: Dentists must focus on utilizing existing techniques to distinguish indications of right on time and propelled caries and give guidance on the best way to counteract and control caries in children. Approaches should be directed to preventive caries control strategies among children.

Clinical significance: Preventing and controlling the development of ECC among children is important to maintain effective eating, speech development, and formation of a positive self-image.

Keywords: Children, Early childhood caries, Fluoride, Nursing caries, Pediatric dentistry.

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INTRODUCTION

The expression "dental caries" is utilized to represent the outcomes, signs, symptoms, and side effects of a localized chemical disintegration of the tooth surface (enamel and dentin) caused by dental plaque and mediated by saliva.¹ Caries is considered as disease with high incidence among childhood chronic conditions, where it is also well-thought-out to cause harm on both population and individual well-being.^{2,3} When comparing it with other common diseases, dental caries is five times as frequent as asthma and seven times as common as hay fever.⁴

The American Academy of Pediatrics demonstrates that dental and oral infections keep on infecting children and, specifically, very young children. In primary teeth, dental caries is a preventable and reversible disease if treated in early stages, but when left untreated it will lead to pain, bacteremia, alteration in growth and development, premature tooth loss, speech disorder, increase in treatment costs, loss of confidence, and negatively affect successor permanent teeth. Dental caries in young children has a pattern; diverse terms and terminology have been utilized to express them.⁵ The definitions used previously to describe this bacterial disease were related to cause and the improper utilization of nursing bottle. These terms are used interchangeably: "Early childhood tooth decay", "early childhood caries (ECC)", "bottle caries", "nursing caries", "baby bottle tooth decay", or "night bottle mouth".^{6,7} The expression "ECC" was proposed more than 20 years ago during a workshop supported by the Centers for Disease Control and Prevention (CDC) trying to scope the consideration upon the various issues, such as financial, sociopsychological, and behavioral, which contributes to the formation of caries at such initial years, instead of attributing its manifestation solely on feeding bottles.⁸

In 1999, a primary definition was established by a workshop organized by the National Institute for Dental and Craniofacial Research following the conference on ECC that was held in 1997.^{5,9} Furthermore, in 2005,

the American Academy of Pediatric Dentistry (AAPD) defined ECC as “the presence of one or more decayed (noncavitated or cavitated lesions), missing (because of caries), or filled tooth surfaces in any primary tooth in a child aged 71 months or younger”.¹⁰ The term “Severe Early Childhood Caries (S-ECC)” refers to “atypical” or “progressive” or “acute” or “rampant” patterns of dental caries, where in their definition AAPD scored ECC as the following: “in children younger than 3 years of age, any sign of smooth-surface caries is indicative of S-ECC. From ages 3 through 5, 1 or more cavitated, missing (due to caries), or filled smooth surfaces in primary maxillary anterior teeth or a decayed, missing, or filled score of ≥ 4 (age 3), ≥ 5 (age 4), or ≥ 6 (age 5) surfaces constitutes S-ECC.”¹⁰ Subsequently, it is suggested that the expression “early childhood caries” is a best fit to reflect the multifactorial etiologic process, where also it can be utilized when representing any type of caries in infants and preschool children.^{11,12}

PREVALENCE

Nevertheless, bearing in mind the prevalence of dental caries in youngsters in the Western countries, caries in children before school age remains an insistent problem. The ECC has become an epidemic that keeps on affecting infants and preschool children around the world. A comprehensive survey of the study of disease transmission of ECC demonstrated that its pervasiveness differs from populace to populace. Maxillary primary incisors and primary first molars are more susceptible to caries. Mandibular incisors are less affected by caries because they are more protected by the salivary secretion produced by both sublingual and submandibular glands in addition to the tongue cover. Both the tongue and saliva come from both submandibular and sublingual glands.¹ A broad audit of caries affecting upper front teeth in kids, containing various reviews from Asia, Middle East, Africa, North America, and Europe found the most astounding caries pervasiveness in the eastern part of South Asia and Africa.¹³

In the United States, the CDC detailed that the predominance of dental decay between young children aged less than 2 years and not older than 5 years (between 2 and 5 years old) was 24.2% in 6 years between 1988 and 1994 and increased by about 3% (27.9%) between 1999 and 2004; this is according to the third National Health and Nutrition Examination Survey.^{14,15} In developing nations, the prevalence of ECC shows an estimate of 1 to 12% in infants, and this increases to reach 85% that has been accounted for disadvantaged groups.¹⁶⁻¹⁸ In the Western world, the pervasiveness at age 3 was about 20%, and solid affiliations were discovered with ethnicity and

financial ability.¹⁹ In the Japanese nationwide overview in 2007, 2.8% of the children aged around 18 months experience ECC, while 25.9% of the kids aged 3 years experience the same condition in Japan.²⁰

ETIOLOGY

Research has confirmed that ECC is a multifactorial disease. As any caries lesion, ECC is caused by poor oral hygiene, bacterial invasion, bad diet habits, etc.^{21,22} Also, the presence of enamel defects might contribute to the formation of lesion, such as hypoplasia, known as hypoplasia-associated severe early childhood caries.²³ This type of decay influences generally young kids at or beneath levels of poverty, teeth which are usually vulnerable to caries have structural damage.

RISK FACTORS

There are several factors that contribute to the formation of ECC, some of which will be discussed in this review.

Microbiological Risk Factors

The ECC is a transmittable disease. *Streptococcus mutans* (SM) and *Streptococcus sobrinus* are the most widely recognized causative specialists. Lactobacilli additionally have a distinct role in the caries progression but not in its initiation.²⁴

Studies have shown that there are two ways for SM transmission: Vertical and horizontal transmission. Vertical transmission is carried between caregiver and child (i.e., mother or father to child).²⁵ Subsequently, poor maternal oral hygiene and higher sugar intake per day rise the chances of transferring the disease to the child by the mother.²⁶ Whereas, for horizontal transmission, neonatal factors may increase the chance of acquiring SM. Infant delivery by cesarean section transmits SM earlier than through natural deliveries.²⁷ The time of 13 to 16 months is roughly needed between SM colonization and caries lesion initiation and advancement.

Dietary Risk Factors

In addition to infection with SM bacteria, children who have high-sugared drinks also suffer from ECC. Sugar is processed by both SM and lactobacilli that will further transform it into acid, which will cause demineralization of tooth structure. Evidence recommends that both cow's and human milk are considered to be less cariogenic than sucrose, with cow's milk being the least cariogenic. The cariogenic capability of newborn child equations fluctuated over the reviews, with some being as cariogenic as sucrose. On the contrary, the available evidence in the literature discussing the cariogenicity of

breast milk is weak and lacks consistency, whereas the cariogenicity of milk formulas varies across studies.^{28,29} The best accessible data show that low level of caries in nations is associated with sugar utilization between 40 and 55 gm per person in 1 day.³⁰ The connection among proper diet and dental caries has turned out to be weaker in contemporary society and this has been credited to the broad utilization of fluoride.³¹

Environmental Risk Factors

Several studies have confirmed that when SM bacteria have been acquired at an early age, it will mostly lead to ECC, where other factors might contribute to caries progression or prevention, such as socioeconomic status of caregivers, water fluoridation, race, number of years of education, and dental insurance coverage.³²⁻³⁴ Relationship among ECC and the financial status has been very much reported. Children with a background marked by dental caries, whose parents and siblings have serious dental caries, are viewed as being at high risk of having dental caries in their future.^{35,36} Additionally, kids involvement of financial burden influences grown-up dental well-being.³⁷ Absence of access to dental care, deficient accessibility of preventive measures, for example, water fluoridation, fluoride supplementation, and dental sealants, and the absence of information of the significance of oral well-being are contributing elements to an oral well-being decrease in young children.

DIAGNOSIS

The ECC starts with a white spot lesion on the maxillary primary incisors along the cervical third of the crown (on the edge of the gingiva). In general, the decay is first seen on the primary maxillary incisors, and the four maxillary anterior teeth are often involved concurrently.³⁸ If the lesion is not arrested and disease continues, caries will progress to form a cavitation.^{39,40} The lesion may appear on either facial or lingual surfaces or on both.²¹ Young children that have ECC are more susceptible to caries infection in both primary⁴² and permanent dentitions.⁴¹ The ECC is not only limited to oral health but is also widespread to cause several health problems. Children with ECC have a slower growth rate when compared with caries-free children, where also ECC may be affected with iron deficiency.⁴² Moreover, the implementation of the new expression of ECC is now in use instead of the previous terminology of bottle caries, when at least one of the following criteria is accompanied by:

- Smooth surface caries in children ≤3 years
- In children between 3 and 5 years of age, any smooth surface of an anterior–posterior tooth, i.e., filled, missing (due to caries), or decayed

- The decayed, missing, and filled teeth index is equal to 4 or more for children 3 years of age, 5 for children 4 years of age, and 6 for kids 5 years of age.⁴³

MANAGEMENT

To manage any disease, the underlying causative factor or factors must be identified. Treatment of ECC sometimes consists of restoration using microrestorative techniques and adhesive materials or by surgical removal of carious teeth. However, it is well established that recurrent caries around restorations is quite common, whereas the relapse after surgical removal of caries tooth is approximately 40% after the first year.^{21,44} This leads to a shift in the management from treatment to prevention of occurrence or decrease in the progression of caries.⁴⁵⁻⁴⁷

Literature has provided general approaches to be used in prevention of ECC (Flow Chart 1).

Prevention of Maternal Bacterial Transmission to the Child

This method is used as an approach in preventing carcinogenicity of feeding. The habit of feeding young children at night using nursing bottle or sippy cups will increase the risk of enamel demineralization. This habit will elevate the chance of dental caries due to flow rate of saliva and oral clearance at night, thus sugary beverage consumption at night should be stopped or at least reduced. Therefore, it is better to start very early in preventing ECC in the prebirth and perinatal periods. Newborn children whose moms have elevated amounts of SM because of untreated dental caries are at more danger of transferring these organisms to the child.⁴⁸

Oral Health Education

The ultimate goal of oral health education is to prevent disease, its motivation is to encourage basic leadership for oral health reviews and to motivate proper decisions for such behaviors. The main factor contributing to caries formation is the substrate component of sugar. Consequently, most dentists shifted their concern to

Flow Chart 1: Strategies to prevent ECC

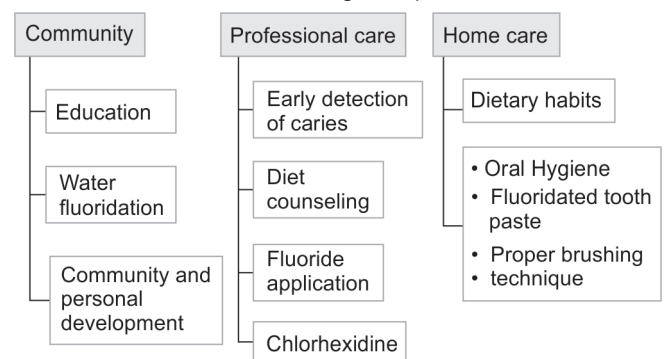


Table 1: Recommended dosage for fluoride supplementation

Age of Child	Fluoride level of drinking water in PPM		
	<0.3 PPM	0.3–0.6 PPM	> 0.6 PPM
Birth–6 Months	No Supplements	No Supplements	No Supplements
6 Months–3 Years	0.25 mg per day	No Supplements	No Supplements
3–6 Years	0.50 mg per day	0.25 mg per day	No Supplements
6–16 Years	1.0 mg per day	0.50 mg per day	No Supplements

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concentrate on child diet modification and feeding habits by educating parents and caregivers.^{49,50} Most children do not visit the dentist until they reach 3 years of age; health care providers including physicians and nurses have a significant role in educating both parents and child, thus decreasing the disease.⁴⁹ Oral health education can be carried out by providing information in the form of pamphlets, experience, or learning activities that are meant to improve oral care.⁵⁰ The AAPD has set some recommendations on expectant direction, where bottle-feeding habits can lead to avoidance of ECC.⁴³

Fluoride

The utilization of fluorides in dentistry started in the 19th century. Fluoride is found in water so that all people ingest some fluoride every day. Water fluoridation is considered as a general well-being measure, this will aid in people in the formation of chewable tablets, washes, capsules, toothpastes, droplets, and by the dental experts in the expert use of varnishes, froths, and gels. The fluoride varnish type contains high concentration of topical fluoride, the mode of action is by increasing the concentration of fluoride on the applied surface of the tooth; this increases fluoride uptake during early stages of tooth demineralization.³⁹

There is a worldwide agreement that normal utilization of fluoride toothpaste constitutes a foundation in youngster dental well-being. Truth be told, a worldwide overview uncovered that most specialists tended to fluoride toothpaste as the principal purpose behind the emotional decrease in caries in the 20th century.⁵¹ Furthermore, toothpaste is presumably the most promptly accessible type of fluoride and toothbrushing is an advantageous and endorsed propensity in many societies.⁵² Fluoride items, for example, mouth wash, dental orifice topical fluoride, and toothpaste have appeared to reduce caries between 70% and 30% of contrasted and no fluoride treatment respectively.^{53,54} While brushing their teeth, young children tend to swallow the toothpaste, which may intensify their experience to fluoride. The AAPD has provided certain recommendations that should be followed while prescribing fluoride toothpaste or fluoride

supplements to patients in order to decrease the chance of fluoride poisoning or fluorosis while maintaining its advantages (Table 1).⁵⁵

CONCLUSION

Moreover, dental specialists need to build up the most ideal approaches to offer preventive and clinically successful care. Logical advances must obscure the boundary among dental and restorative practices. Dentists must focus on utilizing existing techniques to distinguish indications of right on time and propelled caries and give guidance on the best way to counteract and control caries in patients.

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