

REVIEW ARTICLE

Early Childhood Caries - Essential Information for Primary Healthcare Providers

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Abstract

Early Childhood Caries (ECC) is one of the most common chronic infectious diseases of childhood. It represents a significant disease burden with long-term consequences for a child's health and well-being. Primary health care providers (pediatricians, family physicians, pediatric nurses) are the first point of contact for parents for any child health-related issues as they see them repeatedly in the first few years of life for vaccinations and "well-baby" visits. However, their awareness regarding caries in primary dentition and its complications may be limited. This article has summarized important information on ECC, focusing on the health care provider's role in its early diagnosis and prevention.

Keywords

Dental health, early childhood caries, brushing, prevention of caries, pediatric dental care

Introduction

Dental caries in the primary dentition is the most common chronic disease of early childhood and is usually called Early Childhood Caries (ECC). ECC is diagnosed if a child under the age of 6 years presents with one or more decayed, missing (due to caries), or filled tooth surfaces. It is classified as severe if any smooth surface caries is noted in a child younger than three years or more teeth are affected than their chronological age¹.

The prevalence rate of ECC is five times that of asthma and seven times that of allergic rhinitis². Untreated dental caries in young children may lead to pain and infection, necessitating emergency dental visits, hospitalizations, and high treatment costs. Recurrent tooth pain can interfere with eating, sleep quality, and cognitive performance at school. The premature tooth loss might increase the need for long-term orthodontic care, and there might be increased caries risk in later life as well. Children with significant caries persistently score worse in quality-of-life indicators than their dentally healthy peers³. Despite this, parents and health care providers often believe that caries in primary teeth is not preventable and, in any case, do not require treatment as these teeth are eventually replaced by permanent dentition. On the contrary, ECC is largely preventable, and its consequences are avoidable if it is diagnosed early. In this regard, the primary healthcare providers (pediatricians, general practitioners, pediatric nurses) play an essential role in identifying children at high risk for developing ECC as they are the first point of contact for almost all child health problems. Early recognition and timely referral of these children can significantly aid in preventing the complications associated with ECC⁴. In this article, we have summarized important information on ECC, focusing on the non-dental healthcare provider's role in its early diagnosis and prevention.

What is Early Childhood Caries (ECC)?

Dental caries is the chemical dissolution of the tooth surface due to bacterial fermentation



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of carbohydrates in its vicinity. ECC is a particularly virulent form of dental caries in children that often first affects the maxillary incisors of the primary dentition. There is characteristic sparing of mandibular incisors, which are relatively less affected due to protection from the tongue and salivary fluids. ECC was previously referred to as "nursing bottle caries" and "baby bottle tooth decay" due to its frequent association with inappropriate feeding practices⁵. Delayed intervention may result in the rapid and severe involvement of almost all the other teeth in the oral cavity.

Prevalence of ECC

The global prevalence of ECC shows a wide variation ranging from 23% to 90%, with most countries exhibiting prevalence greater than 50%⁶. A higher prevalence in developing countries may reflect the role of socioeconomic factors in its etiology. However, certain groups of children, especially minority and indigenous children are disproportionately affected in even more affluent countries.

Risk factors for ECC

Dietary Habits

The crucial period for ECC begins with the eruption of the first primary tooth. The immature enamel after the eruption is especially vulnerable to the acidic byproducts of carbohydrate fermentation. Frequent and prolonged bottle feeding with sweetened infant formula or milk, especially at night, provides an optimum environment for the establishment of cariogenic (i.e. caries-causing) bacterial flora⁷. Frequent night-time breastfeeding after 12 months of age, combined with repeated consumption of sugary snacks or drinks (e.g., juice) or sweetened medications, significantly increases caries risk⁸.

Early infection with *Streptococcus mutans* bacterium (SM)

The bacterium most closely related to the onset of caries is *Streptococcus mutans* (SM). Mothers with increased SM levels because of their own untreated dental caries may be at risk of earlier bacterial transmission to their offspring⁹. Siblings and other family members may also represent significant sources of horizontal transmission¹⁰. Having a sibling with a history of severe ECC is one factor that may predict high caries risk in an infant. We can identify this important risk factor by including a family history of dental caries as part of history taking during the initial visit.

Low fluoride exposure

Frequent exposure to fluoride has long been associated with lower rates of caries in children. Many communities in the USA have the optimal fluoride level in the community drinking water of 0.7 to 1.2 ppm of fluoride. Children residing in areas where the water supply is low in fluoride (<0.6 ppm) may be at higher risk of developing ECC, especially if they lack exposure to other fluoride sources¹¹. We should be aware of the fluoride content of the water supply in our region so we can offer appropriate advice.

Socioeconomic factors

Low socioeconomic status and low literacy level of the mother may increase caries risk. Chronic under-nutrition may be associated with enamel hypoplasia in the offspring¹². This group is also at greater caries risk due to insufficient fluoride exposure and higher exposure to sugary foods¹³.

Children with special health care needs

Premature birth, low birth weight, and severe illnesses in the neonatal period are associated with developmental defects in the enamel, which make the tooth more susceptible to dental caries¹⁴. Conditions like autism or spastic cerebral palsy, which impede access to the oral cavity for tooth brushing, may also increase caries risk¹⁵.

The Primary Healthcare Provider's Role in Prevention and Diagnosis of ECC

Cultural and socioeconomic factors play a considerable role in preventive dental visits. Most young children do not visit a dentist in the first years of life unless they face an acute

dental problem like an abscess or a traumatized tooth. However, most families visit their primary healthcare provider for vaccinations and general checkups during this period¹⁶. We should consider this as an opportunity to identify children at high risk for ECC and provide parental guidance to them. Since early diagnosis and intervention are crucial in preventing complications, it is vital to manage them appropriately. Parents (we also intend to include all caregivers when we mention parents or mother elsewhere in the article) also rely on their health care provider for advice on correct feeding and oral hygiene practices, including cleaning the gums and brushing (details are provided in the concluding section)¹⁷. The American Academy of Pediatrics and the American Academy of Pediatric Dentistry recommend simple preventative methods like fluoride varnish application which may be incorporated along with nutritional counseling in the routine office visit if appropriate training is provided.

Identification of children at high risk of ECC

The healthcare provider can utilize the American Academy of Pediatric Dentistry (AAPD) risk assessment tool (figure 1) to help predict caries risk in young infants¹⁸. Children can be categorized as high, moderate, or low risk for developing caries based on biologic risk factors, abnormal findings on assessment, or the absence of protective factors. High-risk children should ideally be referred to the dentist for assessment and preventive management before developing frank cavitation.

Figure 1. Caries Risk Assessment form for children between zero to three years of age (For Physicians and other Non-Dental Health Care Providers)¹⁸

Factors	High Risk	Moderate Risk	Protective
Biological			
Mother/primary caregiver has active cavities	Yes		
Parent/caregiver has low socioeconomic status	Yes		
Child has >3 between meal sugar-containing snacks or beverages per day	Yes		
Child is put to bed with a bottle containing natural or added sugar	Yes		
Child has special health care needs		Yes	
Child is a recent immigrant		Yes	
Protective			
Child receives optimally-fluoridated drinking water or fluoride supplements			Yes
Child has teeth brushed daily with fluoridated toothpaste			Yes
Child receives topical fluoride from health professional			Yes
Child has dental home/regular dental care			Yes
Clinical Findings			
Child has white spot lesions or enamel defects	Yes		
Child has visible cavities or fillings	Yes		
Child has plaque on teeth		Yes	

Circling those conditions that apply to a specific patient helps the health care worker and parent understand the factors that contribute to or protect from caries. Risk assessment categorization of low, moderate, or high is based on preponderance of factors for the individual. However clinical judgment may justify the use of one factor (e.g., frequent exposure to sugar containing snacks or beverages, visible caries) in determining overall risk.





Overall assessment of the child's dental caries risk: High Moderate Low

Oral examination for the diagnosis of ECC- lift the lip technique for health care professionals

With gloved fingers of both hands, separate the child's lips to view the labial surface of the upper front teeth. Open mouth slightly to achieve a clear view of the back teeth (use a tongue depressor if needed). Natural daylight is the preferred light source, but a flashlight may be helpful. If there is any gross plaque deposit, remove it by wiping the teeth's surface with a clean gauze¹⁹.

The earliest clinical sign of ECC is often in the form of chalky white spots along the gum line of upper anterior teeth where plaque typically accumulates. The affected tooth's surface will appear dull, rough, and opaque compared to the surrounding enamel. At this stage, it may be reversible with appropriate intervention. If left untreated, the lesion may progress to cavitation and even complete breakdown of the tooth's crown so that only root stumps remain²⁰. The various stages of ECC are depicted in figure 2.

Figure 2. Developmental stages of Early Childhood Caries²⁰.

<p>Initial reversible stage</p> 	<ul style="list-style-type: none"> • Chalky white discoloration along the gum line • Visible plaque may be present • May be reversible with oral hygiene improvement/remineralizing agents
<p>Damaged carious stage</p> 	<ul style="list-style-type: none"> • Yellowish-brown discoloration with cavitation • Dentinal involvement present • Asymptomatic or sensitive to cold
<p>Deep lesion</p> 	<ul style="list-style-type: none"> • Lesions in molars and incisors • Pulpal involvement of incisors • Asymptomatic or complaint of pain
<p>Traumatic stage</p> 	<ul style="list-style-type: none"> • Teeth weakened by caries, fractures on minor trauma • Maxillary incisors are non-vital, pulpal involvement in molars is frequent. • Pain may/may not be present

Fluoride varnish application

After the oral examination, fluoride varnish may be applied to the child's teeth starting at tooth eruption until five years of age²¹. Sodium fluoride varnish with a 2.26% fluoride concentration (22600 ppm) in unit dose packs is recommended for application in a primary care setting. The application frequency is every six months in the low-risk group and every three months in high-risk groups²².

Guidelines for application

Dry the teeth surfaces with gauze and paint the varnish onto all surfaces with the brush provided in the packaging. Instruct the parents to feed their child only soft foods, preferably after a gap of at least 2 hours post-application. Parents should not brush the child's teeth the evening after varnish application to maximize the tooth's contact time. The following day, they should resume brushing twice daily with fluoridated toothpaste.

Parental Counseling for Prevention of ECC

We should emphasize the importance of starting complementary foods at the appropriate time to reduce breastfeeding dependency. After the eruption of teeth, mothers could try to avoid frequent nocturnal breastfeeding. They could switch from bottle-feeding to open cup feeding at a suitable age. They should be educated on avoiding practices like putting the baby to sleep with a bottle in the mouth. They should also be clearly advised against the application of anything sweet on pacifiers or adding sugar or honey to the milk. It would help to restrict meals to three times a day with one or two snacks in between. If sugary snacks are given, they should be with meals rather than between meals, followed by brushing or rinsing the mouth. Encourage the caregivers to give only plain milk or water in a sippy cup. Fruit juice is not recommended in the first year of life²³. Advise against giving sweetened medication in feeding bottles. Instead, a syringe may be used to dispense it into the lower cheek with the infant's head in an elevated position.

To minimize the transmission of the cariogenic bacteria, encourage the mother to seek dental treatment for any active caries she may have to reduce her *Streptococcus mutans* reservoir. Family members should be advised on the risk of spreading such bacteria to the infant due to close contact like kissing on the mouth, which should be avoided as far as possible.

Oral hygiene measures

Encourage the mother to start gum pad cleaning even before the eruption of teeth. She could use clean gauze to wipe the gum pads and remove any debris or plaque at least once a day, preferably before bedtime. Brushing the teeth must be initiated right after the first tooth begins to erupt. Current best practice to reduce ECC risk includes brushing twice daily with a fluoridated toothpaste applied on a baby toothbrush for all children. Fluoride helps in reducing tooth decay by accelerating the post-eruptive maturation of the enamel. A "smear" is appropriate for children less than three; a pea-size amount should be used for children between three to six²⁴. The brushing should be in a gentle side-to-side scrubbing motion to remove plaque. Parents are often concerned that their baby cannot rinse after brushing, but we should educate them that not rinsing will maximize the benefit of fluoride. They should continue brushing their child's teeth until the time that the child is old enough to tie his or her shoelaces. Dietary fluoride supplements may be considered in children residing in regions with a fluoride deficient water supply²⁵. AAPD recommends sodium fluoride tablets or drops at a dose of 0.25 mg daily for children aged between 6 months to 3 years, 0.5 mg for 3 to 6 years, and 1 mg for 6 to 16 years if levels are below 0.3 ppm in their drinking water supply. For levels between 0.3-0.6 ppm of fluoride, 0.25 mg in children between 3-6 years and 0.5 mg between 6-16 years may be prescribed. The community water system level of fluoride is usually obtainable from the local health department. There is a need to review total fluoride exposure from other sources like school drinking water supply, milk, or fluoridated salt before supplementation.

When to Refer to a Dentist?

Many countries recommend a preventive dentist review soon after teeth erupt in infants with at least one visit before one year of age. The healthcare provider can suggest this to families, but where this is not feasible, referral at the earliest based on clinical signs or risk factors, as described above, is essential. If children are identified and promptly referred to a dentist at this pre-cavitation stage, these lesions can often be re-mineralized noninvasively instead of requiring extensive treatment. This referral can be to either a pediatric dentist or a dentist who deals with children depending on availability and preference.

Regular follow up visits may be undertaken at a frequency that is based on their caries risk assessment. They may also be encouraged to receive preventive procedures like fluoride varnish application and dental sealants to reduce this risk further.

Conclusion

ECC is one of the most widely prevalent chronic infectious diseases of childhood. If left untreated, it can cause significant pain, disfigurement, psychosocial stress, and reduced quality of life in affected children. Since it is a preventable condition, increasing awareness among the primary healthcare providers and parents will go a long way in reducing the high incidence of this condition, and the considerable cost and morbidity that result from it.

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