

Severe early childhood caries: an integral approach

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Abstract

Objective: To provide information with the purpose of helping pediatricians to recognize the risk factors for the onset of severe early childhood caries, allowing for early intervention and thus avoiding this preventable disease and its consequences.

Sources: Information was collected from scientific articles published on the databases SciELO, MEDLINE and PUBMED in last 25 years, as well as technical books and guidelines of international committees. The keywords used were: early childhood caries, severe early childhood caries, dental caries, and children.

Summary of the findings: Severe early childhood caries affects infants and children. It is infectious, has a multifactor etiology and fast development, starting soon after dental eruption. Due to the presence of local sociocultural risk factors, it must be regarded as a symptom of alteration in the child's health and lack of adequate care. Its manifestations include pain, abscesses and chewing difficulty, affecting the child's feeding and sleep. Furthermore, it also affects the child's general health, speech, and self-esteem.

Conclusions: Preventive methods to avoid severe early childhood caries have been developed and they should be used as early as possible by means of prevention programs carried out in the community and with families. Professionals responsible for providing care to babies and children should be aware of cases at risk for caries and interfere in order to improve their patients' health.

J Pediatr (Rio J). 2009;85(4):295-300: Dental caries, children, severe early dental caries.

Introduction

Dental caries is the most common chronic disease in childhood, consisting in a severe problem for worldwide public health.^{1,2} An important factor that must be considered is the fact that it can be prevented, controlled or even resolved. In order to prevent it, it is necessary to know its etiology and the risk factors contributing to its development. Control and reversion of such disease are possible if the diagnosis is established at the initial stage, which is characterized by the presence of white spots on tooth enamel without cavities.

When there are dental cavities, there is need of curative and preventive treatment with the purpose of changing the factors that led to the development of dental caries. Disease progression can cause great damage to teeth, or even tooth loss, and it may result in local, systemic, psychological and social complications.

Recent studies carried out in Brazil have demonstrated that the prevalence of childhood caries ranges from 12 to 46%, and the age group having the highest amount of

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caries is that including children from 1 to 3 years.^{3,4} The most recent national epidemiological surveillance of oral health found a prevalence of 26.85% of caries in children between 18 and 36 months,⁵ showing an evident increase as children grow older, regardless of sex.⁵⁻⁷

The World Health Organization set 10-year goals to stimulate developing countries to take measures to improve their oral health indicators. The 2000 goal was to have 50% of 5-year-old with no caries,⁸ which, according the most recent national survey on oral health SB Brasil – The Brazilian Population's Oral Health Conditions – 2003,⁵ was not met in any of the Brazilian macroregions. For 2010, the World Health Organization expects that 90% of these individuals are free of caries.⁹ This challenge requires a joint effort of health professionals with the purpose of identify those children having a risk profile for dental caries in order to prevent it when the cost-benefit ratio still remains extremely positive.

Therefore, the objective of the present study was to conduct a review of the literature with the purpose of offering information to health professionals who have the opportunity to provide care to young children and to identify those individuals exposed to risks of dental caries.

Definition of early childhood caries

The American Academy of Pediatric Dentistry (AAPD)¹⁰ classifies early childhood caries as the presence of one or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger. However, any sign of smooth surface caries, with or without cavity, in children younger than 3 years old, is considered severe early childhood caries (S-ECC). This disease has rampant, acute and progressive characteristics. A child is also considered to have S-ECC if, from 3 to 5 years old, he/she has more than four, five and six dental surfaces affected in primary anterior teeth at 3, 4 and 5 years old, respectively. S-ECC replaces the previous term known as "nursing bottle caries."

Etiology and risk factors for dental caries

Dental caries has a multifactorial etiology. It is developed upon the presence of dental biofilm, which is responsible for mediating the demineralization of dental tissues: enamel and dentin. There is need of interaction among three factors so that caries occur: cariogenic microorganisms (*Streptococcus mutans*), fermentable substrate (such as saccharose) and a vulnerable host.¹¹ The interaction among these factors during a period of time promotes the development of caries, which begins with the appearance of opaque white spots, without cavity, on dental surface, resulting from demineralization of tooth enamel.

The infection with *S. mutans* plays an important role in the onset and progression of the disease. Vertical infection with microorganisms occurs mainly from the mothers or other caregivers' saliva containing high levels of *S. mutans*.^{12,13} When the mothers have high concentration of *S. mutans* in their saliva, children are exposed to early infection and have higher prevalence of caries.¹⁴

The microbiological development of S-ECC can be divided into three steps¹³:

- First step: primary infection by *S. mutans*;
- Second step: accumulation of microorganisms to pathogenic levels as a consequence of frequent and prolonged exposure to cariogenic substrates;
- Third step: demineralization and cavitation of enamel resulting in rampant dental caries.

The substrate is essential for cellular feasibility, proliferation and aggregation. There is strong association between the frequency of carbohydrates intake, mainly saccharose, and caries experience, especially if such contact takes place between meals and during sleep, when the protective effect of saliva is absent, since the salivary flow is reduced.^{15,16}

In children, habits such as the unlimited use of nursing bottles, sleep while being bottled fed (manufactured fruit juices, sweetened teas, fermented milk, milk containing fermentable carbohydrates such as farinaceous food and sugar) are associated with the development of S-ECC.^{17,18} Among family habits, those that have a higher influence on the development of S-ECC are leaving the bottle with a child while sleeping, having problems brushing a child's teeth, and prolonged holding of liquids in the mouth, mainly while sleeping.¹⁹

Children with chronic diseases who use continuous oral medication containing saccharose, such as liquids or chewable pills, with repeated administration sometime just before bedtime, can be at risk if there is no hygiene after the administration of medication.²⁰⁻²² It happens due to the high sugar load in such medications. In Brazil, most pediatric medications analyzed presented critical pH for enamel dissolution (5.5) and high sugar concentration (ranging from 11.21 to 62.46%), which results in a contribution to the development of dental erosion and increase in the cariogenic potential.^{23,24}

Children who have enamel hypoplasia are more vulnerable to the development of caries if they are exposed to the above mentioned situations.²⁵

Immunosuppression increases the susceptibility to caries.²⁶⁻²⁸ Children who need oncological or rheumatological treatment might be more susceptible. There seems also to be a genetic predisposition for higher susceptibility to caries, even though such predisposition has not been completely clarified.²⁹ The genetic composition of *S.*

mutans in children with S-ECC seems to provide higher virulence to such microorganisms than the strains found in caries-free children.³⁰

The AAPD¹⁰ also consider that breastfeeding on-demand after dental eruption and the use of pacifiers immersed in sugary substances are risk factors for the development of caries. Mohebbi et al.³¹ found a strong association between early childhood caries and use of nursing bottle at night, but they found no association with prolonged breastfeeding. Ribeiro & Ribeiro,³² in a critical review of the literature, reported conflicting information on the cariogenicity of breastfeeding. Several studies that related breastfeeding to early or severe childhood caries presented the following risk factors (excluding breastfeeding): enamel hypoplasia, night snacks, use of nursing bottle with carbohydrates, high count of *S. mutans*, first dentist visit after 2 years old, low socioeconomic status and low parents' educational level.³³⁻³⁵

Behavioral characteristics have always been related to caries experience. With regard to children, it is also important to consider their caregivers' life style. There is direct relation between maternal factors, such as active caries and consumption of sugar, and the status of the number of deciduous decayed, missed or filled teeth (dmf-t) in the child.³⁶ Some studies have also found a positive association between maternal smoking and prevalence of caries in children.^{37,38} Lower incidence and severity of caries was found in children whose mothers would regularly take them for routine dental visits.³⁹

Educational level has been considered an important socioeconomic indicator, and maternal educational level is related to the prevalence of dental caries,³⁹⁻⁴¹ as well as fathers' educational level.^{42,43} Mattila et al.⁴⁴ found a higher possibility of children with zero dmf-t when the mothers were older, had higher educational level and better jobs. Several studies have detected a strong association between caries occurrence and socioeconomic indicators.^{39,45-51}

Clinical appearance

The initial clinical sign of childhood caries is the presence of opaque white spots, which are demineralized areas due to the occurrence of dental biofilm (Figure 1). Progression occurs by means of cavities with loss of dental structure, which, if not treated, can lead to destruction of the whole tooth's crown and cause infectious process of the tooth's root due to dental pulp necrosis (Figure 2). S-ECC has a defined and symmetric developmental pattern, which starts at the cervical third of the vestibular face of the upper anterior teeth. Next, it affects the occlusal surface of the first upper and lower molars, upper and lower canines, and second upper and lower molars. At the most advanced stages, it also reaches the lower incisors.⁵²

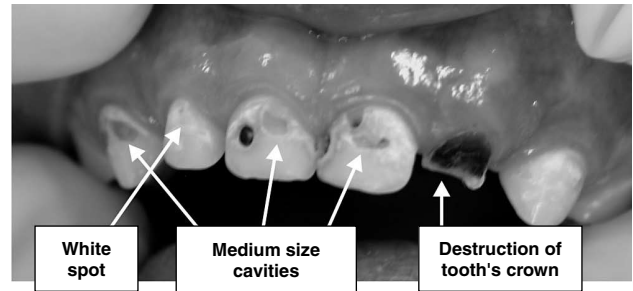


Figure 1 - Clinical appearance of oral cavity in a 4-year-old child with severe early childhood caries. Observe the different phases of development

During the initial phase, only dental enamel is affected, and opaque white spots can be detected. The treatment consists in changing eating habits, oral hygiene and local administration of fluoride. If the disease progresses, dentin is also affected, and cavities will be detected. At this stage, the treatment consists in restoring the affected teeth and preventing new caries. When the diet is changed and hygiene habits are established, the dentin, which was previously white and soften (severe caries) with painful symptomatology, has its appearance changed to a dark color, hard consistency and painless, which means it is a chronic lesion of dental caries.⁵²

If the disease progression is not interrupted, it may cause the destruction of several deciduous teeth, resulting in several local, systemic, psychological and social consequences.

Local, systemic, and social consequences

With the development of carious lesions cavities, the child presents with infection, pain, chewing difficulty, psychological trauma and early teeth loss.^{10,53,54}



Figure 2 - Clinical appearance of oral cavity in a 6-year-old child with severe early childhood caries. Observe the destruction of several crowns

Dental pain is the immediate most common consequence of untreated caries. Children with dental pain have their daily activities affected, such as eating, sleeping and playing. In addition, such pain can impair school performance and be the reason for school absence.⁵⁵

Early deciduous teeth loss can be avoided, since these teeth are very important for an adequate development and growth of maxillary arches, correct organization of occlusion and, chewing and speech function. Dental loss can cause severe consequences to permanent dentition.⁵⁶

When there is early loss in the upper anterior region, there might be abnormal swallowing and production of speech sounds, delay or acceleration of permanent teeth eruption, eating difficulty and development of probable orthodontic problems, as well as psychological disorders.⁵⁷ Robke⁵⁸ detected loss of vertical dimension in 63.3% of the children with extensive carious lesions in the upper incisors caused by S-ECC.

Early loss of posterior teeth (deciduous molars) leads to chewing difficulty, in addition to possibility of loss of space for the permanent tooth.⁵⁹⁻⁶¹ Moreover, early childhood caries have been associated with later caries experience during childhood and in permanent dentition.⁵⁹⁻⁶²

The consequences of S-ECC are deeper than pain and infection. Although these are the primary effects, such disease also affects children's general health. Eating disorders caused by S-ECC are more frequently detected due to its direct impact, but there are also problems affecting the child's general health. For instance, it has been found that children with S-ECC have significantly lower weight than caries-free children.^{63,64} It has been also detected that children with S-ECC weigh less than 80% of their optimal weight, being significantly different from those in the control group. In addition, as children with S-ECC grew older, their chance of having low weight percentages also increased.⁶³ Children with S-ECC were also significantly shorter when compared with children without caries.⁶⁴

It is probable that younger children who have S-ECC at initial stages, before pain and infection, do not change their eating habits, particularly in terms of the high consumption of carbohydrates associated with caries. However, as children grow older and the carious lesions progress, the occurrence of pain and infection can change their eating habits. The reduction in the consumption of certain food due to pain can result in abnormal growth pattern. When aesthetics and oral health are not important for parents, dental services are only sought in case of pain, sleep and eating alterations, or when the pediatrician recommends a visit to the dentist. Then, the status of the untreated carious lesions is often advanced and can start to interfere with the child's developmental pattern. Therefore, the early treatment of S-ECC lesions can preserve oral hygiene and prevent infection and pain in children.⁶³

Another aspect to be considered is bacteremia in cases of dental infections. It may occur as a consequence of odontological interventions, or even during chewing and brushing. It can also be related to several systemic alterations, such as diabetes and endocarditis.⁶⁵⁻⁶⁷

S-ECC interferes both with the quality of life of the child and the family.⁶⁸ This disease has immediate and late impact, causing decrease in the child's learning ability and school absence, as well as parents' days off work. Such pathology also can have consequences on children's social behavior, since they often are teased by their classmates. S-ECC treatment, in addition to being expensive and invasive (exodontia), is stressful for the child, the family and the professional team, specially if the child needs emergency care.⁶⁸

Prevention of severe early childhood caries

The development of deciduous teeth begins in the intrauterine period, being important to control infectious diseases and maternal diet. Therefore, the prevention of S-ECC must begin during pregnancy. Visiting the dentist is important for an evaluation of the mother's oral status, providing curative and preventive treatment, mainly to stimulate oral care with the purpose of controlling *S. mutans* levels and, therefore, decreasing the transmission of cariogenic bacterial to their babies.¹⁰

It has been found that a motivational program beginning during pregnancy and reinforced when the child's turned 6 and 12 months presented caries reduction when compared to the control-group that participated in the program only in the beginning of the study. The authors concluded that the motivational program with several reinforcement contacts initiated during pregnancy was successful in reducing caries in babies.⁶⁹

The findings of Plutzer & Spencer⁶⁹ serve as the basis for the recommendations of AAPD¹⁰ for prevention of S-ECC:

- The first visit to the dentist must occur between 6 months and 1 year of age with the purpose of preventing the risk factors for caries promoting family education.
- Children cannot fall asleep while having liquids containing fermentable carbohydrates. Breastfeeding on demand must be avoided after the eruption of the first tooth, and the child who falls asleep while being breastfed must have his/her teeth cleaned before going to bed.
- Parents are advised to offer cups when the child is approximately 1 year old. To avoid the use nursing bottles to drink liquids containing fermentable carbohydrates.
- To begin oral hygiene when the first tooth comes out.
- Family members should be advised to avoid sharing silverware, blowing the child's foods, putting the child's pacifier inside their mouths, and kissing the child's

mouth. These measures avoid vertical infection with microorganisms.

Final comments

S-ECC is a public health problem and it requires involvement of all health professionals that provide care to children. Oral health cannot be seen as separate from general health. The objective of dentistry surpasses the preservation of the teeth; it aims at maintaining oral and systemic health.

Children receive notions of oral care and values from their families. Therefore, we should change the risk factors for caries development by establishing a partnership with the family, having prevention as the main focus. Prevention is inexpensive, but it demands efforts from family members, who sometimes are not aware of the consequences that caries can bring, or when they realize the problem, the disease is already installed resulting in consequences to the child and family's life.

It is important that the health professionals who provide care to children know how to recognize and change risk factors for disease development, since events that take place during childhood can have an impact on adulthood, influencing the child's future health status.^{70,71}

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