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**Review Article**

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## **Early Childhood Caries and the Role of Pediatricians in its Prevention**

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### **ABSTRACT**

*The aim of this study is to review the existing literature about early childhood caries and the role of pediatricians in regards to prevention of this condition. Early childhood caries is a multi-factorial disease and several factors are implicated in its establishment. Control of this disease is very difficult and affected children have diminished oral health-related quality of life. Taking all evidence together, we propose that physicians and specially pediatricians have an important task to help parents in preventing early childhood caries by delivering suitable and organized information.*

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### **INTRODUCTION**

There is an imprecise tendency for separating oral and general health. Therefore, it is imperative to increase the professionals' knowledge about the caries process and the factors responsible for it, and engage them more actively in oral health improvement and prevention. In this regard there is a need to create a closer cooperation between pediatricians, physicians and pedodontists.

Early Childhood Caries (ECC) is a particular form of dental caries occurring in young children in a distinct pattern. Because of the early onset of the condition and frequent visits by pediatricians and physicians, they have the unique opportunity to affect the oral well-being of the children. The objective of this article is to provide information about the entity, epidemiology, etiology and

consequences of ECC and finally propose guideline for pediatricians regarding prevention of it.

## DEFINATION OF ECC

ECC is a bacterial transmissible infection and since it may lead to significant oral and systemic complications, it is an important public health issue (1). American Academy of Pediatric Dentistry (AAPD) has demonstrated the exclusive and virulent nature of ECC (2). There are two approximate yet distinct descriptions for ECC and Severe Early Childhood Caries (S-ECC) in the literature. ECC is described as the existence of one or more decayed, missing (due to caries) or restored tooth surfaces in a child of 71 months of age or younger. While, any sign of smooth surface caries in children younger than 3 years of age is indicative for S-ECC (3,4).

In addition to this clear description, there is a characteristic appearance following a specific pattern for ECC and S-ECC. In this regard, ECC comprises of dental decays of primary upper incisors followed by the upper and lower first primary molars and the upper canines and occasionally mandible canines (3,5,6) (Figures 1 and 2).

In S-ECC, many teeth are affected with a rapid progressive trait, simultaneously after tooth eruption and in surfaces with low risk for caries development (2,7-9). Sequence and severity of caries involvement is indicated by the sequence of tooth eruption, which results in various timing and duration of tooth exposure to the predisposing factors (10).



Figure 1. ECC in 3-year-old boy



Figure 2. ECC in 5-year-old girl

## EPIDEMIOLOGY

Although a dramatic decrease in the prevalence of dental caries in preschool children of developed countries has been reported, dental caries remains the most prevalent chronic childhood disease (10,11). It is believed that its prevalence is 5 times higher than that of asthma and 7 times greater than that of allergic rhinitis (1).

On the whole, the prevalence of ECC is fluctuating between 1 to 70% (9-11), with a higher prevalence in low socioeconomic groups and less educated populations (7,10,12,13). The prevalence of ECC in western countries is estimated to be between 1 and 12% (13). While, the frequency of ECC in less developed countries like Zimbabwe and Madagascar, is reported to be 25% and 85%, respectively (14). Prevalence of 26.8% in 18-36 months old Brazilian (15) and 19.5% to 44% in Iranian children (7) is also found.

## ETIOLOGY

The etiology of ECC comprises of cariogenic microorganisms, rich carbohydrate diets and the host. The combination of these factors leads to demineralization and consequently dental decays (1,2,5,7,8,10,16,17). Other factors discussed later are also proposed.

**Microorganisms:** Mutans streptococci (MS) is the main microorganism isolated from children with ECC (9). The time and the way of MS acquisition are important variables in natural history of the disease (8). The earlier the

colonization happens, the greater will be the probability of caries formation (7,10). There are controversial reports about the exact age of MS colonization (10,17), but it is mostly reported to happen during the first year of life (10). Acquisition of MS increases during a time period known as “window of infectivity” which coincides with the eruption of lower incisors (6 months) and upper molars (24 months) (1).

There are two main routes for MS transmission: vertical or horizontal routes. Vertical transmission from mother’s saliva to infant’s mouth is the principal and main way (8,10,17). Although less common, horizontal transmission may be a way of acquisition of MS. This type of transmission occurs mostly in nursery facilities of day care centers or within the siblings (1,7).

Some neonatal factors such as the method of delivery may influence the risk of early acquisition via vertical transmission. There is some evidence that children with cesarean section acquire MS earlier compared to vaginally delivered children (7).

**Diet:** Among all sugars, sucrose has the most significant effect on the initiation and the progression of decays (1,8). It has been demonstrated that sucrose produce dextran, which is an essential element in adhering bacteria to the tooth surface, thus increasing the proportion of MS and lactobacilli (10).

Various foods have diverse cariogenic potential. It is shown that bovine milk is the least acidogenic drink with a minimum pH of 6.3. This is due to especial proteins such as casein, which is proved to have significant anticaries characteristics. Animal and epidemiologic studies have demonstrated the cariostatic effect of cow’s milk, while most of the infant’s formula show acidogenic properties (10).

**Host factors:** Host factors include saliva and its immunological factors, morphology and genetic characteristics of the tooth (size, surface,

depth of the fossae and fissures) and dental crowding (1,8). Immediately after eruption and prior to ultimate maturation, tooth enamel is significantly susceptible to bacterial attacks and consequently dental caries (8,10). Post eruptive maturation is accomplished by incorporation of salivary available ions such as fluorine, protecting the exposed enamel surfaces (8). Saliva also acts as a remineralization medium, with its calcium, phosphate and carbonic acid-bicarbonate reservoir (1,8,10).

**Oral hygiene:** A positive correlation exists between visible dental plaque and caries risk. Thus, regular tooth brushing particularly before going to bed with fluoridated tooth paste has an important role in preventing ECC (8).

**Socioeconomic factors:** Family socioeconomic status significantly affects the children oral health and the development of dental caries. In other words, ECC is commonly found in families with poor economic conditions, single parent families, low educational level of parents, and ethnical or racial minorities (8,10,17).

In fact parents education, particularly mother’s educational level, her dental behavior and knowledge contribute to caries risk (8). Also parental tooth brushing habits, their mouth cleaning methods and parental caries experience history are of great importance (10).

Children in deprived families are commonly suffering from malnutrition and under nourishment during fetal life and low birth weight, which consequently lead to enamel defects (8,10,17,18). Additionally, these children tend to have their first dental visit at an older age and mostly with acute painful dental problems. Because of the financial problems in these families, children are usually not exposed to preventive measures such as fluoride therapy (10). They are predisposed to high levels of streptococcal colonization and a greater preference for carbohydrate rich foods (10). Furthermore ECC is found to be more common in children whose mothers had full-time

job compared to those with part time jobs or house wives, and this is more usual in low economic status families (8).

**Bottle feeding:** The relationship between ECC and bottle feeding is well stated in several studies (10). Delayed and regular use of sugary or fermentable drinks may cause early childhood caries (9). One study showed that ECC is five times more prevalent in children who had been bottle-fed in comparison with children who were breast-fed (10).

Wrong bottle feeding habits increases the caries risk and not the bottle feeding solely (10). It has been shown that reduction in salivary flow in combination with baby bottle during the night acts as a threat for oral health. The lower salivary flow rate, may lead to a decreased acid neutralizing capacity of saliva, stagnation of fermentable substrates and prolonged exposure of the tooth surface to them (10).

Other inappropriate bottle feeding behaviors are frequent day time bottle feeding and long duration of its usage beyond one year (10). Milk based formulas even those lacking sucrose, fruit juices and carbonated drinks are considered cariogenic and in association with ECC. Fruit juices and carbonated beverages reduce the plaque pH, thus, initiating the caries process (8,10).

**Beast feeding:** Although there are reliable evidences showing that the severity of the ECC is related to the poor feeding habits, *in vitro* studies have demonstrated human milk is not cariogenic, since it does not reduce the enamel pH. On the other hand, its massive reservoir of calcium and phosphorous promotes enamel remineralization (1).

## CONSEQUENCES

Since ECC is defined as a progressive disease, its impact may remain for the whole life (13) and is considered as a social, functional, physical and behavioral complication (8,9,13). Children with ECC are more likely to develop additional caries

during their primary or permanent dentition (2,6-8,12,16). If untreated, ECC may lead to dental pain, abscess formation, fever, lack of appetite and lethargy which influences the everyday activities (7,8,16). Long term effects of ECC include premature loss of front or back teeth leading to esthetic problems, malocclusion, delayed or deficient growth and low self-esteem (1,2,7-10,12,14,16). Complicated dental treatments may need hospitalization, sedation or general anesthesia which is more expensive and time consuming (2,7,8,11). All of these complications are costly to the child, their parents and the whole society (8).

## THE ROLE OF PEDIATRICIANS AND PHYSICIANS IN ECC PREVENTION

The first step in prevention of ECC starts in prenatal period. At this time the majority of parents are not aware of the importance of preventive dental practice prior to the child's birth and its influence on the future infant's oral and overall health (8).

It is essential for pediatricians to help mothers to have knowledge about their current oral hygiene, sugar consumption and caries status (17). As mother's oral bacterial count determines the infant's oral cariogenic bacteria, it is imperative that pediatricians explain the effect of reducing mother's MS level on decreasing infant caries risk (12,17). Referring the expectant mothers for restoring dental caries and using bactericidal mouth rinse regularly will improve the oral hygiene and reducing the bacterial count (7).

Via prenatal counseling, pediatricians and physicians can discuss poor nutrition during pregnancy and low birth weight as risk factors of ECC. The physicians should emphasize the importance of suitable nutrition during pregnancy because during this period the enamel formation is to be started (19).

Early childhood is an important time in establishing preventive habits, as tooth eruption and bacteria colonization initiates in this time

period (14). During this period not all children have access to professional dental care. Contact of a child with a family physician or pediatrician typically occurs earlier than a child's first dental visit. On average children are seen 11 times for well visits with a physician by three years of age (11). So that dietary counseling during these visits can help in preventing ECC development by increasing parental information about the influence of improper feeding practices and sweetened drinks during the night time (17).

Mothers should be recommended to hold infant during breast feeding. Bottle feeding may be stopped at the age of 12 months, at which the child is able to drink from a cup. American Academy of Pediatrics (AAP) recommends breast feeding for all, but prolonged, excessive or frequent bottle feeding is discouraged. In order to reduce the risk of ECC, it is advocated to feed the child only with formula or milk and not fruit juice, because of their cariogenic nature (17). Beside these, the possibility of transmission of MS through kissing, shared spoon and *etc.* from mother and other individual should be emphasized.

Tooth cleaning/brushing initiation from the eruption of the first primary teeth is a general recommendation that pediatricians can provide to parents (20). Child's teeth should be brushed after each feeding or at least daily (2). Tooth brushing should be performed by parents in preschool children. As fluoridated materials have significant influence on the prevention of ECC, a pea size amount of dentifrice is recommended for children under 6 years. However, tooth paste should be implemented in children older than 2 years (2).

Also pediatricians should provide information on the timing of the first dental visit and refer affected children to pedodontist for fluoride therapy and other therapeutic measures. According to AAPD the first dental examination should be done at the time of eruption of the first tooth and no later than 12 months. At the first

dental visit a dietary counseling, risk assessment and dental and oral examination will be conducted (3).

## CONCLUSION

ECC can be prevented and managed if proper information and skills are implemented. Health professionals, especially pediatricians can engage parents in motivational interviewing and help them to prevent ECC and promote oral health practice.

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