

Early Childhood Dental Caries and Protective Strategies

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Abstract: Dental caries is the most common health problem of childhood caused by the bacteria, especially streptococcus mutant and sugary diet. So we should educate parents and caregivers about the causes of dental carries and how to protect their children from tooth decays. There are different causes of tooth caries such as the kind of nourishing food contents, oral hygiene, toothpaste contents, proper tooth brushing and daily tooth brushing. It is known that when the sugar containing food consumed in daily diet with the help of tooth decay bacteria as streptococcus the sugar is fermented and results in the formation of lactic acid. Finally, the pH of the environment decreases which will ends in the dental caries formation. The main idea of this review is to give a remarkable look at early childhood dental caries in terms daily nourishing, food contents, oral hygiene and its preventive ways with the help of parents and caregivers.

Keywords: Dental Caries, Nourishing Food and Tooth Brushing

1. Introduction

Dental caries, otherwise known as tooth decay, is one of the most prevalent chronic diseases of people worldwide; individuals are susceptible to this disease throughout their lifetime. Dental caries forms through a complex interaction over time between acid-producing bacteria and fermentable carbohydrate, and many host factors including teeth and saliva. The disease develops in both the crowns and roots of teeth, and it can arise in early childhood as an aggressive tooth decay that affects the primary teeth of infants and toddlers (Çolak et al., 2013). Risk for caries includes physical, biological, environmental, behavioral, and lifestyle-related factors such as high numbers of cariogenic bacteria, inadequate salivary flow, insufficient fluoride exposure, poor oral hygiene, inappropriate methods of feeding infants, and poverty. The approach to primary prevention should be based on common risk factors. Secondary prevention and treatment should focus on management of the caries process over time for individual patients, with a minimally invasive, tissue-preserving approach.

Dental caries is one of the main preventable childhood diseases (Pitts, 2007). It is the primary cause of oral pain and tooth loss in children (Featherstone, 2000). Caries are the localized destruction of the tissues of the tooth by bacterial action. Either enamel or cementum is demineralized by microbial acids. The initial caries lesion is sub-surface, due to acid diffusion. The primary lesion that is detectable clinically is known as a white spot and can be reversed by re-mineralization and regrowth of hydroxyapatite crystals, a process enhanced by fluoride. Advanced caries results in cavitation, and can progress to the dentin and into the pulp chamber ultimately causing necrosis and periapical abscesses. (Ozdemir, 2014).

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The term “early childhood caries (ECC)” was suggested at a 1994 workshop sponsored by the Centers for Disease Control and Prevention in an attempt to focus attention on the multiple factors (i.e. socioeconomic, behavioral, and psycho-social) that contribute to caries at such early ages, rather than ascribing sole causation to inappropriate feeding methods (American Pediatric Dentistry, 2001).

In the initial phase, ECC is recognized as a dull, white demineralized enamel that quickly advances to obvious decay along the gingival margin (Berkowitz, 2003). Carious lesions may be found on either the labial or lingual surfaces of the teeth and, in some cases, on both (Kelly & Bruerd, 1983).

ECC does not only affect children's oral health, but also the general health of children (Naidu et al., 2016). Not only oral pain, orthodontic problems, and enamel defects, but also problems with eating and speaking can occur as well as an increased risk for caries development in the permanent dentition (Abanto et al., 2011). As soon as sugars, especially sugary food and beverages, are consumed, the commensal plaque microbiota will absorb these saccharides and metabolize them into acids, mainly lactic acid (Touger & Loveren, 2003). This acid production leads to a pH shift from around 7 (neutral) to a pH < 5.5 (acidic) (Struzycska, 2014). Acid-tolerant bacteria, mainly mutant streptococci, are able to survive these acidic environments (Touger & Loveren, 2003). When oral hygiene habits and nutritional habits do not change, a reduction of highly cariogenic microorganisms (mutant streptococci, *Candida* spp., and lactobacilli) cannot be achieved (Klinke et al., 2014).

In conclusion, ECC develops as soon as the dental plaque is not removed adequately and a sugary diet, especially sweetened food and beverages, is consumed. This leads to a changing metabolism with the dental plaque microbiota producing mainly lactic acids that will demineralize the enamel. *Prevotella* spp. and *Veillonella* spp. were shown to be microbial risk factors, while together with fungi, bacteria can trigger acid metabolisms and virulence of the microorganisms (Hajishengallis et al., 2017).

2. Prevention of Early Childhood Caries

There are three general approaches that have been used to prevent ECC: Education, early detection and dietary habits. All three approaches include training of mothers or caregivers to follow healthy dietary and feeding habits in order to prevent the development of ECC.

Oral Health Education

Dental caries cannot occur without the substrate component of sugar. Therefore, much of the professional advice and practical research has focused on modification of the infant diet and feeding habits through education of the parents. (Ismail 1998). Child health professionals, including but not limited to physicians, physician assistants, nurse practitioners, and nurses, can play a significant role in reducing the burden of this disease. While most children do not visit a dentist until the age of 3 years, children have visited a child health professional up to 11 times for well-child visits by this age (Overton 2005). Oral health education is a designed package of information, learning activities, or experiences that are intended to produce improved oral health. (Adair & Ashcroft 2007). With the primary goal of disease prevention, its purpose is to facilitate decision-making for oral health practices and to encourage appropriate choices for these behaviors.

Effective health education may thus (Curnow et al., 2002):

- produce changes in knowledge;
- induce or clarify values;

- bring about some shift in belief or attitudes;
- facilitate the achievement of skills; and
- bring about change in behaviors or lifestyles.

Health promotion programs to stimulate tooth brushing have been among the most successful educational programs (Almeida et al., 2003). Cross-sectional surveys, clinical trials, and experiments for tooth brushing research studies involving populations of 1450–1545 children have found that tooth brushing with flossing twice a day resulted in increased tooth retention (Curnow et al., 2002).

The American Academy of Pediatric Dentistry (AAPD) has given recommendations on anticipatory guidance, bottle-feeding habits to prevent ECC, and infant/toddler oral hygiene care (Pediatr Dent. 2008).

Avoiding caries-promoting feeding behaviors

1. Fluoride Repetitive consumption of any liquid containing fermentable carbohydrates from a bottle or no-spill training cup should be avoided.
2. Between-meal snacks and prolonged exposures to foods and juice or other beverages containing fermentable carbohydrates should be avoided.

The use of fluorides for dental purposes began in the 19th century. Fluorides are found naturally throughout the world (Ercan et al., 2010). They are present to some extent in all foods and water, so that all humans ingest some fluoride on a daily basis. In addition, fluorides are used by communities as a public health measure to adjust the concentration of fluoride in drinking water to an optimum level (water fluoridation); by individuals in the form of toothpastes, rinses, lozenges, chewable tablets, drops; and by the dental professionals in the professional application of gels, foams, and varnishes.

Fluoride varnish is a concentrated topical fluoride with a resin or synthetic base. At least 19 fluoride varnish reviews (Weintraub, 2003) including a systematic review (Bader et al., 2001) and three meta-analyses (Marinho et al., 2003) have been published in English. In the last three decades, a great deal of research published that evaluated fluoride varnish efficacy in the permanent teeth of school-aged children (J Dent Educ. 2001), regarding fluoride varnish differed for permanent and primary teeth. All of these studies stated that the evidence for the benefit of applying fluoride varnish to permanent teeth is generally positive. Fluoride varnish works by increasing the concentration of fluoride in the outer surface of teeth, thereby enhancing fluoride uptake during early stages of de-mineralization. The varnish hardens on the tooth as soon as it contacts saliva, allowing the high concentration of fluoride to be in contact with tooth enamel for an extended period of time (about 1–7 days). This is a much longer exposure compared to that of other high-dose topical fluorides such as gels or foams, which is typically 10–15 minutes. The amount of fluoride deposited in the tooth surface is considerably greater in de-mineralized versus sound tooth surfaces (Ten & Featherstone, 1991). Thus, the benefits of fluoride varnish are greatest for individuals at moderate risk or high risk for de-mineralization or tooth decay (Marinho et al., 2004).

There is a global consensus that regular use of fluoride (F) toothpaste constitutes a cornerstone in child dental health. In fact, a global survey revealed that most experts addressed F toothpaste as the main reason for the dramatic decline in caries during the last decade of the 20th century (Bratthall et al., 1996). Moreover, toothpaste is probably the most readily available form of F and tooth brushing is a convenient and approved habit in most cultures (Marinho, 2008). Working groups within national

Health Technology Agencies have independently and in parallel presented strong scientific evidence that daily tooth brushing with F toothpaste is the most cost-effective, self-applied method to prevent caries at practically all ages (Jones et al., 2005). Because small children usually swallow 30% of the paste, it is important to limit the amount of toothpaste to a pea size or less. (Seppä, 20014). The amount of toothpaste should not exceed the size of a rice grain or the tip of a pencil eraser for children as young as 6–12 months of age (Twetman et al., 2000). Fluoride products such as toothpaste, mouth rinse, and dental office topical has been shown to reduce caries between 30% and 70% compared with no fluoride therapy (Featherstone 2004). Because young children tend to swallow toothpaste when they are brushing, which may increase their exposure to fluoride (Jenkins, 1985).

The most common method for systematically applied fluoride is fluoridated drinking water shown to be effective in reducing the severity of dental decay in entire populations. Fluoridation of community drinking water is the precise adjustment of the existing natural fluoride concentration in drinking water to a safe level that is recommended for caries prevention (Çolak et al., 2014). Not only children, but also their parents should be motivated to take care of the primary dentition to prevent ECC and consequently further caries development in the secondary dentition (Colak et al., 2013).

In conclusion, ECC develops as soon as the dental plaque is not removed adequately and a sugary diet, especially sweetened food and beverages, is consumed. This leads to a changing metabolism with the dental plaque microbiota producing mainly lactic acids that will demineralize the enamel. *Prevotella* spp. and *Veillonella* spp. were shown to be microbial risk factors, while together with fungi, bacteria can trigger acid metabolisms and virulence of the microorganisms (Hajishengallis et al., 2017).

The primary dentition usually erupts 6 to 8 months after birth (Teng et al., 2015). As the oral cavity is highly sensitive, soft touches of the oral mucosa and gingiva should be performed in the early infant life to get the infants used to tooth brushing. Tooth brushing of at least two to three minutes should be performed two times a day by the caregivers as soon as the first tooth erupts (Teng et al., 2015). Most dentists recommend to use a “pea-size” amount of a fluoride toothpaste for children, which contain usually not more than 500 ppm fluoride (J. American Dent. Assoc. (2006). Additionally, fluoride gels could be used (Limeback & Robinson, 2012).

3. Treatment

Treatment of ECC can be accomplished through different types of intervention, depending on the progression of the disease, the child's age, as well as the social, behavioral, and medical history of the child. Examining a child by his or her first birthday is ideal in the prevention and intervention of ECC 59. (Marinho et al., 2015). During this initial visit, conducting a risk assessment can provide baseline data necessary to counsel the parent on the prevention of dental decay. Children at low risk may not need any restorative therapy. Children at moderate risk may require restoration of progressing and carried lesions, while white spot and enamel proximal lesions should be treated by preventive techniques and monitored for progression. Children at high risk, however, may require earlier restorative intervention of enamel proximal lesions, as well as intervention of progressing and cavitated lesions to minimize continual caries development (Pediatr Dent. 2008).

The current standard of care for treatment of S-ECC usually necessitates general anesthesia with all of its potential complications because the level of co-operative behavior of babies and pre-school children is less than ideal.

Stainless steel (preformed) crowns are pre-fabricated crown forms which can be adapted to individual primary molars and cemented in place to provide a definitive restoration (Tinanoff & Douglass, 2001). They have been indicated for the restoration of primary and permanent teeth with caries, cervical decalcification, and/or developmental defects (e.g., hypoplasia, hypocalcification), when failure of other available restorative materials is likely (e.g., interproximal caries extending beyond line angles, patients with bruxism), following pulpotomy or pulpectomy, for restoring a primary tooth that is to be used as an abutment for a space maintainer, or for the intermediate restoration of fractured teeth.

Another approach of treating dental caries in young children is Atraumatic Restorative Treatment (ART). The ART is a procedure based on removing carious tooth tissues using hand instruments alone and restoring the cavity with an adhesive restorative material. (Kindelan et al., 2008). At present, the restorative material is glass ionomer. ART is a simple technique with many advantages, such as it reduces pain and fear during dental treatment (Dalli et al., 2012). It does not require electricity; and it is more cost-effective than the traditional approach using amalgam. (Ercan et al., 2009). It is an alternative treatment available to a large part of the world's population. (Seale & Casamassimo, 2003). In addition, it is mostly indicated for use in children, as it is reportedly atraumatic because no rotary instruments are used and in most cases no local anesthesia is needed (Franca et al., 2011).

4. Conclusion

In conclusion, tooth decay is one of the significant and costly diseases in the world. Thus, strategies to reduce the risk of dental caries are vital. These strategies usually involve decreasing the growth or activity of bacteria especially *S. mutant*. We should modify daily diet. Parents should advise children to avoid eating between meals especially food containing carbohydrate containing food (Schriks & Amerongen, 2003).

Correct method and frequency of brushing should be followed—in the morning and before going to bed and preferably after every major meal. The use of various interdental cleaning aids, such as dental floss, interdental brush (Klock & Krasse, 1978) should be inculcated. The preventative strategy lies within dietary habits. Therefore, children below certain age must be regularly advised and instructed (Ozdemir, 2008).

In additionally to a low sugary diet, children should brush their teeth twice a day under parental supervision and be supported with brushing. The caregivers should especially support very young children (under the age of 3) continuously (Ozdemir, 2018).

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