

REVIEW ARTICLE

Early Childhood Caries: Causes And Preventive MeasuresFatima Tazyeen¹, Gagandeep Kaur Sidhu²**ABSTRACT**

Providing preventative or restorative care to children presents unique challenges due to lack of cooperation and/or combative behavior. Dental caries is a common, chronic disease of childhood. Humanity has been overwhelmed by the persistence of this very unique disease since prehistoric times. This article aims to address some of the issues for consideration regarding early childhood caries, its multi-factorial nature and its preventive measures.

Keywords: Dental caries; Fluoride; Breastfeeding; Socioeconomic status

How to cite this article: Fatima Tazyeen, Gagandeep Kaur Sidhu. Early childhood caries: causes and preventive measures. International Journal of Contemporary Medical Research 2015;2(3):639-642

¹Consultant Pedodontist, Senior Lecturer, Department of Oral Pathology and Microbiology, Maharaja Ganga Singh Dental College and Research Centre, Sriganganagar, Rajasthan

Corresponding author: Dr. Fatima Tazyeen, 3/252 Gominagar, Opposite Gomati nagar railway station, Lucknow.

Source of Support: Nil

Conflict of Interest: None

INTRODUCTION

Providing restorative care or preventive care to children represents a unique challenge to the dentist because of lack of cooperation and combative behavior. Possibly the most important factor in determining a child's oral health is their parent's knowledge, awareness and attitude about good oral health, dental hygiene, nutrition and their approach to dental care. Many parents are not aware of the strong relation between the oral health and overall health.¹ Caries is a serious oral health issue in children. It is infectious progressive disease that causes destruction of the tooth structure and is induced by the diet and, instead of its decline in all age groups on a worldwide basis, especially due to fluoridization, its prevalence remains stable in deciduous dentition.² Early childhood caries are multiple carious lesions

affecting the primary teeth of infants and preschool children. They are associated with a prolonged and night bottle-feeding rich in fermentable carbohydrate stuff. The carious lesions characterized by their pattern or sequence and the rapidity of their destructive process that results in a widespread loss of tooth structure.³ According to ADA, early childhood caries are defined as the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries) or filled tooth surfaces in any primary tooth in a preschool-age child between birth and 71 months of age. The term "Severe Early Childhood Caries" refers to "atypical" or "progressive" or "acute" or "rampant" patterns of dental caries.⁴

Wyne⁵ distinguished three types of early childhood caries (ECC):

- ECC type I (mild to moderate form): isolated carious lesions in molars and/or incisors (often between two and five years of age).
- ECC type II (moderate to severe form): labial and palatal carious lesions in the maxillary incisors and primary molars.
- ECC type III (severe form): almost all teeth affected, including the lower incisors; in general, this form occurs between the three and five years of age.

Etiology

Harris R et al⁶ carried out a systematic literature review of the international literature from 1966 to 2002 and reported a total of 106 risk factors for the prevalence or incidence of caries and analysed the importance of individual risk factors for caries in primary teeth. The most significant combination was an early infection with *S. mutans*, an unfavourable dietary pattern, and frequent intake of sugar with inadequate oral hygiene. The other factors are low socio-economic status, immigrant families, inadequate health literacy and low educational attainment in parents, in particular in mothers, are all risk factors for a number of diseases including early childhood caries.⁷

Cariogenic microorganisms

The main cariogenic microorganisms are *S. mutans* streptococci, especially *Streptococcus mutans* and *Streptococcus sobrinus*.⁸ Initiation of caries with primary streptococcal infection is followed by the

accumulation of streptococci in the biofilm at pathogenic concentrations which is secondary to the frequent and prolonged exposure to a cariogenic diet. This is followed by fermentation of sugars by streptococci present within the dental plaque that results in enamel demineralization leading to cavitation of dental structures. Colonization of tooth surface by these pathogens produces acid at a faster rate as compared to the capacity of neutralization.² These bacteria can be transmitted via vertical and horizontal route. Vertically can be transmitted from caregiver to child through salivary contact depending upon the frequency and amount of exposure. Children of mothers with high levels of MS due to untreated caries, are at greater risk of acquiring the organism earlier than children whose mothers have low levels. Horizontal transmission occurs between other members of a family or children in daycare. Saliva-sharing activities such as sharing of utensils, orally cleansing a pacifier should be eliminated to reduce child's acquisition of cariogenic microbes.¹⁰

Dietary pattern

Marshal TA¹¹ carried out a study to find the effect of present day changes in drinking patterns among children's and suggested that present-day changes in beverage patterns, particularly the increase in soda pop consumption and decrease in milk intake can result in increase in dental caries rates among children. Faye M et al³ carried out a study to evaluate the patterns of the carious lesions and their relationship to the diet and observed that carious lesions were present on all tooth surfaces but the most common lesion pattern was complete coronal destruction followed by lesions in three surfaces of the tooth. The most frequently affected tooth was the association maxillary incisors and molars and the mandibular molars. The carious lesions were more severe and more frequent in children fed with breast milk associated with pap (traditional maize porridge in South Africa) and hard food and in those fed with breast associated with the bottle pap and food than to children exclusively breast-fed. Hallet et al¹² carried out a cross-sectional study and reported use of bottle, mainly after 12 months, in bed, at night, frequently drinking sweetened liquids throughout the day; beginning to use cups after 24 months and introduction of solid foods after 9 months are the associated risk factors.

Breastfeeding and early childhood caries

Most authors contend that caries is associated with breastfeeding when the consumption pattern has certain aspects such as ad libitum feeding, prolonged breastfeeding, large number of breastfeedings a day

and frequent breastfeedings during the night that results in accumulation of milk within the teeth, which, combined with reduced salivary flow and lack of oral hygiene, may lead to tooth decay.^{2,13} Erickson PR et al¹⁴ carried out study to investigate the role of human breast milk in caries development and derived conclusion that human milk is not cariogenic because it does not decrease the enamel pH significantly in breastfed infants, aged between 12 and 24 months; allows moderate growth of *Streptococcus sobrinus* (i.e., it does not inhibit or stimulate the growth of this microorganism); promotes enamel remineralization by way of calcium and phosphate deposition on the enamel surface; has a poor buffering capacity; and does not cause in vitro enamel decalcification after twelve weeks. However, when sucrose is added to human milk, caries developed in the dentin within 3.2 weeks.

Socioeconomic status

Marmot M et al¹⁵ published a paper regarding the perspective of health inequality and analyzed that there is a correlation between unfavourable socioeconomic conditions and the presence of diseases. VE dos Santos¹⁶ carried out a cross sectional study to assess the prevalence of early childhood caries (ECC), perinatal factors (gestational age, teenage pregnancy and birth weight), family income and nutritional risk in children and concluded that the prevalence of ECC was related to low family income, premature birth and infant obesity.

Host Susceptibility

Hertzman C et al¹⁷ suggested that human life events can change stable biological mechanisms and change them into a genetic legacy process called incorporation of biologic features. Thus, the traditional etiological factor for caries, which involves the poor oral hygiene, association of high sugar intake, lack of exposure to fluoride and perinatal disturbances related to enamel defects, which could affect the genetic legacy. Targino et al¹⁸ carried out a 7-year cohort study, revealed that enamel defects constitute a risk factor for the development of early childhood caries. The literature shows that prematurely born individuals have poor mineralization of the teeth and poorer oral health indicators, supporting the evidence of the role played by enamel defects in the development of ECC. Thus, perinatal factors such as low birth weight and gestational prematurity are risk factors for the development of early childhood caries.¹⁶

Attack pattern of caries

The ECC attack pattern depends on three factors: the timing of the tooth eruption, the time span of the

harmful oral habit, and the type of muscle movements the child makes when sucking. The maxillary primary incisors are usually the first affected teeth, followed by the first primary molars.¹⁹ ECC evolves from decalcification of maxillary deciduous incisors immediately after their eruption, affecting the deciduous molars and canines, if not controlled. While the four maxillary deciduous incisors are the most severely affected teeth by ECC whereas mandibular incisors usually escape ECC because they are protected by the tongue and moistened by the saliva from submandibular glands.² If the mandibular incisors are affected it is usually an indication that the caries are caused by inappropriate pacifier use, or that the child has a classic case of rampant caries.²⁰ Brodeur JM et al¹⁹ suggested that a caries attack pattern should be established for different age categories of children-ages 0 to 71 months. Drury et al²¹ recommend the use of six categories: under 12 months, 12-23 months, 24-35 months, 36-47 months, 48-59 months and 60 to 71 months.

Prevention

Proper oral hygiene practices, such as cleaning an infant's teeth after consumption of foods, liquids, or medication containing fermentable carbohydrates, should be initiated by the time of the eruption of the first tooth. A child's teeth should be periodically checked at home according to the directions of the dentist.⁴ Implementation of oral hygiene measures should be started at the time of eruption of the first primary tooth. Toothbrushing should be performed using a soft toothbrush of age-appropriate size for children by a parent twice daily. 'Smear' or 'rice-size' amount of fluoridated toothpaste should be used in all children under the age of three and a 'pea-size' amount of fluoridated toothpaste should be used in all children ages three to six years.²² As cariogenic bacteria (especially mutans streptococci) are transmitted soon after the eruption of first teeth, reducing the mother's mutans levels may reduce the child's risk of developing ECC. The Association suggests that parents, including expectant parents should be encouraged to visit a dentist to ensure their own oral health and should be counseled regarding preventive measures so that they can perform necessary steps to protect the oral health of their offspring.⁴ Avoidance of high frequency consumption of liquids and/or solid foods containing sugar in particular sugar-containing beverages (eg, juices, soft drinks, sweetened tea, milk with sugar added) in a baby bottle or no-spill training cup is recommended. Infants should not be put to sleep with a bottle filled with milk or liquids containing sugars. Ad libitum breast-feeding should be avoided after the first primary tooth begins to erupt and other

dietary carbohydrates are introduced. Parents should be encouraged to have infants drink from a cup as they approach their first birthday. Infants should be weaned from the bottle between 12 to 18 months of age.²³ Fluoride acts to slow demineralization and enhance remineralization of teeth, thus providing prevention benefit. According to National Maternal and Child Oral Health Resource Center, 2004 survey, topical fluoride in water and toothpaste reduces tooth decay by 29% to 51% in children and adolescents. Fluoridated water and toothpaste are inexpensive, easily accessible and are effective ways to reduce dental caries. Fluoride varnish, applied by health professionals, has been found to be effective in preventing or reducing caries in the primary teeth of infants and children.²⁴

CONCLUSION

The biological determinants, the triad of key causal factors cariogenic microorganisms, cariogenic substrate and susceptible host (or tooth)² are the factors that interact in a certain period of time, causing an imbalance in the demineralization and remineralization between tooth surface and the adjacent plaque (biofilm). The early childhood caries is still a serious public health concern and its control should be a priority, since it may lead to malocclusion of permanent teeth, can cause speech problems, malnutrition and lower self-esteem in children. Pediatricians, dietitians and pediatric nurse practitioners should play their part to help pediatric dentists to provide guidance to parents of infants or toddlers regarding preventive measures, restorative methods and home-care of their offsprings.

REFERENCES

1. Early Childhood Caries Planning, Peoria County August, 2010. Available at: www.peoriacounty.org
2. Ribeiro NM, Ribeiro MA. Breastfeeding and early childhood caries: a critical review. *J Pediatr (Rio J)*. 2004;80:S199-210.
3. Faye M, Ba AA, Yam AA, Ba I. Caries patterns and diet in early childhood caries. *Dakar Med*. 2006;51:72-7.
4. <http://www.ada.org/en/about-the-ada/ada-positions-policies-and-statements/statement-on-early-childhood-caries>
5. Wyne AH. Early childhood caries: nomenclature and case definition. *Community Dentistry and Oral Epidemiology* 1999;27: 313-315.
6. Harris R, Nicoll AD, Adair PM, Pine CM. Risk factors for dental caries in young children: a

- systematic review of the literature. *Community Dental Health* 2004; 21: 71-85.
7. Borutta A, Wagner M, Kneist S. Early Childhood Caries: A Multi-Factorial Disease. *OHDMBSC* 2010;9:4-10
 8. Seow KW. Biological mechanisms of early childhood caries. *Community Dent Oral Epidemiol.* 1998;26:8-27.
 9. Guedes-Pinto AC, editor. *Odontopediatria*. 6^a ed. São Paulo:Santos; 1997.
 10. Berkowitz RJ. Mutans streptococci: Acquisition and transmission. *Pediatr Dent* 2006;28: 106-9.
 11. Marshall TA, Levy SM, Broffitt B, Warren JJ, Eichenberger- Gilmor JM, Burns TL, et al. Dental caries and beverage consumption in young children. *Pediatrics* 2003;112:e184-91.
 12. Hallet KB, O'Rourke PK. Early childhood caries and infant feeding practice. *Community Dent Health.* 2002;19:237-42
 13. Schafer TE, Adair SM. Prevention of dental disease. *Pediatr Clin North Am.* 2000;47:1021-42.
 14. Erickson PR, Mazhari E. Investigation of the role of human breast milk in caries development. *Pediatr Dent.* 1999;21:86-90.
 15. Marmot M, Bell R, Goldblatt P: Action on the social determinants of health. *Rev Epidemiol Sante Publique* 2013;61:S127-S132.
 16. VE dos Santos, Rebeca Maria Brasileiro de Sousa, Maria Cecilia Oliveira, Arnaldo França de Caldas, Aronita Rosenblatt. Early childhood caries and its relationship with perinatal, socioeconomic and nutritional risks: a cross-sectional study. *BMC Oral Health* 2014, 14:47.
 17. Hertzman C, Boyce T: How experience gets under the skin to create gradients in developmental health. *Annu Rev Public Health* 2010, 31:329-347.
 18. Targino AG, Rosenblatt A, Oliveira AF, Chaves AM, Santos VE: The relationship of enamel defects and caries: a cohort study. *Oral Dis* 2011;17:420-426.
 19. Brodeur JM, Galarneau C. The High Incidence of Early Childhood Caries in Kindergarten-age Children. *Journal de l'Ordre des Dentistes du Quebec* 2006;3-5.
 20. Tinanoff N, O'Sullivan DM. Early childhood caries: overview and recent findings. *Pediatr Dent.* 1997;19: 12-6.
 21. Drury TF, Horowitz AM, Ismail AI, Maertens MP, Rozier RG, Selwitz RH. Diagnosing and reporting early childhood caries for research purposes. A report of a workshop sponsored by the National Institute of Dental and Craniofacial Research, the Health Resources and Services Administration, and the Health Care Financing Administration. *J Public Health Dent.* 1999;59:192-7.
 22. Policy on Early Childhood Caries (ECC): Classifications, Consequences, and Preventive Strategies. Reference Manual American Academy of Pedodontics and the American Academy of Pediatrics 2014;36:23-30.
 23. American Academy of Pediatrics. Patient education on line: Weaning to a cup. Available at: "<http://patiented.aap.org/content.aspx?aid=6662>". Accessed January, 2015.
 24. National Maternal & Child Oral Health Resource Center, 2004. Available at: mchoralhealth.org