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REVIEW ARTICLE

Insights into Early Childhood Caries

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ABSTRACT

Childhood and early adolescence are crucial periods in the development of healthy dentition. Early childhood caries (ECC) is an infectious and transmissible disease influenced by multiple factors and requiring a combination of approaches for improvement. Early childhood caries in children is typically first observed clinically as a "white spot lesion." If the tooth surface remains intact and non-cavitated, then remineralization of the enamel is possible. Early childhood caries is a major public health problem, being the most common chronic infectious childhood disease, which is difficult to control. While not life threatening, its impact on individuals and communities is considerable, resulting in pain, impairment of function, and deleterious influence on the child's growth rate, body weight, and ability to thrive, thus reducing the quality of life. With regard to this background, the aim of this review was to explore deep into early childhood caries and its multifactorial nature in detail. Because ECC is an infectious disease, this paper reviews current information regarding the causes, treatment, and prevention of ECC from a microbiologic perspective.

Keywords: Caries, Childhood, Decay.

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INTRODUCTION

Dental caries is an age-old disease that affects humans of all aged throughout the world and is considered a major dental public health problem among children globally.[1] It is a disease that is very difficult to eradicate because of the multifaceted interaction of cultural, social, behavioral, nutritional, and biological risk factors that are associated with its initiation and progression.[2]

Childhood and early adolescence are crucial periods in the development of healthy dentition. Early childhood caries (ECC) is an infectious and transmissible disease influenced by multiple factors and requiring a combination of approaches for improvement.[3] Early childhood caries in children is typically first observed clinically as a "white spot lesion." If the tooth surface remains intact and non-cavitated, then remineralization of the enamel is possible. If the subsurface demineralization of enamel is extensive, it eventually causes the collapse of the overlying tooth surface, resulting in a "cavity." Early childhood caries refers to the presence of 1 or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in a child under the age of 6.[4]

It is strongly associated with vulnerable subpopulations (impoverished, minority, immigrant, migrant, homeless) and is highly prevalent in poor and near-poor preschool children in the United States.[5-7]

Early childhood caries is a major public health problem, being the most common chronic infectious childhood disease, which is difficult to control. While not life threatening, its impact on individuals and communities is considerable, resulting in pain, impairment of function, and deleterious influence on the child's growth rate, body weight, and ability to thrive, thus reducing the quality of life.[8]

Prevention is the most suitable and necessary option to prevent ECC from manifesting. To prevent further tooth destruction and encourage better overall health, treatment should be instituted immediately and specifically. This aggressive approach includes: Fluoride applications, oral hygiene instruction, dietary counseling, and restorative measures, such as atraumatic restorative treatment (ART). To achieve these interventions, advanced behavioral management is an important part of the treatment plan, as even with these proactive measures, children with ECC are likely to develop recurrent caries.

With regard to this background, the aim of this review was to explore deep into ECC and its multifactorial nature in detail. Because ECC is an infectious disease, this paper reviews current information regarding the causes, treatment, and prevention of ECC from a microbiologic perspective.

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RISK FACTORS FOR ECC

Microbiological Risk Factors

Microbial Characteristics of ECC

Bacteriologic studies have demonstrated that in children with ECC, *Streptococcus mutans* regularly exceeded 30% of the cultivable plaque flora. This dense level of dental infection was associated with carious lesions, white spot lesions, and sound tooth surfaces near the lesions.[9,10]

Transmission of S. mutans

The major reservoir from which infants acquire *S. mutans* is their mothers. The evidence for this concept comes from several clinical studies in which *S. mutans* strains isolated from mothers and their babies exhibited similar or identical bacteriocin profiles.[11,12]

Dietary Risk Factors

There is sufficient evidence that sugars (such as sucrose, fructose, and glucose) and other fermentable carbohydrates play a vital role in the initiation and progression of dental caries. Sucrose is the most significant cariogenic food as it converts noncariogenic/anticariogenic foods to cariogenic foods. Sucrose promotes an increase in the proportions of *S. mutans* and lactobacilli and simultaneously decreases the levels of *S. sanguinis*.[13,14]

Susceptible Tooth/Host-related Risk Factors

Several factors can predispose a particular tooth to dental caries. Host risk factors for the development of caries are reduced saliva, immunological factors, and the presence of enamel defects, characterized mainly by hypoplasia, immature enamel, tooth morphology, genetic characteristics of the tooth (size, surface, depth of fossae, and fissures), and crowded/malaligned teeth.[15,16]

Saliva is the major defense system of the host against caries. It removes foods and bacteria, and provides a buffering action against the acids produced. It also functions as a mineral reservoir for calcium and phosphate necessary for enamel remineralization. During sleep, the decrease in salivary flow rate reduces its buffering capacity, consequently making tooth susceptible to caries.[15,16]

ASSOCIATED RISK FACTORS

Bottle Feeding

Bottle feeding, especially nocturnal feeding or, particularly, when children are allowed to sleep with a bottle in their mouth, has been considered cariogenic.[17,18] Du et al[19] found that children who had been bottle-fed had a 5 times greater risk of having ECC compared to children who were breast-fed.

Oral Hygiene

The presence of dental plaque is a high risk factor for developing caries in young children.[20] Some studies have reported that a child's brushing habit, frequency of brushing, and/or use of fluoride toothpaste are associated with the occurrence and development of dental caries.[21] It was found that children who did not have their teeth cleaned at bedtime had a higher risk of developing ECC.[22] As young children lack the ability to clean their own teeth effectively, parents are recommended to clean their children's teeth at least until they reach school age.

Education of Parents

The education level of parents has been shown to be correlated with the occurrence and severity of ECC in their children.[23] Lower prevalence of dental caries and lower mean decayed-missing-filled teeth (DMFT) scores have been associated with higher levels of parental education.[24]

Socioeconomic Factors

There is evidence of powerful links between the individual's socioeconomic experience for disadvantaged children and adverse health events.[25] Children born into low-income families are more likely to have low birth weight, which impacts oral health. They also have more difficulty in school, and poor oral health can increase their school absence. Socioeconomic status can further influence health literacy, which, in turn, affects general health.

Early childhood caries is more common in children from single-parent families and those with parents of low educational level, especially when the mother is illiterate.

CLASSIFICATION OF ECC

Type I (Mild to Moderate) ECC

This refers to the existence of isolated carious lesion(s) involving molars and/or incisors. The cause is usually a combination of cariogenic semisolid or solid food and lack of oral hygiene.

The number of affected teeth usually increases as the cariogenic challenge persists. This type of ECC is usually found in children who are 2 to 5 years old.[26]

Type II (Moderate to Severe) ECC

This refers to labiolingual carious lesions affecting maxillary incisors, with or without molar caries depending on the age of the child and stage of the disease, and

unaffected mandibular incisors. The cause is associated with inappropriate use of a feeding bottle, or at-will breast feeding, or a combination of both, with or without poor oral hygiene. Poor oral hygiene most probably compounds the cariogenic challenge. This type of ECC could be found soon after the first teeth erupt. Unless controlled, it may proceed to become type III ECC.[26]

Type III (Severe) ECC

This refers to carious lesions affecting almost all teeth including lower incisors. This condition is found between the aged of 3 and 5 years. The condition is rampant and generally involves tooth surface(s) that are unaffected by caries, e.g., mandibular incisors.[26]

Consequences of ECC

Early childhood caries is not self-limiting. If treatment for ECC is delayed, the child's condition worsens and becomes more difficult to treat, increasing the cost of treatment. The most common immediate consequence of untreated dental caries is dental pain, which affects children's regular activities, such as eating, talking, sleeping, and playing. Children who had caries of primary dentition early in their life are at a greater risk of developing additional carious lesions in their primary and permanent dentition.[27] Severe ECC can lead to the loss of the child's front teeth at an early age. The child may suffer further developmental setbacks involving speech articulation as these years are critical for speech development. Children with ECC can also experience delays in physical development, especially in height and weight. The pain caused by ECC may lead to a decrease in appetite, ultimately resulting in malnutrition. In fact, early extraction or loss of teeth often results in children suffering from psychological trauma from dental procedures required to restore their teeth. Taunting by siblings, peers, and even extended family members may lead to poor self-esteem.[28]

MANAGEMENT OF ECC

Early childhood caries is an alarming problem because the disease is widespread among young children and, if untreated, can lead to serious disability and, in extreme cases, death.[29] Science-based standards, guidelines, and protocols for effective clinical, behavioral, and nutritional approaches for assessing individual risk, prevention, and management are now needed.

Prevention

Prevention of ECC should begin in the pre- and perinatal periods. The attitudes and awareness of pregnant women may be deficient and unfavorable toward preventive dental practices.[28] Early childhood caries is the result of improper parenting, where children are pacified by unsuitable feeding practices, such as sweetened beverages in cups, or fed biscuits or sweets.[30]

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. Areas of decalcification (early or "white spot lesion") and hypoplasia can rapidly develop cavitation. If lesions are identified early, the use of anticariogenic agents may reduce the risk of development and progression of caries. Fluoride varnish at 1-month intervals may be a practicable option, especially when targeted at children with carious maxillary incisors. Children should also participate in a school-based fluoride mouth-rinsing program.[31] Minimal intervention restorative procedures, such as ART, and the placement of fluoride-releasing glass ionomer cements are efficacious in both preventive and therapeutic approaches.[32] Depending on the extent of the lesions, pulpectomies or extractions may be indicated followed by stainless steel crowns for posteriors and strip crowns for the anteriors.

CONCLUSION

Early childhood caries is very much avertable and controllable with the precise information and skills. A little more efforts and flawless coordination between parents and various oral health care professionals like pediatric dentists, general practitioners, and dental hygienists are required. At every level of healthcare delivery system, early diagnosis and referral and prompt treatment of the children with the signs of decay can help improve the oral and dental health of children.

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