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Treatment of Dental Caries in the Preschool Children and Further Method of Prevention

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Abstract: Early childhood caries is a virulent type of dental decay that has the potential to cause extensive damage to the baby teeth of toddlers and preschool children. This condition is not limited to a specific region, as it affects primarily underprivileged children globally. Typically, the treatment for caries involves either restoring the affected teeth or surgically removing them, accompanied by guidance on feeding habits. Nevertheless, this conventional approach has yielded unsatisfactory clinical results, with relapse rates of around 40% within the initial year following dental surgery. The primary prevention of early childhood caries has mainly focused on advising parents about feeding behaviors that contribute to tooth decay, but this approach has shown limited effectiveness. However, recent strategies that target the infectious aspect by employing topical antimicrobial therapy show potential for better outcomes.

Keywords: preschool, dental caries, prevention, treatment, early childhood caries.

Introduction. Early childhood caries (ECC) is a significant and persistent disease among children, posing a growing public health challenge globally. ECC can lead to an increased risk of developing new caries in both primary and permanent teeth, impacting oral health throughout one's life. The development of ECC is closely linked to changes in the core microbiome of the oral cavity, which can be influenced by dietary habits, oral hygiene practices, fluoride usage, and dental procedures. Therefore, it is crucial to enhance parental oral health knowledge and awareness, establish a dental home early in childhood, and create personalized caries management strategies. Dental treatments based on the minimally invasive approach should be implemented for managing dental caries. This expert consensus focuses on the causes of ECC, assessing caries risk in children, and designing prevention and treatment plans for ECC, with the ultimate goal of promoting lifelong oral health.[1]

Figure 1. Caries of a three-year-old-child's teeth.

The term "dental caries" refers to the outcomes, indications, and symptoms of a localized chemical breakdown of the tooth surface due to metabolic processes occurring in the biofilms (dental plaque) that envelop the affected region. Children aged between 12 and 30 months exhibit a distinct caries pattern that differs from that observed in older children. [2] Caries primarily impacts the maxillary primary incisors and first primary molars in a manner that mirrors the eruption pattern. The longer the tooth remains exposed to the caries challenge, the greater the extent of damage. The upper incisors are particularly susceptible, whereas the mandibular incisors are shielded by the tongue and saliva from submandibular and sublingual glands. This specific dental caries pattern has been referred to as "bottle caries," "nursing caries," "baby bottle tooth decay," or "night bottle mouth." These terms imply that inappropriate bottle feeding is the primary cause of dental caries in early childhood. Current evidence indicates that the use of a sugar-containing liquid in a bottle at night may serve as a significant etiological factor, although it is not the sole factor. Therefore, it is recommended to use the term "early childhood caries (ECC)" when discussing any form of caries in infants and preschool children.[3][4]

The prevalence of early childhood caries (ECC) varies across different groups in developing countries, with disadvantaged groups reporting rates as high as 85%[5]. In the Asian world, the prevalence of ECC at 3 years of age was found to be nearly 25%, and significant correlations were observed with socioeconomic status and ethnicity [6]. A national survey conducted in Bukhara in 2023 revealed that 3.2% of 18-month-old children and 21.5% of 3-year-old children had experienced the ECC [7].

The process of remineralization serves as the body's natural repair mechanism for dental caries, also known as demineralization. During this process, minerals from saliva diffuse into the porous subsurface region of the demineralized lesion. Throughout the day, the cycle of demineralization and remineralization continues.[8] When fluoride is present in saliva, it strongly adheres to the demineralized surface of the tooth, safeguarding its crystal surface against acid dissolution. The outcome of a lesion, whether it progresses, remains the same, or is reversed, is determined by the interplay between protective factors and pathological factors, referred to as the "balance of caries."[9].

Determining the etiology of dental caries in children, providing parental or caregiver education on oral health topics, and managing demineralization are crucial due to the limited cooperative ability of children. Interventions focused on enhancing the intraoral environment have the potential to mitigate the risk of dental caries and halt its progression.[10]

Treatment may involve restorative procedures or the surgical extraction of decayed teeth. Nevertheless, this traditional approach often fails to effectively manage the disease due to the high incidence of caries recurrence around restored teeth and the development of new decay.[11] Studies have shown relapse rates of around 40% within the initial year following dental surgery. Consequently, many countries have transitioned towards a preventive and conservative strategy for managing dental caries rather than relying solely on surgical interventions. The emphasis on prevention and preservation of tooth structure is preferred as the primary approach to managing dental caries.[12] This is supported by the slow progression of dental caries in most individuals, the effectiveness of preventive measures, and the potential harm associated with excessive and premature surgical interventions. In cases where restorative treatment is necessary, modern microrestorative techniques utilizing advanced adhesive materials can help maintain tooth integrity.[13]

In a separate investigation, a cohort of patients who underwent dental surgery under general anesthesia exhibited a noteworthy occurrence of new smooth-surface enamel lesions within a span of 4-6 months. Eidelman et al., in their retrospective analysis of patient records, found that 57% of the study participants who received general anesthesia treatment required further intervention for new carious lesions within 6-24 months following the initial dental surgery. Furthermore, a retrospective study conducted at the Franciscan Children's Hospital and Rehabilitation Center in Boston involving 42 children with ECC treated under general anesthesia revealed that 45% of them experienced a relapse within 12 months after the dental surgery [14]. The current standard of care for ECC, which involves treatment under general anesthesia, yields unsatisfactory clinical outcomes considering the associated morbidity and cost of relapse treatment (such as general anesthesia, sedation, and physical restraint).

To achieve improvements in clinical outcomes, it is imperative to develop novel treatment strategies, such as chemotherapeutic or behavioral approaches, that target the underlying factors contributing to relapse.[15]

Prevention of dental caries for preschool children.

1) Oral hygiene is crucial in the prevention of dental caries and periodontal disease as the presence of bacteria in dental plaques is essential for the progression of these conditions. Daily removal of plaque through brushing, flossing, and rinsing is highly effective in preventing dental caries and periodontal disease. Proper brushing and flossing techniques can be instructed at dental appointments.[16]
2) Fluoride application is an important preventive measure for dental caries as it hinders the demineralization of the tooth's crystal structures and promotes remineralization.[17] The surface of the tooth that has been remineralized becomes more resistant to acid attacks. Moreover, fluoride has the ability to inhibit bacterial enzymes. Various methods of fluoride application include water fluoridation, fluoride toothpaste, fluoride mouth rinse, dietary fluoride supplements, as well as professionally administered fluoride compounds like gels and varnishes.[18]

Conclusion. The prevalence of dental caries among the preschool children in the study was found to be unacceptably high. This finding suggests that the current prevention programs for children's dental caries may be inadequate. In order to enhance effectiveness, it is recommended to implement new intervention programs, such as the application of routine fluoride varnish along with minimal intervention dentistry, for all children. These programs are particularly crucial for children from low socioeconomic backgrounds, those in families with multiple children, and those with poor oral health. Furthermore, dentists should receive additional education on dental check-ups and preventive procedures involving minimal interventions to better serve a larger number of children and achieve a more significant reduction in dental caries among them.

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