

Dental Caries in Children: An Update

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ABSTRACT

Dental caries, also known as cavities, are the most prevalent dental problem in children. The etiology is mostly multifactorial and a result of an imbalance between the constant mineralization and demineralization on the tooth surface. It is important to assess oral health risks, counsel caregivers, and encourage oral hygiene. Recent guidelines by the American Academy of Pediatrics (AAP) underscore the evolving role of the pediatrician in initiating early dental health interventions.

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Dental caries, also known as cavities, are a common problem in children. The age-standardized prevalence worldwide of untreated caries is approximately 8% in deciduous teeth and 29% in permanent teeth [1]. Notable regional variations exist, such as in India and among South Asians, with significant implications for public health [2,3].

It is a complicated and multifactorial problem resulting from an imbalance between the dynamic processes of constant mineralization and demineralization occurring on the surface of the teeth known as the caries balance [4,5]. In a comprehensive review by Kirthinga et al wherein studies from 1981 to January 2019 were analyzed, 123 risk factors for dental caries were identified [6]. In high-income countries, the primary risk factors include dentinal caries and high levels of *Streptococcus mutans* bacteria, whereas enamel defects are more prevalent in upper-middle-income countries. Socio-economic factors such as low household income, maternal education level, mother's employment status, urban or rural residence, being raised by a single mother, and the birth order of the child can also significantly impact the prevalence of dental caries. Dietary habits, particularly the frequency of sugar consumption, quantity of sugar, and timing of meals, as well as calcium and dairy intake during pregnancy are crucial determinants of caries in children.

Feeding practices in infancy, including breastfeeding and bottle feeding, are linked to specific caries patterns, and prolonged breastfeeding beyond six to seven months is associated with a higher caries risk. Oral hygiene practices, notably the use of non-fluoridated toothpaste, tooth brushing frequency, and parental supervision play a critical role in preventing caries. The composition of the oral microbiome, especially the presence of *Streptococcus mutans* and oral thrush, also contributes to caries risk. Other contributing factors include enamel hypoplasia, deep pit and fissures in teeth, and reduced salivary flow resulting from certain diseases like Sjogren's syndrome or specific medications.

The American Academy of Pediatrics (AAP) has recently updated several recommendations for "Maintaining and Improving the Oral Health of Young Children" in a guidance paper [7]. The guidelines were revised given the continued high prevalence of dental caries in children, and these aimed to incorporate emerging evidence on preventive strategies with the changing landscape of oral health care delivery. These recommendations are essential in guiding healthcare professionals, especially pediatricians, in the comprehensive management of oral health for young children. The key updates are as follows:

1. A Shift Toward Early Intervention and Preventive Strategies

One of the key updates is the advocacy for early dental visits, ideally by the age of one year or within six months after the eruption of the first tooth, to establish a foundation for lifelong oral health. This aligns with a broader shift towards early intervention in pediatric oral healthcare [8,9]. The AAP specifically recommends

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brushing children's teeth before bedtime as part of their routine to effectively prevent caries. This practice is vital for removing plaque and reducing the risk of dental caries, forming an integral part of a child's daily oral health care.

Additionally, it emphasizes on the importance of using fluoride toothpaste appropriately in young children – a smear for those aged under 3-years and a pea-sized amount for children aged 3 to 6 years. This specific guidance strikes a balance between maximizing caries prevention and minimizing the risk of dental fluorosis.

This update is based on findings from numerous studies which have shown that the use of fluoride toothpaste plays a significant role in lowering the risk of dental caries [10-12].

The study by Shekar et al. found a complex relationship between fluoride levels and dental caries. In areas with high fluoride concentration like Telangana/Andhra Pradesh, there was a positive correlation with dental caries, suggesting the need for region-specific fluoride usage guidelines [13]. This study highlights the importance of contextual adaptation of these recommendations, especially in a diverse country like India.

2. Dental Home

AAP suggests the establishment of a dental home where there is frequent interaction between the dentist and patient in a comprehensive, continuously accessible, coordinated, and family-centered manner. A dental home should be established within 6 months of the eruption of the first tooth and no later than 12 months of age.

3. Nutritional Counseling and its Role in Caries Prevention

The report advises families to limit the consumption of sugary snacks and beverages, all of which are known to contribute to tooth decay. Instead, a diet rich in fruits, vegetables and water is recommended. The AAP also suggests avoiding the use of a bottle or sippy cup filled with sugary liquids, especially at bedtime. The paper also underscores the importance of dietary counseling aligning with WHO guidelines recommending restriction of sugar intake [14]. Nutritional counseling, thus, becomes a key component of a holistic approach to oral health care.

4. Expanded Role of Pediatricians in Oral Health

In line with the latest guidelines, pediatricians are encouraged to actively participate in oral health counseling, including guidance on brushing techniques, appropriate fluoride use, and the social determinants of health. By advising parents on the necessity of dental checkups, primary care providers can influence the

utilization of dental services and early detection of oral health issues. This marks a significant shift, moving beyond traditional dental practice to integrate oral health more fully into general pediatric care.

The study by Goyal et al highlights a significant gap in the knowledge of pediatricians regarding oral health care in children, including the recommended age to start tooth brushing and the appropriate fluoride concentration in toothpaste [15]. This finding is critical when considering the expanded role of pediatricians in oral health, as suggested by Krol et al [7]. It underscores the need for enhanced training and awareness among pediatricians in India, a sentiment echoed by a study by Karkoutly et al which also found poor knowledge regarding dental health care among pediatricians [16]. This global trend of inadequate oral health knowledge in pediatric care providers emphasizes the necessity of integrating oral health education into pediatric training programs.

5. Teledentistry and Continuous Education

The guidelines also highlight the growing role of teledentistry in enhancing access to dental care and the importance of continuous education for pediatricians to remain informed about the latest oral health practices.

6. Increasing Focus on Behavioral and Educational Interventions

Behavioral interventions, such as modifying dietary habits and improving oral hygiene practices, are emphasized, aligning with the increasing focus on preventive care and education in the management of dental caries. A study by D'Cruz et al demonstrated that active participation of school-aged children in reinforced oral health education (OHE) can enhance their knowledge and practices regarding oral hygiene, leading to better gingival health and reduced plaque accumulation [17]. This aligns with the AAP's focus on education as a key component of oral health maintenance

7. Collaborative Approach in Oral Health Management

Finally, the paper advocates for a collaborative approach involving various healthcare professionals in managing oral health, emphasizing the interdisciplinary nature of modern pediatric oral healthcare. This approach recognizes the complexity of oral health issues and the need for a comprehensive, team-based strategy. By working together, healthcare providers can ensure that children receive comprehensive care that addresses all aspects of their health.

IMPLICATIONS

The National Oral Health Program and Project Panchiri in

Table I Important Changes in the new Guidelines and Their Implications

<i>Domain</i>	<i>Recommendations</i>	<i>Implication</i>
<i>Emphasis on early and regular dental visits</i>	Highlight the importance of establishing a dental home for children by their first birthday, as opposed to the previously recommended age of 3 years	Improved early detection and prevention of dental caries
<i>Fluoride exposure and supplementation</i>	Provides updated recommendations on the appropriate use of fluoride toothpaste, varnish, and supplements, based on a child's age, risk of developing dental caries, and fluoride concentrations in drinking water.	Minimizes the risk of developing oral health issues.
<i>Dietary considerations</i>	Emphasizes the importance of a balanced diet for young children and the role of limiting sugar consumption, especially in the form of sugary drinks,	Prevention of tooth decay
<i>Anticipatory guidance and preventive counseling</i>	Underscores the importance of anticipatory guidance and parent education on oral hygiene practices, fluoride exposure, and the benefits of regular dental visits.	Enhanced parental awareness and education
<i>Collaboration between healthcare professionals</i>	Stresses the importance of interdisciplinary collaboration between pediatricians, dentists, and other healthcare professionals	Improved communication and coordination of care between pediatricians, dentists, and other healthcare professionals, ultimately resulting in better management of children's oral health.

India represent significant efforts to integrate oral health care into the broader healthcare system [18, 19]. The National Oral Health Program aims to improve oral health determinants and reduce oral disease morbidity, while Project Punchiri focuses on addressing untreated dental caries among school-going children in Kerala. Project Punchiri is integrated with the Rashtriya Bal Swasthya Karyakram (RBSK) program, to encounter untreated dental caries among school-going children and spread awareness and adoption of practices for maintaining oral hygiene. Parents/caregivers were interviewed for their knowledge levels and practices regarding oral health. The specialized oral health examination was performed to check for caries, dental fluorosis, malocclusion, developmental anomalies, and oral hygiene status.

These initiatives exemplify the practical application of policy in improving oral health, aligning with the recommendations of Krol et al for integrated and comprehensive oral health care. AAP Guidelines highlight the need for early dental visits, the establishment of a dental home, integration of innovative approaches like teledentistry and adherence to recommended practices like appropriate fluoride use and bedtime brushing routines. They mark a significant shift towards proactive and preventive pediatric oral healthcare. The expanded role of pediatricians is pivotal in this context, encompassing risk

assessment, nutritional counseling, and collaboration with dental care providers. Ultimately, these concerted efforts are crucial for improving oral health outcomes in pediatric populations, demonstrating the interplay between clinical practice, education, and preventive care in addressing the persistent challenge of dental caries in children.

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REFERENCES

1. Collaborators GOD, Bernabe E, Marcenes W, et al. Global, regional, and national levels and trends in burden of oral conditions from 1990 to 2017: a systematic analysis for the global burden of disease 2017 study. *J Dental Res.* 2020;99:362-73.
2. Janakiram C, Antony B, Joseph J, Ramanarayanan V. Prevalence of dental caries in India among the WHO index age groups: a meta-analysis. *J Clin Diagnos Res.* 2018;12. Accessed on Jan 05, 2024. Available from: https://www.researchgate.net/publication/326944071_Prevalence_of_Dental_Caries_in_India_among_the_WHO_Index_Age_Groups_A_Meta-Analysis
3. Miglani S. Burden of dental caries in India: current scenario and future strategies. *Int J Clin Pediatr Dentist.* 2020;13:155.

4. Featherstone JD. The caries balance: the basis for caries management by risk assessment. *Oral Health Prevent Dentist*. 2004;2:259-64.
5. Siqueira W, Custodio W, McDonald E. New insights into the composition and functions of the acquired enamel pellicle. *J Dent Res*. 2012;91:1110-8.
6. Kirthiga M, Murugan M, Saikia A, et al. Risk factors for early childhood caries: a systematic review and meta-analysis of case control and cohort studies. *Pediatr Dent*. 2019;41:95-112.
7. Krol DM, Whelan K; Section on Oral Health. Maintaining and improving the oral health of young children. *Pediatrics*. 2023;151:e2022060417.
8. American Association of Public Health Dentistry. First Oral Health Assessment Policy, 2004. Accessed on Jan 06, 2024. Available from: <https://www.aaphd.org/oral-health-assessment-policy>
9. Guideline on Perinatal and Infant Oral Health Care. *Pediatr Dent*. 2016;38:150-54.
10. Marinho VC, Higgins JP, Sheiham A, et al. Fluoride toothpastes for preventing dental caries in children and adolescents. *Cochrane Database Syst. Rev.* 2003;2003: CD002278.
11. Twetman S, Dhar V. Evidence of effectiveness of current therapies to prevent and treat early childhood caries. *Pediatr Dent*. 2015;37:246-53.
12. American Dental Association. Fluoride: Topical and systemic supplements. *Oral Health Topics* Accessed on Dec 06, 2023. Available from: <https://www.ada.org/en/resources/research/science-and-research-institute/oral-health-topics/fluoride-topical-and-systemic-supplements>
13. Shekar C, Cheluvaiyah MB, Namile D. Prevalence of dental caries and dental fluorosis among 12 and 15 years old school children in relation to fluoride concentration in drinking water in an endemic fluoride belt of Andhra Pradesh. *Indian J Public Health*. 2012;56:122-8.
14. World Health Organization. Guideline: sugars intake for adults and children: World Health Organization; 2015. Accessed on Jan 06, 2024. Available from: <https://www.who.int/publications/i/item/9789241549028>
15. Goyal A, Nishant, Morankar R, Gauba K, Jaiswal M. Awareness among pediatricians regarding oral health care in children including those with special health care needs: A cross-sectional survey. *J Family Med Prim Care*. 2020; 9:4151-5.
16. Karkoutly M, Kataish A, Al Kurdi S, et al. Knowledge, perceptions, and behavior regarding children's oral health among Syrian pediatricians: a cross-sectional study. *BMC Oral Health*. 2023;23:272.
17. D'cruz A, Aradhya S. Impact of oral health education on oral hygiene knowledge, practices, plaque control and gingival health of 13 to 15 year old school children in Bangalore city. *Int J Dent Hyg*. 2013;11:126-33.
18. Ministry of Health and Family Welfare, Government of India. National Oral Health Programme (NOHP): Operational Guidelines National Oral Health Programme (NOHP). Accessed on Nov 14, 2023. Available from: <https://main.mohfw.gov.in/Major-Programmes/Non-Communicable-Diseases-Injury-Trauma/Non-Communicable-Diseases1/National-Oral-Health-Programme-NOHP>
19. NitiAayog, Government of India. Project Punchiri: Oral Health Among Students in Kannur District [Internet]. Accessed on Nov 14, 2023. Available from: <https://nitidataportal.gramener.com/tag/oral-health/>