Policy on Early Childhood Caries: Consequences and Preventive Strategies

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Purpose

Early childhood caries (**ECC**), formerly referred to as nursing bottle caries and baby bottle tooth decay, remains a significant chronic disease of childhood and public health problem.[1] The American Academy of Pediatric Dentistry (**AAPD**) encourages health care professionals and caregivers to implement preventive practices that can decrease a child's risks of developing this preventable disease to reduce the burden on the child, the family, and society.

Methods

This policy, initially developed by the American Academy of Pedodontics (now known as the AAPD) in collaboration with the American Academy of Pediatrics and adopted in 1978,[2] was last revised by the AAPD in 2021.[3] This update used an electronic search of English written articles in the dental and medical literature within the last 10 years, using the search terms (*evidence based dentistry* [**Majr**] OR *pediatric dentistry* [Majr] OR *dental care for children* [Majr]) AND (*dental caries* [Majr] OR *dental caries susceptibility* [Majr] OR *early childhood caries* [**Tiab**] OR *infant oral health* [Tiab] OR *oral microbiome* [Tiab] OR *ECC prevention* [Tiab] OR *patient well-being* [Tiab] OR *nutrition* [Tiab] OR *quality of life* [Majr] OR *ECC* [Tiab]). Two hundred forty-eight articles were identified in the search. Thirty-six articles were selected for review from this search and from references within the selected papers. When information from these articles did not appear sufficient or was inconclusive, expert and consensus opinions by experienced researchers and clinicians were considered.

Background

In 1978, the American Academy of Pedodontics and the American Academy of Pediatrics released a joint statement, *Nursing Bottle Caries,* to address a severe form of caries associated with bottle usage.[2] Initial policy recommendations were limited to feeding habits, concluding that nursing bottle caries could be avoided if bottle feedings were discontinued soon after the first birthday.[2] An early policy revision added ad libitum breastfeeding as a causative factor.[4] Over the next 2 decades, however, recognizing that ECC was not solely associated with poor feeding practices, the AAPD adopted the term ECC to better reflect its multifactorial etiology. Contributors to ECC include[5-9] developmental (eg, enamel hypoplasia and hypomineralization), biological (eg, cariogenic oral microbiome —especially Mutans streptococci [**MS**] and fungi), and behavioral (eg, poor oral hygiene, high-frequency sugar consumption) factors. Additionally, social and structural considerations (eg, socioeconomic status) have an overarching influence on the development of ECC.[10]

ECC is defined as "the presence of one or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth" in a child less than 72 months of age.[11] The definition of severe early childhood caries (S-ECC) is 1) any sign of smooth-surface caries in a child younger than 3 years of age; 2) from ages 3 through 5 years, 1 or more cavitated, missing (secondary to caries), or filled smooth surfaces in primary maxillary anterior teeth; or 3) a decayed, missing, or filled score of greater than or equal to 4 (age 3), greater than or equal to 5 (age 4), or greater than or equal to 6 (age 5).[11]

Epidemiologic data from a 2013-2018 national health survey clearly indicate that ECC remains highly prevalent in poor and near-poor US preschool children.[12] For the overall population of preschool children, the prevalence of ECC, as measured by decayed and filled tooth surfaces (dfs), is unchanged from previous surveys.[12] However, the proportion of children with severe ECC increased significantly.[12] The consequences of ECC include a higher risk of new caries lesions in both the primary and permanent dentitions,[13,14] hospitalizations and emergency room visits,[15] high treatment costs,[16] loss of school days,[17,18] diminished ability to learn,[18] nutritional deficiencies,[19-21] and reduced[22-24] oral health-related quality of life.

Traditional microbial risk markers for ECC include acidogenic-aciduric bacterial species, particularly MS.[25] Studies using direct culture with arbitrarily primed polymerase chain reaction (AP-PCR) fingerprinting and other traditional techniques have shown that MS may be transmitted vertically from parent or caregiver to child and horizontally from other individuals in the immediate environment.[26,27] Advanced technologies that include DNA and RNA sequencing (ie, next

ABBREVIATIONS

AAPD: American Academy of Pediatric Dentistry. **CWF:** Community water fluoridation. **ECC:** Early childhood caries. **Majr:** Medical subject heading major topic. **MS:** Mutans streptococci. **Tiab:** Title and abstract.

generation sequencing), along with machine learning and artificial intelligence, reveal the complexity of the oral microbiome and have highlighted other bacterial species (eg, *Scardovia wiggsiae*, Veillonella ssp.) and fungi (eg, *Candida* species) that also may be associated with ECC.[28-31] In addition to vertical and horizontal transmission, studies on the development of the oral microbiome since birth support the importance of healthy diets and environmental exposures.[32,33] It is recommended that parental education and counseling on the importance of a healthy microbiome and diet in infancy be conducted as early as possible as the oral microbiome associated with ECC can be influenced[6,7,29,34,35] by the child's sex, genetic variants in taste, socioeconomic factors, dietary practices, and lifestyle behaviors.

An associated risk factor to microbial etiology is high consumption of sugars.[36] Bottle feeding, particularly nighttime bottle feeding with sweet drinks or sugar-sweetened beverages[7] (eg, juice, fruit-flavored drinks), continuous use of a sippy or no-spill cup containing sugar-sweetened beverages, and frequent in-between meal consumption of sugar-sweetened snacks or drinks increase the risk of caries.[37] Although benefits of breastfeeding are clear,[38] frequent (on demand) or nocturnal breastfeeding beyond the first year of life is associated with ECC.[39-42] A 2019 consensus statement via the American Academy of Pediatrics, American Heart Association, Academy of Nutrition and Dietetics, and AAPD recommends that sugar in foods and drinks should be avoided in children under 2 years of age.[43] Additional recommendations include complete avoidance of juice in children younger than 1 year and no more than 4 ounces of 100% fruit juice a day for children between the ages of 1 and 3 years.[43,44]

Community water fluoridation (**CWF**) as a primary prevention method is considered a key strategy for preventing dental caries.[45] Children with lifetime exposure to CWF show significantly lower dental caries levels than those without, with the benefit being most pronounced in primary teeth.[46] In addition to reducing the prevalence of severe caries, the use of CWF in high-risk populations may reduce caries-related visits and help avoid preventable dental surgery under general anesthesia.[47] CWF has multiple benefits and attenuates income-related inequalities in dental caries in the US.[48] Despite conflicting reports[49-51] of an association between fluoride consumption and a child's intelligence quotient (IQ), apart from an increased incidence of enamel fluorosis, the literature fails to provide credible evidence linking CWF with negative health outcome in the US at the currently regulated CWF level (0.7 ppm).[52-54]

Current best practice to reduce the risk of ECC includes twice-daily brushing with 1000 ppm fluoridated toothpaste for all children in optimally-fluoridated and fluoride-deficient communities.[55-57] When determining the risk-benefit of fluoride, the key issue is mild fluorosis versus preventing dental disease. A smear or rice-sized amount of 1000 ppm fluoridated toothpaste (approximately 0.1 mg fluoride; see Figure) should be used for children younger than 3 years of age. A pea-sized amount of 1000 ppm fluoridated toothpaste (approximately 0.25 mg fluoride) is appropriate for children aged 3 to 6 years.[58] Parents can ensure their child uses an appropriate amount of toothpaste by dispensing it onto a soft, age-appropriate sized toothbrush and performing or assisting with toothbrushing of preschool-aged children. Minimal or no rinsing can maximize the beneficial effect of fluoride in the toothpaste.[59] Less than twice daily toothbrushing and difficulties in performing the procedure during the preschool years were significant determinants of caries prevalence at the age of 5 years.[56]

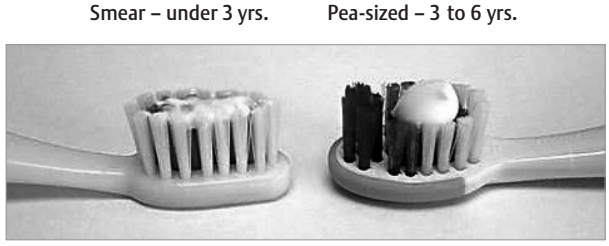


Figure. Comparison of a smear (left) with a pea-sized (right) amount of toothpaste.

Professionally-applied topical fluoride treatments are efficacious in reducing the incidence of ECC. The recommended professionally-applied fluoride treatment for children at risk for ECC who are younger than 6 years is 5% sodium fluoride varnish (NaFV; 22,500 ppm fluoride).[60-62] Evidence suggests that preventive interventions within the first year of life are critical.[63] For this reason, establishment of a dental home within 6 months of the eruption of the first tooth and no later than 12 months of age is especially important in populations at risk for ECC. This may be implemented with the help of medical professionals who, in many cases, are being trained to provide oral screenings, apply preventive measures, counsel caregivers, and refer infants and toddlers for dental care.[64] Additionally, 38% silver diammine fluoride (SDF) is effective for the arrest of cavitated caries lesions in primary teeth[65,66] and may be used as part of an ongoing caries management plan within the context of a dental home.

Policy statement

The AAPD recognizes ECC as a significant chronic disease resulting from an imbalance of multiple risk and protective factors over time. The AAPD encourages the following evidence-based preventive measures to decrease the risk of developing ECC and to promote optimal oral health for infants and children.

- Establishment of a dental home within 6 months of eruption of the first tooth and no later than 12 months of age to conduct caries-risk assessment and parental education.
- At the initial dental visit and periodic dental appointments, delivery of anticipatory guidance including home oral hygiene instructions (eg, parental brushing with an

age-appropriate sized toothbrush and volume of fluoridated toothpaste) and dietary counseling that emphasizes
  - avoidance of on-demand or nocturnal baby bottle- and breastfeeding beyond 12 months of age.
  - encouragement for children between 6 and 12 months old to drink 4 to 8 ounces of water per day and to abstain from all juice consumption.
  - avoidance of foods and drink with added sugars in children under 2 years of age and restriction of 100% fresh or reconstituted juice to no more than 4 ounces a day for children between the ages of 1 and 3 years.
  - avoidance of frequent consumption of sugar-containing liquids and/or solid foods.
- Professional application of fluoride varnish for children at risk for ECC.

Additionally, the AAPD supports interprofessional education and public health efforts to promote oral prevention, including

- working with medical health care professionals to ensure all infants and toddlers have access to dental screenings, counseling, and preventive procedures with a consistent, unified message.
- supporting CWF as a primary prevention for dental caries to reach underserved and vulnerable communities.
- educating legislators, policy makers, and third-party payors regarding the consequences of and preventive strategies for ECC, emphasizing the importance of access to care for all.
- advocating for reimbursement systems to allow access for all children and educational reforms that emphasize evidence-based preventive and comprehensive management of ECC.

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