

# Policy on Early Childhood Caries (ECC): Consequences and Preventive Strategies

## Latest Revision

2021

### 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.<sup>1</sup> The American Academy of Pediatric Dentistry (AAPD) encourages healthcare providers 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 was developed in a collaborative effort of the American Academy of Pedodontics and the American Academy of Pediatrics (AAP) and adopted in 1978.<sup>2</sup> This document is a revision of the previous version, last revised by the AAPD in 2016.<sup>3</sup> The update used electronic and hand searches of English written articles in the dental and medical literature within the last 14 years, using the search terms infant oral health, infant oral health care, early childhood caries, early childhood caries AND oral microbiome, ECC AND oral microbiome, early childhood caries AND prevention, ECC AND prevention. More than 8000 articles were identified in the search. When information from these articles did not appear sufficient or was inconclusive, policies were based upon expert and consensus opinion by experienced researchers and clinicians.

### Background

In 1978, the American Academy of Pedodontics and the AAP released a joint statement *Nursing Bottle Caries* to address a severe form of caries associated with bottle usage.<sup>2</sup> 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. An early policy revision added ad libitum breastfeeding as a causative factor. Over the next two decades, however, recognizing that ECC was not solely associated with poor feeding practices, AAPD adopted the term ECC to better reflect its multifactorial etiology. These factors include susceptible teeth due to enamel hypoplasia, oral colonization with elevated levels of cariogenic bacteria (especially Mutans streptococci [MS]), and the metabolism of sugars by tooth-adherent bacteria to produce acid which, over time, demineralizes tooth structure.<sup>4</sup>

**How to Cite:** American Academy of Pediatric Dentistry. Policy on early childhood caries (ECC): Consequences and preventive strategies. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry, 2022:90-3.

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”<sup>5</sup> in a child under the age of six. The definition of severe early childhood caries (S-ECC) is 1) any sign of smooth-surface caries in a child younger than three years of age, 2) from ages three through five, one or more cavitated, missing (due 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 four (age three), greater than or equal to five (age four), or greater than or equal to six (age five).<sup>5</sup>

Epidemiologic data from a 2011-2012 national survey clearly indicate that ECC remains highly prevalent in poor and near-poor United States (U.S.) preschool children.<sup>6</sup> 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, but the filled component (fs) has greatly increased indicating that more treatment is being provided.<sup>6</sup> The consequences of ECC often include a higher risk of new caries lesions in both the primary and permanent dentitions<sup>7,8</sup>, hospitalizations and emergency room visits<sup>9,10</sup>, high treatment costs<sup>11</sup>, loss of school days<sup>12</sup>, diminished ability to learn<sup>13</sup>, and diminished oral health-related quality of life<sup>14</sup>.

Traditional microbial risk markers for ECC include acidogenic-aciduric bacterial species, namely MS and Lactobacillus species.<sup>15</sup> Studies using direct culture with arbitrarily primed polymerase chain reaction (AP-PCR) fingerprinting and other traditional techniques have shown that MS maybe transmitted vertically from parent or caregiver to child and horizontally from other individuals in his immediate environment.<sup>16,17</sup> Newer technologies that sequence DNA and RNA in a rapid and cost-effective manner, known as high-throughput or next-generation sequencing (e.g. polymerase chain reaction, rRNA gene sequencing), reveal the complexity of the oral microbiome and have highlighted other bacterial species (e.g., *Scardovia wiggsiae*, *Veillonella* spp.) and fungi (e.g., *Candida albicans*)

### ABBREVIATIONS

**AAPD:** American Academy Pediatric Dentistry. **AAP:** American Academy of Pediatrics. **CWF:** Community water fluoridation. **ECC:** Early childhood caries. **mg:** Milligram. **MS:** Mutans streptococci. **U.S.:** United States.

that also may be associated with ECC.<sup>18-20</sup> Recent studies on the development of the oral microbiome since birth continue to support the concept of vertical and horizontal transmission as well as the importance of diet and environmental exposures.<sup>21,22</sup> Parental education and counseling on the importance of a healthy microbiome and diet in infancy should be conducted as early as possible.

An associated risk factor to microbial etiology is high consumption of sugars.<sup>23</sup> Nighttime bottle feeding with juice, repeated use of a sippy or no-spill cup, and frequent in-between meal consumption of sugar-added snacks or drinks (e.g., juice, formula, soda) increase the risk of caries.<sup>24</sup> Although there are clear benefits of breastfeeding in a child's first year of life<sup>25</sup>, breastfeeding and baby bottle use beyond 12 months, especially if frequent and/or nocturnal, are associated with ECC.<sup>26</sup> The American Heart Association recommends that sugar in foods and drink should be avoided in children under two years of age.<sup>27</sup> Additionally, the American Academy of Pediatrics recommends that 100 percent fruit a day for children between the ages of one and three.<sup>28,29</sup>

Community water fluoridation (CWF) as a primary prevention method is considered a key strategy for preventing dental caries.<sup>29</sup> Children with lifetime exposure to CWF show significantly lower dental caries levels than those without, with the benefit being most pronounced in primary teeth.<sup>30</sup> 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.<sup>31</sup> CWF has multiple benefits and attenuates income-related inequalities in dental caries in the U.S.<sup>32</sup> Apart from an increased incidence of enamel fluorosis, the literature fails to provide credible evidence linking CWF with negative health outcome.<sup>33</sup>

Current best practice to reduce the risk of ECC includes twice-daily brushing with fluoridated toothpaste for all children in optimally-fluoridated and fluoride-deficient communities.<sup>34-36</sup> When determining the risk-benefit of fluoride, the key issue is mild fluorosis versus preventing dental disease. A smear or rice-sized amount of fluoridated toothpaste (approximately 0.1 milligram [mg] fluoride; see Figure) should be used for children younger than three years of age. A pea-sized amount of fluoridated toothpaste (approximately 0.25 mg fluoride) is appropriate for children aged three to six.<sup>37</sup> Parents should dispense the toothpaste onto a soft, age-appropriate

sized toothbrush and perform or assist with toothbrushing of preschool-aged children. To maximize the beneficial effect of fluoride in the toothpaste, rinsing after brushing should be kept to a minimum or eliminated altogether.<sup>38</sup> Less than twice daily tooth-brushing and difficulties in performing the procedure during the preschool years were significant determinants of caries prevalence at the age of five years.<sup>36</sup>

Professionally-applied topical fluoride treatments also are efficacious in reducing prevalence of ECC. The recommended professionally-applied fluoride treatment for children at risk for ECC who are younger than six years is five percent sodium fluoride varnish (NaFV; 22,500 parts per million F).<sup>39,40</sup> Additionally, the use of 38 percent silver diamine fluoride (SDF) is effective for the arrest of cavitated caries lesions in primary teeth.<sup>41,42</sup> Evidence suggests that preventive interventions within the first year of life are critical.<sup>43</sup> For this reason, establishment of a dental home within six months of the eruption of the first tooth and no later than 12 months of age is especially important in populations at risk. This may be best implemented with the help of medical providers who, in many cases, are being trained to provide oral screenings, apply preventive measures, counsel caregivers, and refer infants and toddlers for dental care.<sup>44</sup>

### Policy statement

The AAPD recognizes early childhood caries as a significant chronic disease resulting from an imbalance of multiple risk and protective factors over time. To decrease the risk of developing ECC, the AAPD encourages professional and at-home preventive measures that provide evidence-based prevention of ECC such as:

1. establishing a dental home within six months of eruption of the first tooth and no later than 12 months of age to conduct caries risk assessment, parental education, and anticipatory guidance.
2. modifying diets to avoid frequent consumption of liquids and/or solid foods containing sugar<sup>45</sup>, and
  - eliminating baby bottle- and breastfeeding beyond 12 months, especially if frequent or nocturnal.
  - encouraging children between six and 12 months old to drink four to six ounces of water per day.<sup>46</sup>
  - avoiding sugar in foods and drink in children under two years of age.<sup>45</sup>
  - abstaining from 100 percent fruit juice before 12 months of age.
  - limiting juice to no more than four ounces a day for children between the ages of one and three years.
3. implementing early oral hygiene measures no later than the time of eruption of the first primary tooth. Toothbrushing should be performed for children by a parent twice daily, using a soft toothbrush of age-appropriate size. In children under the age of three years, a smear or rice-sized amount of fluoridated toothpaste should be used. In children ages three to six years, a pea-sized amount of fluoridated toothpaste should be used.

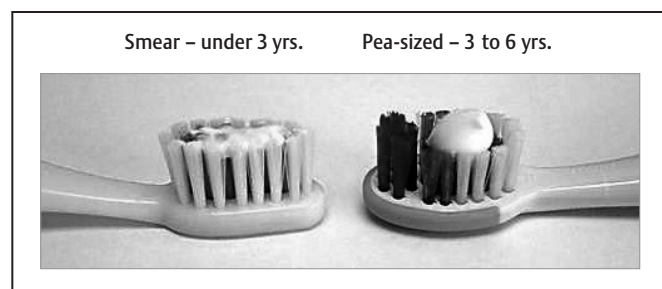


Figure. Comparison of a smear (left) with a pea-sized (right) amount of toothpaste.

4. providing professionally-applied fluoride varnish treatments for children at risk for ECC.
5. supporting CWF as a primary prevention for dental caries to reach underserved and vulnerable communities.
6. working with medical providers to ensure all infants and toddlers have access to dental screenings, counseling, and preventive procedures with a consistent unified message.
7. 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.
8. raising awareness of ECC with parents and oral health and medical professionals.
9. advocating for reimbursement systems to allow access for all children and educational reforms that emphasize evidence-based preventive and comprehensive management of ECC.

## References

1. American Academy of Pediatric Dentistry. Proceedings of the conference: Innovations in the Prevention and Management of Early Childhood Caries. October, 2014. Chicago, Ill. *Pediatr Dent* 2015;37(3):198-299.
2. American Academy of Pedodontics, American Academy of Pediatrics. Nursing bottle caries. January, 1978. Reference Manual 1991-1992. Chicago, Ill.: American Academy of Pediatric Dentistry; 1991:27.
3. American Academy of Pediatric Dentistry. Policy on early childhood caries (ECC): Classifications, consequences, and preventive strategies. *Pediatr Dent* 2016;38(special issue):52-4.
4. Tinanoff N. Introduction to the conference: Innovations in the Prevention and Management of Early Childhood Caries. *Pediatr Dent* 2015;37(4):198-9.
5. Drury TF, Horowitz AM, Ismail AI, et al. Diagnosing and reporting early childhood caries for research purposes. *J Public Health Dent* 1999;59(3):192-7.
6. Dye BA, Hsu K-L, Afful J. Prevalence and measurement of dental caries in young children. *Pediatr Dent* 2015; 37(3):200-16.
7. O'Sullivan DM, Tinanoff N. The association of early childhood caries patterns with caries incidence in preschool children. *J Public Health Dent* 1996;56(2):81-3.
8. Al-Shalan TA, Erickson PR, Hardie NA. Primary incisor decay before age 4 as a risk factor for future dental caries. *Pediatr Dent* 1997;19(1):37-41.
9. Ladrillo TE, Hobdell MH, Caviness C. Increasing prevalence of emergency department visits for pediatric dental care 1997-2001. *J Am Dent Assoc* 2006;137(3):379-85.
10. Griffin SO, Gooch BF, Beltran E, Sutherland JN, Barsley R. Dental services, costs, and factors associated with hospitalization for Medicaid-eligible children, Louisiana 1996-97. *J Public Health Dent* 2000;60(3):21-7.
11. Griffin SO, Barker LK, Wei L, Li C-H, Albuquerque MS, Gooch BF. Use of dental care and effective preventive services in preventing tooth decay among U.S. children and adolescents — Medical Expenditure Panel Survey, United States, 2003–2009 and National Health and Nutrition Examination Survey, United States, 2005–2010. *MMWR Suppl* 2014;63(2):54-60. Available at: “[https://www.cdc.gov/mmwr/preview/mmwrhtml/su6302a9.htm?s\\_cid=su6302a9\\_w](https://www.cdc.gov/mmwr/preview/mmwrhtml/su6302a9.htm?s_cid=su6302a9_w)”. Accessed March 17, 2021.
12. Edelstein BL, Reisine S. Fifty-one million: A mythical number that matters. *J Am Dent Assoc* 2015;146(8):565-6.
13. Blumenshine SL, Vann WF, Gizlice Z, Lee JY. Children's school performance: Impact of general and oral health. *J Public Health Dent* 2008;68(2):82-7.
14. Filstrup SL, Briskie D, daFonseca M, Lawrence L, Wandera A, Inglehart MR. The effects on early childhood caries (ECC) and restorative treatment on children's oral health-related quality of life (OHRQOL). *Pediatr Dent* 2003; 25(5):431-40.
15. Kanasi E, Johansson J, Lu SC, et al. Microbial risk markers for childhood caries in pediatrician's offices. *J Dent Res* 2010;89(4):378-83.
16. Doméjean S, Zhan L, DenBesten PK, Stamper J, Boyce WT, Featherstone JD. Horizontal transmission of mutans streptococci in children. *J Dent Res* 2010;89(1):51-5.
17. Berkowitz RJ. Mutans streptococci: Acquisition and transmission. *Pediatr Dent* 2006;28(2):106-9.
18. Li Y, Tanner A. Effect of antimicrobial interactions on the oral microbiota associated with early childhood caries. *Pediatr Dent* 2015;37(3):226-44.
19. Hahishengallis E, Parsaei Y, Klein MI, Koo H. Advances in the microbial etiology and pathogenesis of early childhood caries. *Mol Oral Microbiol* 2017;32(1):24-34.
20. Mira A. Oral microbiome studies: Potential diagnostic and therapeutic implications. *Adv Dent Res* 2018;29(1):71-7.
21. Dashper SG, Mitchel HL, Lê Cao KA, et al. Temporal development of the oral microbiome and prediction of early childhood caries. *Sci Rep* 2019;9(1):19732. Available at: “<https://doi.org/10.1038/s41598-019-56233-0>”. Accessed September 8, 2020.
22. Dzidic M, Collado MC, Abrahamsson T, et al. Oral microbiome development during childhood: An ecological succession influenced by postnatal factors and associated with tooth decay. *ISME J* 2018;12(9):2292-306. Available at: “<https://doi.org/10.1038/s41396-018-0204-z>”. Accessed September 8, 2020.
23. Moynihan PJ, Kelly SAM. Effect on caries of restricting sugars intake: Systematic review to inform WHO guidelines. *J Dent Res* 2014;93(1):8-18.
24. Tinanoff NT, Kanellis MJ, Vargas CM. Current understanding of the epidemiology, mechanism, and prevention of dental caries in preschool children. *Pediatr Dent* 2002; 24(6):543-51.

25. Salone LR, Vann WF, Dee DL. Breastfeeding: An overview of oral and general health benefits. *J Am Dent Assoc* 2013;144(2):143-51.
26. Peres KG, Chaffee BW, Feldens CA. Breastfeeding and oral health: Evidence and methodological challenges. *J Dent Res* 2018;97(3):251-8.
27. Voss MB, Kaar JL, Welsh JA, et al. Added sugars and cardiovascular disease risk in children: American Heart Association. *Circulation* 2017;135(19):e1017-e1034.
28. Heyman MB, Abrams SA, American Academy of Pediatrics Committee on Nutrition. Fruit juice in infants, children, and adolescents: Current recommendations. *Pediatrics* 2017;139(6):e20170967.
29. Iheozor-Ejiofor Z, Worthington HV, Walsh T, et al. Water fluoridation for the prevention of dental caries. *Cochrane Database Syst Rev* 2015;2015(6):CD010856. Available at: "<https://doi.org/10.1002/14651858.CD010856.pub2>". Accessed October 18, 2021.
30. Slade GD, Grider WB, Maas WR, Sanders AE. Water fluoridation and dental caries in U.S. children and adolescents. *J Dent Res* 2018;97(10):1122-8.
31. Lee HH, Faundez MA, LoSasso AT. A cross-sectional analysis of community water fluoridation and prevalence of pediatric dental surgery among Medicaid enrollees. *JAMA Network Open* 2020;3(8):e205882. Available at: "<https://jamanetwork.com/journals/jamanetworkopen/article-abstract/2769230>". Accessed November 11, 2020.
32. Sanders AE, Grider WB, Mass WR, Curiel JA, Slade GD. Association between water fluoridation and income-related dental caries of U.S. children and adolescents. *JAMA Pediatr* 2019;173(3):288-90.
33. Centers for Disease Control and Prevention. Community Water Fluoridation: 75 years of community water fluoridation. Division of Oral Health National Center of Chronic Disease Prevention and Health Promotion. January 2020. Available at: "[www.cdc.gov/fluoridation/basics/anniversary.htm](http://www.cdc.gov/fluoridation/basics/anniversary.htm)". Accessed March 23, 2021.
34. Santos AP, Oliveira BH, Nadanovsky P. Effects of low and standard fluoride toothpastes on caries and fluorosis: Systematic review and meta-analysis. *Caries Res* 2013;47(5):382-90.
35. American Dental Association Council on Scientific Affairs. Fluoride toothpaste use for young children. *J Am Dent Assoc* 2014;145(2):190-1.
36. Boustedt K, Dahlgren J, Twetman S, Roswall J. Toothbrushing habits and prevalence of early childhood caries: A prospective cohort study. *Eur Arch Paediatr Dent* 2020;21(1):155-9.
37. Wright JT, Hanson N, Ristic H, Whall CW, Estrich CG, Zentz RR. Fluoride toothpaste efficacy and safety in children younger than 6 years. *J Am Dent Assoc* 2014;145(2):182-9.
38. Sjögren K, Birkhed D. Factors related to fluoride retention after toothbrushing and possible connection to caries activity. *Caries Res* 1993;27(6):474-7.
39. Weyant RJ, Tracy SL, Anselmo T, Beltrán-Aguilar EJ, Donly KJ, Frese WA. Topical fluoride for caries prevention: Executive summary of the updated clinical recommendations and supporting systematic review. *J Am Dent Assoc* 2013;144(11):1279-91.
40. American Academy of Pediatric Dentistry. Fluoride therapy. *The Reference Manual of Pediatric Dentistry*. Chicago, Ill.: American Academy of Pediatric Dentistry; 2020: 288-91. Available at: "[https://www.aapd.org/globalassets/media/policies\\_guidelines/bp\\_fluoridetherapy.196.pdf](https://www.aapd.org/globalassets/media/policies_guidelines/bp_fluoridetherapy.196.pdf)". Accessed March 23, 2021.
41. Gao SS, Zhao IS, Hiraishi N, et al. Clinical trials of SDF in arresting caries among children: A systematic review. *JDR Clin Trans Res* 2016;1(3):201-10.
42. Crystal YO, Marghalani Abdullah AA, Ureles SD, et al. Use of SDF for dental caries management in children and adolescents, including those with special health care needs. *Pediatr Dent* 2017;39(5):135E-145E.
43. Lee JY, Bouwens TJ, Savage MF, Vann WF. Examining the cost-effectiveness of early dental visits. *Pediatr Dent* 2006;28(2):102-5, discussion 192-8.
44. Douglass AB, Douglass JM, Krol DM. Educating pediatricians and family physicians in children's oral health. *Academic Pediatr* 2009;9(6):452-6.
45. Centers for Disease Control and Prevention. Nutrition. Infant and toddler nutrition. Food and drinks for 6 to 24 months old. Food and drinks to limit. Available at: "<https://www.cdc.gov/nutrition/infantandtoddlernutrition/foods-and-drinks/foods-and-drinks-to-limit.html>". Accessed June 29, 2021.
46. Centers for Disease Control and Prevention. Nutrition. Infant and toddler nutrition. Food and drinks for 6 to 24 months old. Food and drinks to encourage. November 6, 2020. Available at: "<https://www.cdc.gov/nutrition/infantandtoddlernutrition/foods-and-drinks/foods-and-drinks-to-encourage.html>". Accessed June 29, 2021.