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METHODS FOR PREVENTING DENTAL CARIES IN CHILDREN

Suyunova Aziza Xidir qizi
Termiz Iqtisodiyot va Servis Unversiteti Tibbiyot fakulteti Stomatologiya ta'lim yònalishi 4 kurs talabasi

Eshkarayev Sadriddin Choriyevich
Termiz iqtisodiyot va servis universiteti
Ilmiy ishlar va innovatsiyalar bo‘yicha prorektori
Sadridin_eshkarayev@tues.uz
0000-0003-1711-3303

Abstract: Childhood dental caries is a preventable, biofilm-mediated, sugar-driven, multifactorial disease that can cause pain, infection, impaired nutrition, sleep disturbance, school absence, and substantial treatment burden.

Background: Current prevention is based on repeated caries-risk assessment, twice-daily use of age-appropriate fluoride toothpaste, reduction of free-sugar frequency, establishment of a dental home in infancy, professional fluoride varnish, pit-and-fissure sealants, silver diamine fluoride, and minimally invasive care.

Objective: To review evidence-based home, clinical, family, and school-level methods for preventing caries in children and to identify common causes of programme failure.

Materials and methods: A narrative review of AAPD manuals, WHO guidance, USPSTF recommendations, systematic reviews, and selected clinical guidelines published or updated through 2026. Interventions were assessed by mechanism, effectiveness, frequency of application, feasibility, safety, and monitoring requirements.

Results: No single product can compensate for frequent sugar exposure, inadequate brushing, or absent follow-up. The minimum effective package is supervised brushing twice daily with fluoride toothpaste, practical reduction of free-sugar frequency, risk-based professional fluoride, early dental attendance, and sealant assessment for newly erupted molars. High-risk children may additionally benefit from repeated varnish, 38% silver diamine fluoride, and minimally invasive treatment. Conclusion: Prevention succeeds when the family receives a simple, measurable plan and clinicians monitor lesion activity, behaviour, fluoride exposure, sealant retention, and recall attendance over time.

Keywords: paediatric dentistry, dental caries, prevention, fluoride, sealants, free sugars, caries risk

INTRODUCTION

Dental caries is one of the most common chronic diseases of childhood. Untreated lesions can lead to pain, infection, disturbed sleep, eating difficulty, missed school, emergency attendance, and reduced quality of life. Extensive treatment under sedation or general anaesthesia may be required when disease is advanced or cooperation is limited. Because early childhood caries is strongly patterned by social conditions, access to healthy food, caregiver knowledge, and availability of dental services, prevention must combine biological interventions with realistic family support [1,2].

The contemporary model no longer treats caries as a simple infection caused by one organism. Frequent intake of fermentable carbohydrates changes the ecology of dental biofilm.

Acid-producing and acid-tolerant communities become dominant, plaque pH falls repeatedly, and mineral loss exceeds remineralisation. Saliva, fluoride, tooth morphology, enamel maturation, oral hygiene, medications, socioeconomic circumstances, and previous disease modify the balance. Caries prevention therefore aims to alter the entire disease environment rather than simply remove or restore each cavity.

A major weakness of prevention is the use of generic advice such as "brush twice daily" without checking whether the family has suitable fluoride toothpaste, uses the correct amount, supervises the child, and can sustain the routine. Effective prevention requires a personalised plan with observable targets: which toothpaste will be used, who will brush the child's teeth, when sugary drinks will be replaced with water, when varnish or sealants will be reviewed, and when the next recall will occur. Behaviour that is specified and measured is more likely to be implemented than broad education alone.

Figure 1. Clinical appearance of an untreated cavitated caries lesion in a child
Source: Wikimedia Commons, "Dental Caries Cavity 2.JPG", author Suyash.dwivedi, CC BY-SA 4.0; https://commons.wikimedia.org/wiki/File:Dental_Caries_Cavity_2.JPG

MATERIALS AND METHODS

This article was prepared as a narrative review. The AAPD Reference Manual 2025–2026 and available 2026–2027 updates, World Health Organization oral-health and sugar guidance, US Preventive Services Task Force recommendations, Cochrane reviews, and selected systematic reviews were examined. Search concepts included childhood caries prevention, fluoride toothpaste, fluoride varnish, sealants, silver diamine fluoride, free sugars, dental home, caries-risk assessment, and supervised toothbrushing.

Each preventive method was assessed according to six practical criteria: biological mechanism; magnitude and consistency of clinical benefit; age and caries-risk group; application frequency; feasibility in home, clinic, school, or resource-limited settings; and safety or monitoring requirements. Recommendations were interpreted as components of a risk-based programme rather

than isolated products. Particular attention was given to parental involvement, informed consent, equity, and the difference between arresting disease and restoring lost tooth anatomy.

RESULTS

1. Early and repeated caries-risk assessment

Caries-risk assessment integrates social, behavioural, medical, clinical, protective, and disease indicators [1]. Important factors include previous cavitation, active white-spot lesions, visible plaque, frequent snacks or sweetened drinks, bedtime bottles, inadequate fluoride exposure, enamel defects, reduced salivary flow, special healthcare needs, orthodontic appliances, caregiver caries activity, and difficulty accessing care. Risk is dynamic: a child who was low risk last year may become high risk after medication, dietary change, loss of supervision, or eruption of susceptible molars. Assessment must therefore be repeated rather than completed once as a formality.

The first dental visit is recommended within six months of eruption of the first tooth and no later than twelve months of age. Establishing a dental home allows clinicians to identify feeding patterns, demonstrate brushing, discuss fluoride, evaluate developmental and medical risks, and create an emergency pathway before disease becomes painful. Recall intervals should follow risk and disease activity. A high-risk infant or child with active lesions requires shorter review and preventive intervention than a stable low-risk child.

Table 1. Preventive programme according to age and caries risk

Group	Core home measure	Professional measure	Important warning
0–2 years	From the first tooth, caregiver brushing twice daily with a rice-grain smear of fluoride toothpaste; water as the main drink	Dental visit by 12 months; fluoride varnish according to risk	Do not leave a bottle of sweetened milk, formula, or juice overnight; supervise swallowing
3–5 years	Pea-sized fluoride toothpaste with adult supervision; keep sweets to meal times	Risk-based varnish and recall; active monitoring of early lesions	Even when the child brushes, an adult usually needs to complete effective cleaning

Group	Core home measure	Professional measure	Important warning
6–12 years	Fluoride toothpaste twice daily, interdental cleaning, and limitation of sweetened drinks	Sealants for susceptible newly erupted molars; monitoring of orthodontic risk	Isolation is difficult during partial eruption; sealant retention requires review
High risk	Individual plan, measurable behavioural goal, and review of all fluoride exposure	5% NaF varnish 2–4 times/year, sealants, and when indicated 38% SDF or minimally invasive care	SDF blackens carious dentin; written consent and aesthetic discussion are necessary

2. Fluoride toothpaste and professionally applied fluoride

Fluoride reduces demineralisation, promotes remineralisation, and alters mineral dissolution in an acidic biofilm environment. Brushing should begin when the first tooth erupts and should occur twice daily with fluoride toothpaste. For children younger than three years, a smear approximately the size of a grain of rice is used; from three to six years, a pea-sized amount is appropriate. A parent or caregiver should dispense the toothpaste and perform or complete brushing. The fluoride concentration on the product label should be checked because an extremely low-fluoride paste may provide insufficient protection in a high-risk child [3–5].

Professionally applied 5% sodium fluoride varnish creates a temporary high-fluoride reservoir on the tooth surface and provides additional benefit for children at elevated risk or with early non-cavitated lesions. Frequency is determined by risk, commonly two to four applications per year in high-risk children. Varnish is an adjunct, not a substitute for twice-daily toothpaste and dietary change. Clinicians should document total fluoride exposure, explain post-application instructions, and review lesion activity at subsequent visits rather than treating one application as a permanent solution.

3. Nutrition and reduction of free-sugar frequency

For caries, the frequency and timing of sugar exposure are as important as the total amount. Every sweet drink, snack, sweetened medicine, or prolonged bottle episode can trigger a fall in plaque pH. Repeated exposures throughout the day create insufficient recovery time for saliva and fluoride-mediated remineralisation. Practical counselling should therefore focus on replacing sweetened drinks with water, limiting sweets to meal times, avoiding continuous sipping, reading

labels, and identifying hidden sugars in juices, flavoured milk, biscuits, cereals, and processed snacks [6].

Night feeding requires specific discussion because salivary flow falls during sleep. A bottle containing juice, sweetened milk, or formula should not remain in the mouth throughout the night. After teeth erupt, frequent nocturnal breastfeeding may also require individual risk assessment when it occurs together with other sugar exposures and inadequate plaque control. Counselling should be non-judgmental and adapted to the family's nutritional, cultural, and practical circumstances. The goal is a sustainable reduction in cariogenic exposure, not a rigid instruction that the caregiver cannot follow.

4. Pit-and-fissure sealants, silver diamine fluoride, and minimally invasive strategies

Deep pits and fissures of newly erupted permanent first and second molars are retentive sites that toothbrush bristles may not clean adequately. A pit-and-fissure sealant isolates the surface from biofilm and fermentable substrate and can arrest selected non-cavitated occlusal lesions. An umbrella review published in 2024 supports the clinical effectiveness of sealants in primary and permanent teeth [7]. Success depends on case selection, moisture control, eruption stage, and retention. Loss of part of a sealant does not mean that the method failed; it means that recall examination and repair are required.

Thirty-eight percent silver diamine fluoride can arrest active cavitated lesions non-invasively, particularly in children with limited cooperation, significant medical risk, multiple lesions, or delayed access to definitive care. Its principal limitation is permanent black staining of carious dentin; sound enamel is generally not darkened. Caregivers must receive a clear explanation of colour change, the possibility of repeated application, and the fact that SDF arrests disease but does not restore tooth anatomy or contact. When appropriate, it may later be combined with glass-ionomer or another restorative procedure [8].

Atraumatic restorative treatment and selective caries removal may reduce pain, fear, and the need for extensive instrumentation, but they do not replace prevention. Any restoration remains at risk of recurrent disease if the biological environment is unchanged. Fluoride use, diet, plaque control, and recall must therefore be documented at the same time as operative treatment. Restoring a cavity without modifying disease drivers merely postpones the next lesion.

Table 2. Evidence, application, and limitations of major preventive methods

Method	Main benefit	Application	Limitation and monitoring

Method	Main benefit	Application	Limitation and monitoring
Fluoride toothpaste	Daily reduction in demineralisation and promotion of remineralisation	Twice daily from the first tooth, using an age-appropriate amount	Supervise swallowing in young children; caregiver participation is essential
5% NaF varnish	Additional protection for high-risk children and early lesions	Professional application, commonly 2–4 times/year according to risk	Requires repeat application and review of total fluoride exposure
Pit-and-fissure sealant	Isolates deep fissures from biofilm and fermentable substrate	Susceptible newly erupted molars and selected non-cavitated occlusal lesions	Check retention at every recall; moisture control is critical
Dietary and behavioural counselling	Addresses frequent free-sugar exposure, a major disease driver	Set specific, measurable goals with the family	Generic advice to “avoid sweets” is poorly implemented; social context matters
38% SDF	Non-invasive arrest of active cavitated lesions	Selected active lesions with informed consent and repeated review	Permanent black staining, temporary soft-tissue staining, metallic taste; anatomy is not restored
Dental home and risk-based recall	Early guidance and detection before cavitation or pain	Begin by 12 months; recall interval is individualised	Access to care and caregiver attendance may limit implementation

FAMILY- AND SCHOOL-LEVEL PREVENTION

In young children, the true operator of prevention is the parent or caregiver. Clinical advice should therefore include demonstration and teach-back rather than verbal instruction alone. The caregiver should show how much toothpaste is placed on the brush and how the buccal, lingual, palatal, and occlusal surfaces are cleaned. At review, the clinician should ask specific questions: on how many evenings brushing was completed, which sweetened drink was reduced, who performed

brushing, and how much fluoride is listed on the toothpaste. Measurable behaviour provides a more accurate assessment than the general question “How is brushing going?”

School and nursery programmes cannot replace clinical care, but they can reduce inequalities. Supervised toothbrushing with fluoride toothpaste, provision of water instead of sweetened drinks, short caregiver education, mobile screening, and referral of high-risk children are more effective when delivered as a coordinated package. A one-off lecture or celebration does not usually produce sustained behaviour change. Programmes require a reliable toothpaste supply, hygienic brush storage, trained staff, parental consent, and a defined referral pathway for children in whom disease is detected.

Monitoring should use simple outcomes: number of new cavities, activity of white-spot lesions, plaque levels, proportion brushing twice daily, frequency of sweetened drinks, sealant retention, varnish delivery, and missed recall appointments. A programme should not be judged by the number of children who attended a lecture but by changes in disease and behaviour. In resource-limited settings, high-impact interventions such as varnish, sealants, and SDF should be prioritised for the highest-risk groups, while low-risk children receive strong home prevention and periodic reassessment.

DISCUSSION

The findings show that childhood caries prevention must be multicomponent. Fluoride increases resistance to mineral loss but cannot compensate for continuous sweetened drinking throughout the day. A sealant protects a fissure but does not remove risk from smooth or proximal surfaces. Dietary advice addresses the cause but will not be followed if it is unrealistic for the family. The smallest effective package is therefore supervised brushing twice daily with fluoride toothpaste, reduction in sugar frequency, risk-based professional fluoride, early dental attendance, and consideration of sealants for susceptible erupting molars.

Common reasons for failure are equally clear: giving a leaflet without demonstrating technique; failing to check fluoride concentration; allowing a young child to brush without effective adult completion; treating one varnish application as definitive; failing to review sealant retention; and ignoring the family’s access to water, food, transport, and dental services. A high-risk family does not necessarily need a more complex list of instructions. It needs a short plan that can be implemented, reviewed, and modified.

Prevention also requires accurate safety communication. Fluoride toothpaste used in the recommended amount is effective and safe. Risk arises from regular swallowing of excessive quantities or uncoordinated use of multiple fluoride sources. For SDF, the expected black staining of carious dentin should be shown with a photograph or sample before consent. All interventions

should be based on informed parental permission, the child's best interests, and the least invasive effective option.

Figure 3. Professional preventive examination and oral-hygiene education for children
Source: Wikimedia Commons, Germanna Community College / Robert A. Martin, CC BY 2.0; https://commons.wikimedia.org/wiki/File:Dental_hygiene_students_help_kids_with_free_clinic_(24788962541).jpg

CONCLUSION

Prevention of dental caries in children is not based on one product or one clinical visit. It requires repeated assessment of disease risk and a combined plan that the family can carry out. Core measures are twice-daily brushing from eruption of the first tooth with an age-appropriate amount of fluoride toothpaste, reduction in the frequency of free-sugar exposure, establishment of a dental home by twelve months, risk-based application of 5% fluoride varnish, sealant assessment for newly erupted molars, and use of 38% silver diamine fluoride for selected active cavitated lesions. Effectiveness depends on caregiver supervision, recall attendance, reapplication or repair when indicated, and monitoring of behavioural goals. The true measure of prevention is not the number of recommendations given but fewer new lesions and arrest of existing early disease.

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