Review Article

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Preventive Dentistry in Children with Special Needs: Narrative Review

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ABSTRACT

Children with special healthcare needs face a high prevalence of dental and oral health problems due to unique challenges in maintaining oral hygiene. Preventive dentistry, which encompasses practices and strategies aimed at maintaining optimal oral health and preventing dental caries, periodontal disease, and other oral conditions, is therefore of utmost importance for this vulnerable group. This narrative review compiles the dental health concerns commonly encountered in these children and outlines preventive strategies to address them. Common dental issues encountered in this population include dental caries, gingival inflammation, tooth erosion, and attrition. Factors contributing to these problems range from motor impairments limiting brushing ability, food preferences, bruxism, gastroesophageal reflux disease, and side effects of certain medications. Effective preventive measures involve early dental visits, appropriate oral hygiene routines, judicious use of fluoride toothpaste and supplements, dietary modifications, and cessation of nighttime bottle-feeding. Specific recommendations are provided for caregivers, such as selecting the right toothbrush, maintaining proper brushing techniques, and monitoring fluoride intake based on age and risk factors. Interdisciplinary collaboration between pediatricians, dentists, and other healthcare professionals is crucial in identifying potential dental issues and providing tailored preventive care for children with special needs.

KEYWORDS: children with special needs, dental caries, disabilities, oral hygiene, preventive dentistry

INTRODUCTION

Children with special needs are children with intellectual, physical, or mental disabilities. Their physical, psychological, and social abilities are inadequate[1]. The disabilities could stem from a wide range of conditions, including cognitive impairment (such as global developmental delay (GDD), autism spectrum disorder (ASD)), motor disorders (e.g., cerebral palsy (CP) and brain abnormalities), behavioral and emotional problems (including attention deficit hyperactivity disorder (ADHD)), and sensory impairments (visual and auditory impairments)[2].

Because oral care is difficult for them, children with special needs often have oral health problems. According to a study by Obeidat et al. (2022), 20.3% of children with special needs had oral health needs compared to 12.2% of normal children[3]. The most commonly reported problems in children with special needs are dental caries (16.7%), bleeding gums (3.5%), and toothache (7.2%)[3]. A study by da Silva et al. (2016)

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found that the prevalence of dental caries and periodontal disease in children and adolescents with ASD was as high as 60.6% and 69.4%, respectively[4]. According to studies by Makkar et al. (2019)[5] and Roberts et al. (2016)[6], children with intellectual disabilities (ID) had a high prevalence of dental caries and gingival diseases, as high as 86% and 69%, respectively. A meta-analysis study by Zemene et al. (2024) found that the prevalence of dental caries in children with CP was 42.4%-64%[7]. Table 1 summarizes the prevalence of various dental health problems among children with different special needs, highlighting the conditions of most concern for each group.

Collectively, these data indicate that dental and oral health problems are major concerns for children with special healthcare needs. If left untreated, these children may experience difficulties with eating, sleepless nights, abscess formation, systemic infection, and poor quality of life[8].

The American Academy of Pediatrics has guidelines for children's oral and dental health care[9], yet children with special needs face significant barriers to accessing these services. These challenges arise from factors related to the children, their families, and public health systems[8,10]. Behavioral difficulties, sensory processing issues, and conditions such as ASD, ID, and ADHD often result in disruptive behaviors, poor cooperation, and difficulty following instructions during dental procedures[11]. Furthermore, impaired communication abilities hinder these children from effectively expressing their dental needs or discomfort during treatment[12].

Children with sensory processing disorders often experience heightened anxiety during dental visits, affecting their cooperation[13]. Financial constraints and inadequate insurance coverage limit access to specialized dental care while scheduling and transportation challenges further impede dental screenings and treatment[14]. Additionally, many dental professionals lack the training or experience necessary to manage the unique needs of these children, complicating the provision of appropriate care[15].

Therefore, it is crucial for pediatricians and other healthcare professionals to recognize the increased risk of dental problems in children with special needs and provide guidance on primary oral care for this population. This narrative review aims to discuss dental health concerns, management strategies, and evidence-based recommendations for promoting good oral hygiene and preventing dental problems in children with special healthcare needs.

METHODS

This narrative review synthesizes available literature on preventive dentistry approaches for children with special healthcare needs. A comprehensive search was conducted using multiple electronic databases, including PubMed, Scopus, and Google Scholar, from 2004 to 2024. The following search terms were used in various combinations: "children with special needs", "disabled children", "preventive dentistry", "oral hygiene", "dental caries", and related keywords. In addition to the database searches, the reference lists of relevant articles were manually screened to identify any additional pertinent studies.

Table 1 The prevalence of dental health problems in children with special needs

Special needs category	Prevalence of dental caries	Prevalence of periodontal disease	Prevalence of other notable conditions
Autism spectrum disorder (ASD)	60.6%	69.4%	Not specified
Intellectual disabilities (ID)	86%	69%	Not specified
Cerebral palsy (CP)	42.4-64%	Not specified	Not specified
General special needs	16.7%	Not specified	Bleeding gums 3.5% Toothache 7.2%

Abbreviations: ASD, autism spectrum disorder; CP, cerebral palsy; ID, intellectual disabilities

Studies were included if they provided information on dental health concerns, risk factors, and preventive strategies for children with special healthcare needs or disabilities. Preference was given to recent systematic reviews, meta-analyses, and clinical practice guidelines when available. Given the broad scope of this narrative review, both original research articles and review articles were considered for inclusion.

DENTAL HEALTH PROBLEMS AND MANAGEMENT IN CHILDREN WITH SPECIAL HEALTH CARE NEEDS

Children with special needs require specialized oral and dental health care, as outlined in Table 2.

Table 2 Dental health condition and initial management in children with special healthcare needs

Special healthcare needs	Health condition	Dental problems	Initial management
Cerebral palsy	Poor hand dexterity	Limited brushing ability	- Modified toothbrushes with larger handles or built-up grips to provide a better grasp - Using mouth opening kit to keep the mouth open and allow better access for brushing and cleaning - Caregivers may need to provide hands-on assistance with brushing for children with severe manual dexterity limitation
	Esophageal reflux	Erosion	- Regular brushing with a fluoride toothpaste to help remineralization and protect tooth enamel from acid erosion - Keeping the child in an upright position during and after feeding to prevent reflux
	Bruxism	Broken tooth attrition	- Custom-made occlusal splints or mouth guards - Dental restorations - Botulinum toxin injections into the masseter muscles in severe cases
	Drug-induced sialorrhea	Increased risk of dental caries	- Frequent wiping of the mouth and teeth with a clean, soft cloth or gauze - Encouraging adequate water intake to dilute and wash away saliva - Limiting sugary and acidic foods and beverages to reduce the cariogenic potential of saliva - Regular brushing, flossing, and use of fluoride toothpaste to protect against dental caries
Autism spectrum disorder	Food preferences	Dental caries due to preference for starches and snack foods	- Avoid cariogenic foods
	Hypersensitivity	Difficult oral hygiene practices	- Use toothbrushes with different bristle textures (e.g., soft, extra-soft) - Minimize distractions and sensory stimuli during oral care routines
	Drug-induced xerostomia	Increased risk of dental caries and periodontal disease	- Encouraging frequent sipping of water - Use saliva substitutes or saliva stimulants in severe cases - Topical fluoride treatments to strengthen tooth enamel and provide additional protection against caries
Global developmental delay/ intellectual disability	Bruxism	Broken tooth attrition	- Custom-made occlusal splints or mouth guards - Dental restorations - Botulinum toxin injections into the masseter muscles in severe cases
Epilepsy	Drug-induced gingival hyperplasia	Gingival hyperplasia	- Meticulous oral hygiene practices - Topical fluoride treatments to strengthen tooth enamel and provide additional protection against caries - Use the antimicrobial mouth rinses to reduce plaque levels and prevent gingivitis

Children with CP are physically unable to clean the inside of their mouths, and it is difficult for caregivers to do so because the children cannot open their mouths wide enough[16]. In addition to physical therapy, a modified toothbrush and mouth-opening kit can help resolve this restriction[17].

Children with CP are also prone to gastroesophageal reflux disease due to poor muscle control in the lower esophageal sphincter and swallowing difficulties. This condition can cause tooth erosion[18]. Fluoride treatment helps reduce surface microhardness loss and mineral loss in enamel and dentin[19]. The study by Mazzoleni et al. (2023)[20] found that children using fluoride-containing toothpaste had a significantly lower mean surface roughness (0.82 ± 0.12 μm) of their teeth after a second acid attack compared to children using non-fluoride toothpaste (1.06 ± 0.18 μm). Therefore, children with CP should be encouraged to use fluoride-containing toothpaste to prevent demineralization after acid attacks in their oral cavity.

Children with ASD often prefer foods containing sugar, starch, and dairy products. These foods are cariogenic and should be avoided to prevent tooth decay in these children[21]. In addition, hypersensitivity to certain textures, sounds, or sensations in the mouth can make routine oral hygiene practices challenging. Toothbrushes designed for oral hypersensitivity and minimizing distractions and sensory stimuli during oral care routines help to manage this condition[13].

Bruxism, which is the grinding of teeth, is a common cause of tooth damage among children with CP and GDD. In cases where bruxism is not causing dentin damage, using an occlusal splint can prevent tooth attrition. However, dental restoration may be necessary in severe cases where tooth attrition has occurred. Additionally, Botulinum toxin injections may reduce muscle spasms in the mouth and alleviate symptoms. Three months after receiving Botox injections into the masseter and temporalis muscles, there was a reduction in the Miami Bruxism Score, which measures bruxism severity, from 19 (severe) to 6 (mild)[22].

Some children with special health care needs also have epilepsy. Some antiepileptic drugs (such as phenytoin, sodium valproate, phenobarbitone, and vigabatrin) can induce gingival hyperplasia and lead to periodontitis and tooth decay[23-24]. Antipsychotics, such as risperidone, olanzapine, and clozapine, are frequently prescribed to children with ASD, ID, and other neurodevelopmental disorders. These medications can cause dry mouth (xerostomia) as a side effect, which increases the risk of dental caries, periodontal disease, and oral infection[25]. Children with CP or neuromuscular disorders may be prescribed muscle relaxants like baclofen or tizanidine, which can cause excessive drooling (sialorrhea), leading to perioral skin irritation, halitosis, and increased risk of dental caries and infections[26]. To mitigate these risks, healthcare providers need to be aware of the side effects of these medications and provide appropriate preventive measures[27], as shown in Table 2.

RECOMMENDATION FOR PROMOTING GOOD DENTAL HEALTH IN CHILDREN WITH SPECIAL HEALTHCARE NEEDS

Because children with special healthcare needs have a higher risk of dental health problems, healthcare providers and caregivers need to collaborate in preventing these issues, as shown in Table 3. The fundamental principles for promoting good dental health in children with special healthcare needs are as follows:

Table 3 The roles of caregivers and healthcare providers in promoting good dental health in children with special healthcare needs

Principles for promoting good dental health	Caregiver's roles	Healthcare provider's roles
Regular dental checkups	- Take children for their first dental visit when the first tooth emerges - Follow the recommended schedule for regular dental check-ups, typically every 6 months or more frequently based on the child's risk factors	- Emphasize the importance of regular dental visits, starting with the first tooth eruption - Provide appropriate referrals to dental professionals
Routine oral care	- Use appropriate toothbrushes and toothpaste based on the child's age and risk factors - Assist children with brushing their teeth, especially those with severe motor disabilities - Monitor and limit dietary fluoride intake based on age and fluoride levels in drinking water	- Educate caregivers on proper oral hygiene techniques, including positioning, brushing, and flossing - Recommend suitable toothbrushes, toothpaste concentrations, and dental cleaning aids based on the child's needs - Advise on appropriate fluoride supplementation based on age, risk factors, and drinking water fluoride levels
Diet & eating behavior	- Avoid frequent consumption of starchy, sugary, and acidic foods and beverages - Stop nighttime bottle-feeding before the child reaches 18 months of age	- Provide dietary counseling and recommendations for limiting cariogenic foods and beverages - Advise on the appropriate timing for cessation of nighttime bottle-feeding

Regular dental checkups

Parents must take their children to the dentist when they get their first tooth to learn how to care for their child's teeth and what to monitor[28]. In addition, regular dental visits are essential. The American Academy of Pediatric Dentistry recommends that children with special needs should receive comprehensive oral evaluations and preventive dental care every 6 months, or more frequently if indicated by their risk factors or specific conditions[29]. Based on the research of Ardenghi et al. (2012)[28], an essential factor related to children's first dental visit before the age of 3 is that parents have a better perception of their children's oral health (OR=1.38, 95% CI: 1.01-1.89). Therefore, healthcare providers who have the opportunity to take care of pediatric patients should encourage primary caregivers to recognize the importance of children's oral and dental health. Especially for caregivers who need to take care of children with special medical needs, they are at high risk of dental and oral health issues.

Some children with special needs fear dental health services. Parents can prepare them by telling stories related to dentistry, role-playing a visit to the dentist, watching videos of actual dental visits, and showing the dental care process[30-32]. The study by Bagattoni et al. (2022)[30] found that children whose parents used preparatory tools exhibited less disruptive behavior during the dental appointment than children who did not receive any preparatory material before their visit (p-value = 0.013). Furthermore, the study by Murshid et al. (2017) revealed that the percentage of children with ASD exhibiting positive behavior during dental treatment significantly increased, rising from 47.5% before utilizing the book to 80% after employing the book ($p < 0.001$). Therefore, the preparatory process before a dental visit can help shape positive dental experiences and behaviors in children with special healthcare needs. Children taking medications to alleviate behavioral and emotional problems, such as antipsychotics and psychostimulants, should continue taking them during dental procedures[33]. For children with ASD who often have auditory hypersensitivity, parents may prepare equipment such as noise-canceling headphones[31-32].

Routine oral care

Toothbrushes for children should be designed to fit in their hands, as shown in Figure 1. The bristles should have a straight cross-section and be soft enough to clean between the teeth properly without injuring the gums. The appropriate toothbrush size that fits the child's mouth size is also essential, especially for children with limited mouth-opening capability[17].

The appropriate fluoride concentration in toothpaste is also a crucial factor in reducing the risk of tooth decay. Fluoride strengthens the tooth surface, making it more resilient to acidic substances that can cause decay, and it reduces the buildup of dental plaque[34]. The 2019 study by Walsh et al. concluded that for children and adolescents, using a fluoride toothpaste containing 1,000-1,500 ppm fluoride can reduce caries increments when compared to non-fluoridated toothpaste (standard mean difference of -0.28 to -0.36 (95% CI: -0.43 to -0.25)[34]. However, using toothpaste with excessive fluoride may increase the risk of developing dental fluorosis[35]. Therefore, the American Academy of Pediatric Dentistry recommends using a concentration of fluoride and an amount of toothpaste as shown in Table 4 and Figure 2[36].

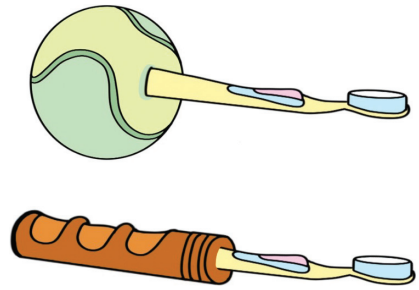

Figure 1 Examples of modified toothbrushes

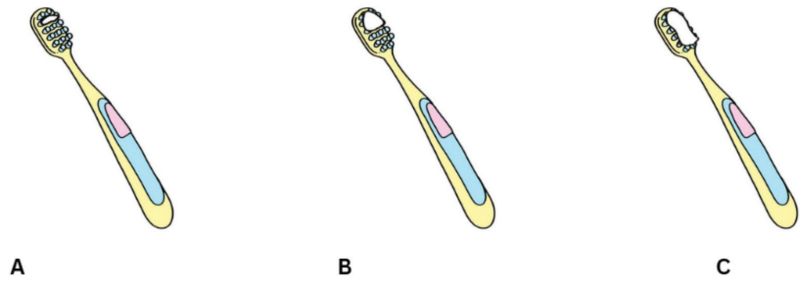

Figure 2 The amount of toothpaste recommended for different age groups.
For newborns up to 3 years old, use rice grain sized toothpaste (2A). For 3-6 years old, use corn grain sized toothpaste (2B). For children over 6, use toothpaste equal to the length of the brush (2C).

Table 4 Appropriate amount of fluoride in toothpaste

Child's age	Recommended amount of toothpaste	Recommended concentration of fluoride in toothpaste	Other additional suggestions
First tooth eruption – 3 years old	Just wet bristles (as much as a grain of rice)	1,000 ppm (1,500 ppm in cases with a high risk of tooth decay)	Parents should brush their children's teeth and wipe off foam after brushing
3 - 6 years old	Equal to brush width (equal to a corn kernel)	1,000 ppm (1,500 ppm in cases with a high risk of tooth decay)	Parents assist in squeezing toothpaste, brushing their child's teeth, and reminding them to spit out foam
6 years old and above	Equal to brush length	1,500 ppm	If a child brushes on their own, the parent should check again

Abbreviation: ppm, parts per million

For children who do not cooperate with brushing their teeth, oral fluoride supplements may be considered. According to a study by Tubert-Jeannin et al. (2011), dietary fluoride supplements can reduce permanent tooth caries by 24%[37]. However, the effectiveness of fluoride supplement for reducing caries, tooth extraction, and fillings in primary teeth is still unclear[38]. Furthermore, using systemic fluoride during the first six years of life increases the risk of developing dental fluorosis[39]. Consequently, dietary fluoride supplements are not recommended for children under 6 years old. Furthermore, fluoride supplements should be based on the fluoride level in the drinking water. Therefore, for children aged 6-16 years, it is recommended that 1 mg/day of fluoride supplement should be used if the fluoride concentration in drinking water is under 0.3 ppm. 0.5 mg/day of fluoride supplement should be used if the fluoride concentration in drinking water is 0.3-0.5 ppm. No supplement is needed if the fluoride content in water exceeds 0.5 ppm[40].

Children with severe motor disabilities require caregiver assistance for effective dental care, including tooth brushing. Caregivers should support the child's back and head while opening their lips to clean their teeth properly (figure 3)[41]. For children with oromotor dysfunction, cleaning around the cheek bulges is essential to remove food residue[41]. Triple-headed toothbrushes are more effective at plaque removal than single-headed ones[42], while the effectiveness of electric toothbrushes compared to traditional ones remains unclear[43].

Figure 3 Position for cleaning teeth of a child with severe motor disability

Dental sealants are another essential technique for preventing dental caries in these children. Dental sealants are thin, protective coatings applied to the chewing surfaces of the molars and premolars. They act as a physical barrier, protecting the tooth enamel from plaque accumulation and acid attacks that can lead to the development of dental caries. A study by Williams et al. (2018) found that after one year 74% of sealants were fully retained without caries present[44]. Moreover, a 14-year follow-up study of Balian found that dental sealants were 90.44-93.6% effective at preventing tooth decay[45].

Diet & eating behavior

Children who frequently consume starchy and sugary foods are at a higher risk of developing dental problems. Streptococcus mutans and Lactobacilus species on dental plaque decompose sugar, producing organic acid. Decreasing the pH on the tooth surface leads to demineralization and eventually causes dental caries[46-47]. Therefore, avoiding foods and beverages with added sugars is especially important in children with limited ability to clean their mouths and teeth.

In addition, nighttime bottle-feeding can lead to tooth decay due to the prolonged presence of milk sugar on the teeth. A 2014 study by Olatosi and Sote revealed that children who were bottle-fed were 4.5 times more likely to suffer from tooth decay compared to those who were not[48]. As a result, it is now recommended that parents stop bottle-feeding their children before they reach 18 months of age to help prevent tooth decay[49].

Finally, effectively providing comprehensive oral health care and early detection of dental health problems requires interdisciplinary collaboration between pediatricians, dentists, and caregivers of children with special healthcare needs. Appropriate dental health care leads to good quality of life, which is the goal of holistic treatment for these children.

DENTAL HEALTHCARE SERVICES FOR CHILDREN WITH SPECIAL HEALTHCARE NEEDS IN THAILAND

Accessing appropriate preventive dental care is crucial for maintaining good oral health in children with special healthcare needs. In Thailand, dental services are available at primary and secondary care levels to support this population.

Primary Care Dental Services[50]

At the community level, primary care units and health centers often provide essential dental services focused on prevention and early intervention. These services may include:

- Distribute complimentary toothbrushes and fluoride toothpaste to promote good oral hygiene practices from an early age.
- General dental check-ups and screenings to identify potential issues like tooth decay or gum disease.
- Educational programs that teach proper brushing and flossing techniques are designed for children and their caregivers.
- Provide guidance on reducing the intake of foods and drinks that can cause tooth decay.

Secondary Care Dental Facilities[50]

For children requiring more specialized dental treatment, secondary care facilities like community hospitals and dental clinics can offer additional preventive and restorative services such as:

- Applying dental sealants to the chewing surfaces of permanent molars helps prevent cavities.
- Provision of custom-fitted mouth guards for children at risk of tooth damage from bruxism or trauma.
- Comprehensive oral rehabilitation under general anesthesia when necessary for severe cases.
- Access to pediatric dentists with specialized training in managing the dental needs of children with disabilities or complex medical conditions.

Utilizing these available healthcare services can significantly benefit children with special needs by promoting preventive oral care, early detection of dental problems, and timely intervention when required. Enhancing awareness of such local resources empowers parents and general pediatricians to better advocate for and ensure optimal dental health outcomes.

CONCLUSION

Children with special health care needs are at higher risk of experiencing dental problems such as dental caries, attrition, and broken teeth. The common causes of dental health issues in these children include poor hand dexterity, esophageal reflux, food preferences, bruxism, and the side effects of medications. To maintain good oral health care in children, following up with a dentist as soon as their first tooth emerges is crucial. Parents should establish an appropriate oral care routine, limit the consumption of foods that promote tooth decay, and cease bottle-feeding before the child reaches 18 months of age. By taking these measures, parents can help ensure their children maintain healthy teeth and oral hygiene.

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