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Prevalence and management of oral health conditions among children with special health care needs

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BOSTON UNIVERSITY
HENRY M. GOLDMAN SCHOOL OF DENTAL MEDICINE

THESIS

**PREVALENCE AND MANAGEMENT OF ORAL HEALTH CONDITIONS
AMONG CHILDREN WITH SPECIAL HEALTH CARE NEEDS**

by

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DEDICATION

To my beloved parents,

To my forever and always,

To lulu, my little pearl

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I am very thankful to all of the continuous heartfelt support provided by my precious family, I am forever grateful to each and everyone of you.

**PREVALENCE AND MANAGEMENT OF ORAL HEALTH CONDITIONS
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ABSTRACT

Purpose

To review the current evidence on the prevalence and management of oral health conditions among children with special health care needs (CSHCN).

Methods

A scoping review was selected as the most appropriate method of review for our main objective.

The research question was defined as: For Special Health Care Needs Children, what is the prevalence of oral health conditions and how are the Special Health Care Needs Children be managed in dental setting?

Results

A total of 247 Studies were identified as of potential relevance. Following removal of duplicates (n = 11), 236 articles were screened in detail and 17 studies met the inclusion criteria. The articles included in this scoping review were published between 2000 and 2021. The ages ranged from birth to <21 years.

The types of disabilities among children with special needs discussed in the chosen studies are Down syndrome, Autism Spectrum Disorder (ASD), Attention-Deficit/Hyperactivity Disorder (ADHD), Intellectual Disability (ID), Cerebral Palsy (CP), Ectodermal Dysplasia (ED), Asthma, Diabetes, Saethre-Chotzen Syndrome (SCS), Idiopathic Short Stature (ISS), Russel-Silver Syndrome (RSS), Growth Hormone Deficiency (GHD), Visual and Auditory Impairments.

Conclusion

The results indicated that oral health conditions and poor oral health is worse among special needs children compared to children without special health care needs. This is a vital matter that should be addressed and considered by health care professionals and caregiver to help CSHCN to lead a better quality of life.

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LIST OF ABBREVIATIONS

ASD	Autism Spectrum Disorder
BU	Boston University
CP	Cerebral Palsy
CSHCN	Children with Special Health Care Needs
DS	Down Syndrome

INTRODUCTION

The care of children is a prime concern and matters to all of us. Children represent the future we will live in and impact on our capacity to develop both as a society and as an individual, so ensuring their healthy growth and development is of a great concern. The Oral health conditions experienced by the children with special health care needs (CSHCN) may be linked directly or indirectly to their disabilities¹.

The risk and potential sequelae of poor oral health and dental decay are greater in medically compromised children².

Unfortunately, the importance of dental care for these children has often been overlooked by the health care practitioners and the parents of disabled children usually do not focus on the dental care as they also have the burden of medical treatment being the primary concern².

Many children with SHCN are evaluated by a multidisciplinary team, including a dentist.

A diagnosis is established, and recommendations for future care are determined. Coordination of dental care with the multidisciplinary team prepares the family for the child's future care and establishes oral health as a vital part of the child's well-being and general health.³

Objective

Our overall objective is to review the current evidence on the prevalence and management of oral health conditions among children with special health care needs (CSHCN).

Specifically, this review aims to investigate in depth, the prevalence of the common oral conditions in children with special health care needs, how are these conditions diagnosed and managed, what special requirements are needed for treating CSHCN, behaviour management if any when managing CSHCN and any specific considerations that are made during the management, treatment and follow-up process.

MATERIAL AND METHODS

Design

A scoping review was selected as the most appropriate method of review for our main objective which is to review the current evidence on the prevalence and management of oral health conditions among children with special health care needs (CSHCN). Scoping reviews are designed to examine the main body of available published evidence with a broad approach regarding a specific topic to identify the boundaries and the context of that topic, and to summarise the most important information and results of the studies included.⁴ This framework comprises of five steps: (i) designing the research question; (ii) identifying relevant studies through a literature search; (iii) analysing selected studies; (iv) extracting and charting data; and (v) collating, summarising, and reporting the results.^{5, 6}

Research Question

A research question was structured based on the PECO (Patient, Exposure, Comparison, Outcome) format to scope the extent of research available on the topic and to avoid the early exhaustion of literature during the search process.

P	Children under the age 21 with special health care needs
E	Oral health conditions
C	Children without special health care needs
O	Prevalence

Table 1. PECO Question

The research question was defined as: For Special Health Care Needs Children, what is the prevalence of oral health conditions and how are the Special Health Care Needs Children be managed in dental setting?

Identification of Relevant Studies

To review the literature, a search was done through data bases that include peer reviewed articles: PubMed®/MEDLINE, Embase, Dental and Oral Surgery Source and Cochrane Library using specific MESH Terms (Appendix 1). The limits for the search were: Studies among CSHCN aged < 21 years, articles published in English language within the last 20 years in the United States and studies among human subjects only were included. The articles in this review were chosen from the resulting list of articles using the limits described here. The chosen articles were retrieved in full-text and were reviewed and evaluated by the author. The reference lists of selected articles were also screened to find other potentially eligible studies.

Data Extraction

From each individual article, the following information was recorded: general characteristics (authors, year of publication, methodological design); patients' clinical features (age, medical status, level of mental/intellectual disability, oral status, etc); main outcome measured; key findings or conclusions; and authors' recommendations or conclusions. The scoping review process used in this review and the entire selection process is described in a flow diagram (Figure 1)

RESULTS:

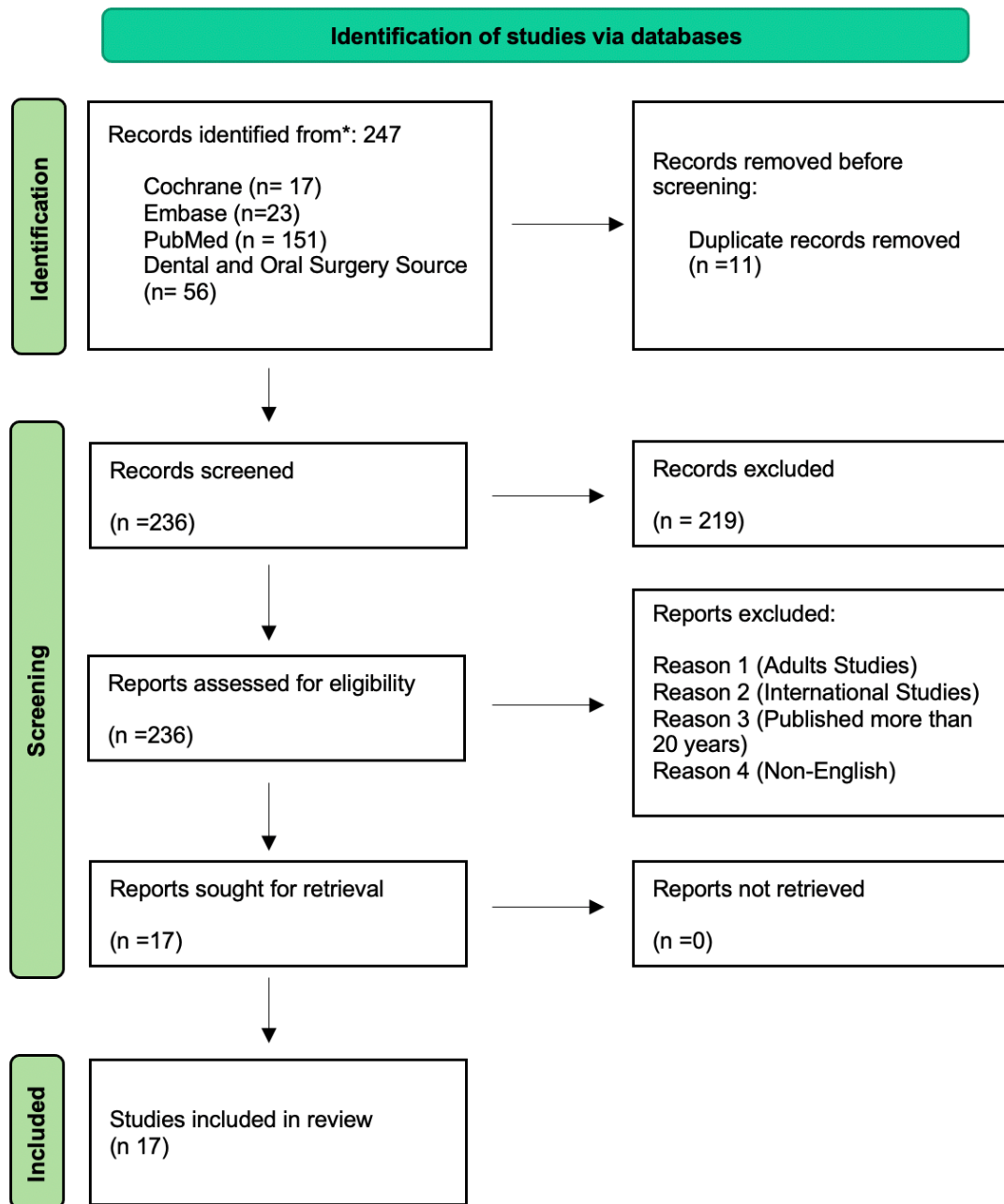


Figure 1. PRISMA FLOW CHART

Authors	Year	Age	Topic	Study Type	Focus	Prevalence/Outcome
J.D. Shulman, S.E. Taylor M.E. Nunn	2001	4-16	The Association between Asthma and Dental Caries in Children and Adolescents: A Population-Based Case-Control Study	Case-control	Asthma /Dental Caries	Any association between asthma and dental caries may occur primarily in younger children with no evidence of an association between asthma and dental caries as children mature.
J.M. Burgette and A. Rezaie	2020	Birth-17	Association between Autism Spectrum Disorder and Caregiver-Reported Dental Caries in Children	Cross-sectional	Autism Spectrum Disorder/Dental caries	children with ASD had significantly greater odds of having caregiver- reported dental caries as compared with children without ASD.
Anwar T Merchant, Monica Jethwani, Youn-Hee Choi, Elaine H Morrato, Angela D Liese and Elizabeth Mayer-Davis	2011	<20	Associations between periodontal disease and selected risk factors of early complications among youth with type 1 and type 2 diabetes: a pilot study	Cross-sectional	Diabetes /Periodontal Disease	Periodontal damage was observed in 52 individuals (34%) overall, but was more common in type 2 (16/29, 55%) vs. type 1 diabetes (37/126, 29%)
Goswami U, O'Toole S, Bernabé E.	2021	12-19	Asthma, long-term asthma control medication and tooth wear in American adolescents and young adults	Cross-Sectional	Asthma/Tooth Wear	This cross-sectional analysis of national data shows that taking long-term asthma medication was positively associated with having tooth wear.
Jennifer Marshall,Barbara Sheller,Lloyd Mancl	2012	Birth-19	Caries-risk Assessment and Caries Status of Children with Autism	Cross-Sectional	Autism Spectrum Disorder/Dental caries	This study confirms the validity of considering autism as an indicator of high caries risk
Tom AndrewWei Yang Jonathan A. Bernstein Gary M. Shaw	2018	Birth	Change in Prevalence of Orofacial Clefts in California between 1987 and 2010	Cross-Sectional	Cleft Lip and Palate/Cleft Palate	We observed a decline in the prevalence in CLP in all ethnic groups, however did not observe the same amount of decline in CP, perhaps due to antenatal screening.
Ingrid M. Ganske, Tim Irwin, Olivia Langa, Joseph Upton III, Wen-Hann Tan, and John B. Mulliken,	2021	Birth	Cleft Lip and Palate in Ectodermal Dysplasia	Cross-Sectional	Eectodermal Dysplasia/ Cleft lip and palate/Cleft palate	As in other types of syndromic CL/P, cleft phenotypic expression in ED is more severe than the general cleft population.

Authors	Year	Age	Topic	Study Type	Focus	Prevalence/Outcome
Waleed F. Janem, Frank A. Scannapieco, Amarpeet Sabharwal, Maria Tsompana, Harvey A. Berman, Elaine M. Haase, Jeffrey C. Miecznikowski, Lucy D. Mastrandrea	2017	10-19	Salivary inflammatory markers and microbiome in normoglycemic lean and obese children compared to obese children with type 2 diabetes	Cohort study	Obesity/type2 diabetes/Oral Health /Periodontal Disease	Obese children with T2D show a trend toward poorer oral health compared to normal weight and obese children without T2D. This study supports a modest link between T2D and periodontal inflammation in the pediatric population.
Peter Damiano, Margaret Tyler, M.A., M.S.W., Paul A. Romitti, Charlotte Druschel,., April A. Austin, Whitney Burnett, Sara Kizelnik-Freilich, James M. Robbins,	2009	2-7	Demographic Characteristics, Care, and Outcomes for Children With Oral Clefts in Three States Using Participants From the National Birth Defects Prevention Study	Cross-Sectional	Special health care needs/ Oral Conditions	Children with OCs from Arkansas were from lower income families, and their parents were less likely to be married. Children with OCs from Arkansas were more likely to have special health care needs and to require mental health care. Few differences were found across states in type of cleft, severity of cleft, or outcomes of cleft care.
Sabrina Sunderji, Bhavini Acharya, Catherine Flaitz, Brett Chiquet,	2017	2-6	Dental Caries Experience in Texan Children with Cleft Lip and Palate	Cross-Sectional	Cleft lip and palate/Cleft palate /Dental Caries	Children with cleft lip and palate are at a greater risk of enamel hypoplasia and dental caries.
Molly Frank, Martha Ann Keels,Rocio Quiñonez, Michael Roberts, Kimon Divaris	2019	<16	Dental Caries Risk Varies Among Subgroups of Children with Special Health Care Needs	Cross-Sectional	Autism spectrum disorder/congenital heart disease/cerebral palsy/ down syndrome/dental caries	Patients with congenital heart disease experienced the highest caries burden in the primary dentition. CHD patients had the highest permanent dentition caries increment, followed by those with autism. Down syndrome patients' caries risk was the lowest among all CSHCN groups studied and essentially identical to healthy controls. Caries experience was the only significant predictor of permanent dentition caries incidence across all groups.

Authors	Year	Age	Topic	Study Type	Focus	Prevalence/Outcome
Lalla E, Cheng B, Lal S, Kaplan S, Softness B, Greenberg E, Goland RS, Lamster IB.	2007	6-18	Diabetes mellitus promotes periodontal destruction in children	Case-Control	Diabetes /Periodontal Disease	These findings demonstrate an association between diabetes and an increased risk for periodontal destruction even very early in life, and suggest that programmes to address periodontal needs should be the standard of care for diabetic youth.
Joan M. Stoler, M.D., Gary F. Rogers, M.D., John B. Mulliken, M.D.	2009	Infants	The Frequency of Palatal Anomalies in Saethre-Chotzen Syndrome	Cross-Sectional	SCS/Palatal Anomalies	Palatal anomalies are relatively common in SCS.
Yehoshua Shapira, Erwin Lubit, D Mladen M. Kufinec, Stom	2000	5-18	Hypodontia in Children with Various Types of Clefts	Cross-Sectional	Clefts/Hypodontia	The prevalence of 77% hypodontia found in our combined sample of children with cleft lip, cleft palate, or both was statistically significantly higher than the rate for children without clefts, and considerably higher than the rate reported earlier for children with clefts
Natalia Hodge, Carla A. Evans, Kirt E. Simmons, Shahrbanoo Fadavi, Grace Viana,	2015	5-14	Occlusal Characteristics of Individuals with Growth Hormone Deficiency, Idiopathic Short Stature, and Russell-Silver Syndrome	Cross-Sectional	GHD/ISS/RSS/Occlusal abnormalities	Occlusal abnormalities are prevalent in children with growth disorders.
DeMattei R, Cuvo A, Maurizio S.	2007	2-<21	Oral assessment of children with an autism spectrum disorder	Cross-Sectional	Autism Spectrum Disorder/Oral Conditions	Children with an ASD appear to have oral conditions that might increase the risk of developing dental disease.
Enrique Bimstein Roy G. Jerrell James P. Weaver Linda Dailey	2014	2-<21	Oral Characteristics of Children With Visual or Auditory Impairments	Case-Control	Visual and Auditory Impairments/Oral Characteristics	Under oral health supervision, children and adolescents with or without hearing or visual impairment develop similar dental caries prevalence. Oral hygiene and resulting gingival inflammation are a challenge for the visually impaired and, to a lesser degree, the auditorily impaired.

Table 2. presents the general characteristics and the main outcome of the studies included in this scoping review.

DISCUSSION

Children with Special Health Care Needs:

Definition:

Children with Special Health Care Needs (CSHCN) are those who have a certain disability that limits them from performing their daily life activities, and they require special attention and needs that other children do not have. The American Academy of Paediatric Dentistry⁷ (AAPD) defines special health care needs as “any physical, developmental, mental, sensory, behavioral, cognitive, or emotional impairment or limiting condition that requires medical management, health care intervention, and/or use of specialized services or programs”. The condition or disability may be congenital, developmental, or acquired through disease, trauma, or environmental cause and may impose limitations in performing daily self-maintenance activities or substantial limitations in a major life activity. Health care for individuals with special needs requires specialized knowledge, as well as increased awareness and attention, adaptation, and accommodative measures beyond what are considered routine.

Types of Special Health Care Needs in Children:

Understanding and being able to identify the type of special health care need in children is an essential part of managing children with each type of disability and providing each with the best care possible. There are four major types of special needs among CSHCN and these categories are defined by the American Academy of Paediatric Dentistry (AAPD):⁷

1. Physical – muscular dystrophy, multiple sclerosis, chronic asthma, epilepsy, etc.
2. Developmental – down syndrome, autism, dyslexia, processing disorders
3. Behavioral/Emotional – ADD, bi-polar, oppositional defiance disorder, etc.
4. Sensory Impaired – Blind, visually impaired, deaf, limited hearing

Prevalence of Special Health Care Needs in Children

In 2020, Over 13.6 million children in the U.S had a special health care need, and 1 in 4 households (24.8)% in the U.S reported one or more children with a special health care need.⁸ The Centres for Disease Control and Prevention (CDC, 2022) also stated that two in five U.S. children aged 17 years and less had a chronic health condition ⁹.

Based on The National Survey of Children’s Health (2017 - 2018)⁸, of over twenty conditions in the NSCH, allergies, ADD/ADHD, and behavior/conduct were the most frequently reported for CSHCN. Also, mental, behavioral, and developmental conditions were more prevalent among CSHCN than among children without special health care needs (non-CSHCN).

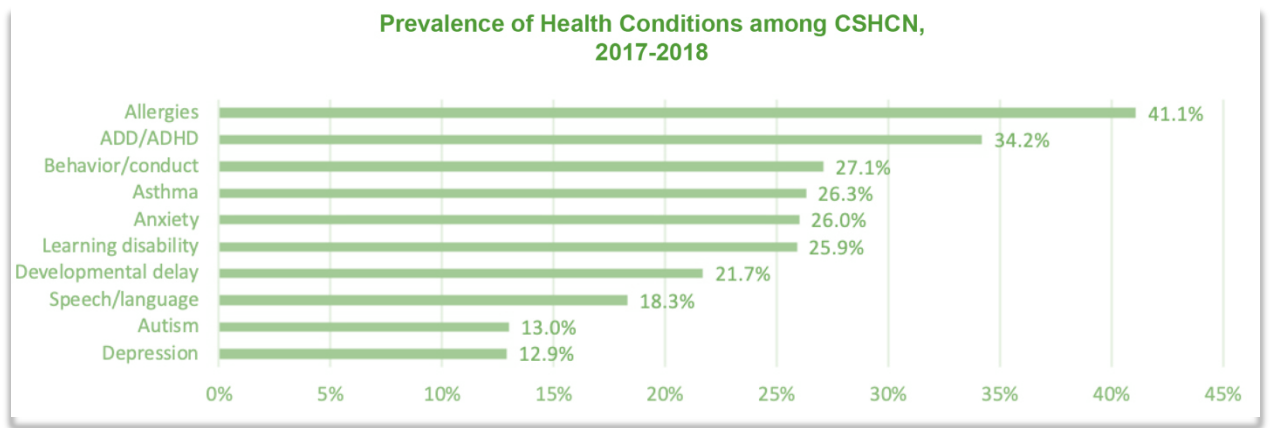


Figure 2. In 2022, NSCH published the most reported conditions for CSHCN

The Prevalence of common oral health conditions among children with special health care needs.

Children with Special Health Care Needs are at a higher risk for poor oral health and oral conditions¹⁰. As these type of patients have mental and physical complications, they may face barriers to adequate oral health care. ¹¹

After reviewing the findings of the present scoping review, we observed that the most common medical conditions in this discussion and topics that are commonly focused in paediatric dentistry practices during the management of children with special health care needs are: (i) Prevalence of oral conditions; (ii) Behavioural management of CHSCN; (iii) Medications, drug interactions if any and medical emergencies; and (iv) Additional clinical recommendations specific to CSHCN.

These topics are described in detail for each type of special health care need that was selected and reviewed in this scoping review.

Asthma

Asthma is a common childhood disease, affecting 1 in 10 children¹². Although often thought of as acute respiratory distress brought on by environmental factors, asthma is a chronic airway disease characterized by inflammation, increased mucus production, and bronchial constriction.¹² It is twice as common in prepubertal boys but affects both genders equally during adolescence and adulthood¹².

Asthma can be classified according to presence and severity using the Halterman et al (2000) approach demonstrated in Table 3.¹³

Oral Conditions and Implications:

Oral findings of children with moderate to severe asthma include higher caries rates, decreased salivary rates, increased prevalence of oral mucosal changes characteristic of chronic mouth breathers, and increased levels of gingivitis.	Category	In past 12 months
	Severe	2 hospitalizations or 4 asthma-related acute visits
	Moderate	1 hospitalization 2 acute visits or 3 episodes of wheezing
	Mild	No hospitalizations 1 asthma-related acute visit 2 episodes of wheezing
	Controls	No reported physician-diagnosed asthma

Table3. Asthma Classifications

Increased incidence of orofacial abnormalities such as high palatal vault, more posterior crossbites, greater overjet, and increased facial height is also seen¹².

Medications:

Goswami et al. (2021) stated that taking long-term asthma medication was positively associated with having tooth wear¹⁴. An earlier study in 2001 written by Shulman et al reported that, Any association between asthma and dental caries may occur primarily in younger children with no evidence of an association between asthma and dental caries as children mature¹⁵.

Patients taking systemic corticosteroids and those who were hospitalized or in the emergency department in the preceding year should be treated with caution because they are at higher risk of morbidity and mortality. Sometimes, deferring the dental visit until the patient's asthma is well controlled is recommended¹⁶. Patients who use bronchodilators should take a dose before their appointment and bring their inhalers or nebulizers into the dental office. Acute symptoms may be prevented by the use of the child's bronchodilator (inhaled β_2 receptor agonist such as albuterol).

Dental Visits and Clinical Recommendations:

A dental procedure might precipitate an acute attack for the asthmatic child, that is why before initiating dental treatment, the dentist should know what are the frequency and severity of the attacks, what are the triggering agents, when the patient was

hospitalized or was in the emergency department, when the last attack occurred, what medications the patient takes, and what limitations on activity the patient may have ¹².

Behavioural Management:

Behavioral methods are used to reduce anxiety, and nitrous oxide–oxygen analgesia may be helpful. Hydroxyzine hydrochloride (Vistaril) and diazepam (Valium) have been successful in alleviating anxiety. Barbiturates and narcotics are not indicated because of their potential for histamine release, leading to a bronchospasm. Aspirin compounds and nonsteroidal anti-inflammatory agents are contraindicated because about 4% of patients experience wheezing after taking these drugs. Acetaminophen is recommended. Positioning a child with mild asthmatic symptoms in an upright or semi-upright position for the dental procedure may be beneficial^{12,16}.

Similar to precautions taken for other patients, it is vital to avoid the potential for dental materials and products to exacerbate the asthma.

Medical Emergency Management:

Emergency treatment for a person with asthma and who is in respiratory distress requires discontinuing the dental procedure, reassuring the patient, and opening the airway.

Staff should administer 100% oxygen while placing the patient in an upright or comfortable position. Keeping the airway open, administer the patient's β_2 agonist with an inhaler or nebulizer^{12,17}.

If there is no improvement, administer subcutaneous epinephrine (0.01 mg/kg of 1:1000 solution) and obtain medical assistance immediately¹⁷.

Autism Spectrum Disorder:

According to the American Psychiatric Association's (2013) Autism Spectrum Disorder (ASD) is a developmental disability that includes deficits in social communication and social interaction and the presence of restricted, repetitive patterns of behavior, interests, or activities that can persist throughout life¹⁸. The prevalence is estimated to be 6 per 1000 children, with greater frequency of occurrence in boys than in girls¹².

Oral Conditions and Implications:

Children with ASD have multiple medical and behavioral problems that may make dental treatment difficult. These children often have poor muscle tone, poor coordination, drooling, a hyperactive knee jerk, and strabismus¹².

Children with ASD may have strict routines and prefer soft and sweetened foods. Because of poor tongue coordination, children with ASD tend to “pouch” food instead of swallowing. Children with ASD may have strict routines and prefer soft and sweetened foods. As this habit, combined with the desire for sweetened foods, leads to increased susceptibility to caries¹².

Burgette and Rezaie (2020) stated that children with ASD had significantly greater odd of having caregiver reporting dental caries as compared with children without Autism¹⁹. A similar study was done earlier in 2010 by Marshal, J et al which also confirms the validity of considering autism as an indicator of high caries risk²⁰. When comparing ASD children based on their residency, living with parent or in residential school, Children with ASD and who resides with their parents were more to have gingivitis and bruxism²¹.

Dental Visits and Clinical Recommendations:

Children with ASD tend to adhere to routines, and may require several dental visits to adapt to the dental environment and see it as a routine. The use of a Papoose Board or Pedi-Wrap may be necessary and in some instances has a calming effect on the child¹².

Behavioural Management:

The following procedures have proven to be beneficial in establishing dentist-patient-parent-staff rapport and reducing the patient's anxiety about dental care¹²:

- It is recommended that the family take a tour of the office before attempting treatment. Both the patient and family (parent/caretaker/guardian) can be brought to meet the office staff. This will familiarize the patient with the personnel and facility and reduce the patient's fear. It is also suggested that the patient should bring a favorite item (stuffed animal, blanket, or toy) to hold for the visit which may help in reducing the patient's anxiety level.
- It is advisable that being repetitive, speaking slowly and in simple terms is always a better technique in communicating with autistic children. Making sure explanations are understood by asking the patient if there are any questions or if the individual has an alternative communication system, such as a picture board or electronic device, would be helpful to assist with dental explanations and instructions.
- One instruction at a time, Rewarding the patient after the successful completion of each procedure and/or invite the parent/guardian into the operatory for assistance and to aid in communication with the patient is always a great way of managing a child with Autism Spectrum Disorder.

- It is also vital to keep appointments short and Gradually progress to more difficult procedures (e.g., anesthesia and restorative dentistry) after the patient has become accustomed to the dental environment.
- Maintaining a lighter schedule to better accommodate the needs of the patient.

Visual and Auditory Impairment

Hearing loss (deafness) is a disability that is often overlooked because it is not obvious²². Total hearing loss affects 1.8 million people, and there are 14 million hearing-impaired individuals in the United States²². In 2021, There is about 1 in 600 neonates were affected with a congenital hearing loss²².

Total visual impairment (blindness) affects more than 30 million people²³. According to the World Health Organization, in 2010 the number of people in the world who were visually impaired was estimated to be 285 million; among those individuals, 39 million were blind and 1.4 million were children²³.

Oral Conditions and Implications:

Poor oral health and increased gingival inflammation has been described to be common in individuals with auditory or visual impairments and has been considered to be an added difficulty for some of these individuals who are already experiencing reduced activities of daily living, social isolation, and depression associated with their disability²⁴.

Bimstein E et al (2014), studied the oral characteristics of children with visually and auditory impairments and reported that children and adolescents with or without hearing or visual impairment develop similar dental caries prevalence²⁵. Oral hygiene and resulting gingival inflammation are a challenge for the visually impaired and to a lesser degree, the auditorily impaired²⁵. In children and adolescents with such special health care needs, one must be alert to the fact that appropriate oral health considerations should be tailored to specific disabilities.

Dental Visits, Clinical Recommendations and Behavioral Management:

The following techniques are to be considered in the treatment of a hearing-impaired patient ¹²:

- During the initial appointment, determining how the patient desires to communicate (i.e., interpreter, lip reading, sign language, note writing [for child who can read], or a combination of these). Looking for ways to improve communication. It is useful to learn some basic sign language. Facing the patient and speaking slowly at a natural pace and directly to the patient. Exaggeration of facial expressions and the use of slang language make lip reading difficult.
- Assessing speech, language ability, and degree of hearing impairment when taking the patient's complete medical history, Identifying the age of onset, type, degree, and cause of hearing loss, and determine whether any other family members are affected is vital
- Enhancing visibility for communication, Watching the patient's expression, Making sure the patient understands what the dental equipment is, what is going to happen, and how it will feel, Have the patient use hand gestures if a problem arises, If appropriate, write out and display information is crucial ways to manage a hearing impaired patient.

- Reassuring the patient with physical contact, holding the patient's hand initially, or placing a hand reassuringly on the patient's shoulder while the patient maintains visual contact.
- Using the tell-show-feel-do approach, visual aids and allowing the patient to see the instruments, and demonstrate how they work as
Hearing-impaired children may be very sensitive to vibration.
- Displaying confidence, smiling and reassuring gestures to build up confidence and reduce anxiety is helpful.
- Allowing extra time for all appointments and Avoiding blocking the patient's visual field, especially with a rubber dam.
- Adjusting the hearing aid (if the patient has one) before the handpiece is in operation because a hearing aid amplifies all sounds. Many times the patient will prefer to have it turned off.

Before initiating dental treatment for a visually impaired child, the dentist should keep the following points in mind¹²:

- Determining the degree of visual impairment.
- If the patient is accompanied by a companion, finding out who is the companion and introducing other office personnel is crucial.
- Establishing rapport, offering verbal and physical reassurance and when making physical contact, holding the patient's hand often promotes relaxation.
- In guiding the patient to the operatory, asking if the patient desires assistance is advisable. Gaining verbal consent before grabbing or moving or stopping the patient. Parents should be encouraged to accompany their child.
- Painting a picture in the mind of the visually impaired child by describing the office setting and treatment, Giving the patient adequate descriptions before performing treatment procedures and using the same office setting when possible for every dental visit will help achieve good management.

- Allowing the patient to ask questions during the course of treatment, keeping in mind that the patient is highly individual, sensitive, and responsive.
- Rather than using the tell-show-do approach, inviting the patient to touch, taste, or smell, recognizing that these senses are acute.
- Describing in detail the instruments and objects to be placed in the patient's mouth.
- The patient may have a heightened sensitivity to taste and require introducing smaller quantities initially to gain acceptance.
- Some patients may be photophobic and need to wear sunglasses.
- Keeping distractions to a minimum, and avoiding unexpected loud noises and Limiting providers of the patient's dental care to one dentist whenever possible.

Down Syndrome (Trisomy 21 Syndrome)

Down syndrome is the most commonly known chromosomal disorder and is caused by the presence of an extra copy of chromosome 21 (trisomy 21)¹². Medical conditions that occur more frequently in infants and children with Down syndrome and that increase the morbidity and mortality of these individuals include cardiac defects, leukemia, and upper respiratory infections¹².

The incidence of congenital cardiac defects is about 40%, and as a result patients have a higher risk for periodontal disease²⁶. Therefore, the presence of a heart condition among these patients should be noted as it is vital information that should be considered prior to dental treatment¹².

Oral Conditions and implications:

Skeletal findings in this group of children include an underdeveloped midface which may create a prognathic occlusal relationship.

Oral findings include mouth breathing, open bite, appearance of relative macroglossia, fissured lips and tongue, angular cheilitis, delayed eruption times, missing and malformed teeth, oligodontia, small roots, microdontia, crowding, and a low level of caries²⁷.

Children with Down syndrome also experience a high incidence of rapid, destructive periodontal disease, which may be related to local factors such as tooth morphology, bruxism, malocclusion, and poor oral hygiene²⁷.

Certain systemic factors are also believed to contribute to periodontal disease, including poor circulation and decreased cellular motility of gingival fibroblasts,²⁸ decreased humoral response, general physical deterioration at an early age, and genetic influences.

Bell et al.²⁹ reported that severity of tooth wear (both attrition and erosion) was significantly greater in children with Down syndrome than in children without the syndrome.

Dental Visits, Clinical Recommendations and behavioural management:

Many children with Down syndrome are cooperative and dental procedures may be provided without compromise if the dentist works at a slightly slower pace¹².

Emphasis should be placed on preventive dental care with frequent follow-up visits to monitor oral hygiene.

A recent study by Cheng et al.³⁰ documented periodontal healing responses in adult patients with Down syndrome using nonsurgical periodontal therapy in conjunction with the use of chlorhexidine rinse twice a day and chlorhexidine gel and monthly recalls.

Comprehensive dental care is an overall goal with alteration based on the individual's level of functioning.

Light sedation and immobilization may be indicated in those children who are moderately apprehensive. Severely resistive patients may require general anesthesia.¹²

Diabetes and Obesity:

Diabetes mellitus is a disease involving insulin production and/or resistance.³⁰ Decreased insulin or insulin insensitivity leads to impairments in carbohydrate, fat, and protein metabolism. This disorder is characterized by hyperglycemia when left untreated.³¹ Chronic hyperglycemia predisposes to vascular compromise with subsequent dysfunction of the cardiovascular system, peripheral nervous system, kidneys, and other body systems.³⁰ Type 1 or insulin-dependent diabetes mellitus occurs most commonly in children.³²

Obesity is common in the US adolescent population, with its prevalence tripling over the past four decades^{33,34}. Moreover, type 2 diabetes (T2D) in children and adolescents is increasing in parallel with increasing rates of obesity³⁵. While type 1 diabetes represents >90% of the new diabetes diagnoses in children, recent data demonstrates that the incidence of T2D is equivalent in at-risk pediatric populations³⁶, such as those of minority race/ethnicity and strong family history of T2D.

Oral Conditions and Implications:

Three out of the seventeen articles included in this review studied the association between diabetes and/or obesity and poor oral health and periodontal disease^{37,38,39}. All three confirmed that diabetes and obesity can be risk factors for oral conditions.

Periodontal damage was observed in 52 individuals (34%) overall, but was more common in type 2 (55%) vs. type 1 diabetes (29%)³⁷. Obese children with T2D were more likely to have poorer oral health compared to normal weight and obese children without T2D³⁸. The findings showed an association between diabetes and an increased risk for periodontal destruction even very early in life³⁹.

Medical Emergencies and Clinical Recommendations:

Emergencies in children with diabetes may be the result of hypoglycemia or hyperglycemia. ⁴⁰ Hyperglycaemia leads to diabetic ketoacidosis which requires several days to develop, during which time the patient appears ill. It does not occur suddenly in a previously alert and well patient. Therefore, this disorder will generally not lead to an acute emergency in the dental office. Regardless, if the diabetic patient does not look well, and particularly if the breath has an acetone-like odor, he or she should be instructed to seek medical attention immediately ^{31,40}.

If a diabetic patient, who appears well, has a sudden deterioration in cognition or loss of consciousness in the dental office, the condition is more likely to be due to acute hypoglycemia^{31,40}.

For a dental visit, patient is recommended to continue with their daily regimen and eat their normal diet.⁴⁰This should prevent hypoglycemia (<80 mg/ dL blood glucose). The exception to this rule is when patients are instructed to have nothing by mouth (NPO) before sedation or general anesthesia prior to treatments planned in the operating room.⁴¹

In case of an emergency, patients should be placed in a position of comfort. A blood glucose sample should be obtained if possible⁴⁰. Management of hypoglycemia involves the administration of glucose.^{31,41} The oral route is used if the patient is conscious and is experiencing early symptoms. Oral glucose tablets 37.5 g can be administered and repeated as necessary. Sugar dissolved in juice or a sugar-containing soft drink may also be used. Simple sugars are more rapidly absorbed than complex carbohydrates.

Should the patient become unconscious, Basic Life Support can be initiated. Definitive care requires IV access and 50% dextrose IV⁴⁰. This will rapidly bring the patient back to consciousness among severely hypoglycemic patients. Administering glucose orally is not advisable if the patient is significantly obtunded or unconscious, as

aspiration or airway obstruction may occur⁴⁰. Glucagon may also be considered in a similar situation³¹.

Cerebral Palsy

Cerebral palsy is one of the primary disabling conditions of childhood. The incidence of cerebral palsy in the United States (2019) for all ages is 1.5–3 cases per 1000 individuals^{12,42}. One newborn in 2019 is approximately 200 live births will be affected with this condition. Cerebral palsy is not a specific disease entity but rather a collection of disabling disorders caused by insult and permanent damage to the brain during the prenatal and perinatal periods, during which time the central nervous system is still maturing. This disability might involve muscle weakness, stiffness or paralysis, poor balance or irregular gait, and uncoordinated or involuntary movements¹².

Oral Conditions and Implications:

No intraoral anomalies are unique to persons with cerebral palsy. However, several conditions are more common or more severe than in the general population such as periodontal disease, dental caries, malocclusions, bruxism and trauma^{26,12}.

A patient with cerebral palsy who has involuntary movements of the limbs and head might be perceived as an uncooperative and unmanageable. Moreover, if they have unintelligible speech, uncontrollable jaw movements, and spastic tongue, they are often erroneously assumed to be intellectually delayed¹².

Dental Visits and Clinical Recommendations:

In providing treatment for children with cerebral palsy, it is imperative that a dentist evaluate each patient thoroughly in terms of personal characteristics, symptoms, and behavior and then proceed as conditions and needs dictate¹².

Taking a thorough medical and dental history is very important, and the parent or guardian should be interviewed before the initiation of any treatment. It may also be beneficial to consult the patient's physician regarding the patient's medical status¹².

The following suggestions are offered to the clinician as being of practical significance in treating a patient with cerebral palsy¹²:

- Treating a patient who uses a wheelchair in the wheelchair. Many patients express such a preference, and it is frequently more practical for the dentist. For a young patient, the wheelchair may be tipped back into the dentist's lap.
- If a patient is to be transferred to the dental chair, asking about a preference for the mode of transfer is vital and if the patient has no preference, the two-person lift is recommended.
- Making an effort to stabilize the patient's head throughout all phases of dental treatment, trying to place and maintain the patient in the midline of the dental chair, with arms and legs as close to the body as feasible.

- Keeping the patient's back slightly elevated to minimize difficulties in swallowing. (It is advisable not to have the patient in a completely supine position.)
- When the patient has been placed in the dental chair, the patient's degree of comfort should be determined and assessing the position of the extremities. The limbs should not be forced into unnatural positions. Considering the use of pillows, towels, and other measures for trunk and limb support to provide the maximum comfort to the patient. Using stabilization carefully to control flailing movements of the extremities is crucial.
- For control of involuntary jaw movements, choosing from a variety of mouth props will help to control it. Patient preference should weigh heavily because a patient with cerebral palsy may be very apprehensive about the ability to control swallowing. Such appliances may also trigger the strong gag reflex that many of these patients possess. Allowing frequent time-outs for the patient to regroup, relax, and breathe normally.
- To minimize startle reflex reactions, avoiding presenting stimuli such as abrupt movements, noises, and lights without forewarning the patient.

- Introducing intraoral stimuli slowly to avoid eliciting a gag reflex or to make it less severe.
- The use of the rubber dam, a highly recommended technique, for restorative procedures.
- Working efficiently and quickly to minimize patient time in the chair to decrease fatigue of the involved muscles. Sedation or general anesthesia may be an option for more complex patients.

Conclusion

This project will have the potential to have a positive impact on the community. As it focuses on the care for the most vulnerable patients, disabled and with limited access. In this review, the prevalence of the oral health conditions among CSHCN and the major clinical recommendations relevant to pediatric dentistry and literature published over the last 20 years regarding the best approaches for proper dental management of children with special health care needs are described in detail. The results indicated that oral health conditions and poor oral health is worse among special needs children compared to children without special health care needs. This is a vital matter that should be addressed and considered by health care professionals and caregivers to help CSHCN to lead a better quality of life.

Special needs children need more help with activities of daily living from their caregivers and proper oral health management by a specially trained dentist. Due to the wide variation of medical health conditions and their clinical presentation of the disease, each patient should be managed on an individual basis and the child's physician should be consulted before any dental care is initiated.

There is limited recent studies focusing on the prevalence of oral health conditions among children with special health care needs. Out of 17 studies included, none of the studies evaluated haematological diseases. Most studies also described the prevalence of oral cleft/cleft lip. However, in this review we did not include this condition for further discussion as the breadth of information on oral cleft and cleft lip is vast and is worthy of a review specific to that topic. More research effort is necessary to look at the prevalence of oral health conditions in different regions of the country (US) and can be compared to prevalence internationally. There is a need for more literature research studies to assist pediatric dentistry practitioners in better understanding of oral health issues among CSHCN and managing the oral health care among these children more effectively thus providing improved dental experiences which can help in improving their overall oral and systemic health.

Strengths and limitations:

Strengths:

In order to answer the question and objectives of this topic, the best approach was to conduct a scoping review; as the area of this topic is broad, complex and heterogeneous in nature.

It is also not defines clinical question, so using a scoping review helped in giving an overview and map the evidence in the literature and it also identified the gaps in existing literature and gives statements in knowledge gaps.

Limitations

Unlike systematic reviews, scoping reviews do not incorporate a quality assessment of the studies included. This scoping review was aimed at collecting useful clinical information that is available and easily accessible to help paediatric dentists during the management of children with the most common special health care needs. Through this approach, we intended to define the scope of the literature relevant to this topic. However, as with any scoping review, a likely publication bias was present due to the selection of studies conducted only in the United States with English language. Furthermore, the article search was restricted to an 20-year period; thus, our reference screening might have been underrepresented.

However, we are confident that a significant number of studies included provided an overview and useful information on the oral health care of children with special health care needs.

Other limitations of the present study were the high heterogeneity of the detected articles and our limited ability to consistently summarise details of the extracted data or finding

APPENDIX

Cochrane

ID	Search Hits
#1	MeSH descriptor: [Attention Deficit Disorder with Hyperactivity] explode all trees 3084
#2	MeSH descriptor: [Anxiety Disorders] explode all trees 7991
#3	MeSH descriptor: [Depressive Disorder] explode all trees 13506
#4	MeSH descriptor: [Autism Spectrum Disorder] explode all trees 1909
#5	MeSH descriptor: [Cerebral Palsy] explode all trees 1711
#6	MeSH descriptor: [Cognition Disorders] explode all trees 6167
#7	MeSH descriptor: [Diabetes Mellitus] explode all trees 35898
#8	MeSH descriptor: [Asthma] explode all trees 12294
#9	MeSH descriptor: [Hemophilia A] explode all trees 470
#10	MeSH descriptor: [Hemophilia B] explode all trees 121
#11	MeSH descriptor: [Vision Disorders] explode all trees 1636
#12	MeSH descriptor: [Hearing Disorders] explode all trees 2129
#13	MeSH descriptor: [Craniofacial Abnormalities] explode all trees 628
#14	MeSH descriptor: [Down Syndrome] explode all trees 419
#15	MeSH descriptor: [Disabled Children] explode all trees 128
#16	{OR #1-#15} 85494
#17	MeSH descriptor: [Child] explode all trees 62176
#18	MeSH descriptor: [Adolescent] explode all trees 110769
#19	(teen* OR child* OR infant OR adolescent):ti,ab,kw 296406
#20	{OR #17-#19} 296406
#21	#16 AND #20 24006
#22	MeSH descriptor: [Tooth Diseases] explode all trees 12176
#23	MeSH descriptor: [Mouth Diseases] explode all trees 13174
#24	MeSH descriptor: [Oral Health] explode all trees 518
#25	("dental health" OR "dental trauma"):ti,ab,kw 815
#26	{OR #22-#24} 22611
#27	#21 AND #26 470
#28	MeSH descriptor: [] explode all trees and with qualifier(s): [epidemiology - EP] 45951
#29	MeSH descriptor: [Prevalence] explode all trees 4984
#30	#28 OR #29 46554
#31	#27 AND #30 22

PubMed

((("Attention Deficit Disorder with Hyperactivity"[Mesh] OR "Anxiety Disorders"[Mesh] OR "Depressive Disorder"[Mesh] OR "Autism Spectrum Disorder"[Mesh] OR "Cerebral Palsy"[Mesh] OR "Cognition Disorders"[Mesh] OR "Diabetes Mellitus"[Mesh] OR "Asthma"[Mesh] OR "Hemophilia A"[Mesh] OR "Hemophilia B"[Mesh] OR "Vision Disorders"[Mesh] OR "Hearing Disorders"[Mesh] OR "Craniofacial Abnormalities"[Mesh] OR "Down Syndrome"[Mesh]) AND (child*[tiab] OR adolescent[tiab] OR teen*[tiab] OR infant[tiab])) OR ("Disabled children"[Mesh])) AND (("Mouth Diseases"[Mesh] OR "Tooth Diseases"[Mesh] OR "Oral Health"[mesh] OR "dental health"[tiab] OR "dental trauma"[tiab]))) AND (epidem* OR prevalence OR occurrence) AND (1997:2022[pdat])

Dental and Oral Surgery Source

(((TI ("Attention Deficit Disorder with Hyperactivity" OR "Anxiety Disorders" OR "Depressive Disorder" OR "Autism Spectrum Disorder" OR "Cerebral Palsy" OR "Cognition Disorders" OR "Diabetes Mellitus" OR "Asthma" OR "Hemophilia A" OR "Hemophilia B" OR "Vision Disorders" OR "Hearing Disorders" OR "Craniofacial Abnormalities" OR "Down syndrome" OR disab* OR "special needs" OR "special health" OR "handicap*" OR impair*) AND TI (child* OR adolescent OR teen* OR

infant)) OR (AB ("Attention Deficit Disorder with Hyperactivity" OR "Anxiety Disorders" OR "Depressive Disorder" OR "Autism Spectrum Disorder" OR "Cerebral Palsy" OR "Cognition Disorders" OR "Diabetes Mellitus" OR "Asthma" OR "Hemophilia A" OR "Hemophilia B" OR "Vision Disorders" OR "Hearing Disorders" OR "Craniofacial Abnormalities" OR "Down syndrome" OR disab* OR "special needs" OR "special health" OR "handicap*" OR impair*) AND AB (child* OR adolescent OR teen* OR infant))) AND (TI ("Mouth Diseases" OR "Tooth Diseases" OR "Oral Health" OR "dental health" OR "dental trauma" OR "dry mouth" OR "dental caries" OR "gum disease" OR "cleft palate" OR "periodontal disease") OR AB ("Mouth Diseases" OR "Tooth Diseases" OR "Oral Health" OR "dental health" OR "dental trauma" OR "dry mouth" OR "dental caries" OR "gum disease" OR "cleft palate" OR "periodontal disease"))) AND TX (prevalen* OR occur* OR epidemi*)

Embase:

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OR 'epidemiometry':ti,ab OR 'historically controlled study':ti,ab OR 'interrupted time
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(('juvenile'/exp OR 'juvenile':ti,ab OR 'youth':ti,ab) AND (2000:py OR 2001:py OR
2002:py OR 2003:py OR 2004:py OR 2005:py OR 2006:py OR 2007:py OR 2008:py OR
2009:py OR 2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py OR 2015:py OR
2016:py OR 2017:py OR 2018:py OR 2019:py OR 2020:py OR 2021:py OR 2022:py))
AND [english]/lim

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