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Dental caries and quality of life of visually impaired children: A systematic review

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Abstract. This study aimed to determine the prevalence of dental caries in visually impaired children, its impact on their quality of life, influencing factors, and to recommend effective preventive interventions. **Materials and methods.** A systematic literature review was conducted following PRISMA guidelines using secondary data from Scopus and PubMed. From 238 retrieved articles, title screening and duplicate removal reduced the count. Applying inclusion and exclusion criteria resulted in 77 articles, and after abstract screening and full-text examination, 30 articles were included in the study. **Results.** The study reveals a high prevalence of dental caries in visually impaired children, ranging from 57.7% to 71%, due to challenges in maintaining oral hygiene and limited dental care access. Dental caries adversely affects their quality of life, causing pain, discomfort, and functional limitations, underscoring the need for early detection and treatment. Internal factors such as oral hygiene practices, detection abilities, and saliva activity influence caries prevalence. External factors, including family support, access to dental services, and social environment, significantly impact the oral health and quality of life of these children. **Conclusion.** To prevent dental caries in visually impaired children, it is recommended to employ multisensory education, innovative techniques, family involvement, community programs, specialized prevention, early intervention, regular check-ups, and effective oral hygiene practices. Given the high risk of dental caries due to hygiene challenges and limited access to care, comprehensive interventions and family support are essential for improving oral health.

Key words: dental caries, tooth decay, visually impaired, blind, children, oral health

Влияние кариеса зубов на качество жизни детей с нарушениями зрения: систематический обзор

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Реферат. Цель исследования — определить распространенность кариеса зубов у детей с нарушением зрения, его влияние на качество жизни, факторы влияния и рекомендовать эффективные профилактические мероприятия. **Материалы и методы.** Систематический обзор был проведен в соответствии с рекомендациями PRISMA с использованием вторичных данных из Scopus и PubMed. Из 238 найденных статей отбор по названию и удаление дубликатов позволили сократить число статей. В результате применения критериев включения и исключения было отобрано 77 статей, а после проверки аннотаций и изучения полного текста в исследование включено 30 статей. **Результаты.** Исследование показало высокую распространенность кариеса зубов у детей с нарушениями зрения — от 57,7 до 71%, что связано с трудностями в поддержании гигиены полости рта и ограниченным доступом к стоматологической помощи. Кариес зубов негативно влияет на качество их жизни, вызывая боль, дискомфорт и функциональные ограничения, что подчеркивает необходимость раннего выявления и лечения. Внутренние факторы: практика гигиены полости рта, способность к обнаружению и активность слюны — влияют на распространенность кариеса. Внешние факторы, включая поддержку семьи, доступ к стоматологическим услугам и социальное окружение, значительно влияют на здоровье полости рта и качество жизни этих детей. **Заключение.** Для профилактики кариеса у детей с нарушениями зрения рекомендуется использовать мультисенсорное обучение, инновационные методы, вовлечение семьи, общественные программы, специализированную профилактику, раннее вмешательство, регулярные осмотры и эффективные методы гигиены полости рта. Учитывая высокий риск развития кариеса зубов из-за проблем с гигиеной и ограниченного доступа к медицинской помощи, комплексные вмешательства и поддержка семьи необходимы для улучшения здоровья полости рта.

Ключевые слова: кариес зубов, кариес, инвалиды по зрению, слепые, дети, здоровье полости рта

INTRODUCTION

Dental caries is the most common chronic disease in children worldwide. According to the World Health Organization (WHO), dental caries affects a significant proportion of children worldwide, with figures indicating that 60 to 90% of schoolchildren are impacted by this oral health issue [1]. According to the National Basic Health Research in 2018, the prevalence of dental caries in Indonesia increased to 57.6 from 53.2% in 2013, with dental caries affecting up to 90% of the toddler population [2]. Moreover, other study highlighted that the prevalence of dental caries in Indonesia was 88.8%, with a root caries prevalence of 56.6% [3]. Furthermore, the Indonesia Basic Health Research (Riskesdas) in 2013 reported an increase in the prevalence of dental caries to 53.2% from 43.4% in 2007 [4].

The prevalence of dental caries in visually impaired children can range from 40% to as high as 98.7% [5]. Other study reported a dental caries prevalence of 71% in the blind group, indicating a significant burden of dental caries among visually impaired children [6]. The study highlighted that visually impaired individuals are at a higher risk of developing dental caries due to challenges in detecting early signs of caries development, such as discoloration, which serves as an early indication of the disease process [7]. Factors such as poor oral hygiene practices, dietary habits, limitations in cleaning ability, and inadequate parental and healthcare provider support contribute to the heightened risk of dental diseases in visually impaired children [8]. Visually impaired children often face challenges in maintaining proper oral hygiene, leading to issues such as gingivitis, periodontal diseases, and ultimately dental caries [9, 10]. They also tend to have difficulty accessing dental health facilities that are friendly and able to treat children with visual impairments. Additionally, the inability to visualize plaque on dental surfaces and the challenges in effective plaque removal are significant contributors to the development of caries and periodontal diseases in this population [11].

Dental caries not only causes pain and discomfort, but can also negatively affect the quality of life of a visually impaired child. These negative impacts include feeding difficulties caused due to pain and discomfort due to dental caries. This can cause nutritional deficiencies and result in physical and mental development of children to cause stunting [12]. Dental caries can impact the ability to engage in educational activities and daily routines. The pain and discomfort associated with dental caries can interfere with activities such as studying, sleeping, and eating, affecting the overall well-being and functioning of these children [13]. Difficulty socializing due to blind children with dental caries may feel embarrassed or uncomfortable to socialize with their friends because of bad breath or pain they experience [14]. This can cause them to feel isolated and lonely.

Understanding the impact of dental caries prevalence on the quality of life of visually impaired children is very important because it can be used as an effort to develop effective interventions to prevent dental caries in visually impaired children, can improve access to dental health services for visually impaired children, and increase public awareness about the importance of dental health in visually impaired children. The results of this study are expected to help improve the quality of life of visually impaired children in Indonesia.

This study aimed to determine the prevalence data of dental caries in visually impaired children in various regions, the impact of dental caries on the quality of life of visually impaired children, what factors influence the relationship between dental caries and quality of life in visually impaired children, and recommend effective interventions to prevent dental caries in visually impaired children.

MATERIAL AND METHODS

The method used in this study is systematic literature review. This method is used to collect relevant research about impact of dental caries prevalence on quality of life of visually impaired children. The search instrument used by Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA).

Search strategy

This study is a systematic literature review that aimed to determine the prevalence data of dental caries in visually impaired children in various regions, the impact of dental caries on the quality of life of visually impaired children, what factors influence the relationship between dental caries and quality of life in visually impaired children, and recommend effective interventions to prevent dental caries in visually impaired children.

A literature search will be conducted in May 2024. The data used in this study were secondary data obtained from research conducted by previous researchers and not from direct research. The secondary data sources were obtained from reputable international journal articles according to predetermined themes. The literature was obtained from the Scopus and PubMed databases. Keywords related to “dental caries”, “oral hygiene”, “visually impaired”, “blind”, “children” and obtained 238 documents. Articles included in the search were those published in English from 2014–2024. During the search process, researcher used Boolean operators and wildcard characters precisely to focus our search and detect the singular or plural form of the same term in all databases used.

Study selection and eligibility criteria

The process of collecting data in this systematic literature review begun with an article search. To prevent errors and bias in selecting articles, at least 2 researchers screened each article independently. Researchers filtered articles by title and abstract, and then assessed the full text of potentially relevant articles resulting in 30 articles worthy of use in the study. A further 30 articles underwent data extraction, where relevant information such as research location, research subjects and samples, research instruments, research design, and research results would be extracted and synthesized. Finally, a narrative synthesis would be performed to summarize the findings and identify patterns and themes throughout the study. Systematic review is a research method that can be used to answer these questions. It can combine results from several studies and provide stronger evidence

about the impact of dental caries prevalence on quality of life of visually impaired children.

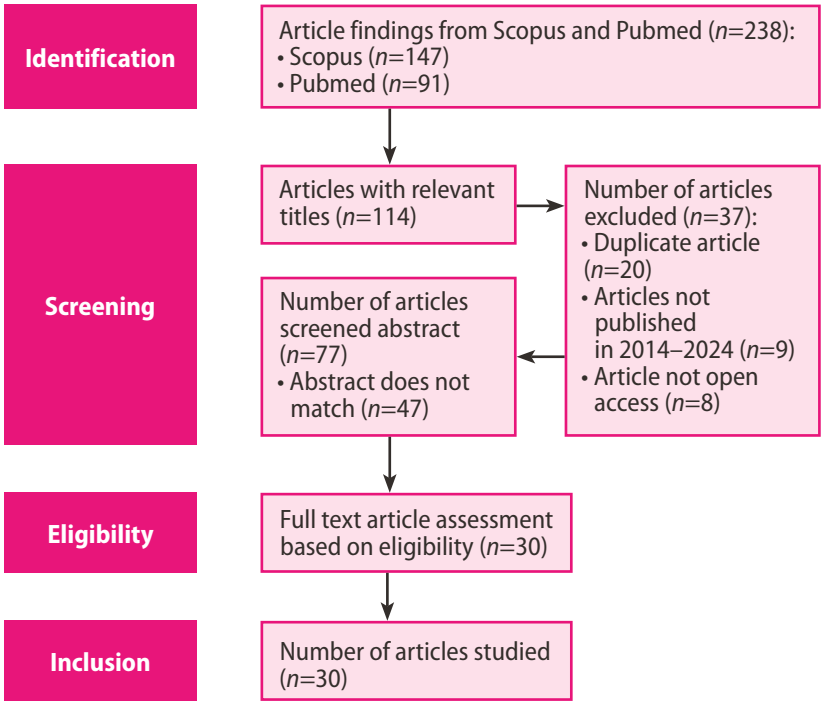
Inclusion criteria:

- Research article that discusses the impact of dental caries prevalence on quality of life of visually impaired children;
- English language documents published in recent 10 years (2014—2024);
- Open access full text available;
- Research conducted in different countries;
- Quantitative, qualitative, experimental research methods.
- Exclusion criteria:
- Systematic review;
- Literature review;
- Non-research.

RESULT

Based on the search results utilizing predetermined keywords and inclusion criteria, a total of 238 potential articles were initially retrieved from two prominent databases: Scopus (*n*=147) and PubMed (*n*=91). Subsequent to the title screening process, the number of articles with relevant titles is 114. Following the removal of duplicate articles (*n*=20), as well as those not published between 2014 and 2024 (*n*=9), and non-open access article (*n*=8). Total 77 articles were retained for further analysis. A subsequent screening of abstracts led to the evaluation of 77 articles, with 47 found to have abstracts not meeting the predetermined criteria (see Figure).

A subsequent assessment involving full-text examination was then conducted to ascertain eligibility, resulting in the inclusion of 30 articles for the study (see Table).



Article extraction process flowchart

DISCUSSION

Prevalence of dental caries in visually impaired children

Research about the prevalence of dental caries in visually impaired children indicates a high prevalence with rates ranging from 57.7% to 66.1% [24, 25 ,39]. Research by Mishra et al. (2021) observed a high prevalence of dental caries in visually impaired children, with 71% affected, indicating a significant burden of this oral health issue in this specific group [26]. This finding is further supported by Sarwendah et al. (2022), who noted a low to moderate caries index in visually impaired children aged 6—12, emphasizing the presence of dental caries even in visually impaired individuals [31]. Additionally, Waheed et al. (2022) reported that 60.68% of children in their study had dental caries, further highlighting the widespread nature of this condition among children, including those with visually impaired [40].

The etiology of dental caries in visually impaired children is multifactorial, influenced by various factors contributing to the development of this oral health issue. One significant factor contributing to the increased prevalence of dental caries in visually impaired children is the challenges they encounter in maintaining optimal oral hygiene practices. Natarajan et al. (2023) highlighted that visually impaired individuals are at a higher risk of developing dental caries because they may not be able to detect early signs of caries development, such as discoloration, which serves as an early indication of the disease process [7]. This inability to visually identify oral health issues may lead to delayed detection and treatment of dental caries, contributing to its higher prevalence in visually impaired children. Moreover, the study by Liu et al. (2019) in Northeast China noted that visually impaired schoolchildren exhibited a high prevalence of dental caries, poor periodontal health, and severe malocclusion [25]. This suggests that the oral health status of visually impaired children may be compromised due to factors such as inadequate access to dental care, lack of awareness about oral hygiene practices, and difficulties in performing routine oral care tasks independently, all of which can contribute to the development of dental caries. Additionally, parental factors and socioeconomic status play a crucial role in the occurrence of dental caries in children, including those with visually impaired. Research Li et al. (2023) found that fluoride use and parents' educational background had an impact on the caries experience of visually impaired students [24]. This indicates that parental knowledge, attitudes, and practices regarding oral health can influence the oral health outcomes of visually impaired children, highlighting the importance of parental involvement in promoting good oral hygiene habits and preventive dental care.

Research results

Title, Author, Year	Aims	Sample	Methods	Findings
Are teachers working with visually impaired children prepared to be advocates of oral health? Pilot study Chalas et al., 2023 [15]	To assess the level of pro-health awareness in oral health prevention among teachers working with visually impaired children in Poland and Slovakia.	109 teachers working directly with visually impaired children.	Questionnaire survey.	The knowledge of proper oral hygiene was found to be unsatisfactory, highlighting the need for further education and resources in this area.
Impact of verbal, braille text, and tactile oral hygiene awareness instructions on oral health status of visually impaired children Chowdary et al., 2016 [16]	Same as title.	120 institutionalized visually impaired children aged 6—16 years, divided into 3 groups: verbal and tactile, verbal and braille, and verbal, braille, and tactile	A prospective, interventional design with 3 groups receiving different types of oral hygiene instructions. Plaque and gingival scores were evaluated at 1, 3, and 6 months intervals.	The reduction in plaque and gingival scores in all groups, with the highest reduction in plaque scores 70.6% and the highest reduction in gingival scores 84%.
Effectiveness of a novel oral health education technique in maintenance of gingival health and plaque removal efficacy among institutionalized visually impaired children of Bhubaneswar city: A randomized controlled trial. Das et al., 2019 [17]	To assess the effectiveness of the Audio Tactile Performance (ATP) technique in maintaining gingival health and plaque removal efficacy among institutionalized visually impaired children.	60 persons divided into control group (Braille combined with audio-aids) or test group (ATP).	Randomized controlled trial.	The ATP technique was comparable to the control group. The gingival score reduction showed higher baseline scores in the test group (4.58±1.63) than in the control group (4.12±1.66), but the difference was not statistically significant.
New vision for improving the oral health education of visually impaired children – A non-randomized control trial. Debnath et al., 2017 [18]	To assess the effectiveness of innovative oral health education methods among visually impaired children in Bengaluru city, India, using a close-ended questionnaire and plaque index	40 visually impaired individuals attending a special school for the blind in Bengaluru, Karnataka, India	A non-randomized controlled trial over six months at KLE Institute of Dental Sciences in Bengaluru, Karnataka, India. It involved assessing oral health knowledge, attitudes, and practices using a questionnaire in Braille and plaque assessment. Innovative education methods included a music-based brushing technique, dental cast models, and a health talk with a Braille booklet	A significant improvement in oral health knowledge, attitudes, and practices among visually impaired children after the oral health education intervention. The mean KAP score increased from 6.98 to 14.68, and there was a notable decrease in poor plaque scores
Effectiveness of various sensory input methods in dental health education among blind children – a comparative study. Ganapathi et al., 2015 [19]	Same as title.	200 blind children aged 8 to 14 years from two blind schools with similar teaching standards.	Randomized the 200 blind children into five groups and provided dental health education through different sensory input methods. Oral health knowledge and plaque scores were assessed before and after the intervention.	There was a statistically significant increase in knowledge scores and plaque scores in all study groups compared to baseline, indicating the effectiveness of the sensory input methods in dental health education among blind children.
Effect of oral health education by audio aids, Braille & tactile models on the oral health status of visually impaired children of Bhopal city. Gautam et al., 2018 [20]	Same as title.	Sixty visually impaired children aged 5—18 years were selected and divided into three groups: Group A (Audio aids + Braille), Group B (Audio aids + tactile models), and Group C (Audio aids + Braille + Tactile models)	Instructions were given to maintain good oral hygiene and brushing techniques were explained using Braille, tactile models, and audio aids. After three months, the oral hygiene status was recorded and compared using the patient hygiene performance index	A decrease in mean plaque scores in all groups, indicating improved oral hygiene. However, inter-group comparison of PHP index scores was not statistically significant

Title, Author, Year	Aims	Sample	Methods	Findings
Dental disease outcomes following a 2-year oral health promotion program for Australian aboriginal children and their families: A 2-arm parallel, single-blind, randomised controlled trial. Jamieson et al., 2018 [21]	To reduce children's experience of dental disease at age 2 years through a multifaceted oral health promotion initiative developed for Aboriginal Australian communities.	448 women pregnant with an Aboriginal child who were randomly allocated to either the intervention (*n*=223) or control group (*n*=225).	The study was a single-blind, parallel-arm, randomized controlled trial that included providing dental care to mothers during pregnancy, applying fluoride varnish to children's teeth at specific ages, and using motivational interviewing along with anticipatory guidance.	At the two-year follow-up, 325 mother-child dyads were retained, with 159 in the intervention group and 165 in the control group. The mean dt at age two years was 0.62 for the intervention group and 0.89 for the control group, showing improvements in oral health for Aboriginal children
Prevalence of dental caries, oral hygiene knowledge, status, and practices among visually impaired individuals in Chennai, Tamil Nadu. John et al., 2017 [22]	Same as title.	404 visually impaired individuals in Chennai city, Tamil Nadu, aged between 15 and 30, from four randomly selected schools for the visually impaired.	Cross-sectional design and adopted WHO guidelines for diagnosing dental caries. Data collection included interviews, clinical examinations, and oral hygiene education.	42% of visually impaired individuals had fair oral hygiene, with a high prevalence of dental caries. The mean DMFT was 4.5±2.7, indicating a need for improved oral health education and preventive measures.
Assessment of oral hygiene status and prevalence of dental caries and traumatic injuries to anterior teeth among visually impaired children in Chennai city. Natarajan et al., 2023 [7]	Same as title.	130 visually impaired children from two blind schools in Chennai city.	Cross-sectional design to assess the oral hygiene status, dental caries, and traumatic injuries to anterior teeth among visually impaired children in Chennai city. Data on schools for blind children were obtained from "Welfare of the differently abled—Tamil Nadu", and statistical software was used to estimate the sample size.	54.6% of children had good oral hygiene, 40% had dental caries in permanent dentition, and 35.4% had traumatic injuries to anterior teeth.
Effectiveness of oral health education program using braille text in a group of visually impaired children-before and after comparison trial. Khurana et al., 2019 [23]	To evaluate the impact of Braille text and verbal, oral hygiene instructions on the oral health status of visually impaired children.	165 visually impaired males aged 7—19 years residing in a Blind School in New Delhi.	Nonrandomized before and after comparison trial design without controls. Oral health education was provided using Braille text and verbal instructions, with assessments conducted at regular intervals.	The statistically significant improvements in plaque index and gingival index scores among both completely and partially visually impaired children
Oral health status of students with visual orhearing impairments in Northeast China. Li et al., 2023 [24]	Same as title.	118 visually impaired students and 56 hearing impaired students who underwent oral examinations and questionnaire-based surveys	Oral examinations and questionnaire surveys	The prevalence of dental caries in visually impaired and hearing-impaired students was around 66%, with various factors impacting their oral health status
Oral health status among visually impaired schoolchildren in Northeast China Liu et al., 2019 [25]	To assess the oral health status of visually impaired schoolchildren in northeast China and investigate the influencing factors	103 visually impaired schoolchildren from the only special school for the blind in northeast China	Oral examinations and questionnaire surveys	An overall caries prevalence of 78.64% among visually impaired schoolchildren in northeast China, with a mean number of caries of 2.43
Prevalence of Oral Health Status and Needs in Institutionlized Physically Challenged Children Mishra et al., 2021 [26]	Same as title.	700 physically handicapped children, with 400 males and 300 females, attending various special schools in the city.	Epidemiological survey among physically handicapped children aged 6—15 in special schools. Oral examinations were done using standardized methods	48.8% of the physically challenged children had dental caries, with varying prevalence among different handicap groups.
Efficacy of a Modified Audio-Tactile Performance Technique with Braille (ATPb) on the Oral Hygiene Status of Visually-Impaired Children Nair et al., 2021 [27]	To develop a new oral health education program, specifically the Modified Audio-Tactile Performance Technique with Braille (ATPb), to improve oral hygiene maintenance in visually-impaired children	90 visually-impaired institutionalized children aged 6—15 years from schools in southern India, with the ability to read braille as an essential criterion for inclusion	Three different oral health education techniques were utilized: Audio Method (AM), Audio-Tactile Performance (ATP) Technique, and Modified ATPb Technique.	The Modified Audio-Tactile Performance Technique with Braille (ATPb) showed the most significant reduction in plaque scores

Title, Author, Year	Aims	Sample	Methods	Findings
Oral health behavior and its association with the Caries Index in visually impaired children **Puteri et al., 2020 [28]**	Same as title.	68 subjects, with 34 visually impaired children and 34 nonvisual impaired children, who were selected from four schools in Surabaya, Indonesia.	Observational cross-sectional design and included questionnaires and intraoral examinations to assess oral health behavior and the Caries Index in visually impaired children.	The visually impaired group had a low Caries Index (CI) of 1.5, with no significant difference in CI between visually impaired and nonvisually impaired groups. Knowledge significantly affected the CI of visually impaired children.
Overview of Dental Caries Severity and Nutritional Status in Preschool Children in Jatinangor in September 2014 **Putri et al., 2016 [13]**	To investigate the proportion of dental caries severity related to the nutritional status of children aged 3—5 years in Jatinangor.	64 children aged 3—5 years selected through cluster random sampling from three Pre-school Education Centers in Jatinangor.	Descriptive approach to assess dental caries severity and nutritional status in preschool children aged 3—5 years in Jatinangor. Dental caries was measured using the def-t index, while nutritional status was determined through anthropometric measurements.	92% of the children had dental caries, with 75% classified as severe. Additionally, 28% of the children were mildly undernourished, while 72% were well-nourished. Children with severe dental caries were more likely to have mild undernutrition.
Comparison of Different Modes of Oral Health Education in Visually Impaired Children **Santhoshi, 2024 [29]**	To evaluate and compare the effectiveness of different modes of oral health education in improving oral hygiene knowledge and practices among visually impaired children.	Visually impaired children aged 8—15 years who were totally blind (certified as 100% blind by an ophthalmologist) and willing to participate.	The study divided 100 visually impaired children into four groups: Braille, NVDA, Braille + NVDA, and control.	The combination of Braille and NVDA was the most effective in improving oral hygiene knowledge and practices.
Effect of specially designed oral health preventive programme on oral health of visually impaired children: use of audio and tactile aids **Sardana et al., 2019 [30]**	To educate and motivate visually impaired children to maintain their oral health using methods that are easy for them to understand and to evaluate the changes in gingival index, plaque index, and knowledge, attitude, and practice (KAP) over a 6-month period	148 visually impaired children from two institutes, with Group I from the Government Institute for the Blind in Panipat and Group II from the Vocational Rehabilitation and Training Center in Ludhiana	Aspecially designed oral health education program and two different motivational techniques (tactile and auditory) to educate visually impaired children over a 6-month period	Both groups showed significant improvement in mean plaque 52.7% and gingival scores 62.2% after the 6-month evaluation.
Overview of Blind-Children Caries Index in Special Need Schools in Cimahi City **Sarwendah et al., 2022 [31]**	To assess the caries index in blind children and emphasize the importance of oral health in this population.	21 blind children aged 6—12 from SLBN A Citeureup Cimahi City and SLBN A Bandung City, using consecutive sampling.	A descriptive method with a cross-sectional design and consecutive sampling of blind children aged 6—12 at SLBN A Citeureup Cimahi City and SLBN A Bandung City.	The blind children in SLBN A Citeureup Cimahi City had a low def-t index, while those in SLBN A Bandung City had a moderate def-t index.
A music- and game-based oral health education for visually impaired school children; multilevel analysis of a cluster randomized controlled trial **Sharififard et al., 2020 [32]**	To compare the effectiveness of oral health education using the Audio Tactile Performance (ATP) technique alone, ATP combined with oral health education for mothers, and ATP along with an art package on the oral health status of visually impaired school children.	visually impaired children from preschool to 10th grade in Tehran, Iran, with a total of 200 participants from 32 classes.	Stratification by grade before cluster randomization to assign visually impaired children from three schools in Tehran to three different groups receiving different oral health education interventions.	200 visually impaired children, with a high response rate of 95—99%. The mean age of the children was 12.29 years, with more males than females participating. The incidence of bleeding on probing was 69.7%, and the mean Oral Hygiene Index-Simplified (OHI-S) was 1.99. The study found improvements in OHI-S over time in all three groups.
Assessment of dental caries, oral hygiene status, traumatic dental injuries and provision of basic oral health care among visually impaired children of Eastern Odisha **Suresan et al., 2017 [33]**	Same as title.	238 visually impaired children from institutionalized special schools in eastern Odisha, with a total population of 250 children.	A descriptive, cross-sectional design with a universal sampling protocol. Clinical examinations were conducted using ADA Type III criteria, and data were collected through a structured questionnaire and oral health assessments.	A high prevalence of dental caries, traumatic dental injuries, and poor oral hygiene among visually impaired children in eastern Odisha.

Title, Author, Year	Aims	Sample	Methods	Findings
Effectiveness of different oral health education interventions in visually impaired school children Tiwari et al., 2019 [10]	To improve the knowledge, attitude, practices (KAP), and oral hygiene status in visually impaired school children using different interventions such as the Audio Tactile Performance technique (ATP), Braille, and a combination of both methods.	90 visually impaired children aged 12–15 years from a school in Maharashtra were selected for the study through a nonrandomized method and divided into three groups for the interventions.	A nonrandomized interventional design with three groups of visually impaired children. Different oral health education interventions, including ATP, Braille, and a combination of both, were implemented to assess their impact on oral hygiene status and KAP scores.	The improvements in oral hygiene status and knowledge, attitude, and practices (KAP) scores in visually impaired school children after receiving different oral health education interventions.
Knowledge, Attitude, and Practice of Pediatric Dentists Regarding Oral Health Management of Visually Impaired Children Tyagi et al., 2023 [34]	Same as title.	511 pediatric dentists from various continents, with the majority being postgraduate students practicing in the private sector	An observational cross-sectional design with an online survey questionnaire to assess pediatric dentists' knowledge, attitudes, and practices related to managing oral health in visually impaired children	The pediatric dentists had limited knowledge and practices in managing oral health in visually impaired children, highlighting the need for improved education and training in this area
Impact of dental caries severity and activity on oral health-related quality of life among children aged 8—11 years do Oliveira et al., 2023 [35]	Same as title.	119 children aged 8 to 11 years from Pelotas, southern Brazil.	The observational study followed STROBE guidelines. Data collection occurred between July 2019 and February 2020, with ethical approval obtained.	92.44% of children evaluated had dental caries, with 39.5% having severe carious lesions, 34.45% with initial carious lesions, and 18.49% with moderate lesions.
Impact of untreated dental caries on oral health-related quality of life of children with special health care needs Faker et al., 2018 [36]	To evaluate the impact of untreated dental caries, along with sex, age, and socioeconomic factors, on the oral health-related quality of life (OHRQoL) of children with special health care needs (SHCN)	128 children with special health care needs (SHCN) aged 1 to 9 years who participated in the research	A cross-sectional design with a convenience sample of children with special health care needs (SHCN) in Brazil, assessing their oral health-related quality of life (OHRQoL)	68.75% of children with special health care needs (SHCN) experience with caries severity being associated with a negative impact on OHRQoL
Oral health status and treatment needs among deaf, mute and visually impaired children of Gulbarga district — A population based cross sectional study Goud et al., 2021 [37]	Same as title.	284 school children aged 6–24 years, comprising deaf, mute, and visually impaired children.	A cross-sectional study was conducted using a structured questionnaire to gather demographic data and oral hygiene practices. Clinical examinations were performed using WHO assessment forms to assess oral health status and treatment needs	The majority of children lacked knowledge about dental caries and gum disease. Visually impaired children had higher mean OHI-S scores compared to deaf and mute children. Deaf and mute children showed a higher percentage of healthy periodontium
Effectiveness of Different Educational Methods on Oral Health in 7—13-Year-Old Visually Impaired Children in Tehran: A Randomized Trial Masoumi et al., 2021 [11]	Same as title.	88 visually impaired children aged 7 to 13 years from elementary schools for visually impaired children.	A clinical trial design and included verbal-tactile, verbal-braille, multisensory, and control groups	All groups experienced a decrease in plaque and gingival indices, with the multisensory group demonstrating the most significant reduction.
Oral Hygiene Status, Salivary and Microbiological Parameters Among Visually Impaired and Normal-Sighted Children After Specialized Oral Health Education: An Interventional Study Deshpande et al., 2024 [38]	Same as title.	50 participants, with 25 visually impaired children (Group A) and 25 normal-sighted children (Group B), aged between 12 and 15 years.	Simple random sampling to select 25 visually impaired children (Group A) and 25 normal-sighted children (Group B) aged 12 to 15 years.	Visually impaired children demonstrated greater improvements in salivary pH, buffering capacity, and Streptococcus mutans count compared to normal-sighted children, while normal-sighted children showed a greater reduction in Lactobacillus acidophilus count.

Furthermore, dietary habits and nutritional status have been identified as significant factors contributing to the development of dental caries in children. Research by Putri et al. (2016) reported a high prevalence of dental caries in preschool children and emphasized the importance of nutritional status in relation to dental health [13]. Poor dietary choices, high sugar consumption, and inadequate nutrition can increase the risk of dental caries in visually impaired children, underscoring the need for promoting healthy eating habits and nutritional education in this population. In conclusion, the causes of dental caries in visually impaired children are complex and multifaceted, involving factors such as challenges in maintaining oral hygiene, limited access to dental care, parental influences, socioeconomic status, dietary habits, and nutritional status. Addressing these factors through targeted interventions, education, and access to appropriate dental services is essential to prevent and reduce the prevalence of dental caries in visually impaired children, ultimately improving their oral health outcomes.

Impact of dental caries on the quality of life of visually impaired children

Quality of life encompasses an individual's overall well-being and satisfaction with various aspects of life, including physical, social, and mental health, appearance, and interpersonal relations. It involves the subjective evaluation of one's life circumstances, happiness, and fulfillment across different domains, reflecting the individual's perception of their health and life experiences [23]. In the context of oral health, quality of life is influenced by factors such as oral diseases, pain, functional limitations, and psychological well-being, underscoring the significance of maintaining good oral health for overall quality of life [37].

Dental caries can have a significant negative impact on the quality of life of visually impaired children. Research has shown that untreated dental caries is associated with various detrimental effects that can affect the overall well-being of children with special needs, including those who are visually impaired [36]. Studies have indicated that severe dental caries can lead to discomfort, toothache, changes in body weight, and growth, all of which contribute to a decline in the Oral Health-Related Quality of Life (OHRQoL) of affected children and their families [41]. The impact of dental caries on children's quality of life is well-documented and is linked to factors such as pain, impaired function, and even loss of school days [42].

Moreover, the negative consequences of dental caries on the quality of life of children, particularly in preschoolers, have been highlighted in various studies. Additionally, the severity and activity of dental caries have been shown to lead to pain, functional impairment, and other negative effects on the oral health-related quality of life among children aged 8—11 years [35]. In the context of visually impaired children, the challenges posed by dental caries can be exacerbated due to limitations in performing activities that require vision assistance, such as maintaining oral hygiene practices like brushing teeth [31]. This can result in multiple dental problems, including caries, which can further deteriorate the quality of life of visually impaired children. The association between dental caries and oral health-related quality of life in disabled children has been extensively studied, revealing a substantial negative impact on various domains related to quality of life [43]. The presence of dental caries has been linked to reduced school performance and social life in children, highlighting the far-reaching consequences of untreated tooth decay [44].

In conclusion, dental caries can significantly diminish the quality of life of visually impaired children by causing pain, discomfort, functional limitations, and other challenges that affect their overall well-being. Early detection, prevention, and treatment of dental caries are crucial in mitigating these negative impacts and improving the oral health-related quality of life of children with visually impaired.

Internal factors

The risk factors and prevalence of dental caries are influenced by various internal factors. These internal factors encompass aspects such as oral hygiene knowledge and behaviors [11, 22, 28, 30]. The ability to detect early signs of caries development, such as discoloration, is compromised in visually impaired individuals, leading to delayed intervention and increased susceptibility to dental caries [7]. Additionally, the physical constraints and lack of cleaning habits among visually impaired children contribute to a higher prevalence of dental caries and gingival diseases [30]. Furthermore, the oral health status and treatment needs among visually impaired children are influenced by factors such as urease activity in saliva and plaque, which can act as endogenous protection against dental caries [2]. Salivary parameters, including urease activity, play a crucial role in maintaining oral health and preventing caries in this population [38].

In conclusion, internal factors such as oral hygiene practices, the ability to detect early signs of caries development, and physical constraints and lack of cleaning habits play a crucial role in influencing the prevalence of dental caries among visually impaired individuals. By addressing these internal factors through targeted interventions and specialized care, it is possible to enhance the oral health status and overall well-being of visually impaired individuals.

External factors

Research has emphasized the importance of family support in promoting oral health practices and improving the quality of life of visually impaired children. Studies have shown that family members play a crucial role in assisting visually impaired children with daily oral hygiene routines, reinforcing positive oral health behaviors, and ensuring regular dental check-ups, which can significantly influence the prevention of dental caries and the overall oral health status of these children [21]. Moreover, the effectiveness of oral health promotion programs involving family participation has been demonstrated in enhancing dental health outcomes among visually impaired children. Interventions focusing on providing dental care to mothers during pregnancy, applying fluoride varnish to children's teeth, and delivering motivational interviewing alongside anticipatory guidance have shown positive results in reducing the prevalence of dental caries and improving oral health among visually impaired children and their families [21]. This highlights the importance

of involving families in oral health initiatives to support the well-being of visually impaired children.

Additionally, studies have indicated that family support and participation in oral health education programs can lead to improved oral hygiene knowledge and practices among visually impaired children. Educational interventions utilizing a combination of Braille and NVDA (NonVisual Desktop Access) have been effective in educating and motivating visually impaired children about maintaining oral hygiene, underscoring the positive impact of family-supported educational approaches on oral health outcomes [29]. By incorporating family-friendly educational materials and strategies, researchers aim to empower families to actively engage in promoting the oral health of visually impaired children.

Furthermore, the evaluation of oral health status and care needs among visually impaired children has highlighted the significance of family support in addressing the challenges faced by this population. Families of visually impaired children may encounter difficulties in accessing oral health information and services, emphasizing the necessity for tailored educational programs involving family members in promoting oral health awareness and self-care practices [15]. By equipping families with the essential knowledge and resources to support the oral health needs of visually impaired children, researchers aim to enhance the quality of life and overall well-being of this vulnerable population. Research has emphasized the importance of ensuring that visually impaired children have sufficient access to oral health services, including regular dental check-ups, preventive care, and treatment for dental issues, to enhance oral health and overall well-being [19]. Access to specialized oral health services tailored to the needs of visually impaired children is crucial in addressing dental caries and improving the quality of life within this population.

Additionally, studies have highlighted the importance of effective oral health education interventions in improving access to oral health services for visually impaired children. Educational programs utilizing sensory input methods, such as audio aids, Braille, and tactile models, have been pivotal in providing essential oral health information and promoting access to oral health services for visually impaired children [22]. By incorporating innovative educational techniques that cater to the unique needs of visually impaired individuals, researchers aim to enhance access to oral health resources and services, ultimately influencing the relationship between dental caries and quality of life in this population. Furthermore, the efficacy of oral health educational interventions in enhancing access to oral health services for visually impaired children has been demonstrated in various studies.

Interventions focusing on oral health education in institutionalized settings for visually impaired children have shown positive outcomes in improving access to oral health information and services, leading to enhancements in oral hygiene status and practices [10]. By implementing targeted educational programs that improve access to oral health resources, researchers aim to bridge the gap in oral health services for visually impaired children and promote better oral health outcomes. The assessment of oral health status and care needs among visually impaired children has underscored the significance of addressing barriers to accessing oral health services. Factors such as lack of awareness, limited availability of specialized oral health care facilities, and challenges in communication with healthcare providers can impede access to essential oral health services for visually impaired children [9]. By identifying and addressing these access barriers through tailored interventions and educational programs, researchers aim to enhance oral health outcomes and improve the quality of life for visually impaired children.

Social environmental factors are crucial in influencing the relationship between dental caries and quality of life in visually impaired children. Access to social support systems, community resources, and societal attitudes towards oral health significantly impact the oral health outcomes and overall well-being of visually impaired children. Research has highlighted the importance of social environmental factors in shaping oral health behaviors, access to oral health services, and the quality of oral health education for this vulnerable population [10]. Studies have demonstrated that social environmental factors, such as family support, peer influence, and community engagement, can positively influence oral health practices and outcomes in visually impaired children. Family involvement in oral health care, encouragement from peers to maintain good oral hygiene, and community initiatives promoting oral health awareness can enhance the quality of life and oral health status of visually impaired children [19]. By fostering a supportive social environment that values oral health and promotes positive oral health behaviors, researchers aim to mitigate the impact of dental caries and improve the overall well-being of visually impaired children.

Moreover, the effectiveness of oral health education interventions in addressing social environmental factors has been shown in various studies. Educational programs utilizing sensory input methods, community outreach initiatives, and peer support networks have shown promise in improving access to oral health resources, promoting oral health awareness, and enhancing oral hygiene practices among visually impaired children [5]. By incorporating social environmental factors into oral health education programs, researchers aim to create a supportive ecosystem that empowers visually impaired children to prioritize their oral health and well-being. Assessment of oral health status and care needs among visually impaired children has emphasized the importance of considering social environmental factors in oral health interventions. Factors such as social deprivation, limited access to dental services, and community infrastructure can impact the oral health outcomes of blind children [22]. By addressing these social determinants of health through targeted interventions and community-based programs, researchers aim to improve access to oral health services, reduce the prevalence of dental caries, and enhance the quality of life for visually impaired children.

In conclusion, research underscores the critical role of family support in promoting oral health practices and improving the quality of life for visually impaired children. Family involvement is pivotal in assisting with daily oral hygiene routines, reinforcing positive behaviors, and ensuring regular dental check-ups, which significantly influence the prevention of dental caries. Effective oral health promotion programs that involve family participation, such as those providing prenatal dental care and motivational interviewing, have shown substantial improvements in dental health outcomes. Moreover, educational interventions using Braille and audio aids have proven successful in enhancing oral hygiene knowledge and practices among visually impaired children. Addressing barriers to oral health services through tailored educational programs that incorporate sensory methods can bridge gaps in access and promote better oral health outcomes. Social environmental factors, including family support, peer influence, and community engagement, also play a crucial role in shaping oral health behaviors and improving the overall well-being of visually impaired children. By fostering supportive social environments and utilizing innovative educational approaches, researchers aim to enhance oral health and quality of life for this vulnerable population.

Recommendations for effective interventions for the prevention of dental caries

Some recommendations for effective interventions for preventing dental caries in visually impaired children are:

1) Utilization of multisensory input methods for educational interventions such as audio aids, Braille, and tactile models, to provide comprehensive oral health education to visually impaired children [10, 16, 19, 20, 23, 27, 30, 33]. This approach can enhance the understanding and retention of oral health information, leading to improved oral hygiene practices and reduced risk of dental caries.
2) Integrate innovative educational techniques, such as music-based and game-based oral health education, to engage visually impaired children and make oral health education more interactive and enjoyable [32, 45]. By incorporating fun and engaging elements into educational programs, children are more likely to retain information and adopt positive oral health behaviors.
3) Encourage family members to actively participate in oral health education programs and support the oral hygiene practices of visually impaired children. Family support plays a crucial role in reinforcing good oral health habits and ensuring regular dental check-ups, which are essential for preventing dental caries.
4) Implement community-based oral health promotion programs that target visually impaired children and provide access to essential oral health resources and services. By engaging with the community and raising awareness about oral health, these initiatives can help improve oral hygiene practices and reduce the prevalence of dental caries in this population.
5) Develop specialized oral health preventive programs tailored to the unique needs of visually impaired children, incorporating audio and tactile aids to enhance oral hygiene practices [5]. These programs can focus on practical skills and techniques that are accessible and effective for visually impaired individuals.
6) Emphasize the importance of early identification of dental caries coupled with effective oral health promotion programs to provide practical knowledge to visually impaired children [22]. Early intervention can help prevent the progression of dental caries and promote better oral health outcomes in this population.
7) Encourage regular dental check-ups for visually impaired children to monitor their oral health status, detect any early signs of dental caries, and provide timely interventions [21]. Routine dental visits are essential for maintaining oral health and preventing the development of dental caries.
8) Focus on promoting effective oral hygiene practices, such as proper tooth brushing techniques and the use of fluoride products, to prevent dental caries in visually impaired children [17]. By equipping visually impaired children with the necessary knowledge and tools to engage in self-care practices, researchers aim to empower them to uphold good oral hygiene and prevent the occurrence of dental caries [9]. Providing hands-on demonstrations and practical guidance can help reinforce good oral hygiene habits.

Effective interventions for preventing dental caries in visually impaired children should encompass a holistic approach that includes multisensory input methods, innovative educational techniques, family involvement, community outreach initiatives, specialized oral health programs, early identification and intervention, regular dental check-ups, and promotion of oral hygiene practices. By addressing these key areas, healthcare providers and educators can work towards improving oral health outcomes and enhancing the quality of life for visually impaired children.

CONCLUSION

Visually impaired children have a high prevalence of dental caries due to challenges in maintaining oral hygiene, delayed detection, and inadequate access to dental care. Poor dietary habits and nutritional status further increase their risk. Comprehensive interventions, including multisensory educational methods and innovative techniques, are essential for improving oral health outcomes. Family support plays a crucial role in promoting good oral hygiene and ensuring regular dental check-ups. Community-based programs and specialized preventive care tailored to visually impaired children are also important. Early detection and effective oral hygiene practices are vital for maintaining their oral health and overall well-being.

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REFERENCES:

1. **Chuyen N.V., Du V., Ba N.V., Long D.D., Son H.A.** The prevalence of dental caries and associated factors among secondary school children in rural highland Vietnam. — *BMC Oral Health*. — 2021; 21 (1): 349. PMID: 34271899
2. **Handayani A.T.W., Budirahardjo R., Mafilda F.N.** The relationship between knowledge and attitude of mothers towards their toddlers dental health care. — *Dentino: Jurnal Kedokteran Gogo*. — 2022; 28; 7 (2): 220. DOI: 10.20527/dentino.v7i2.14635
3. **Cahyaningrum F.D., Hermawati**. The relationship level of knowledge of teeth-brushing to the dental caries incidence in school-age children. — *Jurnal Kesehatan Komunitas Indonesia*. — 2023; 31; 3 (2): 217—25. DOI: 10.58545/jkki.v3i2.194
4. **Agustina D., Hanindriyo L., Widita E., Widyaningrum R.** The correlation between occurrence of dental caries and oral health-related quality of life (OHRQoL) of elderly population in Yogyakarta Special Region. — *Journal of Medical Sciences*. — 2018; 50 (2): 191—200. DOI: 10.19106/JMedSci005002201808
5. **Maulanti T., Nurmala I.** A systematic review of oral health educational media innovation for visually impaired children: which one brings the best impact of change? — *Special Care In Dentistry*. — 2021; 41 (4): 442—52. PMID: 33825212
6. **Mishra N.K.** Renal calculi (kidney stones) and its therapy. — *Indo Global Journal of Pharmaceutical Sciences*. — 2019; 9 (1): 1—4. DOI: 10.35652/IGJPS.2019.9101
7. **Natarajan D., Kannappan J., Srinivasan D., Chiriyankandath J.L., Arumugam S.E., Annamalai S.S.R.** Assessment of oral hygiene status and prevalence of dental caries and traumatic injuries to anterior teeth among visually impaired children in Chennai City. — *International Journal of Clinical Pediatric Dentistry*. — 2023; 21; 16 (1): 93—96. PMID: 37020782
8. **Aggarwal T., Goswami M., Dhillon J.K.** Assessment of oral health educational program on oral health status of visually impaired children in New Delhi. — *Special Care in Dentistry*. — 2019; 39 (2): 140—146. PMID: 30648764
9. **Bhor K.B., Vinay V., Ambildhok K., Shetty V.** Effectiveness of oral health educational interventions on oral health of visually impaired school children: a systematic review and meta-analysis. — *Special Care in Dentistry*. — 2021; 41 (3): 291—308. PMID: 33471416
10. **Tiwari B.S., Ankola A.V., Jalihal S., Patil P., Sankeshwari R.M., Kashyap B.R.** Effectiveness of different oral health education interventions in visually impaired school children. — *Special Care in Dentistry*. — 2019; 39 (2): 97—107. PMID: 30657191
11. **Masoumi S., Askarizadeh N., Ghasemi M.** Effectiveness of different educational methods on oral health in 7—13-year-old visually impaired children in Tehran: A randomized trial. — *Journal of Comprehensive Pediatrics*. — 2021; 12 (4): e112406. DOI: 10.5812/compreped.112406
12. **Setijanto D., Bramantoro T., Anggraini N.D., Maharani A.D., Angesti D., Hidayat D.S., Ramadhani A.** The correlation analysis of dental caries, general health conditions and daily performance in children aged 2—5 years old. — *Dental Journal*. — 2020; 53 (3): 122—125. DOI: 10.20473/j.djmkg.v53.i3.p122-125
13. **Putri A.D., Ma E.S., Djais J.T.B.** Overview of dental caries severity and nutritional status in preschool children in Jatinangor in September 2014. — *Althea Medical Journal*. — 2016; 3 (2): 314—318. DOI: 10.15850/amj.v3n2.464
14. **Shimada A., Noda M., Matoba Y., Kumagai T., Kozai K., Sugiyama M.** Oral lactic acid bacteria related to the occurrence and/or progression of dental caries in Japanese preschool children. — *Bioscience of Microbiota, Food and Health*. — 2015; 34 (2): 29—36. PMID: 25918670
15. **Chałas R., Mikuľáková W.B., Maksymiuk P., Skawińska-Bednarczyk A., Hudáková L., Pietrak J., Andraščíková Ľ., Zubrzycka J., Jordán D., Radácsi A., Szőke J.** Are teachers working with visually impaired children prepared to be advocates of oral health? Pilot study. — *Children (Basel)*. — 2023; 10 (7): 1235. PMID: 37508732
16. **Chowdary P.B., Uloopi K., Vinay C., Rao V.V., Rayala C.** Impact of verbal, braille text, and tactile oral hygiene awareness instructions on oral health status of visually impaired children. — *Journal of Indian Society of Pedodontics and Preventive Dentistry*. — 2016; 34 (1): 43—47. PMID: 26838147
17. **Das D., Suresan V., Jnaneswar A., Pathi J., Bala Subramaniam G.** Effectiveness of a novel oral health education technique in maintenance of gingival health and plaque removal efficacy among institutionalized visually impaired children of Bhubaneswar city: A randomized controlled trial. — *Special Care in Dentistry*. — 2019; 39 (2): 125—134. PMID: 30597580
18. **Debnadh A., Srivastava B.K., Shetty P., Eshwar S.** New vision for improving the oral health education of visually impaired children — A non randomized control trial. — *Journal of Clinical and Diagnostic Research*. — 2017; 11 (7): ZC29—ZC32. DOI: 10.7860/JCDR/2017/26515.10170
19. **Ganapathi A.K., Namineni S., Vaaka P.H., K V., Das R., Devi M., Akkaloori A., Kumbakonam A.** Effectiveness of various sensory input methods in dental health education among blind children — A comparative study. — *Journal of Clinical and Diagnostic Research*. — 2015; 9 (10): ZC75—8. PMID: 26557623
20. **Gautam A., Bhambal A., Moghe S.** Effect of oral health education by audio aids, braille & tactile models on the oral health status of visually impaired children of Bhopal City. — *Journal of Oral Biology and Craniofacial Research*. — 2018; 8 (3): 168—170. PMID: 30191102
21. **Jamieson L., Smithers L., Hedges J., Parker E., Mills H., Kapellas K., Lawrence H.P., Broughton J.R., Ju X.** Dental disease outcomes following a 2-year oral health promotion program for australian aboriginal children and their families: a 2-arm parallel, single-blind, randomised controlled trial. — *EClinicalMedicine*. — 2018; 1: 43—50. PMID: 31193658
22. **John J.R., Daniel B., Paneerselvam D., Rajendran G.** Prevalence of dental caries, oral hygiene knowledge, status, and practices among visually impaired individuals in Chennai, Tamil Nadu. — *International Journal of Dentistry*. — 2017; 2017: 9419648. PMID: 28458691
23. **Khurana C., Tandon S., Chand S., Chinmaya B.** Effectiveness of oral health education program using braille text in a group of visually impaired children-before and after comparison trial. — *J Edu Health Promot*. — 2019; 8 (1): 50. PMID: 31008117
24. **Li J., Zhang K., Cha C., Lu Z., Liu L.** Oral health status of students with visual or hearing impairments in Northeast China. — *BMC Oral Health*. — 2023; 26; 23 (1): 242. PMID: 37101257

25. Liu L., Zhang Y., Wu W., He M., Lu Z., Zhang K., Li J., Lei S., Guo S., Zhang Y. Oral health status among visually impaired schoolchildren in Northeast China. — *BMC Oral Health*. — 2019; 19 (1): 63. PMID: 31029116
26. Mishra R., Singh A.K., Tyagi S., Choudhary H.V., Gupta S.K., Kumar K. Prevalence of oral health status and needs in institutionlized physically challenged children. — *Journal of Pharmacy and Bioallied Sciences*. — 2021; 13 (Suppl 1): S184—S186. PMID: 34447071
27. Nair D.J., Shetty A.A., Hegde A.M. Efficacy of a modified audio-tactile performance technique with braille (ATPb) on the oral hygiene status of visually-impaired children. — *Journal of Clinical Pediatric Dentistry*. — 2021; 1; 45 (1): 15—21. PMID: 33690826
28. Puteri M.M., Ruslan F.K.D.R., Wibowo T.B. Oral health behavior and its association with the caries index in visually impaired children. — *Special Care in Dentistry*. — 2020; 40 (1): 79—83. PMID: 31808184
29. Santhoshi K., Ansari K.R., Mekala S., Kala T., Madala M.V., Onteru P. Comparison of different modes of oral health education in visually impaired children. — *Journal of Pharmacy and Bioallied Sciences*. — 2024; 16 (Suppl 2): S1721—S1725. PMID: 38882738
30. Sardana D., Goyal A., Gauba K., Kapur A., Manchanda S. Effect of specially designed oral health preventive programme on oral health of visually impaired children: use of audio and tactile aids. — *International Dental Journal*. — 2019; 69 (2): 98—106. PMID: 30238976
31. Sarwendah S., Hartman H., Alfin M. Overview of blind-children caries index in special need schools in Cimahi city. — *Journal of Health and Dental Sciences*. — 2022; 2 (2): 356—374. DOI: 10.54052/jhds.v2n2.p365-374
32. Sharififard N., Sargeran K., Gholami M., Zayeri F. A music- and game-based oral health education for visually impaired school children; multilevel analysis of a cluster randomized controlled trial. — *BMC Oral Health*. — 2020; 20 (1): 144. PMID: 32423446
33. Suresan V., Das D., Jnaneswar A., Jha K., Kumar G., Subramaniam G. Assessment of dental caries, oral hygiene status, traumatic dental injuries and provision of basic oral health care among visually impaired children of Eastern Odisha. — *J Indian Soc Pedod Prev Dent*. — 2017; 35 (4): 284—290. PMID: 28914238
34. Tyagi P., Mali S., Tiwari S., Kale S., Bhargava S., Akhani U. Knowledge, attitude, and practice of pediatric dentists regarding oral health management of visually impaired children. — *International Journal of Clinical Pediatric Dentistry*. — 2023; 15 (6): 764—769. PMID: 36866142
35. Oliveira T.T.D.V., Menegaz A.M., Rosário A.M.D., Romano A.R., Schardosim L.R., Mendes F.M., Göettems M.L., Azevedo M.S. Impact of dental caries severity and activity on oral health-related quality of life among children aged 8—11 years. — *Braz Oral Res*. — 2023; 37: e41. PMID: 37132728.
36. Faker K., Tostes M.A., Paula V.A.C.D. Impact of untreated dental caries on oral health-related quality of life of children with special health care needs. — *Braz oral res*. — 2018; 32: e117. PMID: 30892372
37. Goud V., Gupta R., Suresh Babu A., Das D., Kulkarni G., Swathi K. Oral health status and treatment needs among deaf, mute and visually impaired children of gulbarga district — a population based cross sectional study. — *J Family Med Prim Care*. — 2021; 10 (10): 3664—3669. PMID: 34934663
38. Deshpande A.P., Ankola A.V., Sankeshwari R.M., Nagmoti M.B., Kabra L., Pai Khot A.J., Kumar R.S. Oral hygiene status, salivary and microbiological parameters among visually impaired and normal-sighted children after specialized oral health education: An interventional study. — *Cureus*. — 2024; 16 (3): e56304. PMID: 38629023
39. Singh A., Dhawan P., Gaurav V., Rastogi P., Singh S. Assessment of oral health-related quality of life in 9—15 year old children with visual impairment in Uttarakhand, India. — *Dent Res J*. — 2017; 14 (1): 43—49. PMID: 28348617
40. Waheed M.S., Shirazi M.F., Khan M.J., Khan N., Naeemullah, Ishtiaq M., Darwesh N.M. Dental caries: Epidemiological & public health approach among children of District Nowshera Khyber Pakhtunkhwa Pakistan. — *Pakistan Journal of Medical and Health Sciences*. — 2022; 16 (5): 1175—1177. DOI: 10.53350/pjmhs221651175
41. Akhter R., Hassan N.M.M., Martin E.F., Muhit M., Smithers-sheedy H., Badawi N., Khandaker G. Caries experience and oral health-related quality of life (OHRQoL) of children and adolescents with cerebral palsy in a low-resource setting. — *BMC Oral Health*. — 2019; 19 (1): 15. PMID: 30646890
42. Knapp R., Gilchrist F., Rodd H.D., Marshman Z. Change in children's oral health-related quality of life following dental treatment under general anaesthesia for the management of dental caries: a systematic review. — *Int J Paed Dentistry*. — 2017; 27 (4): 302—312. PMID: 27531644
43. Jawed R., Khan Z., Younus M., Abid K., Saleem M., Kibria Z. Association of dental caries and oral health related quality of life (ohrqol) in disabled children. — *PAFMJ*. — 2021; 71 (4): 1198—1203. DOI: 10.51253/pafmj.v71i4.3842
44. Amer A.I., Alsehaim W.Y., Alabdalaal W.H., Alsemran O.M., Mansori O.M., Almahmadi D.S., Subahi M.S., Feteih M.M., Alshehri S.A., Alasmari M.F., Alqahtani M.A. Effect of untreated dental caries on school performance and social life. — *Int J Community Med Public Health*. — 2021; 9 (1): 481. DOI: 10.18203/2394-6040.ijcmph20214796
45. Shankar K.S., Arumugham M., Mohammed M.A.A., Kaur Sandhu S., Bennadi D., Verma J., Pulluri S.S. Effectiveness of oral health education interventions using braille on oral health among visually impaired children: proposal for a systematic review. — *Journal of Pharmacy and Bioallied Sciences*. — 2024; 16 (Suppl 1): S97—S101. PMID: 38595616