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Effectiveness of Various Modes of Education of Tooth Brushing Technique in Plaque Control Among Visually Impaired Children: A Systematic Review

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Review

History

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ABSTRACT

Aim: To compare different forms of newer tooth brushing techniques and oral health educational approaches to assess how well these children's oral health knowledge, oral hygiene practices, plaque and gingival status, and dental caries status have improved as a result of the implementation of various OHE techniques for visually impaired school children.

Methodology: Comprehensive data search was conducted in EBSCO Host, PubMed, Scopus, Google Scholar, and Web of Science until 31st January 2023 for studies in the English language. Three reviewers critically assessed the studies for eligibility criteria, and data extraction was performed. Quality assessment of the included studies was performed using a quality assessment Revised Cochrane Risk of Bias tool for randomized control trials (RoB 2.0)

Results: The search strategy yielded 32 manuscripts after screening through titles and abstracts, full text, and removing duplicates. In the end, 6 articles were included in a systematic review according to pre-set eligibility criteria. The present review emphasized newer oral health educational approaches for visually impaired children and improvement in their oral hygiene practices and plaque status.

Conclusion: The visually impaired children should be provided with the knowledge and abilities they'll need to take care of their oral health and hygiene on their own.

Keywords: Visually Impaired Persons, Health Education, Child, Toothbrushing, Systematic Review.

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Introduction

The most crucial sense for discovering the world around us is vision, and vision impairment, particularly in childhood, can have serious consequences for a person's ongoing physical, neurological, cognitive, and emotional growth over their entire lifetime.[1] Around 1.5 million children are blind worldwide, and this number seems to be rising. One child goes blind per minute, or 500,000 children annually, and almost half of them pass away within a year or two.[2] As there is no population-based nationwide survey available, the prevalence of blindness in India is estimated to be 0.8 per thousand children in the age range of 0 to 15 years. At least 210,000 children are blind or have severe visual impairments.[3,4] Children who go blind have a significant negative impact on the family's economic, psychological, and emotional development. Compared to a sighted child, a blind child is more likely to experience developmental milestone delays, frequent hospitalisations, and early death. Such severe visual impairment also negatively impacts orientation and educational activities from an early age, which results in a lack of work privilege.[5]

Children who are visually impaired struggle daily to carry out their regular tasks. One of them is to maintain good oral hygiene. They rely on someone else to complete their everyday tasks. The carers for the visually impaired tend to take care of their general health, but oral health is neglected.[6,7] Subjects with visual impairments are more likely to experience more dental problems and more issues with oral care access. The majority of them are ignorant of basic oral health prevention measures. For children who are visually impaired, preventive and oral health education methods are more cost-effective and less time-consuming than conventional dental care.[8]

It's important to improve communication between dentists and people with visual impairments, and one way to do this is through oral health education. For visually impaired children, oral health education along with self-maintenance skills provide the most substantial improvements in oral hygiene.[7] Visually impaired children need to be taught dental hygiene in a unique way that takes more time and patience. Most oral health education (OHE) programmes rely on auditory and tactile sensations since children with visual impairments rely heavily on speech, sound, and touch to orient themselves to circumstances. There are several unique and special approaches for providing OHE to help visually impaired children with their dental health.[9]

There are a variety of specialised and unique methods for providing OHE to enhance the oral health status of children with visual impairments, such as teaching with conventional audio aids, specially designed Braille booklets, teaching each child their tooth-brushing technique on dental models using songs, and the audio-tactile performance (ATP) technique.

'Audio tactile performance technique (ATP)' is a specially designed oral health education method for visually impaired children to educate them on oral hygiene maintenance. The technique was given this name because children were first taught verbally about the value of brushing their teeth before being made to feel the teeth on a large-scale model and then brushing the model using the Fones method with help. It includes three components: audio, tactile, and effectiveness.[10] A study introduced the importance of the 3D braille media technique for the improvement of oral hygiene in visually impaired children. It is a learning process in which braille alphabet booklets are used to improve oral health status and oral hygiene maintenance.[11] Also, Tiwari B.S. *et al.* concluded that the reduction in oral plaque scores following the sequential implementation of the oral health education model in various formats, such as Braille, audio, or their combination, etc., demonstrates the success of the programme's motivational component.[12] AS Varghese *et al.* conducted a study in 50 visually impaired children in which they concluded that oral hygiene improvement was seen in children who received audio instructions and music-assisted toothbrushing programs. The oral health condition of visually impaired children has significantly improved as a result of using these specially designed oral health education programs.[13]

It is a constant struggle to get visually impaired children to use OHE resources and translate information from contemporary OHE approaches into oral hygiene practices. The aim of this systematic review is to compare different forms of newer tooth brushing techniques and oral health educational approaches to assess how well these children's oral health knowledge, oral hygiene practices, plaque and gingival status, and dental caries status have improved as a result of the implementation of various OHE techniques for visually impaired school children.

Material and Methods

Protocol and Registration

This review has been registered in PROSPERO, an international prospective register of systematic reviews supported by the National Institutes of Health Research and created by the University of York's CRD (Centre for Reviews and Dissemination). A thorough methodology was devised, and it is carried out in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) declaration. The registration number for this review is CRD**42022375677** and can be accessed at:

https://www.crd.york.ac.uk/prospero/export_details_pdf.php

Study Design

This study design involves a meticulous and transparent process of identifying, selecting, and critically appraising relevant studies from diverse sources, such as academic databases, grey literature, and unpublished research. The systematic review design is widely recognised for its objectivity, transparency, and ability to provide a robust summary of the available evidence on a given topic.

Eligibility criteria

Based on the PRISMA guidelines, the following focused question was developed:

PICO can be referred to as:

1. **Population:** Visually impaired children
2. **Intervention:** Toothbrushing
3. **Comparator:** Various modes of toothbrushing techniques or oral health education
4. **Outcome:** Oral health status

The following PICO question was raised:

Which mode of education of tooth brushing technique is effective in the reduction of plaque and gingivitis in visually impaired children?

Search Strategy

A thorough data search was conducted in EBSCO Host, PubMed, Scopus, Google Scholar, and Web of Science. The dates of publication filter for the search using PubMed were set to be up until January 2023. The article type filter was configured to include only experimental studies. Although research reported in other languages was also chosen and subsequently subjected to Google translation to acquire the data in English, Studies were only rejected in terms of language if it was impossible to translate the data into English. No filters for full-text articles were set. The search terms were decided after searching through the literature and the MeSH database.

Search Terms

The following combination of keywords, MeSH terms, were used in the electronic search for terms related to intervention: "Audio tactile performance" OR "ATP" AND "Braille" OR "3DBraille" AND "Dental model" OR "Dental models" OR "Model, Dental" AND "Music-based toothbrushing" AND "Toothbrushing" OR "Oral hygiene" OR "Visually impaired person" OR "Blind person" OR "Impaired Person, visually" OR "Person, visually impaired" OR "Visually impaired children". Additionally, the randomised controlled trial (RCT) search filter was applied. Searches were restricted to human research.

Inclusion and Exclusion Criteria

Inclusion Criteria

1. Studies done on visually impaired children to assess various modes of education of tooth brushing technique in plaque control.
2. Studies with institutionalised or non-institutionalised settings.
3. Studies involving population belonging to the 4–18 age groups.

4. Studies done on both the gender i.e., males and females.
5. Studies with a randomised control trial.
6. Study assessing oral diseases, which includes plaque formation and gingivitis as a part.
7. Study published from inception till January 2023.
8. Studies written in the English language and studies written in any other language that are possible to get translated into English.

Exclusion criteria:

1. Reviews
2. Case reports
3. Case series
4. Conference proceedings
5. Letters to the editor
6. Short communications

Screening and Data Extraction

Three reviewers independently examined the titles and abstracts obtained through the search strategy and included them if they met the inclusion criteria. Later on, the whole texts of all the included studies were obtained. They first retrieved the complete text of the article and analysed it before deciding whether or not the articles matched the criteria needed for inclusion. A fourth and fifth reviewers were consulted if there was any uncertainty over the inclusion of any research article. Relevant data were gathered by the reviewers, the results were collated, and all the data were meticulously validated.

Data Collection Process

With the assistance of a professional, a standardised data extraction form was created in Microsoft Excel. The Excel spreadsheet initially had 3–4 entries, and an expert reviewed it. Disagreements between the authors were resolved by discussion. This sheet for data extraction was referred to as a pilot sheet. After the retrieved data was verified under specified categories, the next extraction procedure was started.

Outcome Variables

Data extraction from the selected studies used preset primary and secondary outcome variables. Oral health status was one of the secondary outcomes examined in addition to the major outcomes of PI, GI, and OHI. It was considered that outcome factors changed from the baseline to the 6-month follow-up.

Assessment of Risk of Bias

A quality assessment of the included studies was performed using a Revised Cochrane Risk of Bias tool for randomised control trials (RoB 2.0).[14] The risk of bias in the included studies was evaluated independently by reviewers. Any disagreement was looked into until a conclusion was reached. Studies were divided into three risk categories: high, unclear, and low. When one or more important domains are absent, there is a high risk of bias; when one or more important domains are not defined, there is an uncertain risk of bias; and when all quality standards are considered to be fulfilled, there is a low risk of bias. A graph was used to summarise the bias risk.

Strategy for Data Synthesis

A qualitative synthesis was performed for data analysis among the selected studies. The mean and standard deviation (when specified in the manuscript) of oral hygiene among the visually impaired children population were recorded from the selected studies. Reviewers independently assessed the studies for the Revised Cochrane Risk of Bias tool for randomized control trials (RoB 2.0) quality assessment. Any discrepancies between them were resolved via discussion. No meta-analysis could be conducted because of the high degree of heterogeneity in the chosen trials and the scarcity of well-designed RCTs in the literature.

Results

A total of 356 records were identified through database searches in PubMed and Scopus. Google Scholar yielded 12 articles based on titles, giving a total of 368 articles overall. These 368 articles were subjected to a screening process based on titles, duplicates, abstracts, and full-text reading and were included and excluded according to the predefined eligibility criteria. [Figure 1]

First step: The articles were screened based on titles to include the relevant manuscripts. From 368 manuscripts, 150 manuscripts were included as the titles represented the population and outcome of the review. Thus, 218 manuscripts were excluded at this step.

Second step: The remaining 150 manuscripts were screened for duplicates. From these, 45 manuscripts were found to be duplicates, which came up repeatedly in different search strategies. Thus, these 45 manuscripts were excluded, leaving the remaining 105 manuscripts.

Third step: In this step, 105 manuscripts were screened based on their abstracts. If the abstract gave relevant information, then the manuscripts were included. In case the information in the abstract is not clear and the reviewer is in doubt, the article was retained to move it into the full-text screening step. Only those manuscripts were excluded that did not match the eligibility criteria of population and the outcome of the review. Thus, 73 manuscripts were excluded based on abstracts.

Fourth step: The remaining 32 manuscripts were read for full text, and a final decision was made on whether to include or exclude them from the review. If, after reading the full text, the manuscripts were unable to provide the relevant information, then it was excluded at this final step. Thus, a total of six manuscripts were included.

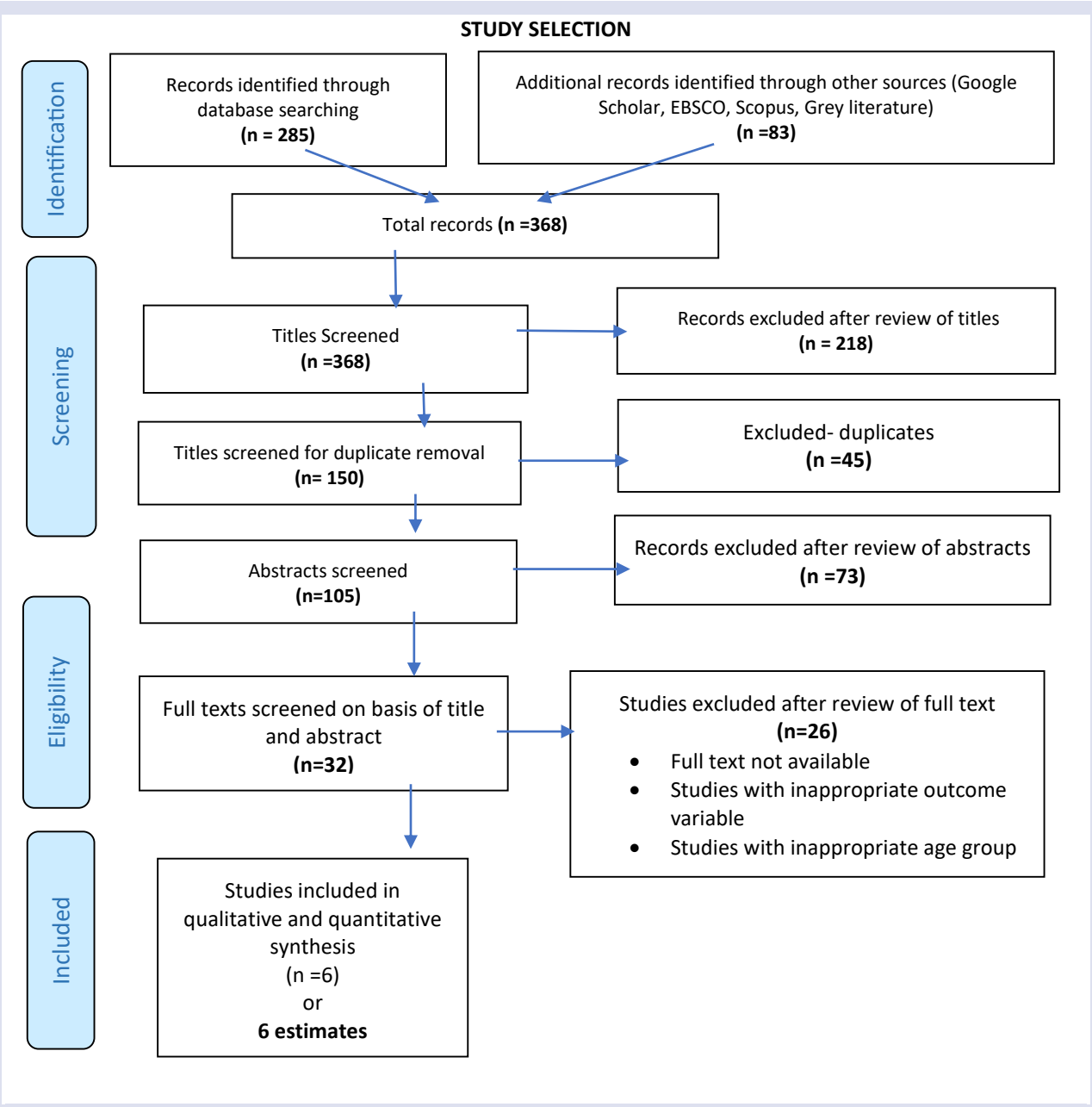

Figure 1. [PRISMA FLOW CHART

Study Characteristics

This review contains six articles, the general features of which are shown in Table 1. All of the studies[15–20] used a randomised control trial as their study design. The majority of the research is from different regions of India, with one study from each of Pakistan and Thailand. [16, 17] Out of the 6 RCTs, three studies[16-18] involved pre- and post-intervention in two groups, while three studies involved pre- and post-intervention in three groups.[15,19,20] All the studies selected[15–20] included schools without a track record of oral health care interventions. The participants had complete visual impairments throughout the duration of the interventions. The ages of the participants ranged from 6 to 16 years old. Everyone who participated was able to read Braille and had no other systemic illnesses. Additionally, the parents or guardians and the participating pupils each provided their informed consent and assent. A total of 374 participants were included in the studies' analysis, with 288 in the New toothbrushing techniques\OHE group and 69 in the Braille group, [15, 19, 20] 99 in the ATP group[15,18–20], 30 in Audio and Braille[18], 37 in Braille and ATP group[15,19], 53 in Guided tooth brushing programme and Modified Bass method with verbal and tactile toothbrushing instructions[16,17], and 86 in Traditional oral health talk group.[16,17,20]

The interventions utilised in the included research varied significantly in terms of methodology. As a result, the interventions that the research reported were divided into the following categories: (1) Contemporary OHE methods Braille text, audio tactile performance, oral hygiene instructions delivered verbally, oral brushing demonstrations using dental models or music, a

combination of the above methods, and (2) traditional techniques: oral hygiene instructions delivered verbally, audio recordings, and verbal tooth brushing demonstrations; the intervention study period lasted from one month to six months. Only dental experts offered newer toothbrushing strategies in various forms in all studies.[15–20] Overall, dropouts were noted at the end of the follow-up period.

Depending on the duration of the research, the OHE was administered in various ways in all of the studies in the beginning with the following reinforcement periods: one at baseline, 1 month, and 6 months[16]; one at baseline, 7th day, and one month[15]; two at baseline, every 3rd week, 3 months, and 6 months[18,20]; one mentioned reinforcement but did not mention time intervals[19]; and one at baseline only.[17]

The studies had different post-intervention measures of outcome. Two studies assessed the Turesky-Gilmore-Glickman modification of the Quigley-Hein plaque index and gingival index of Loe and Sillness.[16,18] Loe and Silness plaque index by two studies[15,19], oral hygiene index by one study, [17] Debris index, calculus index, and gingival index plaque index by one study.[20]

Assessment of Risk of Bias

Each study's risk of bias is assessed, and it is divided into three categories: high, medium, and low. For each domain in each of the included studies, a summary of the assessments of the risk of bias is shown in [Figure 2]. The quality assessment of the given six studies was executed according to the Revised Cochrane Risk of Bias tool for randomised control trials (RoB 2.0), where four studies showed a high risk of bias[15,16,19,20] and two studies showed a low risk of bias.[17,18] [Table 2]. Randomization was reported by all the included studies.[15–20] Allocation concealment was reported in only two studies.[15,18] For each study[15–20], participant and examiner blindness were not clearly defined. For 4 studies[15,16,19,20], selective reporting and other biases were low-risk, but they were high-risk for 2 studies.[17,18]

Figure 2. Risk of bias graph: For individual studies and across all studies

Table 1. Characteristics of included studies

Study Id	Place of study	Study design	Age group	Method of intervention	Sample size	Reinforcement period	Follow up period	Method of outcome assessment	Authors conclusion
Deshpande S. et al[15]	Pune, India	Randomized control trial	12-16 years	G1: Braille G2: ATP G3: Combination of both	60	at baseline, 7th day, and 1 month for all the groups	Follow up after 1 month	Loe and Silness plaque index	Braille and the ATP technique for teaching about oral health were both excellent tools when used separately, but they performed better together.
Smutkeeree A. et al[16]	Thailand	Randomized control trial	10-12 years	G1: Horizontal scrub method G2: Modified bass method with verbal and tactile tooth brushing instruction twice daily	57	at baseline, 1 month, and 6 months.	Follow up at 1 month and 6 months	1. Turesky-Gilmore-Glickman modification of Quigley-Hein plaque index 2. Gingival index of Loe and Silness	Plaque and gingival index significantly decreased as a result of the effectiveness of horizontal scrub and modified bass toothbrushing techniques.
Qureshi A. et al[17]	Karachi, Pakistan	Randomized control trial	10-15 years	Test: Guided toothbrushing program Control: verbal oral hygiene message	50	No reinforcement	Follow up after 30 days	OHI index	As compared to verbal oral hygiene instructions, the author determined that guided manual toothbrushing improves the oral hygiene status of visually impaired children.
Das D. et al[18]	Bhubaneshwar, India	Randomized control trial	10-15 years	Test: ATP Control: Braille(oral health education booklets) and audio-aids	60	at baseline and every 3rd week for 90 days	Follow up at 30 days and after 90 days	1. Turesky-Gilmore-Glickman modification of Quigley Hein Plaque index 2.Loe and Silness gingival index	According to the study's results, a new approach to teaching visually impaired children about their oral health through (ATP) was just as effective at keeping their gingival healthy and plaque removal efficacy as the conventional method of using audio and braille text.
Indurkar M. et al[19]	Pune, India	Randomized clinical trial	9-15 years	G1 : Braille, G2: ATP, G3: Combination of both	51	Reinforcement has been given. But intervals are not mentioned	Follow up after 3 months	1. Loe and Silness plaque index 2. Loe and Silness	The authors concluded that a combination of techniques can aid in a better

								gingival index	comprehension of oral hygiene practices, improving not only the oral health of visually impaired children but also their general well-being. For visually impaired children, a combination of the three techniques—verbal, Braille text, and ATP—can be effective in producing the best results. The best results were obtained using the Fones technique and toothpaste containing fluoride.
Shrivastava R. et al[20]	Madhya Pradesh, India	Randomized clinical trial	6-16 years	G1: Verbal, G2: Braille, G3: ATP	96	baseline and at every 3 weeks for 6 months	Evaluation at baseline, 3 month, and 6 months follow-up	1. Debris index 2. Calculus index 3. Gingival index	

Table 2. Quality assessment of the included studies was performed using a quality assessment tool for prevalence studies and each study was categorized into high, medium, and low-quality studies.

SR.NO	Author's name	Randomization process	Deviation from the intended variation	Missing outcome data	Measurement of the outcome	Selection of reported result	Overall bias
1.	Deshpande S. et al [15]	Yes	No	Yes	Unclear	Yes	High risk
2.	Smutkeeree A.[16]	Yes	No	Yes	No	Yes	High risk
3.	Qureshi A. et al[17]	No	Yes	Yes	Yes	Yes	Low risk
4.	Das D. et al [18]	Yes	Yes	Yes	Yes	No	Low risk
5.	Indurkar M. et al[19]	No	No	No	No	Yes	High risk
6.	Shrivastava R et al[20]	No	No	Yes	No	No	High risk

Quality assessment of given 6 studies was executed according to the Revised Cochrane Risk of Bias tool for randomized control trials (RoB 2.0) where 4 studies showed a high risk of bias and 2 studies showed a low risk of bias.

Discussion

One of the challenges in dentistry is the prevention of dental caries and periodontal disease for individuals with special needs. Any effort to change oral hygiene must focus heavily on education because this is the main way to influence behavior. If patients are aware of the reasons for suggested changes in oral hygiene behaviour as well as the consequences of sustaining poor oral hygiene conditions, the possibility of behavioural change is significantly boosted.[21] An individual's social and physical appearance is greatly influenced by oral health. Hence, it is necessary to practice proper oral hygiene activities. This becomes a difficult task and can sometimes be challenging for visually impaired individuals. These individuals, due to their limitations, do not follow ideal toothbrushing techniques.[22] Access to dental care and information about oral health may be affected by visual impairment. For children who are visually impaired, a good oral health education programme needs to be implemented.[23] Newer oral health education techniques included in this review were a guided toothbrushing programme, methods of brushing with tactile sensation, Braille, 3D braille, and a multi-sensory approach with a combination of two techniques (ATP, Braille). As the perceptions of smell, touch, taste, and audio

are very sharp in visually impaired children, educating them about oral health using these techniques is simple.

There are a variety of specifically tailored newer oral health education programmes that were created for children with visual impairment, delivered by dental health experts, ranging from 1 month to 6 months.[24,10-11,15-20] This review includes interventions aimed at educating children with visual impairments who had never attempted to learn via an oral health care programme about proper tooth brushing procedures and other components of oral health.[15-20] None of the articles included in this review received specific grants from any funding agency in the public, commercial, or not-for-profit sectors. The credibility of study findings is also increased with ethical approval, which is essential when making decisions based on the research findings. This review's four articles describe getting institutional ethical permission, consent, and assent before starting their research.[15-18] Two studies included in this review have not mentioned institutional ethical approval, but they have mentioned consent or assent from visually impaired children or their parents or guardians. Prior to enrolling a participant and persisting after enrolment, informed consent and assent are voluntary commitments to participate in research. The majority of the research was done in India, maybe because the prevalence of childhood blindness is as high as 1.5 per 1000 children in developing countries as compared to developed countries, where the prevalence is 0.3 per 1000.[5]

In this systematic review, all the studies included were randomised control/clinical trials, and the effectiveness of the brushing technique that was taught was assessed through, i) the Oral Hygiene Index (OHI), the Turesky-Gilmore-Glickman modification of the Quigley-Hein plaque index, the gingival and plaque index of Loe and Sillness, the Debris index, and the Calculus index. ii) oral hygiene practices.

The training and calibration of examiners, as well as ensuring maximal intra- and inter-examiner reliability, are essential factors in producing accurate results. Three studies[17,18,20] included in this review showed maximum intra- and inter-examiner reliability, while the remaining three studies[15,16,19] did not evaluate the kappa statistics. The accuracy with which a method measures what it is supposed to measure is known as its validity. The techniques and tools used to gather the data must be reliable to produce relevant findings, which guarantees that the analysis of the data and the conclusions reached are reliable as well. All six studies have tested the validity of the instruments used for evaluating the outcomes. [15-20] All the studies included in the systematic review have successfully accomplished their objectives.[15-20]

Effective information distribution is the key to addressing challenges with visual impairment. Individuals who are visually impaired can be taught about oral hygiene and oral health through a variety of methods. The study by Deolia S *et al.* showed that the "audio-tactile performance technique" method of oral health education was successful in teaching visually impaired children to practice oral hygiene correctly. Children who are visually impaired benefit most from oral health education and oral hygiene maintenance skills when their oral hygiene is improved.[25] A study conducted in 2019 by Agarwal Swati and Natani Ankit showed that comparing all the oral health education methods, none of them is better than the other, and a well-planned and well-executed combination of all the educational approaches is the only way to create a notable improvement in the delivery of oral hygiene instructions and, as a result, the oral health status of children with visual impairments. The study highlighted the significance of creating a very effective integrated system of training methods for visually impaired children that is simple to conceive and easy to carry out by a dentist. Periodic reinforcement of knowledge helps persuade visually impaired children to adopt a more positive outlook on maintaining their oral health.[26]

The studies conducted by D.Sushmita *et al.*, Diptajit *et al.*, and I.S. Maya *et al.* have compared braille, ATP, and a combination of both. All the studies concluded that a combination of both braille and ATP is more effective in improving oral hygiene in visually impaired children. Mean plaque and gingival scores have been reduced in combination techniques. Visually impaired children can improve their oral hygiene to the greatest extent by receiving oral health education in conjunction with self-maintaining skills. Combining various techniques can aid in improving an individual's understanding, memory, and reinforcement of oral hygiene practices, which can both benefit an individual's oral health and subsequently their related overall health.[15,18,19]

This systematic review's primary objective was to assess recent OHE approaches to determine which strategy is most effective for teaching children with visual impairments to maintain their oral hygiene. All of the more recent toothbrushing techniques had comparable effects on the children's short-term improvement in oral hygiene behaviour, which was reflected in their oral health status. This shows that the oral hygiene education (OHE) offered by the experts, which included auditory sense and tactile perception, helped children increase their ability to concentrate, motor skills, social skills, and collaboration, which helped them learn and adapt to the practices of oral hygiene favourably. The study conducted by Kumar RVS *et al.* concluded that oral health education programmes are nevertheless likely to have an important influence on the oral health of disabled children.[27] Periodic reinforcement is an important factor in delivering toothbrushing techniques to maintain good oral health status among these children. A study by Shrivastava R concluded that the state of these particular children's oral hygiene is improved by learning newer toothbrushing techniques and the knowledge and abilities to maintain them. Combining all three techniques—verbal, Braille text, and tactile performance—gives the best results because they can all help these children get the results they need. The Fone's approach and the use of fluoride toothpaste produced the best results since they were simple for children to remember and comprehend.

The use of mild reminders and an emphasis on positive reinforcement is beneficial.[20]

Enhancing oral hygiene for individuals with visual impairments in the future can involve leveraging advanced technology and incorporating innovative design principles.

- AI-powered oral hygiene assistant: Create a virtual assistant or mobile app powered by artificial intelligence that provides personalized oral hygiene instructions. This assistant could use voice commands and provide feedback on brushing techniques, flossing, and other oral care routines.
- Tactile Navigation System in the Bathroom: Implement a tactile navigation system on bathroom surfaces to guide individuals with visual impairments to easily locate oral care products, sinks, and other essential elements in the bathroom.
- Smart Braille Labels: Incorporate smart Braille labels on oral care products, providing information about expiration dates, ingredients, and usage instructions. These labels can be read using smartphones or dedicated devices equipped with Braille readers.
- Voice-activated oral care products: design oral care products that respond to voice commands, making it easier for individuals with visual impairments to control devices like toothbrushes, water flossers, or UV sanitizers.

By combining these futuristic technologies and design principles, it's possible to create a more inclusive and effective oral hygiene experience for individuals with visual impairments.

Limitations and Suggestions

The newer OHE methods are child-friendly and make learning pleasurable for these children. However, the generalisability of the present review is limited, taking into consideration that the

- The majority of the studies were conducted in India and some parts of Asia.
- The studies conducted were not longitudinal in nature, and recent OHE methods were evaluated for a short period, showing oral hygiene improvement during that point in time; hence, the results cannot be generalised.
- Also, the sample size in each study and the duration of training were smaller, and more studies with a larger sample size should be carried out.
- More studies should be carried out in other parts of the world for the given population so that the results can be generalised worldwide.
- Longitudinal studies with larger sample sizes should be carried out.

Conclusions

- The findings consistently underscore the challenges faced by visually impaired children in maintainig proper oral hygiene practices.
- These challenges include limited access to visual cues, difficulties in mastering effective brushing techniques, and a higher prevalence of dental issues compared to their sighted peers.
- Implementing comprehensive oral health education programmes specifically tailored to the needs of visually impaired children can play a pivotal role.
- These programmes should focus on tactile and auditory techniques, providing hands-on training, and leveraging alternative sensory modalities to compensate for the absence of visual cues.
- Addressing these challenges requires a multidimensional approach that involves parents, educators, healthcare professionals, and policymakers.
- Though it is essential, education alone won't solve the problem. The aim is to provide visually impaired children with the knowledge and abilities they'll need to take care of their oral health and hygiene on their own.

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