



Audio Tactile Performance Technique as an Effective Method in Improving the Oral Hygiene Status of the Visually Impaired Population in Comparison With Braille: A Systematic Review

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ABSTRACT

Dental care is found to be among the most neglected and unmet needs among the visually impaired individuals due to lack of understanding the importance of having good oral hygiene, inability to understand the needs and a huge communication gap between the dentist and the visually impaired. The aim of this systematic review is to determine the effectiveness of Audio-Tactile Performance (ATP) in improving the oral hygiene status of the visually impaired population in comparison with braille. The search was done using the MeSH terms and keyword search in the electronic databases namely PubMed, Cochrane Library, Science Direct and Google Scholar. Articles were selected if the studies evaluated the effectiveness of oral hygiene instructions by ATP and Braille using plaque and gingival index. The electronic search yielded a total of 31 articles out of which after removing the duplicates, screening the title, abstract and application of inclusion and exclusion criteria 5 articles were included. All the studies included were based on the data extraction and analysis of the studies for quality. The outcome measure was to evaluate the reduction in mean plaque and gingival index scores by Sillness and Loe after the intervention with Audio-Tactile Performance and Braille. Based on this systematic review, Audio-Tactile Performance can be used to improve the oral hygiene status but it is most effective in improving when combined with braille rather than being used seperately.

Key words: Visually impaired, Audio-tactile performance, Braille, Oral hygiene status

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INTRODUCTION

Vision is one of the most important sense required for interpreting the environment around us and when the vision is impaired it causes a substantial toll on the individual and the society leading to significant suffering, difficulties, disabilities, loss of productivity and reduced health related quality of life for millions of people all over the world [1,2]. According to WHO blindness is defined as person having a "visual acuity of less than 3/60 m or corresponding visual field loss in the better eye with the best possible correction" meaning that whilst a blind could see 3 m, a normal person without any visual impairment could see 60 mm [3]. WHO estimates suggest that across the world about 35 million people are

blind and among them over 11.7 million are from India [4].

The visually impaired face a number of difficulties in carrying out their daily activities as they are dependent on their caretakers. Their general health is taken care of by their caretakers, but the oral health is not given the required importance [5]. They find it challenging to maintain proper oral hygiene and are not able to detect and recognise early dental diseases [6]. Visually impaired tend to have significant plaque and are considered to have high risk for dental diseases due to their diet, eating patterns, medications, physical limitations, lack of cleaning ability and attitude of their caregivers [7]. Literature search reveals dental care to be among the most neglected and unmet need among visually impaired individuals as a result of lack of understanding the importance of having good oral hygiene, inability to understand the needs and a huge communication gap between the

dentist and the visually impaired [8].

Bridging the communication gap between the dentist and visually impaired people is necessary and can be achieved by oral health education. Oral health education is effective in improving the knowledge and oral health related practices of the target population. If there is involvement of significant others like caretakers or teachers or parents in oral health education, it would bring out a higher magnitude of change in the improvement of the oral health. It is not possible for the visually impaired to learn the methods of oral health maintenance by visual imitation like their sighted counterparts. Hence a special approach is required for teaching them about oral hygiene. Various methods have been proposed in the literature on teaching oral health education to the visually impaired.

Deprived of sight, the visually impaired usually negotiate with the external world using their non-visual senses, like hearing and touch. Braille is considered as an important media or language for reading and writing as it is analogous to printing. It allows them to perceive and visualise the world via touch and also to understand and assert a certain meaning to meaning to a word. Braille script may not be sufficient enough sometimes, with the help of advancing technology audio aids can be used to help the visually impaired to perceive things in a different way. Audio aids are useful in being time saving & can be repeatedly played to achieve desired results [8,9].

One such novel health education method is the Audio Tactile Performance (ATP) technique, which is specially designed to educate the visually impaired regarding their oral hygiene maintenance. It includes an interactive session (audio) wherein a good rapport is established first creating a very friendly atmosphere. It is followed by making them feel their teeth on a large sized model (tactile) and are then taught to brush on the model with assistance followed by which they are asked to feel their own teeth with their tongue for deposits, if present, they are identified with the feeling of roughness. They are then taught to brush their own teeth with assistance performance.

Lack of comprehensive oral health education (OHE) material which could be easier for

understanding by visually impaired individuals was the basic consideration behind formulating the present study. This systematic review aims in identification and appraisal of available evidence regarding the most effective method among braille and audio-tactile instructions in improving the oral health status of the visually impaired population.

Our recent research portfolio slides numerous articles in reputed journals [10-14]. Based on this experience we planned to pursue Audio-tactile performance technique as an effective method in improving the oral hygiene status of the visually impaired population in comparison with braille –A systematic review.

MATERIALS AND METHODS

Search strategy for identification of studies

The PICO model used for the research was P (Visually impaired individuals), I(Audio-Tactile Performance), C(Braille), O(Oral Hygiene Status [OHI-S]). For identification of the studies included or considered for this review, detailed search strategies were carried out on Cochrane Database of Systematic Reviews, PUBMED Advanced Search, Google Scholar and Science Direct. No time restriction was applied during the electronic search to include the search phase of the systematic review. The variables of interest considered were mean plaque and mean gingival index scores before and after the oral hygiene education. Articles were screened on the basis of their titles following which duplicates were removed from other databases. The title of the articles and abstracts were reviewed. The full text of the selected articles were retrieved and further analysed.

SEARCH METHODOLOGY

The search methodology applied in PUBMED was using the following keywords

Search (Impaired Person, Visually) OR Impaired Persons, Visually) OR Person, Visually Impaired) OR Persons, Visually Impaired) OR Visually Impaired Person) OR Visually Impaired Persons) OR Blind Person) OR Blind Persons) OR Person, Blind) OR Persons, Blind) OR Visually Challenged Person) OR Visually Challenged Persons) OR Visually Impaired Adolescent) OR Visually Impaired Adolescents) OR Visually Impaired Adult) OR Visually Impaired Adults)

OR Visually Impaired Child) OR Visually Impaired Children) OR Visually Impaired School Children) OR Visually Impaired School Boys) OR Visually Impaired School Girls) OR Institutionalized Visually Impaired Children) OR "Visually Impaired Persons"[Mesh])) AND (Perception, Touch) OR Perceptions, Touch) OR Touch Perception) OR Touch Perceptions) OR Tactile Perception) OR Tactile Perceptions) OR Perception, Tactile) OR Perceptions, Tactile) OR Audio aid) OR Audio aids) OR Audio instructions) OR Verbal) OR Verbal instructions) OR Audio-tactile Models) OR Tactile Model) OR Tactile Models) OR AudioTactile Performance) OR "Touch Perception"[Mesh]) OR Auditory pattern recognition) OR "Pattern Recognition,

Physiological"[Mesh]) AND (Braille) OR Braille language) OR Braille Instructions) OR Braille Model) OR Braille Models) OR Braille Text) AND (Oral Hygiene) OR Oral Hygiene Status) OR Oral Health) OR Oral Health Status) OR Hygiene, Oral) OR Dental Hygiene) OR Hygiene, Dental) OR Oral Hygiene Indexe) OR Oral Hygiene Indexes) OR Oral Hygiene Indices) OR Oral Hygiene Index) OR Hygiene Indexe, Oral) OR Hygiene Indexes, Oral) OR Index, Oral Hygiene) OR Indices, Oral Hygiene) OR Indexe, Oral Hygiene) OR Indexes, Oral Hygiene) OR "Oral Hygiene" [Mesh]).

SELECTION OF STUDIES (Figure 1)

Inclusion criteria

- ✓ Studies comparing Audio-Tactile Performance

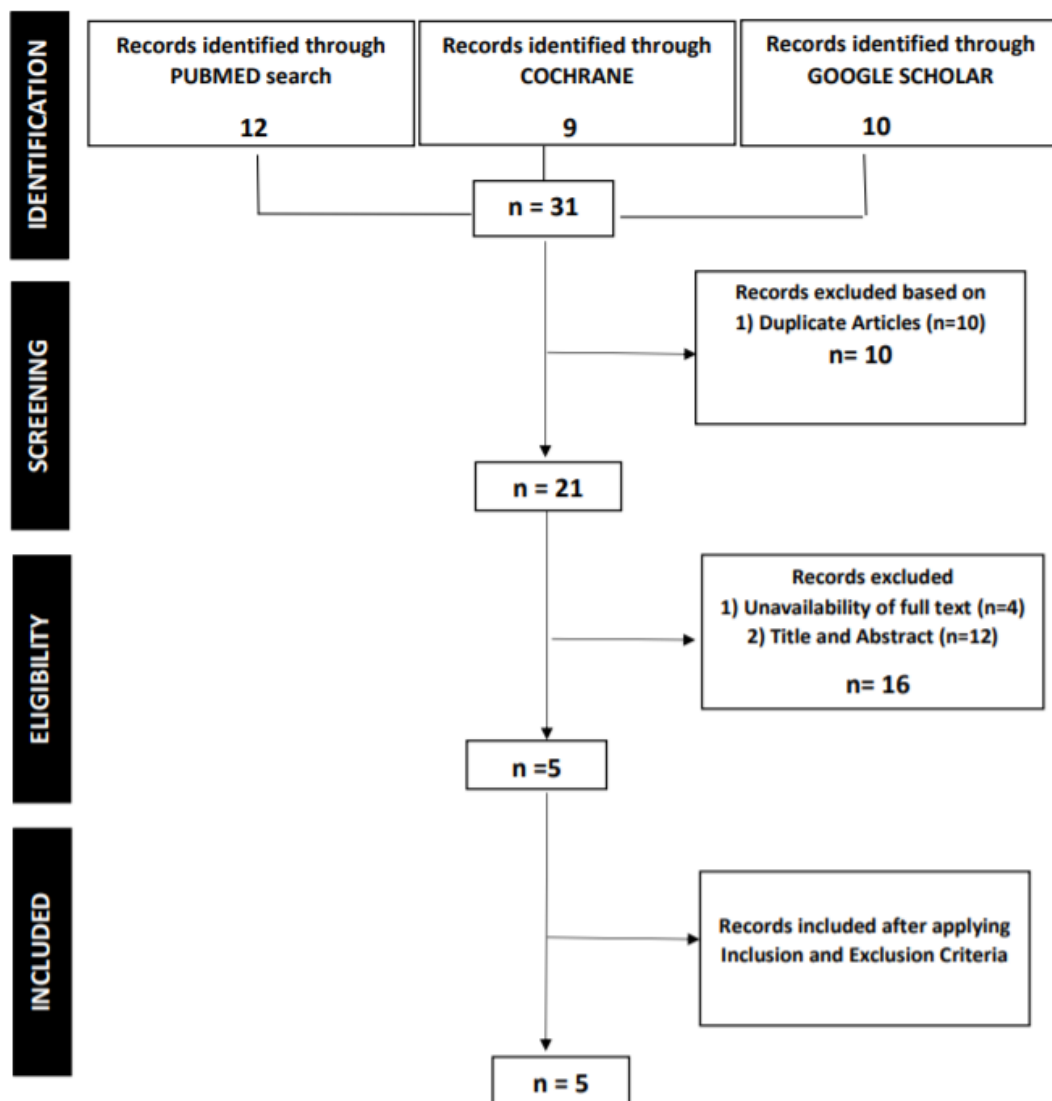


Figure 1: Search flowchart.

Technique and Braille on oral health education in the visually impaired population.

- ✓ Studies which had included adjunct oral health education methods such as audio aids along with braille and audio-tactile performance methods.
- ✓ Studies done only in english language were included.

Exclusion criteria

- ✓ Studies that did not include Audio-Tactile Performance Technique as an oral health education method in the visually impaired population.
- ✓ Studies that did not compare Audio-Tactile Performance Technique with Braille on oral health education in the visually impaired population.
- ✓ Studies that compared braille with other oral health education methods apart from Audio-Tactile Performance Technique.
- ✓ Studies that did not involve oral health

assessment using plaque index and gingival index and review articles.

RESULTS AND DISCUSSION

The search identified 21 publications out of which 12 were excluded after reviewing the title and abstract, 4 were excluded due to unavailability of full text. A total of 5 publications which fulfilled all the criteria were included in the systematic review (Tables 1 and 2).

Quality assessment of the studies

These five articles were assessed for their quality using Review manager software namely in Revman 5.3. Quality assessment of interventional studies includes seven domains. Each domain consisted of one question which was answered “low risk” or “high risk” or “unclear risk”. The domains included are Random sequence generation (selection bias), Allocation concealment (selection bias), Blinding of participants and personnel (performance bias), Blinding of outcome assessment (detection

Table 1: General characteristics of included studies.

Author, Year	Study design	Study participants	Study participants	Time of assessment	Statistical evaluation	
Brahmanna Chowdary et al. [17]	Prospective Interventional Study	120 visually impaired children aged between 6-16 years	Group I (40): Verbal and tactile	Baseline, 1 month, 3 months, 6 months	One-way ANOVA to analyse the intra- and inter-group comparisons	
			Group II (40): Verbal and braille			Tukey post-hoc test for multiple group comparisons.
			Group III (40): Verbal, braille, and tactile			
Sushmita Deshpande et al. [15]	Randomized Control Trial	60 visually impaired individuals ranging from age 12-16 years	Group 1(20): Braille	Baseline, 1 month	Wilcoxon sign rank	
			Group 2(40): Audio-tactile			Kruskal–Wallis ANOVA
			Group 3(40): Audio-tactile Braille			
Diptajit Das et al. [5]	Randomized Control Trial	60 visually impaired subjects between the age group of 10-15 years	Control Group (30): Braille booklet+single information session through audio record	Baseline, 30 days, 90 days	Student's t-test and Chi Square test	
			Test Group (30): Audio-tactile performance			ANOVA
Anjali Gautam et al. [16]	Prospective Study	60 visually impaired children aged 6-16 years	Group A (20): Audio aids+Braille	Baseline, 1 month, 3 months	ANOVA	
			Group B (20): Audio aids+Tactile model			
			Group C (20): Audio aids+Braille+Tactile model			
Barkha S. Tiwari et al. [18]	Non-randomized Intervention Study	90 visually impaired children between the age group of 12-15 years	Group 1(30): Audio-Tactile performance	Baseline, 21 days, 3 months, 6 months, 9 months	One-way ANOVA and Post hoc Tukey Test	
			Group 2(30): Braille			McNemar test was used to assess the changes in response before and after health education
			Group 3(30): Audio-Tactile performance			

Table 2: Summation of outcomes of the included study.

S. No	Study	Results
1	Brahmanna Chowdary et al. [17]	Group III (combination of verbal, braille and tactile) showed higher percentage of reduction in plaque scores at 6 months when compared to baseline with the Group I (verbal+tactile) and Group II (verbal+braille) Group II (verbal and braille) showed a higher percentage of reduction in gingival scores at 6 months when compared to baseline with the Group I (verbal+tactile) and Group III (verbal+braille+tactile)
2	Sushmita Deshpande et al. [15]	Group 3 (Combination of Braille and Audio-tactile performance) showed statistically significant result on comparison between pre and post – intervention plaque scores
3	Diptajit Das et al. [5]	There was no statistically significant difference between Control (Braille) and Test group (Audio-Tactile Performance) in plaque reduction scores at 90 days interval Test group (Audio-Tactile Performance) showed statistically significant reduction in the gingival scores at 90 days interval when compared to baseline & 30 days interval.
4	Anjali Gautam et al. [16]	Group C (Audio aids+Braille+Tactile models) showed greater percentage of reduction of plaque and gingival scores at 3 months interval when compared to baseline of the Group A (Audio aids+Braille) and Group B (Audio aids+Tactile models)
5	Barkha S. Tiwari et al. [18]	Group 3 (Braille+Audio-Tactile Performance) showed higher plaque and gingival reduction at 9 months interval when compared to the Group 1(Audio-Tactile Performance) and Group 2 (Braille) which was statistically significant

bias), incomplete outcome data (attrition bias), Selective reporting (reporting bias) and other bias. This data was fed into Review manager software namely in Revman 5.3 to obtain a colour coded chart of risk of bias summary and graph.

Risk of bias

Study done by Das et al. [5] had a low risk of bias whereas the study done by Deshpande et al. [15] and Gautam et al. [16] had moderate risk of bias. Studies done by Brahmanna Chowdary et al. [17] and Barkha S Tiwari et al. [18] had high risk of bias.

Oral health education is the most widely accepted method in prevention of oral diseases. It is cost-effective, easy to teach and also decreases the incidence of new disease [18]. Maintaining oral hygiene is a difficult task for the visually impaired individuals when compared to individuals with normal eyesight which will eventually lead to poorer oral hygiene and high caries index [19]. Study done by Purohit et al. in South India [20] Anaise et al. in Israel [21] and Shaw et al. in the UK [22] showed that poor oral health attributes to special care children. Chemical method of plaque removal, individual care training and for the visually impaired will help in maintaining proper oral health [23]. Conventional methods such as visual aids, disclosing agents in teaching oral health education cannot be used in visually impaired individuals who depend on touch and feel to understand [24]. The difficulty in making the visually impaired individual understand the oral hygiene instructions and to perform them are the major challenges. If the oral hygiene instructions are given to their understanding by any other methods, it will help to improve their oral hygiene.

Braille is a system which consists of bumps and indentations on a surface which represents letters that can be recognised by touch. This was introduced by Louis Braille, a French educator. This Braille method is used extensively to give education to the visually impaired individuals. Initially braille was used to instruct oral hygiene instructions to visually challenged individuals. But recently studies have found that the visually challenged population performed oral hygiene techniques more effectively when tactile aids such as audio aids were used along with braille [7].

According to Brahmanna Chowdary et al., [17] 120 visually impaired children aged 6-16 years were included in the prospective interventional study. They were divided into 3 groups (n=30). Group 1 consisted of verbal and tactile, Group 2 verbal and braille and Group 3 verbal, tactile and braille. Individually, instructions regarding maintenance of good oral hygiene and horizontal scrub technique of toothbrushing were explained to all the children of respective groups. At the end of 1 month, 3 month and 6 months interval oral health status was evaluated using Plaque Index and Gingival Index. In this study he found out that Group 3 – verbal, braille and tactile showed significantly higher percentage of reduction in plaque scores when compared to other 2 groups. He concluded the study by saying that combination of verbal, braille and tactile mode of oral health education proved to be an effective tool to improve oral hygiene practice [17].

According to Deshpande et al. 60 visually impaired adolescents aged between 12-16 years were divided into 3 groups with 20 members in each group receiving oral hygiene instructions

in different modes. Group 1 consisted of Braille, Group 2 Audio-tactile performance, Group 3 Braille and Audio Tactile performance. After the end of thirty days oral health status of the participants were obtained using plaque index. After analysis it was found that the combination of braille and audio-tactile performance group showed statistically significant difference between pre and post intervention scores when compared. The study was concluded by saying that even though braille and audio-tactile performance are effective when used separately it is more effective when used in combination [15].

According to Diptajit Das et al., a parallel arm single blinded randomised control trial was conducted with 60 visually impaired subjects aged between 10-15 years were included in the study. They were divided into a test and control group consisting of 30 members in each group. Control group received oral health education material by braille and audio mode while the test group received through audio-tactile performance technique. Clinical examinations for plaque and gingival scores were assessed at baseline, 30 days interval, and 90 days interval. After analysis it was found that statistically significant reduction in gingival scores (Whole mouth) was observed at 90 days interval when compared to baseline and 30 days interval while in plaque reduction scores, statistically significant difference was not seen between control and test group. The findings of the study showed that a novel oral health education technique (ATP) proved to be at par with the traditional method of combination of audio and Braille text in proper maintenance of gingival health and plaque removal efficacy [5].

According to Anjali Gautam et al., a prospective study was conducted by including 60 visually impaired children aged between 6-16 years. They were divided into 3 groups (n=20) and were given oral hygiene instructions and brushing techniques in different methods. Group A (Audio aids+Braille), Group B (Audio aids+Tactile models), Group C (Audio aids+Braille+Tactile models). After the end of 1 month and 3 months, the oral hygiene status was recorded and compared using Plaque and Gingival index. After evaluation it was found that Group C (Audio aids+Braille+Tactile models) showed a higher

percentage of reduction in plaque and gingival score at 3 months when compared to baseline. The study depicts that the combination of audio aids, Braille and tactile models is an effective way to provide oral health education and improve oral health status [16].

According to Tiwari et al. a prospective interventional study was conducted by including 90 visually impaired children aged between 12-15 years. They were divided into 3 groups (30 each) Group 1: ATP (audio, tactile performance technique), Group 2: Braille, and Group 3: ATP+Braille. The oral hygiene status was recorded and compared using plaque and gingival index after a 21-day, 1-, 6-, and 9-month interval. Group 3 showed the highest percentage of reduction in plaque (55%) and gingival (52%) scores when compared with Group 1 and Group 2. The study concluded that combination of ATP (audio, tactile, and performance technique) and Braille was an effective way to improve oral hygiene status in visually impaired children [18].

CONCLUSION

Oral health education along with self-maintaining skill imparts maximum benefits in oral hygiene improvement of visually impaired children. They can maintain an acceptable level of oral hygiene when taught with customized and new techniques like the ATP. With the available evidence, this systematic review concludes that Audio-Tactile Performance can be used to improve the oral hygiene status but it is most effective in improving when combined with braille rather than being used separately.

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CONFLICT OF INTEREST

There was no potential conflict of interest as declared by the authors.

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