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Effect of different methods of education on oral health in children with hearing impairment: A systematic review

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Review Article

Abstract

BACKGROUND AND AIM: The aim of oral health education is to prevent oral diseases. Literature review indicates that oral hygiene is poor in children with hearing impairment. Different methods have been used to teach oral health to children with hearing impairment. This systematic review was undertaken to evaluate the efficacy of different methods of oral health education to improve oral health in children with hearing impairment.

METHODS: Two independent researchers searched the Web of Science, PubMed, Scopus, and Cochrane Library databases without language restrictions, and a time limit of up to December 2016. Articles were imported to EndNote software and duplicate articles were removed. Relevant and proper articles were selected after considering the inclusion and exclusion criteria. Quality assessment was carried out, and articles with a score of more than 5 were selected for analysis in the review.

RESULTS: Of 453 articles found, 12 were assessed for eligibility based on defined inclusion criteria, and 9 studies were included in the review after quality assessment. Different methods such as video clips and dental models were used to train children. Out of the 9 studies, 8 studies showed a reduction in plaque index, and 4 studies were effective in improving gingival indexes. The results showed that educational intervention was effective in improving oral health.

CONCLUSION: Oral health education was effective in improving oral health status in children with hearing impairment without considering the method of education and learning barriers in these children.

KEYWORDS: Hearing Impairment; Oral Health; Education; Systematic Review; Children

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Oral hygiene is an essential component in human health with an effect on quality of life.[1-3] Despite improvements in oral health in recent decades, oral diseases are still prevalent in human societies.[4] Furthermore, oral diseases are one of the most prevalent diseases in the world.[1]

People with handicaps have a poorer oral health than the general population. Individuals with different handicaps are faced with many social and environmental determinants of health such as lower income and educational levels compared to their normal peers.[5] Hearing impairment is one of the common physical handicaps.[1] Nearly 360 million people live with hearing loss in the world (328 million adults and 32 million

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children). The majority of these individuals live in low- and middle-income countries.[6] Children with hearing impairment "display more problems, such as depression, anxiety, and low self-concept".[7] In addition, they have communication barriers to receive adequate oral health awareness and inadequate ability to control their dental plaque.[1,8] Literature review indicates that oral hygiene in children with hearing impairment is poor and inappropriate.[9-14]

Oral health education is the most cost-effective method for preventing dental diseases. The World Health Organization (WHO) recognizes oral health education as a behavior that improve oral health, and decrease the risk of oral diseases.[2] Oral hygiene instructions can be rendered with the use of educational aids.[3]

A study in the Rochester Institute of Technology showed that deaf students could succeed in college education if proper communication methods be used in teaching despite their limitations.[15]

In recent years, oral health education for individuals with hearing impairment has been the focus of attention. According to previous studies, different methods, including educational videos, illustrated books, and even manual use of toothbrushes and tooth models for education are effective in improving the oral health status in students with hearing impairment.[8,16-18] However, to date no systematic review has been carried out in this field. Therefore, the aim of this systematic review was to determine whether oral health education in students with hearing impairment improve oral health status among them, and also to determine the most cost-effective method of oral health education in such children.

Methods

A systematic literature review was conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement to evaluate the impact of different educational methods to improve the oral health status in children with hearing impairment. The bibliographic database resources, including the Web of Science, PubMed, Scopus, and Cochrane Library were searched without a time limit up to December 2016. For more precise search, the researchers used a combination of sensitive keywords according to Medical Subject Headings (MeSH) terms in the following structure: "oral health OR oral hygiene OR mouth diseases OR dental health surveys OR dental hygiene AND education OR train OR literacy program OR teaching OR educational activities OR training programs OR intervention AND deafness OR hearing impairment OR hearing loss OR hearing disorder OR disability". Furthermore, the lists of relevant articles were reviewed to find additional references.

The search was conducted by two researchers independently, and then they reviewed the titles and abstracts of articles to select proper articles. First, the articles were found and imported to the EndNote software; then repetitive articles were deleted. After that, a list of titles and abstracts were prepared. Inclusion criteria consisted of articles on oral health education, and articles related to children with hearing impairment. The articles were considered to determine the relevance of their titles to our subject and check the full text of them. Subsequently, some articles were eliminated based on exclusion criteria. Exclusion criteria included non-compliance with the subject, inaccessibility of the full text, inadequate data, and articles in languages other than English. In all these studies, education intervention was conducted for oral health.

Then, the qualitative evaluation checklist for article[19] was used to select the high-quality articles. In this checklist, the following items were evaluated to rate articles: comprehensive and structured abstract, a clear-cut target population, the outcome, the time and area of the study, random sampling, the type of blinding in the study, the clarity of goals and assumptions, the identification of initial and secondary

outcomes, and follow-up duration. If any of these items were considered, the score for the question was 1, and otherwise the score was 0. The maximum score was 10, and articles with a score of more than 5 were selected for analysis. Data were extracted from selected articles, and imported into Excel software program.

Results

Initially, 453 articles were found, and after reviewing and quality assessment, 9 articles with a score of more than 5 were included in the systematic review (Figure 1).

Five studies were conducted in India, and all the articles were published from 2011 on. In total, 1183 students aged 5-18 years with hearing impairment were trained in oral health for a mean duration of 16 weeks. Indexes such as Quigley-Hein plaque and gingival indexes were used for oral health assessment. In all the studies, the tooth plaque index was evaluated. Different methods such as video clips and dental model were used to train children (Table 1).

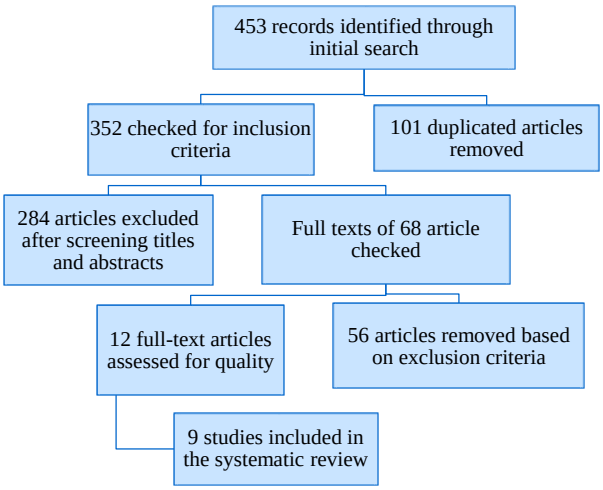

Figure 1. Selection of articles in this study

Table 1. Basic information of the included studies in review

References	Country	Age (year)	Sample size	Duration (week)	Type of education	Time for giving toothbrush and toothpaste	Outcomes assessed
Carissa et al.[22]	Indonesia	6-12	31	20	Pantomime	Not mentioned	Modified PHP index
Arunakul et al.[18]	Thailand	6-10	66	12	Video clip and illustrated book	Not given	Quigley-Hein PI, Gingival bleeding index, and GI
Shetty et al.[1]	India	6-14	110	12	Video clip	Not mentioned	Quigley-Hein PI and GI
Sandeep et al.[8]	India	6-16	372	12	Video clip	At the beginning	Silness-Löe PI and GI
Pouradeli et al.[16]	Iran	7-19	73	4	Video clip and manually using brush and tooth models	At the beginning	O'Leary PI
Alse et al.[17]	India	5-17	56	3	Manual use of brush and tooth models	At the beginning	Quigley Hein PI and DMFS index
Pareek et al.[20]	India	6-15	315	6	Video and roll-on technique and dental models	At the beginning	Quigley-Hein PI and GI
Doichinova and Peneva[21]	Bulgaria	5-12	100	12	Animated cartoons and manually using brush and tooth models and plastic dolls	Not given	Greene and Vermillion PI
Lamba et al.[23]	India	6-18	17	3	Manual use of brush and tooth models	At the beginning	Silness-Löe PI, GI, and DMFS index

PHP: Patient hygiene performance; PI: Plaque index; GI: Gingival index; DMFS: Decayed, missing, and filled surfaces

Table 2. The mean difference in plaque index (PI) before and after the education

References	Plaque index	Groups	Mean difference	p
Carissa et al.[22]	Modified PHP index	One group	1.25	0.0500
Arunakul et al.[18]	Quigley-Hein PI	Group A (Only video clip)	0.79	< 0.0100
		Group B (Only illustrated book)	0.75	< 0.0100
		Group C (Both video clip and illustrated book)	0.87	< 0.0100
		Group D (Control)	0.64	< 0.0100
Shetty et al.[1]	Quigley-Hein PI	One group	0.32	< 0.0010
Sandeep et al.[8]	Silness-Löe PI	Study	0.37	< 0.0010
		Control	0.08	0.0500
Pouradeli et al.[16]	O'Leary PI	Group A (Only video clip)	15.7	0.0010
		Group B (Only models)	15.2	0.0010
Alse et al.[17]	Quigley-Hein PI	Group A	0.10	0.0030
Pareek et al.[20]	Quigley-Hein PI	Group A	0.83	0.6400
		Group B	0.95	
		Group C	0.92	
Doichinova and Peneva[21]	Greene and Vermillion PI	One group	0.48	< 0.0010
Lamba et al.[23]	Silness-Löe PI	One group	0.75	< 0.0001

PHP: Patient hygiene performance; PI: Plaque index

The plaque index was high in initial of the studies, and it was decreased after education in all studies, also these reductions were statically significant in eight studies (Table 2).

In 4 articles, gingival index was measured, and it improved after training significantly (Table 3).

Discussion

In this study, we reviewed the results of 9 articles that evaluated the effect of oral health education on oral health status in children with hearing impairment. The results of these studies indicated that oral health education had a positive effect on improving oral health in such children.

All the studies, except for one study, showed that oral health status significantly improved after training. Of course, in this study, due to the considerable difference between the plaque index before and after training in each group, this difference was not statistically significant. Maybe, further statistical tests should be used to examine the difference between the mean difference in the plaque index before and after oral health education.[20]

In a study by Doichinova and Peneva, there was simultaneous use of animated cartoons, and manual use of toothbrushes and tooth models and plastic dolls for educating oral health. The results showed that the oral health status improved.[21] Carissa et al. used pantomime method for oral health education, which improved the oral health status.[22]

Table 3. Mean difference in gingival index before and after education

References	Groups	Mean difference	P
Arunakul et al.[18]	Group A (Only video clip)	0.17	< 0.0100
	Group B (Only illustrated book)	0.21	< 0.0100
	Group C (Both video clip and illustrated book)	0.17	< 0.0100
	Group D (Control)	0.17	< 0.0100
Shetty et al.[1]	One group	0.29	< 0.0010
Sandeep et al.[8]	Study	0.31	< 0.0010
	Control	0.1	0.0500
Lamba et al.[23]	One group	0.46	< 0.0001

In Shetty et al.[1] Pouradeli et al.[16] and Arunakul et al.[18] studies, video clip method was used for oral health education, which proved effective in improving oral and dental health in children with hearing impairment.

Moreover, in the study by Arunakul et al.,[18] in one group, video clip and illustrated book were simultaneously used for training, which significantly improved oral health status of children with hearing impairment. In another group, only an illustrated book was used for training oral health, which proved effective in improving oral health status. Finally, in this study, a comparison was made between four teaching groups, including only video, video and illustrated books simultaneously, only illustrated book, and control group with no training. The results showed that the plaque index significantly decreased in all the groups, and there was no difference between the four groups. Since all the trained and untrained children were studying in the same school, and due to their communication with each other, it was possible that the control group subjects received educational materials from other groups. Moreover, at the beginning of the study, some methods were used for standardization until the plaque score reached zero in all the groups. Therefore, the students in the control group paid more attention to their oral hygiene during the study period. Maybe, that is why the differences were not significantly different between the trained and untrained groups.[18]

In three studies, education was rendered using a toothbrush and a dental model with the help of sign language. The results of these studies showed that oral health status significantly improved after training.[16,17,23]

In the study by Pouradeli et al., a comparison was made between two teaching oral hygiene methods through video and dental model. In both methods, plaque indices reduced after education, and there was no significant difference between the two methods. Perhaps, due to the relation of students in the school, the training was communicated between them; therefore, no difference was detected between the two teaching methods.[16]

Besides, in Pouradeli et al.[16] and Shetty et al.[1] studies, after a reinforcement period for education, the students were not given any training for a few months, and the oral health status was reassessed. The oral hygiene status was still favorable, indicating that students with hearing problems could learn as well as normal students, and education could have a stable effect on their performance if they received correct education.

In previous studies, the plaque index has been measured using different indexes such as Greene and Vermillion, and Silness and Löe, with the plaque index decreasing significantly after training in all the studies. Despite differences in the methods used for measuring and rating the plaque in each of these studies, each of these indexes can well reflect oral hygiene status.[1,8,16-18,20-23] In addition, the gingival index was evaluated before and after training, and it improved after training in five studies.[1,8,18,,20,23] Therefore, correct and proper method of brushing can be a very effective way to improve oral hygiene status in students with hearing impairment, who are well trained, and can apply this method.

The main limitations in this study were the limited number, and average quality of articles in this field. In addition, there was high heterogeneity between studies, which could be due to differences between teaching methods, sample size, etc. In these studies, except for one study, there was not a control group to compare the effect of training with children not receiving training. Therefore, in further studies, surveying a group as a control group is recommended. Moreover, further studies are necessary to determine the best method of teaching, and to identify the needs and deficiencies of oral hygiene education in children with hearing impairment. Finally, in relation to the condition and facilities, we can choose the best method for teaching oral health in such children.

Conclusion

According to the results of this study, despite the fact that children with hearing impairment have limitations in communication and learning, they can learn oral hygiene methods like healthy children. Oral health education is effective in reducing plaque index and in improving oral health status in children with hearing impairment. Based on the availability of facilities, the best teaching methods should be selected.

Conflict of Interests

Authors have no conflict of interest.

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