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Short-term effect of two education methods on oral health among hearing impairment children

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Original Article

Abstract

BACKGROUND AND AIM: Poor oral health among children with impaired hearing has been reported frequently due to lack of communication skills and effective health educations. In this study, we assessed the effect of two training methods on short-term oral health outcomes among children with impaired hearing.

METHODS: In this experimental study, 80 hearing impairment (HI) student aged 7-19 years old were randomized into two groups, one group watched a guided training video and the other group was educated by a dental model. The training sessions were weekly and continued for 1 month. A trained dentist examined all participants using O'Leary plaque index (PI) at baseline, 1-month, and 3-month visits.

RESULTS: At baseline, the difference between the mean O'Leary PI in the video training and dental model training groups was not significant (34.3% vs. 35.6%). In the video training group, sharp decrease was seen at the 1-month visit (reinforcement periods), i.e., 18.7% ($P = 0.001$), followed by a slight increase at the 3-month visit (non-reinforcement periods), i.e., 19.1% ($P = 0.100$), respectively. On the other hand, in the dental model, a decreasing trend was seen 24.7% at 1-month (reinforcement periods) and 19.9% ($P = 0.001$) at 3-month visits (non-reinforcement periods). Overall, there were no significant differences between the two methods of training ($P = 0.300$).

CONCLUSION: Both video and dental model effectively improve the oral health of children with HI in short term. Continuous school-based oral health education programs, particularly for HI children, need to be considered.

KEYWORDS: Hearing Impairment; Plaque Index; Oral Health; Education

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Oral health is a critical component of the overall health and quality of life worldwide.^{1,2} Oral health effects on nutrition, growth, learning, communication, and quality of life of partially children.³ Dental procedures and treatments for poor oral health conditions are

so expensive and roughly cost 5-10% of all public health budgets in industrialized countries.⁴

Dental caries is one of the preventable diseases in childhood and caused by dental plaque.^{5,6} Several studies showed that children with disabilities have higher levels of caries and

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untreated periodontal disease.^{1,7-10} Children with impaired hearing have difficulties in speaking and communication and so learning process would be longer and even more challenging than the other children without such disabilities.⁹ Schools are potentially perfect places for training and development of healthy habits and behaviors for children at young ages.³ Previous studies have shown that education through posters or instructional videos in sign language was useful to raise awareness about oral cancer, prostate, and breast cancer among deaf people.¹¹⁻¹³

Previous studies showed that training through video and dental model has been shown to be effective in improving the oral health of students with hearing impairment (HI) in Andhra Pradesh and Karnataka, India, respectively.^{1,14} However, they did not measure the effect of oral health education after the period without any training, and they using one method of education in each research, also they using different indexes to recorded plaque score. As regards we not found the similar study in Iran, in this study, we assessed the effect of two training methods on short-term oral health outcomes among children with impaired hearing in reinforcement and non-reinforcement period.

Methods

Sampling and random allocation

Using the list of graduate students (N = 100) from the three primary schools that provide education services for children with HI in Kerman, we recruited 80 eligible participants into the study according to inclusion criteria. Then, children divided into two groups (Group A and Group B) by random allocation. That is, students in each class were random divided into two groups (A and B) by lottery. Students were given training oral health through videos on Group A and through the dental model in Group B.

Ethics review and consenting process

All protocol and study procedures were reviewed and approved by Ethics Committee

Institution of Kerman University of Medical Sciences, Kerman, Iran (Ka/93/658-12 February 2015). A trained staff explained the study objectives and procedures to children's parents in group sessions and after debriefing answer to questions. Then, a written informed consent was obtained from all those provided consent.

Inclusion and exclusion criteria

Children aged between 7 to 19 years that present in the day of study and impaired hearing (70 dB or greater)¹⁵ whom their parents provided written informed consent were eligible and recruited into the study. Disoriented children those with other oral diseases including dental fluorosis, severe caries, and severe periodontal disease.¹⁶ Mental and physical disabilities at baseline visit were excluded from the study.

Measurements and procedures

A trained dentist used O'Leary plaque index (PI) to assess the oral health status of children with dental mirror and a probe in broad daylight. This index evaluated the presence of bacterial plaque on the four dental surfaces (mesial, buccal, distal, and lingual) by adding the total surfaces with plaque and dividing this by the total number of dental surfaces examined and then multiplying it by one hundred. The value of 10% or less considered as optimum oral health.¹⁷

After the baseline oral examination, all children received a package containing toothbrush, toothpaste, and dental floss and were asked to brush all tooth surfaces, three times a day after breakfast, lunch, and dinner. Parents were asked to avoid helping the children to brush their teeth during the study.

Training video clip

A 5-minute muted video clip (source: Colgate site: <http://www.colgatebsbf.com.au/Kids>) on how to brush and floss tooth correctly was demonstrated on screen for students in Group A. This session was guided by a trained dentist and a teacher who explained the content of the video by sign language. To ensure the training was sufficient, at the end

of the session, a child was asked to do the brushing and flossing, and further tuning and guidance was given.

Dental training model

First, a trained dentist explained the correct flossing and tooth brushing techniques using a toothbrush, flossing, and dental model for about five minutes to students in Group B assigned to this intervention. Simultaneously, a trained teacher explained the procedures in sign language. To ensure the training was sufficient, at the end of the session, a child was asked to do the brushing and flossing, and further tuning and guidance was given.

In both groups, the training sessions were repeated weekly for a period of 1 month. At 1-month visit, all children were reexamined by the same dentist, and O'Leary PI was calculated for all. Next, all children were asked to continue toothbrushing and flossing for 2 months. No training was given during this period, and after 2 months, they were reexamined by the same dentist and again the O'Leary PI was calculated for all (Figure 1).

Dentist does not know about type of training when recorded the plaque score in three times of study. In addition, data were encoding, and analyzer does not know about

type of training.

Data analysis

We used the SPSS software (version 18.0, SPSS Inc., Chicago, IL, USA) for data analysis. The result of Shapiro–Wilk test showed that data had normality distribution. The change in the average of O'Leary PI over time and between the two groups was assessed by repeated measure test. Impact of follow-up time, HI severity, sex, education level, and age on outcome was assessed by linear mixed model; $P < 0.050$ was considered as significant.

Results

Study participants' characteristics

Our sample comprised 73 students. Seven cases were excluded from the study as they have dental fluorosis, severe caries, and mental and physical disabilities. Overall, 40 (54.8%) were male and the age ranged from 7 to 19 years old. While 36 (49.3%) of children had severe HI, the remaining suffered from moderate HI. Overall, 91.8% of students' mothers and 95.9% of students' fathers had diploma or less. No dropouts occurred during the study follow-up. Oral health education was given to 39 students

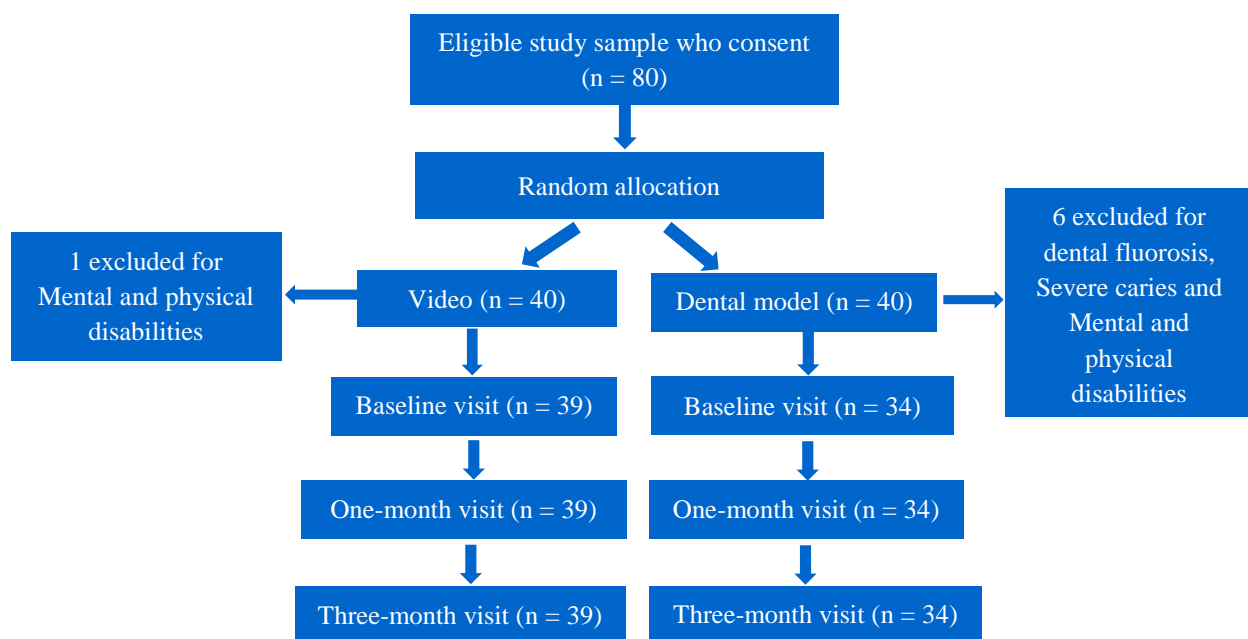


Figure 1. Flowchart of the study

Table 1. Demographic characteristics variable of children in two methods of training

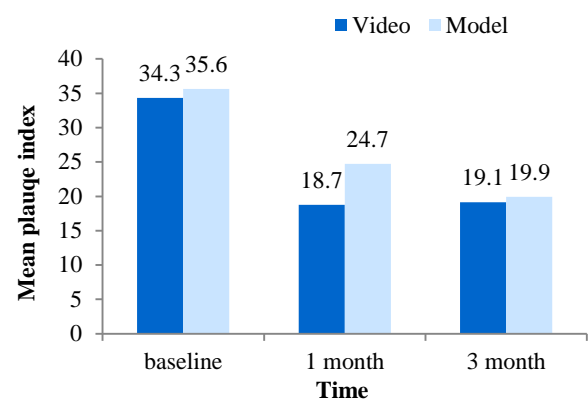
Variable	Categories	Type of train		P
		Video [n (%)]	Model [n (%)]	
Gender	Female	17 (43.6)	16 (47.1)	0.760
	Male	22 (56.4)	18 (52.9)	
Hearing impairment	Severe	21 (53.8)	15 (44.1)	0.400
	Moderate	18 (46.2)	19 (55.9)	
Education level	First to third	18 (46.2)	17 (50.0)	0.740
	Fourth to sixth	21 (53.8)	17 (50)	
Age	7-12	22 (51.2)	21 (48.8)	0.640
	12-19	17 (56.7)	13 (43.3)	

through videos and 34 students through the dental model. The distribution of sex, age, HI severity, and education level was similar between the two intervention groups (Table 1).

PI

At baseline, the difference between the mean O'Leary PI in the video training and dental model groups was not significant ($34.3\% \pm 16.4\%$ vs. $35.6\% \pm 11.4\%$). In the video training group, sharp decrease was seen at the 1-month visit, i.e., $18.7\% \pm 8.1\%$ ($P = 0.001$), followed by a slight increase at the 3-month visit, i.e., $19.1\% \pm 5.5\%$ ($P = 0.100$) at the end of reinforcement and non-reinforcement periods, respectively. On the other hand, in the dental model, a decreasing trend was seen $24.7\% \pm 11.0\%$ at 1-month and $19.9\% \pm 6.0\%$ ($P = 0.001$) at 3-month visits at the end of reinforcement and non-reinforcement periods, respectively (Figure 2). Overall, there were no significant

differences between the two methods of training ($P = 0.300$).

**Figure 2.** Mean plaque score at each time point of the study in two methods

After adjusting for covariates such as follow-up time, HI severity, sex, education level, and age, the average change of PI was similar in the two groups (difference -1.42 , $P = 0.300$) (Table 2).

Table 2. Estimates of fixed effects of independent variables on plaque score

Variable	Parameter	Estimate	Standard error	P
Time	T (0)	-5.90	0.69	0.001*
	T (1)			
	T (3)			
Method	Video	-1.42	1.36	0.300
	Model			
Hearing	Full loss	-2.50	1.72	0.150
	Half loss			
Sex	Female	0.10	1.38	0.940
	Male			
Education level	First to third	-0.67	1.68	0.690
	Fourth to sixth			
Age (year)	7-12	0.42	0.39	0.280
	12-19			

*Significant ($P < 0.050$)

Discussion

The purpose of this study was to evaluate the impact of two methods of education on oral health status in HI student. The score of dental PI was considerably higher than the desirable score¹⁷ at the baseline of this study. This represented a high percentage of dental plaque and poor oral health status. Previous studies, which done in different places, confirm the same result.^{1,7,8,10,14,18,19} However, in one study, acceptable oral health was revealed among HI students. The reason of difference could be explained through differences in study design: As this study was conducted in a private school where the children had a high socioeconomic status, beside arranged dental checkup.²⁰ It can be said that impaired hearing is not the only reason for poor oral health and as regards, more than 90% of students in our study belonged to poor socioeconomic class; socioeconomic status plays an important role in oral health status of HI children, too.¹⁸

After education in both methods, PI decreased significantly after 1-month training. These results are in agreement with other studies that showed education improved oral health status in reinforcement period.^{9,14,21} Further, PI was reassessing after 2 months without education. In both methods, oral health status was significantly improved compared to baseline; these results are in agreement with another study even though the study method was slightly different. In a study conducted by Shetty et al.,⁹ students were trained oral health through video followed by daily education for a month, and in Livny et al.²² study, training program was conducted in eight times per year, and immediately, after each training, oral health status was assessed. Furthermore, in Seema study, children were trained one time, and after 3 weeks, oral health status was assessed.¹ Similarity, the results of our study to other studies represented this fact that despite differences in cultural and socioeconomic conditions in nations and ethnic groups, proper education

about oral health can eliminated these differences and change the health behavior that leads to improving oral health. However, education might not be the only reason to improve the oral health status because these HI students belong to poor socioeconomic class and given toothpaste and toothbrush can play motivational and encouraged role for them.

However, at baseline, the difference between the mean O'Leary PI in the video training and dental model groups was not significant. In the video training group, sharp decrease was seen after reinforcement periods, followed by a slight increase after non-reinforcement periods. On the other hand, in the dental model, a slight decrease trend was seen after reinforcement periods and non-reinforcement periods. This result may indicate that students are more interesting to watch video, and they tried to repeat tooth brushing according to educational video, so PI decreased faster than dental model method in reinforcement period. However, at the end of study, two methods have similar effect to improve the oral health status and students performed as well as trainings after stop education. Since similar study not found, this result is not comparable with other study. Although in Arunakul study, all methods used for education oral health (video and book) had positive effect on oral health status of HI Children.²³ Furthermore, result of Lees study showed that visual instructions were more effective than written instructions in patients with fixed appliances.²⁴

Finally, this study can begin for assessing the impact of different methods of education to change the oral health status in HI students; it is hope that results of this study could provide a more effective way to improve oral health and change health behavior in these HI students in Kerman.

Limitations and recommendations

- Lack of a control group (a group without education) because of the low population but

due to this fact that PI was measured in baseline and before any intervention, each student can be itself controlled.

- Due to significant reduction of dental plaque in HI students after training, preparation proper educational program targeted on oral health to overcome the communication barriers is recommended.

- Suggest that other methods used to assess the impact of oral health education of HI children, including training through posters, lecture and also in groups of children with other disability.

Conclusion

Both video and dental model methods for

oral health education effectively improve the oral health status of children with HI in short term. Continuous school-based oral health education programs, particularly for disable children, need to be considered and depending on the condition must use the best method.

Conflict of Interests

Authors have no conflict of interest.

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