Original Article

Pioneering Strategies for Relieving Dental Anxiety in Hearing Impaired Children: a Randomized Controlled Clinical Study

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KEY WORDS
Dental sign language;
Anxiety;
Hearing impairment;
Dental treatment;

Received April 2016;
Received in revised form October 2016;
Accepted December 2016;

ABSTRACT

Statement of the Problem: Hearing impaired children have a problem in understanding and comprehending with dental treatments. Visual language is the sensible answer of how to improve communication with them.

Purpose: To evaluate the applicability of dental sign language in Hearing impaired children in relieving anxiety during stressful dental treatment by improving their means of communication.

Materials and Method: This randomized clinical trial was carried out in the Department of Pedodontics and Preventive Dentistry which included 40 Hearing Impaired children meeting inclusion criteria. The selected children were randomly divided into the study and control group comprising of 20 each. In the control group, initial oral examination and dental treatment (oral prophylaxis and class I restoration) were performed without the use of dental sign language. In the study group, the dental sign language specific to dental treatment was educated and during their subsequent visit to the dental clinic after dental sign language reinforcement, oral prophylaxis and class I restoration were done. Subjective and objective measurements of anxiety were recorded for both groups using facial image scale (FIS), pulse oximeter and electronic blood pressure apparatus to compare for correlation. The obtained data were subjected to statistical analysis using unpaired t-test.

Results: There was a statistically significant reduction in the anxiety levels ($p< 0.05$) in the study group compared to the control group.

Conclusion: Dental sign language was effective in reducing the level of anxiety in children who are hard of hearing. Dental sign language was able to improve behavior positively during dental treatment and may also aid in developing a positive dental attitude among children who are hard of hearing.

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Cite this article as: Chandrasekhar S., Prasad MG., Radhakrishna AN., Suravarapu PR., Uppu K., Bolla D. Pioneering Strategies for Relieving Dental Anxiety in Hearing Impaired Children- a Randomized Controlled Clinical Study. *J Dent Shiraz Univ Med Sci.,* 2017 June; 18(2): 112-117.

Introduction

Deafness is known as the invisible disability. [1] Loss of hearing can cause people to become isolated and lonely, exerting a tremendous effect on both their social and working life. [2] Communication is the biggest barrier deaf children face as it is a two-way process. Patients with hearing loss need to be helped to understand as well as possible and also need to know how to communicate in the best way. [1]

Many methods of communication are available to

help the hearing-impaired children to function in a normal way (hearing aids, cochlear implants, video phone/relay, phone relay, interpreters). However, most of the techniques are either expensive or not readily available, few are not useful because of the severity of hearing impairment, and others are practical difficulties during treatment. Sign language is the sensible answer for improving communication with hearing impaired children. [2]

Dental anxiety is a common problem that affects people belonging to all ages and appears to develop mostly in childhood and adolescence. Dental anxiety can prevent patients from cooperating totally during dental treatment. Dentists need to understand the anxiety and its repercussions in dental care so that a relationship of trust may be established with the patient for the implementation of strategies aimed at reducing the anxiety caused by dental treatment. [3] Anxiety reducing strategies are further compromised in hearing impaired children because of their problem in communicating with others. Hence, the aim of this study was to evaluate the applicability of dental sign language in hearing impaired children for relieving anxiety during dental treatment by improving their means of communication.

Materials and Method

This study was performed in the Pediatric and Preventive Dentistry Department, St. Joseph Dental College, India. This randomized clinical trial comprised of 40 children who were equally divided into the study and control group. Both groups had an equal distribution of males and females. Children who had moderate to severe hearing impairment with moderate to poor oral health requiring restoration for a class I dental lesion and with no previous dental experience were selected for the study. The selected children age ranged between 6-12 years with mean age of 8.4±3.4 years. The protocol of the study was approved and ethical clearance was taken from the Institutional Ethical Committee. Informed written consent was obtained from parents/guardians of the selected children participating in the study.

In the control group, oral prophylaxis and class I restorations were done without the explanation of the treatment procedure. During treatment, there were no means of communication used between the operating dentist and the child.

In the study group, 20 children were divided into groups of 10 each, for convenience to effectively educate dental sign language. The dental sign language specific to dental treatment was educated by trained professionals using visual aids. (Figure 1, 2) During their visit to the dental clinic, a quick review of dental sign language using the visual aids was given before the treatment, which acted as reinforcement. All treatment procedures and instructions to be followed were explained using the dental sign language by the operating dentist. During the procedure, use of dental sign language was repeated for giving instructions and also for reassurance to patients, which acted as a means of communication.

Figure 1: Dentisign. [12]

Subjective and objective measurements of anxiety were recorded in both groups using electronic blood pressure apparatus (Figure 3a), physiological parameters inclusive of the pulse oximeter (Figure 3b) and Facial image scale (FIS) [4] (Figure 3c). Data obtained were analyzed using statistical software (SPSS version 15.0, SPSS Inc, Chicago, USA). The unpaired t-test was used to calculate the correlation between the subjective and objective measurements of anxiety between boys and g-

Figure 2: Additional dental signs used in the study. [13]

irls in both study and control group. The unpaired t-test was used to calculate the correlation between the variables before, during and after treatment between the study and control groups.

Results

The mean values and standard deviation of systolic and diastolic blood pressure, FIS and pulse rate among girls and boys in the control group are presented in Table 1. The mean systolic blood pressure in girls and boys were 114.5±1.9 and 114.51±1.7 respectively. The mean diastolic blood pressure in girls was 71.96±1.4 whereas in boys it was 67.33±1.04. The FIS values in girls and boys were 3.42±0.11 and 2.81±0.16 respectively. The pulse rate in girls was 99.66±3.8 and for boys it was 91.66±1.41. There was no statistically significant difference in subjective and objective measurement of anxiety in the control group. (Table 1)

The mean values and standard deviation of systolic and diastolic blood pressure, FIS and pulse rate among girls and boys in the study group are presented in Table 2. The mean systolic blood pressure in girls and boys were 121.09±2.19 and 120.51±1.69 respectively. The mean diastolic blood pressure in girls was 73.73±1.13 whereas in boys was 72.92±0.94. The FIS values in girls and boys were 2.04±0.26 and 1.56±0.16 respectively. The pulse rate in girls was 91.76±2.57 and for boys it was 89.05± 2.02. There was statistically significant difference in subjective and objective measurement of anxiety ($p< 0.05$) except for the pulse rate in the study group. (Table 2)

The mean values of systolic and diastolic blood pressure, FIS and pulse rate among children in the study and control group before, during and after dental treatment are presented in Table 3.

Before the initiation of dental treatment, there was a statistically significant difference in systolic and diastolic blood pressure among study and control group with higher values in the control group. During and after the completion of dental treatment there was no statistically significant difference in systolic and diastolic blood pressure among the study and the control group (Table 3).

With respect to FIS and pulse rate in children, there was no statistically significant difference in the study and control group before the initiation of dental tr-

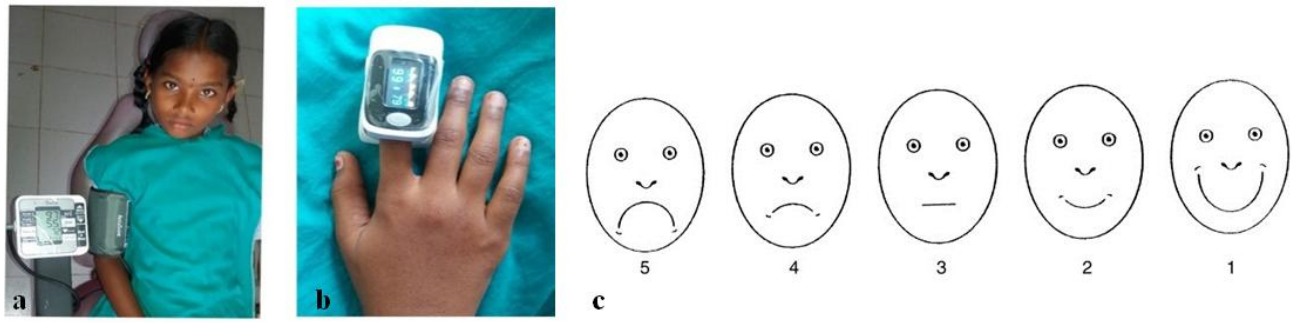

Figure 3: Subjective and objective measurements of anxiety, **a:** Electronic blood pressure apparatus, **b:** Pulse oximeter, **c:** Facial image scale (FIS). [4]

Table 1: Mean values and standard deviation of systolic and diastolic blood pressure, Facial image Scale (FIS) and pulse rate among girls and boys in the control group.

Control group	Systolic blood pressure	Diastolic blood pressure	FIS	Pulse rate
Girls	114.5±1.9	72.18±1.4	3.42±0.11	99.66±3.8
Boys	114.51±1.7	67.33±1.04	2.81±0.16	91.66±1.41
p-value	0.7	2.4	3.8	0.89

eatment. During and after the completion of dental treatment there was a statistically significant difference in FIS values and pulse rate among study and control group with higher values in the control group (Table 3).

By using the dental sign language, there was a significant reduction in anxiety levels as described by the parameters from the pre-treatment to post-treatment period in the study group. However, in the control group, there was no significant difference in the anxiety levels from the pre-treatment to the post-treatment period (Table 3). Dental sign language has proved to be effective in reducing the level of anxiety in children who are hard of hearing.

Discussion

Deaf people have a problem in learning health recommendations. Limited knowledge of deaf people makes their health care more complicated, due to their communication problems. [5]

The hearing-impaired children may have special accessibility problems in health care because the health system does not meet their special needs for communication. Healthcare staffs are often not aware of the barriers faced by the hearing impaired. Many hearing-impaired patients complain that they were not properly informed about the disease they had, treatment and prognosis. Hearing-impaired patients have the same rights to full information as other patients. Inadequate communication may create problems for the professional if the patient does not follow treatment instructions properly. [6]

Communication is the process of exchanging messages or information between two or more parties. The basic forms of communication are of two types such as verbal and non-verbal communication. [7] There has been little consideration of dental care for children with hearing impairments. Till date, there are no studies reported in the literature comparing the efficacy of sign language described specifically for dentistry in relieving anxiety for hearing impaired children.

Dental fear has been ranked fourth among common fears. Anxious individuals are generally uncooperative during their dental visits, tend to cancel more dental appointments, and develop decreased pain threshold. [8] The main causes of dental fear and anxiety reported by the children were fear of pain and fear of unknown. [9]

In the present study, the mean values of subjective and objective measurements of anxiety were higher in girls compared to boys. This is similar to the observations in the studies conducted by Berge M *et al.* [10] and Chellappah NK *et al.* [11]

Literature indicates a shortage of information on the prevalence of dental fear in special children. This study demonstrated that a high proportion of hearing impaired children suffered from dental anxiety, thus requiring measures to overcome them. Dental sign language is a sign-language system specially designed for dentistry, explaining the various dental equipment, procedures, and techniques. Hearing impaired children cannot verbalize their concerns and fears during the dental treatment. Dental sign language can help in restoring trust in a dentist-patient relationship. In the present study, fear of the unknown was eliminated by explaining the procedure to children using the dental sign language. Raymond Cadden was the creator of the eight-sign method (Dentisign) that was designed to reduce the anxiety levels during dental treatment. But the-

Table 2: Mean values and standard deviation of systolic and diastolic blood pressure, Facial image scale (FIS) and pulse rate among girls and boys in the study group.

Study group	Systolic blood pressure	Diastolic blood pressure	FIS	Pulse rate
Girls	121.51±1.69	73.73±1.13	2.04±0.26	91.76±2.57
Boys	114.59±2.19	71.18±0.94	1.56±0.16	89.05±2.02
p– Value	0.004	0.014	0.01	0.54

Table 3: Mean values of systolic and diastolic blood pressure, Facial image scale (FIS) and pulse rate among children in study and control group before, during and after dental treatment.

Groups	Systolic blood pressure			Diastolic blood pressure			FIS			Pulse rate		
	Pre	During	Post	Pre	During	Post	Pre	During	Post	Pre	During	Post
Control	111	118.8	113	68.1	71	69.6	2.9	3.45	3.1	92.85	98.3	94.65
Study	125	110.7	117.3	75	72	71.7	2.85	1.3	1.05	96.75	87.7	85.55
p-value	<0.05*	>0.05	>0.05	<0.05*	>0.05	>0.05	>0.05	<0.05*	<0.05*	>0.05	<0.05*	<0.05*

ese 8 dental signs were not sufficient to communica-te effectively with the disabled children. [12] Hence, in combination with Dentisign additional signs specific to dentistry [13] were used to explain the procedure.

In the present study, there was a statistically significant difference in systolic and diastolic blood pressure before the initiation of treatment, with higher values in the study group. Once the treatment was initiated there was a marked reduction in the blood pressure values in the study group, which was statistically significant.

With respect to the values of FIS and pulse rate, there was no statistically significant difference between the study and the control group before the initiation of treatment. With the initiation of treatment, there was a statistically significant difference between the study and control groups with higher values in the control group. Similarly, after completion of treatment, there was a statistically significant difference between the study and control groups with higher values in the control group. These findings indicate that with the use of sign language designed specifically for dental treatment a statistically significant reduction in the anxiety levels was observed in the hearing impaired children.

Champion *et al.* [14] evaluated difficulties experienced by hearing-impaired children in accessing dental care and/or in receiving dental treatment. Major issues raised by respondents were lack of deaf awareness, lack of specific calling systems, need to learn and to use basic sign language, using explanatory videos/books, dentist not pulling the mask down to speak to, not facing child to communicate, and lack of positive attitude of dentist in handling hearing impaired children. [14]

In our study, most of the issues raised by the hearing-impaired children respondents were overcome by utilizing the dental sign language. Children were able to express their thoughts and feelings with the dentist during the procedure using the signs such as stop, suction, pain and so on. This shows that an element of control and also means of communication were provided for the hearing impaired children which may explain the reason for decreased anxiety in the study group. Children were able to learn dental sign language within 20 minutes and used learned signs effectively during dental treatment which proves that the dental sign language was easy to learn, remember and implement.

The limitation of the present study is the sample size, further studies with a larger sample size that include more children in each gender and with different age groups are recommended. Moreover, further studies can be pursued by comparing sign language with other means of communication in children having differing levels of hearing impairment. In this study, the blood pressure was different before the procedure which may cause an error, but this was a variable that could not be controlled. Since even an eye-to-eye communication may impact the anxiety of a patient, there might be a bias in the selection of the study group. The effectiveness of sign language could have been further proved by including a third control group that only receives a simple communication like holding the hands.

Conclusion

In the present study, dental sign language proved to be effective in relieving the anxiety in hearing impaired children. By learning these simple signs, dentists can help in developing a positive attitude and make hearing impaired children dental visits more pleasant.

Conflict of Interest

The authors of this manuscript certify that they have no conflict of interest.

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