Research Article

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Impact of Customized oral health education module among Visual, Hearing impaired and Normal healthy children in Central India: A Longitudinal study.

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ABSTRACT

Objective: To evaluate and compare the oral hygiene status of visual impaired, hearing impaired and normal healthy school going children in the age group of 5-18 years and to assess the impact of customized oral health education module on their oral hygiene status.

Materials and methods: A nine month comparative study was conducted among total 300 visual impaired, hearing impaired and normal healthy school going children aged 5–18 years. The study was carried out in three phases. Phase I and phase II were carried out at baseline which included clinical examination and education of children using customized module. Phase III was carried out by taking follow-up visits at the interval of three, six and nine months which included the clinical examination and reinforcement using customized oral health education module.

Assessment of oral hygiene status was done using standardized proforma, plaque index (PlI) and simplified oral hygiene index (OHI-S), at baseline, three, six and nine months. All the analyses were performed using SPSS version 20.0 (IBM Corp) software.

Results: At baseline the difference of mean PlI and OHIS score for all the three groups was statistically insignificant with p-value of 0.0569 and 0.0304 respectively. In all three groups, the mean PlI and OHI-S showed statistically significant difference across time points with p-value < 0.0001.

Conclusion: Oral health education in the form of customized oral health education module with periodic reinforcement is an effective method which improved oral hygiene status in normal healthy, visually impaired and hearing impaired children.

Keywords : visually impaired children, hearing impaired children, oral hygiene, oral health education, customized oral health education, normal School going children.

INTRODUCTION

Oral health is an important aspect of health for all children especially for children with special health care needs [1].
Individuals with special needs prone to poor oral health

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because they have greater limitations in oral hygiene performance due to their potential motor, sensory and intellectual disabilities [2].

Unfortunately, oral health care is one of the greatest unattended health needs of these children [1]. Many teaching methods and mechanical aids are available for these children to enhance their development [3]. Therefore, techniques should be customized according to patients' abilities and needs, incorporating the basic principles [4].

In the literature, very few specific health education programs catering to disabled children have been reported and also very few studies assessed the impact of customized oral health education module on the oral hygiene status of these children.

Hence, the present study was planned to evaluate the oral hygiene status of visually impaired, hearing impaired and normal healthy children in the age range of 5-18 years in the Nagpur city of Maharashtra and further the impact of customized oral health education module was assessed at three, six and nine months.

MATERIALS AND METHOD

Ethical clearance was obtained from the Institutional Ethical Committee for conducting the study. Prior permission for carrying out this study was obtained from Zilla Parishad Education Officer and District Social Welfare Officer of Nagpur city. Necessary permission from the school principal and written informed consent from the parents/local guardians and assent from the children was obtained.

In the present study, list of the various visual impaired, hearing impaired, primary and secondary schools and institutions was obtained. From the list, schools/institutes were stratified according to the type of disability they serve. Within each stratum, one school/institute was randomly selected to conduct the study by chit method each for normal healthy children, visually impaired, hearing impaired children i.e. total three schools/institutes were selected. A total of 300, children were selected out of them 100 children were visually impaired, 100 children were hearing impaired and 100 children were normal healthy.

Inclusion criteria

Children of age group 5-18 years. Children without any systemic diseases. School going/institutionalized children

Group I: Normal healthy children Group II: Visually impaired children Group III: Hearing impaired children.

Exclusion criteria

Children whose parents/caretakers did not sign the consent letter of participation.

A customized oral health education module was prepared which included an oral health talk and an information booklet. The module included information regarding oral health, the structure of gingiva and tooth, the structure of plaque, etiology, and development of dental caries and gingival diseases. It also included information about the oral health care of an infant, children and adolescents, and some golden rules to keep the teeth healthy.

To ensure comprehensive ability content validity of the oral health education module was evaluated by an expert panel (from the Department of Pediatric Dentistry) and was modified in accordance with their recommendations. The oral health education module was constructed in English and separate Marathi translations were later made and used in the study.

For normal healthy children and hearing impaired children, the module was printed on a normal paper and a booklet was prepared. For visually impaired children, the module with the same content (as that of the module for normal healthy and hearing impaired children) was printed into Braille script. Validation of a customized oral health education module was done from respective subject experts.

The total study duration was of nine months and the study was carried out in two phases. Phase I was carried out at baseline and phase II included the follow-up visits at the interval of three, six and nine months.

Phase I: Baseline: Clinical examination and oral health education using the customized module Clinical examination was done for the children in their respective schools by making them seated on ordinary chair. Examination was done by a single examiner using mouth mirror and probe in natural day light.

The plaque disclosing agent was applied using cotton tips. After the application of the disclosing agent, the subjects were evaluated by the same examiner for the disclosed plaque and the scores were recorded using Turesky Modification of Quigley Hein Plaque Index [5]. Simplified oral hygiene index [6] was used for the assessment of oral hygiene status.

Customized oral health education module in the form of the booklet was given to each child and an oral health talk was delivered by the principal investigator. For hearing impaired children the talk was communicated with the help of sign language interpreter using the sign language.

Phase II: Follow up at three, six and nine months: Clinical examination and oral health education using the customized module There was no dropout and all the 300 participants were examined at three, six and nine months. The plaque score, oral hygiene status, were assessed using the same indices as used in baseline recording. Reinforcement of oral health education module was done at three, six and nine months.

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Statistical analysis

The data were entered into a database using Microsoft Excel 2007 spreadsheet and analyzed using statistical software. Intergroup and inragroup comparisons were done for plaque index and OHI-S using one-way analysis of variance. All the analyses were performed using SPSS version 20.0 (IBM Corp) software and the statistical significance was evaluated at 5% level.

RESULT

Table 1 provides the descriptive statistics and comparison of age across three study groups. The mean age of children in group I was 12.56 ± 1.93 years, while that in group II was 13.60 ± 2.40 years and in group III was 13.73 ± 2.04 years. The mean age of children in group I was significantly lower than that of group II and group III. There was statistically insignificant difference of mean age between the group II and III.

Table 1. Descriptive statistics for age according to study groups.

Age in years	Groups		
	Group I: Normal (n=100)	**Group II: Visually impaired (n=100)**	**Group III: Hearing Impaired (n=100)**
Mean	12.56	13.60	13.73
SD	1.93	2.40	2.04
Median	13.00	15.00	14.00
Minimum	7.00	7.00	6.00
Maximum	17.00	16.00	16.00

P-value < 0.0001 (HS); Obtained using one-way ANOVA; HS: Highly Significant;

Table 2 shows the distribution of gender across three study groups. Out of 100 children in group I, there were 47 males and 53 females, while in group II, there were 62 males and 38 females and in group III, there were 57 males and 43 females. The distribution of gender types was insignificantly different across three groups as revealed by p-value 0.0944 (p > 0.05).

Table 2. Descriptive statistics for gender distribution according to study groups.

Gender	Groups			P-value[a]
	Group I (n=100)	**Group II (n=100)**	**Group III (n=100)**	
Male	47	62	57	0.0944 (NS)
Female	53	38	43	

[a] Obtained using Pearson's Chi-square test; NS: Non Significant

Table 3 provides the comparison of plaque and oral hygiene indices across three study groups. In group I, the mean total PII was 2.56 ± 0.34, while in group II it was 2.46 ± 0.27 and in group III it was 2.50 ± 0.31. The difference of mean PII was statistically insignificant as indicated by p- value of 0.0569. Similarly, mean debris index in group I was 1.28 ± 0.67, in group II was 1.19 ± 0.47 and in group III was 1.16 ± 0.57. The difference of means was statistically insignificant with p-value of 0.2823. The mean calculus index in group I was 0.59 ± 0.62, in group II was 0.68 ± 0.71 and in group III was 0.40 ± 0.56. The difference of means was statistically significant with p-value of 0.0067. Tukey's post-hoc test revealed that the difference between group II and III was significant, while the mean for group I was insignificantly different than that of group II and III. The mean OHI in group I was 1.86 ± 1.0, in group II was 1.87 ± 0.93 and in group III was 1.53 ± 1.0. The difference of means was statistically significant with p value of 0.0304. Pair wise comparison revealed that mean for group II was significantly higher than that of group III.

Table 4 (Graph 1) gives the comparison of mean index values representing plaque and OHI-S score according to groups. One-way repeated measures analysis of variance and post-hoc analysis were performed with multiple testing corrections using Bonferroni test. In group I, the mean plaque index, debris index, calculus index and the total oral hygiene index showed

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statistically significant difference across time points as revealed by p-value < 0.0001. The means for all the indices differed significantly from each other except calculus index. For this index, the difference between baseline and three months was statistically insignificant. In group II, the means for all the indices showed statistically significant difference of means across time points with p < 0.0001. Pair wise analysis also revealed statistically significant difference between all the time points, except calculus index. This index showed insignificant difference between six and nine months. In group III, the means for all the indices showed statistically significant difference of means across time points with p-value < 0.0001. Pair wise analysis also revealed statistically significant difference between all the time points, except calculus index. This index showed insignificant difference between three and six months.

Table 3. Comparison of plaque index and OHI-S across three study groups at baseline.

Index	Statistic	Groups			P-valuea
		Group I	Group II	Group III	
Total PII	Mean Median SD	2.56 2.55 0.34	2.46 2.48 0.27	2.50 2.52 0.31	0.0569 (NS)
Debris index	Mean Median SD	1.28 1.05 0.67	1.19 1.00 0.47	1.16 1.00 0.57	0.2823 (NS)
Calculus index	Mean Median SD	0.59 0.30 0.62	0.68 0.55 0.71	0.40 0.10 0.56	0.0067 (S)
OHI-S	Mean Median SD	1.86 1.70 1.10	1.87 2.00 0.93	1.53 1.20 1.00	0.0304 (S)

[a] Obtained using one-way ANOVA; S: Significant; NS: Non Significant

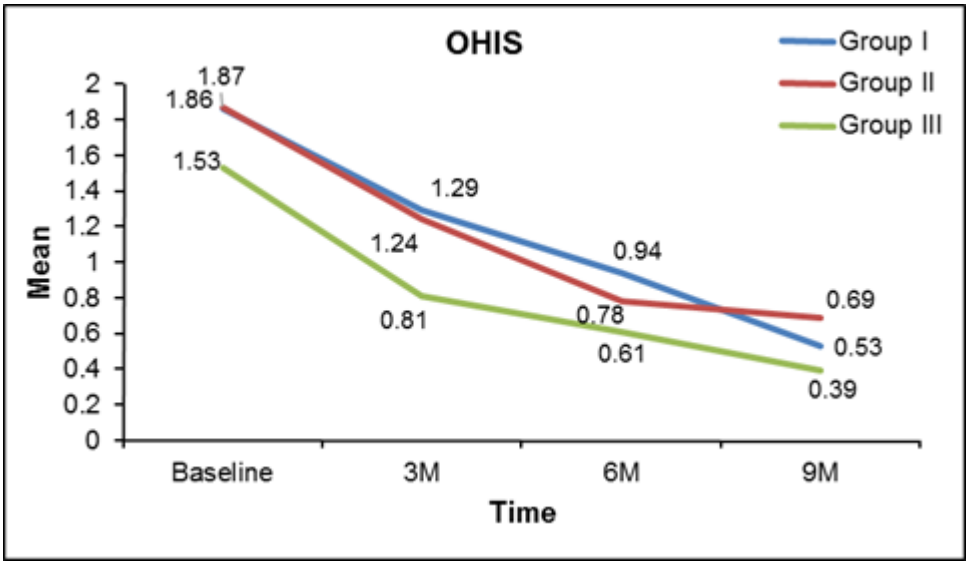
Table 4. Comparison of plaque index and OHI-S with time in each group.

Group	Index	Baseline	3M	6M	9M	P-valuea
	PII	2.56 ± 0.34	2.12 ± 0.23	1.39 ± 0.24	1.02 ± 0.07	< 0.0001(HS)
	Debris	1.28 ± 0.67	0.76 ± 0.46	0.58 ± 0.34	0.36 ± 0.22	< 0.0001(HS)
Group I						
	Calculus	0.59 ± 0.62	0.53 ± 0.58	0.37 ± 0.47	0.17 ± 0.29	< 0.0001(HS)
	OHIS	1.86 ± 1.10	1.29 ± 0.91	0.94 ± 0.63	0.53 ± 0.37	< 0.0001(HS)
	PII	2.46 ± 0.27	1.76 ± 0.29	1.43 ± 0.20	1.04 ± 0.07	< 0.0001(HS)
	Debris	1.19 ± 0.47	0.76 ± 0.31	0.47 ± 0.21	0.42 ± 0.20	< 0.0001(HS)
Group II						
	Calculus	0.68 ± 0.71	0.51 ± 0.63	0.31 ± 0.38	0.26 ± 0.34	< 0.0001(HS)
	OHIS	1.87 ± 0.93	1.24 ± 0.76	0.78 ± 0.45	0.69 ± 0.43	< 0.0001(HS)
	PII	2.49 ± 0.31	1.65 ± 0.40	1.29 ± 0.14	1.02 ± 0.14	< 0.0001(HS)
	Debris	1.16 ± 0.57	0.64 ± 0.39	0.46 ± 0.2	0.31 ± 0.19	< 0.0001(HS)
Group III						
	Calculus	0.40 ± 0.56	0.19 ± 0.34	0.15 ± 0.38	0.08 ± 0.2	< 0.0001(HS)
	OHIS	1.53 ± 1.00	0.81 ± 0.59	0.61 ± 0.45	0.39 ± 0.29	< 0.0001(HS)

[a] Obtained using repeated measures ANOVA test; HS: Highly Significant.

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Graph 1. Line plots showing mean OHIS across time points in three groups.



DISCUSSION

Oral health is an important part of overall health and plays a vital role in each individual's well- being and quality of life by influencing physical and mental well-being, appearance, and interpersonal relations in a positive way. As one's esthetics and communications is influenced by oral hygiene, it has a strong biological, psychological, and social projections [7].

Oral health education towards the maintenance of oral hygiene is more important to establish good oral health routines and knowledge early in life [8]. Instructions need to be clear and easy to understand, targeting children's personal needs and also adapts to their educational level and cognitive ability [9] with periodic reinforcement [10].

In the present study, Plaque scores for all the children were recorded using Modified Quigley- Hein plaque index as it is considered to be most sensitive in visible plaque scoring [11]. Oral hygiene was assessed by using Greene and Vermillion's simplified oral hygiene index (OHI-S) as it is less time consuming and it is used to evaluate an individual's level of oral cleanliness.

The mean age in the present study for the group of normal healthy children (Group I) was 12.56 years, for the group of visually impaired children (Group II) was 13.60 years and for hearing impaired children (Group III) was 13.73 years. Though the mean age of children in group I was significantly lower ($p<0.0001$) than that of group II and group III, the mean age in all three groups was in age bracket of 12-14 years. Hence, changes in oral health status due to age differences between three groups were expected not to differ significantly [12].

In the present study, the difference in the mean plaque score of the three groups at baseline was statistically not significant. Highest plaque score was seen in normal healthy children followed by hearing impaired and visually impaired children. This is not in accordance with the study conducted by Ameer N et al. (2012) [13] who assessed the oral hygiene status in 14–17-year-old visually impaired, deaf and dumb and normal children. They observed highest mean plaque score in deaf and dumb children followed by visually impaired and then normal healthy children.

At the baseline, the mean OHI-S score in the present study showed no significant difference in the normal healthy and visually impaired children. This is in accordance with the study conducted by Jain A et al. (2013) [12] who evaluated the oral hygiene status amongst 6-18 years old visually impaired and sighted students. In the present study, hearing impaired children had significantly good oral hygiene as compared to visually impaired children which is in accordance with the study conducted by Reddy VK et al. (2013) [14] who compared the oral hygiene status among institutionalized visually impaired and hearing impaired children of age between 7 and 17 years. This may be perhaps due to the fact that hearing impaired children can visualize the act of tooth brushing, which is still one of the most common means of maintaining oral hygiene especially, in developing countries like India [14].

In the present study, a significant reduction in the plaque scores was observed in all the three groups at three, six and nine months indicating a positive impact of customized oral health education module. Ganapathi AK et al. (2015) [15] observed significant reduction in plaque score after six months of oral health education through the pamphlets (leaflets) printed in Braille script in 8-14 years old visually impaired children. Similarly Sandeep V et al. (2016) [16] found significant reduction in

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plaque scores in hearing impaired children of age 6-16 years, after 12 weeks of the motivation in the form of visual clips.

After oral health education, the present study showed significant improvement in oral hygiene at nine months as compared to the baseline in all three groups. This was in accordance with the study conducted by Tavargeri A et al. (2018) [17] who observed significant improvement in oral hygiene in visually impaired children at two months of oral health education by using Braille- formatted booklets.

In present study, significant improvement in oral hygiene among all the study groups might be because of the periodic reinforcement with the help of customized oral health education module in which the importance of oral health was emphasized. When proper instructions regarding oral hygiene maintenance were given, the oral health status of these children was improved.

Within the limitations of the study, it was observed that the customized oral health education module had positive impact on oral health of normal healthy, visually impaired and hearing impaired children. There is an immediate need to make dental practitioners and dental students aware of the special problems posed by these children and they should be trained with the help of dental health programs for the rehabilitation of these special children. The oral health care of these children should be approached jointly with general health care in order to achieve a more holistic view of the individual's physiological and psychological well being.

The limitation of the present study was small sample size, hence the findings cannot be generalized to the entire normal, visually impaired and hearing impaired population.

CONCLUSION

Even though the oral hygiene status in all the groups was in fair category, in visually impaired children the OHI-S score was more than normal healthy and hearing impaired children indicating the difficulty in maintenance of good oral hygiene.

Oral health education in the form of customized oral health education module with periodic reinforcement is an effective method which improved oral hygiene status in normal healthy, visually impaired and hearing impaired children.

Limitations

The limitation of the present study was small sample size, hence the findings cannot be generalized to the entire normal, visually impaired and hearing impaired population. In this study, the role of other factors like technique of tooth brushing, flossing, use of mouth wash, dietary patterns, motor skills and obtaining the help from guardians were not considered which might have a different impact on oral hygiene status in all the three groups.

REFERENCES

1. Shetty V, Hegde AM, Bhandary S, Rai K.: Oral Health Status of the visually Impaired Children –A South Indian Study. J Clin Pediatr Dent. 2010,34:213–216

2. Avasthi K, Bansal K, Mittal M, Marwaha M.: Oral health status of sensory impaired children in Delhi and Gurgaon. International journal of dental clinics. 2011,3:21-23

3. Gautam A, Bhambal A, Moghe S.: Impact of oral health education by audio aids, Braille and tactile models on the oral health status of visually impaired children of Bhopal City. J Indian Soc Pedod Prev Dent. 2018,36:82- 5

4. Hebbal M, Ankola AV.: Development of a new technique (ATP) for training visually impaired children in oral hygiene maintenance. Eur Arch Paediatr Dent. 2012;13:244-7.

5. Turesky S, Gilmore ND, Glickman I. Reduced plaque formation by chloromethyl analogue of victamine C. J Periodontol. 1970, 41: 41-43.

6. Greene JC, Vermillion JR. The simplifi ed oral hygiene index. J Am Dent Assoc. 1964, 68:7-13.

7. Rao D, Amitha H, Munshi AK.: Oral hygiene status of disabled children and adolescents attending special schools of South Canara, India. Hong Kong Dent J. 2005,2:107-113

8. Sanjay V, Shetty SM, Shetty RG, Managoli NA, Gugawad SC, Hitesh D.: Dental health status among sensory impaired and blind institutionalized children aged 6 to 20 years. J Int Oral Health. 2014,6:55-8.

9. Jain M, Bharadwaj SP, Kaira LS, Chopra D, Prabu D, Kulkarni S.: Oral health status and treatment need among institutionalised hearing-impaired and blind children and young adults in Udaipur, India. A comparative study. Oral Health Dent Manag. 2013,12:41-9.

10. Joybell C, Krishnan R, Kumar S.: Comparison of Two Brushing MethodsFone's vs Modified Bass Method in Visually Impaired Children Using the Audio Tactile Performance (ATP) Technique. J Clin Diagn Res. 2015,9:ZC19- ZC22.

11. Bhor K, Shetty V, Garcha V, Nimbulkar GC.: Effect of oral health education in the form of Braille and oral health

talk on oral hygiene knowledge, practices, and status of 12–17 years old visually impaired school girls in Pune city: A comparative study. J Int Soc Prev Community Dent. 2016,6:459.

12. Ramseier CA, Leiggener I, Lang NP, Bagramian RA, Inglehart MR.: Shortterm effects of hygiene education for preschool (kindergarten) children: A clinical study. Oral Health Prev Dent. 2007,5:19-24.

13. Zaki BA, Badt HL.: The effective use of self-teaching oral hygiene. J Periodontol. 1974,45:491.

14. Cugini M, Thompson M.: Correlations between Two Plaque Indices in Assessment of Toothbrush Effectiveness. J Cont Dent Pract. 2006,7:1-11

15. Jain A, Gupta J, Aggarwal V, Goyal C.: To evaluate the comparative status of oral health practices, oral hygiene and periodontal status amongst visually impaired and sighted students. Special Care in Dentistry. 2013,33:78-84.

16. Ameer N, Palaparthi R, Neerudu M, Palakuru SK, Singam HR, Durvasula S.: Oral hygiene and periodontal status of teenagers with special needs in the district of Nalgonda, India. J Indian Soc Periodontol. 2012,16:421-5.

17. Reddy VK, Chaurasia K, Bhambal A, Moon N, Reddy EK.: A comparison of oral hygiene status and dental caries experience among institutionalized visually impaired and hearing impaired children of age between 7 and 17 years in central India. J Indian Soc Pedod Prev Dent. 2013,31:141-5.

18. Ganapathi AK, Namineni S, Vaaka PH, K V, Das R, Devi M, Akkaloori A, Kumbakonam A.: Effectiveness of various sensory input methods in dental health education among blind children- a comparative study. J Clin Diagn Res. 2015,9:ZC75-8.

19. Sandeep V, Kumar M, Vinay C, Chandrasekhar R, Jyostna P.: Oral health status and treatment needs of hearing impaired children attending a special school in Bhimavaram, India. Indian J Dent Res. 2016,27:73-7.

20. Tugeman H, Rahman NA, Yusoff A, Daud MK.: Oral Health Knowledge, Practice and Dental Plaque Maturity Status of Hearing-Impaired Children. Sains Malays. 2016,45:761-8.

21. Tavargeri A, Kudtarkar SS.: Evaluating the Oral Health Knowledge and the Status of Visually Impaired Children using Braille. J Oral Health Comm Dent. 2018,12:41-46.

22. Doichinova L, Peneva M.: Prevalence of Dental Caries in Hearing Impaired Children than 5 to 12 Years Old in Sofia. Int J Sci Res. 2013,4:1088-91.