

## Effectiveness of multisensory oral health education on oral hygiene among visually impaired children - A prospective interventional study.

### Dr. Alaka Subodh

Assistant Professor, Department of Public Health Dentistry, Sri Sankara Dental College, Varkala, Trivandrum

### Dr. Abhilash R Krishnan

Professor and HOD, Department of Oral Medicine and Radiology, Sri Sankara Dental College, Varkala, Trivandrum

### Ameesha, Anakha U S, Angelin Andrews, Amal Raj C G

Final Year Student, Department of Public Health Dentistry, Sri Sankara Dental College, Varkala, Trivandrum

#### Abstract

**Problem:** Since visually impaired children could not acquire oral hygiene skills through conventional oral health education techniques, alternative modes of health education should be developed for them.

**Approach:** 150 visually impaired children from two blind schools in Trivandrum district were included in the study. They were randomly divided to 2 groups (Audio group and Audio-tactile group) OHIS and BOP were recorded before and after intervention and was compared. **Findings:** More participants in Audio-tactile group (76.9%) showed good oral hygiene compared to Audio group (46.2%) during post intervention stage. **Solution:** A multisensory mode of health education will be beneficial for a vulnerable group like visually impaired

**Keywords:** 1. Visually impaired persons, 2. health education, 3. oral hygiene, 4. oral health

#### **Introduction**

The child is not just a miniature adult but a dynamic organism undergoing constant mental, physical and emotional changes. Some children may need extra help to develop these basic skills especially those with special health care needs

According to WHO (International Classification of Diseases 11), a person is defined to be visually impaired or blind if the presenting visual acuity (VA) in the better eye is worse than 3/60 and near vision impairment is defined as presenting near VA worse than N6 with existing correction.<sup>1</sup>

Oral health is an inseparable part of general health and wellbeing. Patients with special health care needs are at increased risk for oral disease. Oral diseases can have a direct and devastating impact on the health and quality of life of those with disabilities when compared to healthy people<sup>2</sup>. There are evidences in published literatures highlighting the need to provide more new models of oral health education for people with blindness<sup>3</sup>

The conventional method of teaching oral hygiene instruction requires the use of visual perception. Such measures are not beneficial for visually impaired children, who use more of their audio and tactile sensations for acquiring knowledge<sup>4</sup>

Oral health not only affects aesthetics, but also communication which has a strong bio psychosocial projection<sup>5</sup>. Studies show that children with special health care needs have more dental health problems and more untreated dental disease relative to other healthy children because of issues like lack of knowledge, awareness about oral hygiene, decreased accessibility, unaffordability of oral health care, parental negligence and may have great limitations in practicing proper oral hygiene practices due to their existing disability<sup>6</sup>

In India, the Ministry of Social Justice and Empowerment (MoSJE) is responsible for developing programs that extend support to people with disabilities. As a recent initiative, the ministry has recommended that the revision of the blindness be cut off to 20/400 instead of 20/200 that is currently followed by NPCB<sup>1</sup>.

This study is designed to assess the oral health status of children with visual impairment. This study will be conducted for a period of 2 months in two blind schools that comprises of nearly 150 children with visual impairment. The oral health status will be assessed by clinical examination and recorded using oral hygiene index (OHI-S) and bleeding on probing (BOP) and a comparison will be done on the effectiveness of multisensory oral health education in improving the oral health status of children with visual impairment.

The need of the study is to determine the oral health status of children with visual impairment and to compare and evaluate multisensory oral health education in improving the oral health status of these children.

## Methodology

The proposed study will be a prospective intervention study with the following procedural steps:

- I. Obtaining the approval for the study protocol from the Institutional ethical committee and obtaining official permission to conduct the study from school authorities and parents.

- II. Procedure:

### Pre-intervention

- The examination was done by a single examiner during working days in two blind schools in Trivandrum city with 150 children with visual impairment aged 5- 15 years (preschool to 10<sup>th</sup> standard).
- After obtaining the informed consent from parents and school authorities, the examiner visited each school once in 2 weeks for a period of 2 months.
- The oral hygiene status was assessed using the OHI-S index (1964)
- The examination for BOP proceeds from the first to the fourth quadrants using the WHO Periodontal Probe. Bleeding <30% of all probed sites was considered as local and bleeding >30% of sites was defined as general bleeding. Local and general bleeding was coded "YES" and absence of bleeding was coded "NO".<sup>7</sup>

### Intervention

- The total sample was divided randomly into 2 groups, 75 each in a group
- 1<sup>st</sup> group (Audio group):  
A verbal oral health education will be delivered to the children and a proper brushing technique (scrub technique for 5–9-year-olds and roll technique for 10–15 year-old children)<sup>8-10</sup>
- 2<sup>nd</sup> group (Audio tactile perception):  
A verbal oral health education will be delivered to the children and a proper brushing technique (scrub technique for 5–9-year-olds and roll technique for 10–15 year-old children)<sup>8-10</sup> will be taught individually by the intra-oral guidance with their hand and their own toothbrush

**Reinforcement** will be done once in 2 weeks for 2 months

**Post-intervention**

- At the end of 2 months, the OHI-S index and BOP is again recorded.
- The pre-intervention and post-intervention oral hygiene status will be compared and the effectiveness of the multisensory oral health education will be assessed.

**Statistical analysis**

Statistical tests were done using SPSS software (version 25.0; SPSS, Chicago, IL, USA). Mean, standard deviation and percentage distribution of the data was obtained and evaluated using descriptive statistics. Chi-square test was used to test the significance between the OHI-S, BOP, Age, Gender and Class with Health education method. A p value < 0.05 was considered statistically significant.

**Results**

The study included 150 participants out of which 75 were in Audio group and 75 were in Audio-tactile group.

**Table 1: Frequency of distribution of demographic details and variables**

SLNO:			Percentage
1.	Age (years)	5 -10	46.2
		11 - 15	53.8
2.	Gender	Male	50.0
		Female	50.0
3.	Class	1- 5	48.1
		6 – 10	51.9
4.	Health education method	Audio	50.0
		Audio tactile	50.0
<b>Pre-Intervention</b>			
5.	DI-S	Good	15.4
		Fair	55.8
		Poor	28.8
6.	CI-S	Good	73.1
		Fair	23.1
		Poor	3.8
7.	OHI-S	Good	26.9
		Fair	51.9
		Poor	21.2
8.	BOP	Absent	86.5
		Present	13.5
<b>Post-Intervention</b>			
9.	DI-S	Good	59.6
		Fair	36.5
		Poor	3.8
10.	CI-S	Good	86.5
		Fair	13.5
		Poor	0.00

11.	OHI-S	Good	61.5
		Fair	34.6
		Poor	3.8
12.	BOP	Absent	100.0
		Present	0.00

**Table 1** shows the frequency of distribution of demographic details and variables. 53.8% belongs to 11-15 age groups whereas 46.2% belongs to 5-10 age group. Males and females are equal in number. 51.9% belongs to class 6-10 and 48.1% belongs to class 1-5. In pre intervention stage 51.9% shows fair OHIS where 26.9% shows good and BOP were present 13.5% of the participants. In post intervention stage 61.5% shows good OHIS where 34.6% shows fair OHIS and BOP were absent among all children.

**Table 2: Comparison of age and oral hygiene status of the children**

		AGE		p-value
		5-10	11-15	
<b>Pre-intervention</b>				
DI-S	Good	20.8%	10.7%	p=0.574
	Fair	54.2%	57.1%	
	Poor	25.0%	32.1%	
CI-S	Good	87.5%	60.7%	p=0.065
	Fair	8.3%	35.7%	
	Poor	4.2%	3.6%	
OHI-S	Good	45.8%	10.7%	p=0.017*
	Fair	37.5%	64.3%	
	Poor	16.7%	25.0%	
BOP	Absent	87.5%	85.7%	p=0.0851
	Present	12.5%	14.3%	
<b>Post-intervention</b>				
DI-S	Good	66.7%	53.6%	p=0.115
	Fair	25.0%	46.4%	
	Poor	8.3%	0.0%	
CI-S	Good	87.5%	85.7%	p=0.851
	Fair	12.5%	14.3%	
	Poor	0.0%	0.0%	
OHI-S	Good	70.8%	53.6%	p=0.401
	Fair	25.0%	42.9%	
	Poor	4.2%	3.6%	
BOP	Absent	100%	100%	-
	Present	0.0%	0.0%	

**Table 2** shows the comparison of the age and oral hygiene status of children. In pre intervention stage, under 5-10 age group 45.8% participants show good OHIS, 37.5% shows fair OHIS, 16.7% shows poor OHIS. In 11-15 age groups 10.7% participants shows good OHIS, 64.3% shows fair OHIS, 25% shows poor OHIS. The results were statistically significant (p=0.017). BOP present in 12.5% among 5-10 age group where 14.3% among 11-15 age group.

In post intervention stage, 5-10 age group 70.8% participants shows good OHIS, where 25% shows fair OHIS, 4.2% shows poor OHIS. In 11-15 age group 53.6% shows good OHIS, 42.9% shows fair OHIS, whereas 3.6% shows poor OHIS. BOP was absent in both age group.

**Table 3: Comparison of gender and oral hygiene status of the children**

		GENDER		p-value
		Male	Female	
<b>Pre-intervention</b>				
DI-S	Good	11.5%	19.2%	p=0.567
	Fair	53.8%	57.7%	
	Poor	34.6%	23.1%	
CI-S	Good	65.4%	80.8%	p=.252
	Fair	26.9%	19.9%	
	Poor	7.7%	0.0%	
OHI-S	Good	26.9%	26.9%	p=0.202
	Fair	42.3%	61.5%	
	Poor	30.8%	11.5%	
BOP	Absent	80.8%	92.3%	p=0.223
	Present	19.2%	7.7%	
<b>Post-intervention</b>				
DI-S	Good	53.8%	65.4%	p=0.682
	Fair	42.3%	30.8%	
	Poor	3.8%	3.8%	
CI-S	Good	80.8%	92.3%	p=0.223
	Fair	19.2%	7.7%	
	Poor	0.0%	0.0%	
OHI-S	Good	53.8%	69.2%	p=0.256
	Fair	38.5%	13.8%	
	Poor	7.7%	0.0%	
BOP	Absent	100%	100%	-
	Present	0.0%	0.0%	

**Table 3** shows the comparison of gender and oral hygiene status of children. In pre intervention stage among males 26.9% of participants shows good OHIS, 42.3% shows fair OHIS, 30.8% shows poor OHIS. Among females 26.9% shows good OHIS, 61.5% shows fair OHIS and 11.5% shows poor OHIS. BOP was present in 19.2% of male participants and 7.7% of female participants.

In post intervention stage male group shows 53.8% good OHIS, 38.5% shows fair OHIS and 7.7% shows poor OHIS. In females 69.2% shows good OHIS and 13.8% shows fair OHIS. BOP was completely absent in both male and female participants

**Table 4: Comparison of Health education method and oral hygiene status of the children**

		Health Education Method		p-value
		Audio	Audio-tactile	
<b>Pre-intervention</b>				
DI-S	Good	7.7%	23.1%	p=0.157
	Fair	53.8%	57.7%	
	Poor	38.5%	19.2%	
CI-S	Good	57.7%	88.5%	p=0.035*
	Fair	34.6%	11.5%	
	Poor	7.7%	0.0%	
OHI-S	Good	15.4%	38.5%	p=0.006*

	Fair	46.2%	57.7%	
	Poor	38.5%	3.8%	
BOP	Absent	88.5%	84.6%	p=0.685
	Present	11.5%	15.4%	
<b>Post-intervention</b>				
DI-S	Good	42.3%	76.9%	p=0.027*
	Fair	50.0%	23.1%	
	Poor	7.7%	0.0%	
CI-S	Good	80.8%	92.3%	p=0.223
	Fair	19.2%	7.7%	
	Poor	0.0%	0.0%	
OHI-S	Good	46.2%	76.9%	p=0.042*
	Fair	50.0%	19.2%	
	Poor	3.8%	33.8%	
BOP	Absent	100%	100%	-
	Present	0.0%	0.0%	

**Table 4** shows comparison of health education method and oral hygiene status of the children

In pre intervention stage audio method group shows 15.4% good OHIS, 46.2% shows fair OHIS and 38.5% shows poor OHIS. In audio-tactile method, 38.5% shows good OHIS where 57.7% shows fair OHIS, 3.8% shows poor OHIS. These were statistically significant ( $p=0.006$ ). In audio method group BOP present in 11.5% where 15.4% shows BOP in audio-tactile method.

In postintervention, audio method group shows 46.2% good OHIS, 50.0% shows fair OHIS and 3.8% shows poor OHIS. In audio-tactile method 76.9% shows good OHIS, 19.2% shows fair OHIS and 33.8% shows poor OHIS. These were statistically significant ( $p=0.042$ ).

### **Discussion**

In Preintervention stage, while considering OHIS according to age, most of the children below 10 years of age had good oral hygiene (45.8%) when compared to those above 10 years (10.7%). This could be because the former group was assisted or supervised by a care taker or parents while brushing whereas the latter were not. Comparing the BOP, it was present in most of the children at this stage. Prashanth et al also concluded 'not much worsening of oral health status' in visually impaired individuals<sup>11</sup>. Similar oral hygiene levels as in the present study were reported by Watson et al in his study<sup>12</sup>. Many other authors have even reported poor levels of oral hygiene among visually impaired children<sup>13-15</sup>. The importance of supervising such children during brushing was mentioned in study conducted by Yalcinkaya et al<sup>16</sup>.

Also, while comparing the health education methods with OHIS and BOP, the Audio group had 15.4% participants with good oral hygiene whereas only 38.5% had good oral hygiene among Audio-tactile group.

While interaction with the students in the pre intervention stage we observed that the duration of brushing was up to a minute and a little more than a minute was insufficient in majority of the children. 100% of the children used horizontal method of brushing which is insufficient to remove the dental plaque. Only half of the children brushed their teeth twice a day and some of them brushed their teeth once a day. It was clear that the participants were not trained and did not have proper oral hygiene skills. The main attributed factor for capacity to acquire oral hygiene skills is visual impairment as it impedes observation of right movements. This could also result in poor muscle coordination which will hamper in acquiring the oral hygiene skills. The majority of the blind children cooperated in the training process. A large number of them (40%) felt anxious while giving health education. The children had a very short attention span. Most of them showed quick loss of attention, which was too unsustainable. Obviously, the lack of visual perception makes it difficult to attract the attention of the child and creates a serious difficulty in the process of learning and motivation. All children have difficulty in understanding and remembering the

information among the Audio group compared to Audio tactile group. Most children needed extensive verbal explanations and physical incentives to perceive the information.

In the post intervention session, while comparing health education method with OHIS most of the participants in Audio-tactile group (76.9%) had good oral hygiene. This shows that the Audio-tactile method is more effective when compared to Audio group. The participants are more able to understand the oral hygiene practices through the Audio-tactile method. Assistance from their parents/caretakers would rather improve the oral hygiene.

The limitations of the study were that the number of individuals selected for the study were from the same institute and the total number of participants was small. To improve the oral hygiene status of individuals with disabilities is a daunting task, but it can be achieved if even the parents or guardians are given suitable health education. So, the differing needs of these special children and their caregivers needs to be addressed in future. This study only provides an insight into the increase in awareness and increase in oral health maintenance after a comprehensive oral health programme in a relatively small sample. So, a mass study is required if any other factors are required to be modified for the improvement of oral health education among visually impaired children

### Conclusion

Visually impaired children have an equal right like any other children to receive oral health education. Being a vulnerable group, their oral health should be given much more importance especially in lowincome countries. Visually impaired children depend more on senses like sound, smell, touch and taste to learn things. So, a multi-sensory approach in imparting oral health education will be more effective in them than a uni-sensory mode. Such oral health education models can also guide policymakers to design suitable school-based programs to improve the oral health of visually impaired children.

### References

1. Vaishali KV, Vijayalekshmi P. Understanding definitions of visual impairment and functional vision. *Comm Eye Health* 2021; 33(110 2020): S16-S17.
2. Doichinova L, Gateva N, Hristov K. Oral hygiene education of special needs children. Part 2: visually impaired children. *Biotechnology & Biotechnological Equipment*. 2019; 33(1):821–826
3. Ganapathi A K, Namineni S, Vaaka P, VamsilathaK, Das R, Devi M, Akkaloori A, Kumbakonam A. Effectiveness of Various Sensory Input Methods in Dental Health Education Among Blind Children- A Comparative Study. *Journal of Clinical and Diagnostic Research*. 2015; 9(10): ZC75-ZC78
4. Sardana D, Goyal A, Gauba K, Kapur A, Manchanda S. Effect of specially designed oral health preventive programme on oral health of visually impaired children: use of audio and tactile aids. *International Dental Journal* 2019; 69: 98–106
5. Debnath A, Srivastava B K, Shetty P, Eshwar S. New Vision for Improving the Oral Health Education of Visually Impaired Children- A Non Randomized Control Trial. *Journal of Clinical and Diagnostic Research*. 2017; 11(7): ZC29-ZC32
6. Shariffard N, Sargeran K, Gholami M, Zayeri F. A music- and game-based oral health education for visually impaired school children; multilevel analysis of a cluster randomized controlled trial. *BMC Oral Health*. 2020; 20:144
7. Zimmermann H, Hagenfeld D, Diercke K, El-sayed N, Fricke J, Greiser KH et al. Pocket depth and bleeding on probing and their associations with dental, lifestyle, socioeconomic and blood variables: a cross-sectional, multicenter feasibility study of the German National Cohort. *BMC Oral Health*. 2015; 15:7.
8. Smutkeeree A, Rojlakkanawong N, Yimcharoen V. A 6-month comparison of toothbrushing efficacy between the horizontal scrub and modified bass methods in visually impaired students. *Int J Paediatr Dent*. 2011; 21(4):278–83.
9. Pujar P, Subbareddy VV. Evaluation of the tooth brushing skills in children aged 6–12 years. *Eur Arch Paediatr Dent*. 2013; 14(4):213–9.
10. Muller-Bolla M, Courson F. Toothbrushing methods to use in children: a systematic review. *Oral Health Prev Dent*. 2013; 11(4):341–7.

11. Prashanth ST, Bhatnagar S, Das UM et al. Oral health knowledge, practice, oral hygiene status, and dental caries prevalence among visually impaired children in Bangalore. *J Indian Soc PedodPrev Dent* 2011 29: 102–105.
12. Watson EK, Moles DR, Kumar N et al. The oral health status of adults with a visual impairment, their dental care and oral health information needs. *Br Dent J* 2010 208: E15.
13. Joybell C, Krishnan R, Suresh Kumar V. Comparison of two brushing methods – fone's vs modified bass method in visually impaired children using the audio tactile performance (ATP) technique. *J Clin Diagn Res* 2015 9: ZC19–ZC22.
14. Mahantesha T, Nara A, Kumari PR et al. A comparative evaluation of oral hygiene using Braille and audio instructions among institutionalized visually impaired children aged between 6 years and 20 years: a 3-month follow-up study. *J Int Soc Prev Community Dent* 2015 5(Suppl 2): S129–S132.
15. Yalcinkaya SE, Atalay T. Improvement of oral health knowledge in a group of visually impaired students. *Oral Health Prev Dent* 2006 4: 243–253.