

Impact of artificial intelligence guided videos versus other audio-visual aids on oral health status in visually impaired children

Dr. Ankit Mahajan¹, Dr. Supriya Singh², Dr. Manisha R. Patil³, Dr. Mohit Singh⁴,
Dr. Meenakshi Upadhyay⁵, Dr. Rajat Mohanty⁶

¹Senior Resident, Department of Dentistry, Government Medical College and Hospital, Kathua, Jammu and Kashmir (U.T), India.

²Department of Dentistry, Nalanda Medical College and Hospital, Patna, Bihar, India.

³Consultant Paediatrician, Srushti Clinic, Kolhapur, Maharashtra, India.

⁴Associate Professor, Department of Prosthodontics, Graphic Era Institute of Medical Sciences, India.

⁵Professor, Sardar Patel Post Graduate Institute of Dental & Medical Sciences, Lucknow.

⁶Department of Oral and Maxillofacial Surgery, Kalinga Institute of Dental Sciences, KIIT Deemed to be University, Bhubaneswar, Odisha, India.

ABSTRACT

Background: Visual impaired children have been generally reported to have poor oral health. The present study aimed to evaluate the impact of artificial intelligence guided videos versus other audio-visual aids on oral health status in visually impaired children. **Materials and methods:** This prospective cross-sectional study was conducted in a school for specially abled children after obtaining permission for conducting this study from institutional ethical committee and school authorities. This study comprised 100 visually impaired children aged between 8 to 15 years age belonging to both genders selected using randomization technique. Students were equally distributed in four groups which comprised of 25 subjects each: a) Group A: Students were given oral health education using pamphlets written in Braille, b) Group B: Subjects were trained using audios, c) Group C: Subjects were trained using combination of Braille pamphlets and audio and d) Group D: Children were trained using artificial intelligence guided videos. The study data was collected in three stages. In stage 1, assessment of knowledge regarding oral health was evaluated by means of a questionnaire written in Braille at baseline i.e., before conducting oral health education training. The clinical oral examination was performed at oral health status was assessed using the 'oral hygiene index - Simplified' (OHI-S) scores by recording plaque scores. In second stage, study participants received educational training on oral health regarding importance of good oral health and maintenance of oral hygiene, techniques for brushing, dental caries, periodontal health and fluoride use and in stage three, OHI-S scores were observed and recorded. A post-intervention questionnaire was again distributed and responses were recorded after four weeks. Statistical analysis was performed by use of statistical software, Statistical Package for the Social Sciences (SPSS) statistics 25.0 (IBM, NY, US). Descriptive statistics was done and Chi-square, Wilcoxon and post-hoc analytical tests were performed. Confidence interval was kept at 95% with P value < 0.05. **Results:** Statistically significant improvement in mean \pm S.D. scores for OHI-S index and knowledge scores were obtained after providing oral health training to the children. **Conclusion:** Providing oral health education by any means has been demonstrated to improve oral health status as well as knowledge scores.

Keywords: oral health, education, OHI-S, knowledge, visual, impairment, children

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INTRODUCTION

There are about 2,10,000 Indian children suffering from severe form of visual impairment or blindness. Childhood blindness has been reported to have 0.5/1,000 prevalence rate. About 50 percent of various reasons that are

responsible for blindness in school children are of preventable nature. ^[1] Poor oral health in visually impaired children is mainly due to dental caries, periodontal problems, trauma and hypoplasia. ^[2,3] These lead to poor level of quality of life as exhibited by high rates of

absenteeism from classes, difficulty in eating or sleeping which influences one's social life.^[4,5]

Hence, it is important to facilitate improvement in oral health status of visually impaired children.^[6] Visually impaired children have poor hand to eye coordination thus limiting dexterity that makes maintenance of oral hygiene less efficient which results in poor status of oral health.^[2] This visual impaired state restricts dental office visits, along with ignorance from parents and lack of sufficient training to dental professionals. A significant proportion of the children with visual impairment do not have knowledge of methods required for dental/oral care.^[7,8] However, after attending dental health education program, majority of these children reported an improvement in brushing frequency i.e., two times per day.^[7]

Hence, oral health education plays a significant role in improving oral health problems. However, visually impaired children make use of other senses such as touch as well as hearing to learn new skills. There are multiple methods that can be used to provide oral health education to these children like use of audio aids, instructions written in Braille format and utilization of large models.^[9] The use of these aids demonstrate synergistic effects which enhances learning efficiency.

Artificial Intelligence guided oral health education provides a personalized as well as interactive process of learning which is of greater importance in visually impaired children. The school oral health educational programs play an important role in providing knowledge concerning good oral health and behavioural changes required for maintaining good oral hygiene.

Therefore, this study was planned with an aim of studying the impact of artificial intelligence guided videos versus other audio-visual aids on oral health status in visually impaired children.

MATERIALS AND METHODS

Study design and settings

This prospective and cross-sectional study was conducted in a school for specially abled children after obtaining permission for conducting this study from institutional ethical committee and school authorities. This study was comprised of 100 visually impaired children aged between 8 to 15 years age belonging to both the genders.

Study participants and sampling

The study subjects were selected using randomization. The selected students were equally distributed into four groups comprising of equal numbers of subjects: a) Group A: Students belonging to this group were given oral health

education using pamphlets written in Braille, b) Group B: Subjects belonging to this group were trained using audio recordings, c) Group C: Subjects in this group were trained using combination of Braille pamphlets and audio and d) Group D: Children belonging to this group were trained using artificial intelligence guided videos.

Inclusion criteria: These were a) visually challenged children with age ranging from 8 to 15 years, b) those who demonstrated willingness for participation in this study and c) children who were completely blind from birth. Exclusion criteria: These were as follows a) partially blind children, b) children suffering from any systemic disease and/or any other handicap, c) children who were undergoing or had undergone orthodontic treatment and d) uncooperative children.

Data collection tool and techniques

The study data was collected in three stages: Stages 1, 2 and 3.

- A) Stage 1: In this stage, assessment of knowledge regarding oral health was evaluated by means of a questionnaire written in Braille at baseline i.e., before conducting oral health education training. The clinical oral examination was performed and oral health status was assessed using the 'oral hygiene index - Simplified' (OHI-S) scores by recording plaque scores.
- B) Stage 2 (Intervention): In this intervention stage, study participants received educational training on oral health regarding importance of good oral health and maintenance of oral hygiene, techniques for brushing, dental caries, periodontal health and fluoride use.
- C) Stage 3: This stage was conducted after four weeks of providing oral health education to selected children. OHI-S scores were observed and recorded. A post-intervention questionnaire was again distributed and responses were recorded.

Statistical analysis

The statistical analysis was performed by using statistical software, Statistical Package for the Social Sciences (SPSS) statistics 25.0 (IBM, NY, US). Descriptive statistics was done and Chi-square, Wilcoxon and post-hoc analytical tests were performed. Confidence interval was kept at 95% with P value less than 0.05.

RESULTS

- a) Mean \pm S.D age distribution (years): Group A subjects demonstrated mean \pm S.D. age to be 10.09 ± 0.29 , groups B, C and D demonstrated mean \pm S.D. ages as 13.01 ± 1.79 , 12.48 ± 0.96 and 12.37 ± 0.67 , respectively.

Table 1: Table demonstrating age distribution in groups

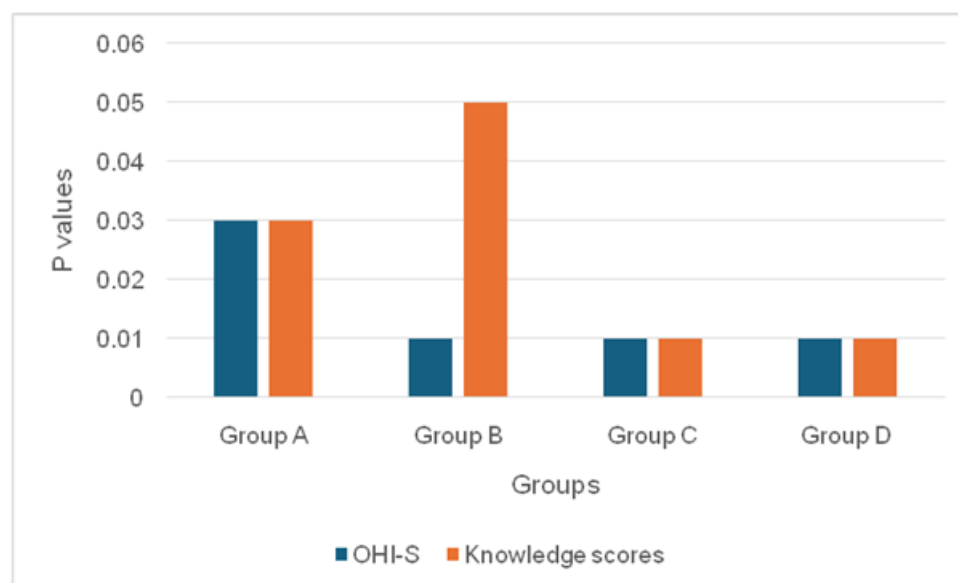
Studied groups	Mean ± S.D. age (in years)
Group A	10.09 ± 0.29
Group B	13.01 ± 1.79
Group C	12.48 ± 0.96
Group D	12.37 ± 0.67

- b) Gender distribution: There were 45% male and 55% female subjects suffering from visual impairment.
- c) Plaque and knowledge scores before and after intervention: Mean ± S.D. oral hygiene index - Simplified (OHI-S) and knowledge scores were noted at baseline and at 6th month follow-up. Mean ± S.D. OHI-S at baseline for groups A, B, C and D were found to be-1.95 ± 0.36, 2.65 ± 1.56, 1.67 ± 0.21 and 1.79 ± 0.15, respectively. On the other hand, the mean ± S.D.OHI-S scores at follow-up were obtained as 0.02 ± 0.24, 0.09 ± 0.23, 0.23 ± 0.78 and 0.04 ± 0.23 in groups A, B, C and D, respectively. Statistically significant differences (P < 0.05) were obtained on comparing the mean ± S.D. OHI-S scores in all the study groups. Mean± S.D knowledge scores at baseline were obtained as- 2.19 ± 0.68, 2.16 ± 0.78, 1.78 ± 0.02 and 1.87 ± 1.09 in groups A, B, C and D which were observed to improve significantly to 5.12 ± 1.09, 4.82± 1.63, 4.08 ± 0.14 and 4.96 ± 1.76, respectively. These were observed as having statistically significant differences (P < 0.05) (table 2 and graph 1) .

Table 2: Table demonstrating mean ± S.D. scores for OHI-S and knowledge scores before and after oral health education

Group name	Mean ± S.D. OHI-S score		P values	Mean ± S.D. knowledge score		P values
	Before OHE	After OHE		Before OHE	After OHE	
Group A	1.95 ± 0.36	0.02 ± 0.24	0.03	2.19 ± 0.68	5.12 ± 1.09	0.03
Group B	2.65 ± 1.56	0.09 ± 0.23	0.01	2.16 ± 0.78	4.82 ± 1.63	0.05
Group C	1.67 ± 0.21	0.23 ± 0.78	0.01	1.78 ± 0.02	4.08 ± 0.14	0.01
Group D	1.79 ± 0.15	0.04 ± 0.23	0.01	1.87 ± 1.09	4.96 ± 1.76	0.01

Graph 1: Graph showing P values obtained after inter-group comparisons



DISCUSSION

The children with special needs possess distinct physical level, emotional quotient, intellectual quotient and social abilities. At present, India has nearly 21 million individuals affected by different disabilities. The visual impairment has been reported to affect approximately 1.4 million children all across the globe, two thirds of affected children live in developing countries.^[3]

Good oral health remains to be an important part of general physical health and well being that has a direct influence on one's quality of life. The present study was conducted with an aim to analyze different oral health education methods to evaluate knowledge as well as oral hygiene before and following the interventions. Statistically significant differences were obtained on comparing the mean \pm S.D. scores obtained for both oral hygiene as well as knowledge levels, thus, demonstrating importance of health education regardless of means used in the study.

The various studies have demonstrated improvement in knowledge of oral hygiene in visually impaired individuals by using the tactile along with auditory methods. Our study findings are reflecting these observations. Similarly, Sharififard et al (2020) reported that use of audio-tactile technique can be useful to impart oral health education thereby, causing enhancement in oral health outcomes in children with visual impairment.^[10]

Also, Ganapathi et al (2015) observed that visually impaired children maintain optimum oral hygiene levels using oral health education by specialized customized techniques like- Braille, use of models and audio aids.^[11]

However, in contrast to our observations, Singh N et al (2016) observed that providing dental health education by

employing various means in comparison with sole utilization of any single method shows relatively better outcome.^[12]

One limitation of the present study was its limited sample size, hence, conducting further research with a larger sample would be reflecting outcome of different methods in teaching visually impaired children more clearly.

CONCLUSION

Oral health is important part of general well-being. Children having visual impairment usually have been shown to have poor oral health status. Thus, an oral health education program is necessary to help these specially abled children to learn about the importance of good oral health and ways of maintaining optimum oral hygiene.

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