

The effectiveness of dental health education tools for visually impaired students in Bukit Mertajam

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Abstract. Oral health is a vital component of overall health. It is important in adults and children alike, however, it is even more crucial for children with special needs as they have limited ability to perform oral health practices. Disabled children deserve the same opportunity for oral health as normal children. Unfortunately, oral health care is the most unattended health needs of the disabled children. This study aimed to assess the effectiveness of dental health education tools for visually impaired students in two schools in Bukit Mertajam, Penang. The project utilized dental health education tools consisting of an oral health module (printed in braille for the blind and in font 18px for the partially blind), an audio narration of the module were prepared and content-validated by an expert panel. Baseline plaque scores of 38 subjects aged 6-17 years were determined by a trained dental staff nurse. The module was then administered to the subjects facilitated by the teachers. Post intervention plaque scores were recorded again after one month. The pre and post intervention data were analyzed using Wilcoxon Signed Ranks Test with a significant p value set at < 0.05 . The results showed that there was a reduction in the overall median plaque score in both partially blind ($n = 22$) and totally blind ($n = 16$) subjects (2.2 (IQR 0.7) to 1.8 (IQR 0.5) and 2.1 (IQR 0.4) to 2.0 (IQR 0.7) respectively). The score difference in the totally blind group was significant ($p=0.025$). Reductions in plaque scores were also observed in stratified data (based on age); with the partially blind aged 12-17 years showing the greatest reduction. However, the difference was not statistically significant ($p=0.067$). At younger age, tooth brushing should be supervised by parents as their manual dexterity and cognitive ability is still low. In addition, the younger subjects are less motivated if compared to the older ones. These factors could affect the result of the overall mean OHI-score in this study. In conclusion, the tools appeared to have a positive effect on promoting good oral hygiene among students with visual impairment. We recommend for further studies to be conducted on a bigger sample.

INTRODUCTION

Oral health is a vital component of overall health. Oral health care is vital for all adults and children alike, however, it is even more important for children with special needs as they have limited ability to perform oral health practices. Disabled children deserve the same opportunity for oral health as normal children. Unfortunately, oral health care is the most unattended health needs of the disabled children [1].

Visual impairment is a form of disability and these children face challenges in conducting their daily tasks. Basically, there are two types of visual disability namely partial blindness and total blindness [2]. A study reported

that visually impaired children have poorer oral health status compared to sighted children, while partially blind children have better oral hygiene status compared to totally blind children [3]. Another study found that as visually impaired children age, the oral hygiene in partially blind children improved whereas it deteriorated in totally blind children [4]. The main reason for the difficulty in maintaining good oral hygiene is attributable to the inability of visually impaired children to visualize plaque accumulation on their tooth surface and lack of understanding of the importance of oral hygiene [5].

The usual method of teaching proper tooth brushing is by visual perception, thus, the visually impaired children are deprived of the opportunity to learn by imitation. Plaque is disclosed by using disclosing tablet where plaque will be stained red after the patient chewed the tablet. This is usually followed by a demonstration on proper tooth brushing technique in front of a mirror to ensure that the disclosed plaque is totally removed. Unfortunately, this method does not benefit the blind. They depend more on tactile sensation (touching) and hearing to learn. Hence, health care providers should have a unique and innovative teaching methods as well as effective communication skills to transfer the information and knowledge to these children so that they are empowered to take care of their own oral hygiene in the future.

The aim of this study is to develop dental health education tools designed for children with visual impairment and to investigate the effectiveness of these tools by using the Simplified Oral Hygiene (OHI-S) index.

METHODOLOGY

This study was conducted at two schools in Bukit Mertajam with special programmes for visually impaired children, namely, Sekolah Kebangsaan Pendidikan Khas (for visually impaired) and Sekolah Menengah Kebangsaan Alma. These two schools are funded by the Ministry of Education and cater for visually impaired children from the Northern region of Peninsular Malaysia. All the visually impaired students accepted to these schools must be first confirmed to be totally or partially blind by an ophthalmologist. There were 45 visually impaired students with age range from 6-17 year old. Students with other disabilities were excluded from the study and following screening for sample selection, only 38 students were recruited into the study.

Clinical Examination

All the 38 students consented by their parents/caretakers underwent clinical examination to determine their oral hygiene status by using the simplified oral hygiene index (OHI-S) [6]. For primary dentition, the modified version of OHI-S [7] were used.

The students were requested to chew a plaque disclosing tablet and swish it around in mouth for 30 seconds. They were then asked to spit it out followed by gentle rinsing with water. The presence of soft debris deposit (material alba) which has been stained were scored on the specific surfaces of the index teeth: buccal/ labial surface of the maxillary right first molar (tooth 16), the maxillary right central (tooth 11), the maxillary left first molar (tooth 26), the mandibular left central incisor (tooth 31) the lingual surface of mandibular right first molar (tooth 46) and the mandibular left first molar (tooth 36) or their substitutes. Examination was done only on fully erupted teeth. A tooth was deemed to be fully erupted when only its occlusal or incisal surface has reached the occlusal plane.

For primary dentition, the index teeth are the maxillary right molar (tooth 55), the maxillary right central incisor (tooth 51), the maxillary second left molar (tooth 65), the mandibular right second molar tooth (tooth 85), the mandibular left central incisor (tooth 71) and the mandibular left second molar (tooth 75).

TABLE 1. The scores and criteria used in the study.

Scores	Criteria
0	No debris or stain present
1	Soft debris covering not more than one third of the tooth surface, or presence of extrinsic stains without other debris regardless of surface area covered
2	Soft debris covering more than one third, but not more than two thirds, of the exposed tooth surface.
3	Soft debris covering more than two thirds of the exposed tooth surface.

An examiner was trained and intra-examiner reproducibility for plaque scoring using the simplified oral hygiene index (OHI-S) was conducted prior to the study.

Introduction to Dental Health Education Tools

The students were then exposed to the dental health education tools consisting of an oral health module printed in braille for the blind and in font 18px for the partially blind, an audio narration of the module were prepared and content-validated by an expert panel.

Post intervention plaque score

Post intervention plaque scores were recorded after one month using the same previous clinical examination method. The pre and post intervention data were analyzed by SPSS version 22 with a significant *p* value set at < 0.05. This study was approved by the Human Research Ethics Committee, Universiti Sains Malaysia (FWA Reg. No : 00007718; IRB Reg. No : 00004494) and Ministry of Education.

RESULTS

Out of total 38 students enrolled in this study, there were 22 partially blind and 16 totally blind as shown in FIGURE 1. The pre mean OHI-S score of partially blind (2.2 (IQR 0.7)) and blind (2.1 (IQR 0.4)) subjects showed that soft debris covered more than one third of the exposed tooth surface.

Distribution of visual impairment

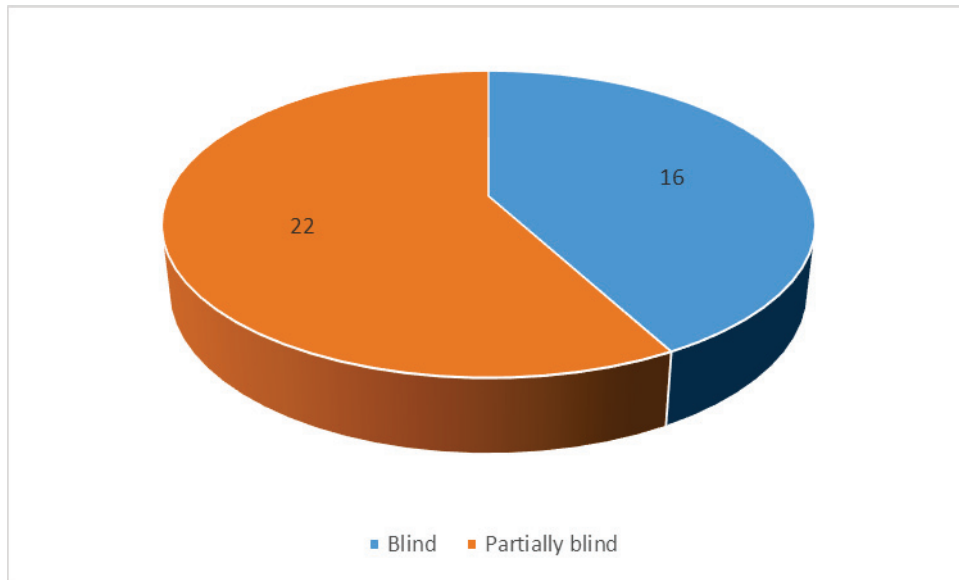


FIGURE 1. Distribution of visual impairment

Comparison of Pre and Post Plaque score between the partially blind and blind students

After the intervention, there was a reduction in the overall median plaque score in both partially blind ($n = 22$) and totally blind ($n = 16$) subjects (2.2 (IQR 0.7) to 1.8 (IQR 0.5) and 2.1 (IQR 0.4) to 2.0 (IQR 0.7) respectively). The score difference in the totally blind group was significant ($p = 0.025$) as shown in Table 2. Reductions in plaque scores were also observed in stratified data (based on age); with the partially blind aged 12-17 years showing the greatest reduction. However, the difference was not statistically significant ($p = 0.067$) as shown in Table 3.

TABLE 2. Comparison of Pre and Post Plaque score between the partially blind and blind students (Wilcoxon Signed Ranks Test)

Status	Plaque score	Median	IQR	P-value
Partially blind	Pre	2.2	0.7	0.087
	Post	1.8	0.5	
Blind	Pre	2.1	0.4	0.025*
	Post	2.0	0.7	

TABLE 3. Comparison of Pre and Post Plaque score between the partially blind and blind students stratified based on age (Wilcoxon Signed Ranks Test)

Status	Plaque score	Median	IQR	P-value
Partially blind Age 6-11 yrs	Pre	2.1	0.6	0.421
	Post	1.8	0.5	
Age 12-17 yrs	Pre	2.0	0.8	0.067
	Post	1.7	0.8	
Blind Age 6-11 yrs	Pre	2.2	0.2	0.136
	Post	2.0	0.7	
Age 12-17 yrs	Pre	2.0	0.8	0.189
	Post	2.0	0.8	

DISCUSSION

Visually impaired children are facing challenges in maintaining proper oral hygiene [8]. Difficulty in removing plaque is the main factor of differentiation between normal and visually impaired child [9].

In this study it was shown that visually impaired children exhibit fair to poor level of oral hygiene, which is similar to many other studies done before [10-16]. In contrast to a study done in Chandigarh, India in 2013, 95% of the visually impaired children had good and fair oral hygiene with mean plaque score of 1.34[17]. This could be due to the caretakers implementing mandatory health care to the children. However, they had a higher prevalence of bleeding sites compared to the sighted students, which perhaps could be explained by the limited ability of the visually impaired student to visualize the existence of plaque [18]. All of the children in this study stayed in boarding school and their suboptimal level of oral hygiene could be due to lack of assistance or supervision by the care taker[16].

The limitation of this study is the small number of subjects, even though we tried to recruit all the students and at the same time the age range of the subjects was wide, 6-17 years old. At age 6 years, tooth brushing should be assisted and supervised by parents as their manual dexterity and cognitive ability is still low compared to the older subjects this could be seen in the improvement of the oral hygiene after the intervention. In addition, the younger subjects are less motivated if compared to the older ones [19]. The age factors could also affect the result of the overall mean OHI-score in this study. Even though general oral health care is being provided by the nearby government dental clinic, lack of knowledge and experience of the service providers in handling visually impaired students is probably one of the barriers in improving the oral health of these students. A customized awareness programme is needed considering the limitation of the visually impaired students.

CONCLUSION

The pre mean OHI-S score of the subjects showed that the visually impaired students had poor oral hygiene. Despite the partially blind subjects had a better improvement after the intervention in median OHI-S score than those who were totally blind, the difference was not statistically significant. The tools appeared to have a positive effect on promoting good oral hygiene among students with visual impairment especially the older subjects. The present data might have merit as basis for a larger and more well-planned comprehensive study in order to reveal a deeper understanding of the oral health problems among visually impaired children. The visually impaired children need early special attention and guidance to help them to improve their oral hygiene status and be independent.

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