ORIGINAL ARTICLE

Oral Health Status of a Group of Visually Impaired School Children in Kuala Lumpur

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ABSTRACT

Introduction: Children with visual impairment are reported to be at higher risk of poor oral health. They faced difficulties in basic skills including oral care. For this reason, they may develop dental caries and periodontal disease. The aim of this study was to assess the oral health status of a group of visually impaired school children in Kuala Lumpur. **Methods:** A cross-sectional study was carried out on students from a Special Education School in Kuala Lumpur. Oral examination was conducted to determine caries experience and oral hygiene status. Caries was measured using DMFT index and simplified oral hygiene index (OHI-S) for oral hygiene status. Oral examination was based on modified World Health Organization (WHO) oral health assessment criteria for children. Chi-square test was used to determine associations between demographic variables and oral health status. **Results:** A total of 91 visually impaired students (41 blind, 50 low vision) within the age group of 13 to 17 years old participated in this study. The mean OHI-S score was 1.68 (SD 0.87) with majority of students had fair oral hygiene (39.6%) and 29.7% with poor and very poor oral hygiene. The mean DMFT score of total students were 0.80 (SD 1.62). Male students demonstrated significantly better oral health status than female in relation to prevalence and mean score of dental caries. **Conclusion:** Most of the visually impaired children in this study showed fair oral health status. Regular oral health education is recommended to improve the oral hygiene especially in the totally blind group.

Keywords: Visually impaired, Simplified Oral Hygiene Index, Oral hygiene

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INTRODUCTION

Visual impairment is one of the disabilities, defined by the Centres for Disease Control and Prevention (CDC) as a condition in which eyesight of a visually impaired person cannot be corrected to 'normal level' (1). According to the International Classification of Diseases 11, there are two groups of visual impairments, namely distance and near vision impairments. Distance vision impairment is further classified into mild, moderate, severe and blindness (2). In year 2017, it was estimated that 1.3 billion people had some form of distance and near vision impairments. In relation to distance vision, 188.5 million were with mild, 217 million had moderate to severe, and 36 million people were blind (3). It was also estimated that 19 million children aged below 15 had visual impairment.

Two decades earlier, a survey conducted by the National Eye Survey, Malaysia (NES, 1996) reported that 54,000 Malaysians were blind and 464,000 had low vision (4). A study by Zainal et al in 1998 among Malay adults in selected villages in Kuala Selangor reported that the prevalence of visual impairment and blindness were 0.7% and 5.6% respectively, with increasing prevalence in the older age group (5). In a more recent survey among patients in University Malaya Medical Centre, it was observed that 9.6% of patients had visual impairment and 0.9% were blind (6).

As for visual impairment in children, it was estimated that there were about 2,300 blind children in Malaysia, in which 2,000 of them were in the school-going age (7). Findings from a study among school children aged 15 years old and below from 24 schools for the blind in Malaysia reported that 95.6% of the children had childhood blindness or severe visual impairment. The major cause of visual impairment were diseases of the retina, in which majority were potentially prevented and treated (7).

With regards to oral health and dental care in visually impaired children, researchers have consistently shown that the group had poorer oral health conditions as compared to the general population. They were reported

to demonstrate poorer oral hygiene with higher scores of plaque accumulation (8,9). Similarly, caries experience was also prevalent with high decayed, missing and filled teeth, DMFT, (dental caries index scores), among visually impaired school children between the age group of 6 to 12 years old children (10,11). These children are challenged every single day in learning or observing the basic skills of life including oral care (12). For this reason, they might have experienced higher levels of dental diseases. Conventional teaching methods like using visual aids and disclosing agents are not useful for this group to maintain good oral hygiene, because they completely depend on senses of touch and feel to learn (13). Dental health personnel like dentists, dental nurses and hygienists can play a role to assist visually impaired individuals by early diagnosis and prompt treatment (14).

In Malaysia, study in two visually impaired schools in Bukit Mertajam, Penang showed that majority of the students had fair to poor level of oral hygiene (15). In another study on self-reported oral hygiene practices, oral health knowledge and periodontal status among visually impaired adults, findings highlighted that visually impaired respondents demonstrated poorer periodontal status than the general population with 53.8% had tooth sensitivity and 43.6% inflamed and painful gums. Not only that, plaque accumulation and bleeding sites were 81.7%, and 35.1% respectively, and bleeding on probing was significantly highest among the blind group (16). However, local data on oral health status of the visually impaired school children is limited and not recent. Thus, the aim of this study was to assess the oral health status of a group of visually impaired school children in Kuala Lumpur.

MATERIALS AND METHODS

Study background

This study was a cross-sectional design, carried out on a group of visually impaired students in Kuala Lumpur. There are four Special Education Schools (Sekolah Pendidikan Khas) focused on visually impaired children in Kuala Lumpur, in which three are primary schools and one secondary school. The secondary school was chosen as it comprises of students above 12 years old. The school has 137 students, in which 65 are low vision and 72 completely blind.

Students within the range of 13 to 17 years old, with all types of visual impairments and able to communicate in Bahasa Malaysia or English language were included in the study. Those who had to attend school examinations during the study period were excluded. Through the school teachers, all the students were invited to participate in a dental screening at the school hall. Prior to the examination, students were briefed on the aim and conduct of the study.

Based on a formula (17) used to calculate the adequate sample size in cross-sectional studies, n = z2 x P(1-P) / d2, where n is the sample size, z is the level of confidence at 95%, P is the estimated prevalence (5.9% prevalence of fair oral hygiene among visually impaired children) (18), and d is precision of 5%, the estimated sample size was 85. With estimation of 15% non-response subjects, a sample size of 98 was required. A total of 100 students that matched the selection criteria and were given consent by their parents were included through convenience sampling.

Based on the International Classification of Diseases 11 by WHO, distance vision impairment can be classified into mild, moderate, severe and blindness (2). For analysis purposes, mild and moderate visual impairment students in this study were grouped into low vision, while severe impairment and blindness as blind.

Study instruments

Information on socio-demographic characteristics were obtained from face-to-face interview, which include sex, age and ethnicity. The clinical oral examination was carried out by a single examiner to determine the oral health status of the students, namely the oral hygiene status and dental caries experience. Intra-examiner calibration procedure for dental caries was obtained during the clinical examination. Ten percent of the students were randomly selected to be re-examined to check for intra-examiner reliability (Cohen's kappa 0.92).

Oral hygiene status was assessed using the Simplified Oral Hygiene Index (OHI-S) which comprised of two components, Debris Index and Calculus Index (19). Debris Index was scored as: 0 = absence of debris; 1 = debris covering not more than one-third of the tooth surface; 2 = debris covering more than one-third but not more than two-third of the tooth surface; and 3 = soft debris covering more than two-thirds of the examined tooth surface. The calculus index was scored as: 0 = no calculus present; 1= supragingival calculus covering maximum a third of the exposed tooth surface; 2= supragingival calculus covering more than one third but not more than two-third of the exposed tooth surfaces; and 3= supragingival calculus covering more than two third of the exposed tooth surface. Six index teeth of each subject (all first molars, upper right and lower left central incisors) were selected for score recording. Labial surfaces were examined for all the teeth except for lower molars, where the lingual surfaces were assessed. The OHI-S index score was determined by summing the Debris index and Calculus index. The oral hygiene of each student was classified as good, fair, poor or very poor based on scores for OHI-S: good (≤ 1.0), fair (1.1 – 2.0), poor (2.1-3.0) and very poor (>3).

Dental caries experience was measured using Decayed,

Missing and Filled Teeth Index (DMFT). Disposable examination kit (mouth mirror and dental probe) was used for the oral examination of the students. They were seated on a portable dental chair and aided by portable light. Findings from the dental caries assessment was translated into DMFT index, the widely accepted index for measuring dental caries experience in oral health surveys. Components of DMFT index were: D for decayed teeth, M for missing teeth due to caries and F for teeth that had been previously filled. Total score of the three components was the value of DMFT score for each student, ranging from 0 to 28. Clinical examination was based on the WHO criteria for oral health survey (20).

Data analysis

Data were entered and analyzed using IBM SPSS version 24 with descriptive statistics analysis using frequency and proportion for categorical variables, and mean and standard deviation for continuous variables. The association between categorical variables namely age group, sex and type of blindness with oral health status were analyzed using Chi-square test. P-value of <0.05 was considered as statistically significant.

RESULTS

Demographic characteristics of the study population

A total of 91 students participated in the study, giving rise to 91% response rate. The age of the students ranged from 13 to 17 years old, with a mean of 15.6 (SD 1.7). Majority were male (n=56; 61.5%) and 38.5% female (n=35). With respect to types of blindness, 48.4% (n=44) was totally blind and 51.6% (n=47) was partially blind or with low vision. The students' characteristics are summarised in Table I.

Oral hygiene

Only 30.8% (n=28) students had good oral hygiene (OHI-S score 0-1), while majority (39.5%; n=36) were rated as 'fair' (OHI-S score 1.1-2.0). About 29.7% were with poor and very poor oral hygiene. The mean OHI-S score was 1.68 (SD 0.87), with mean Debris and Calculus indexes of 1.55 (SD 0.74) and 0.13 (SD 0.20) respectively. Comparison between gender showed a higher percentage of male students (32.1%) had good oral hygiene compared to their female counterparts, but however no statistically significant was observed (p>0.05). Younger age group (13 to 15 years old) demonstrated better oral hygiene with 35.7% of them had good OHI-S score compared to 28.6% in the older students (p>0.05). In relation to the type of blindness, totally blind students were reported to experience poor and very poor oral hygiene (31.9%) compared to low vision students (27.7%) but findings were not statistically significant (p>0.05) (Table II).

Table I: Demographic characteristics of participants (n=91).

Variables	n (%)
Age (years)	
Mean age (SD)	15.6 (1.7)
13 - 15	42 (46.2)
> 15	49 (53.8)
Gender	
Male	56 (61.5)
Female	35 (38.5)
Ethnicity	
Malay	78 (85.7)
Chinese	7 (7.7)
Others	6 (6.6)
Type of Blindness	
Blind	44 (48.4)
Low vision	47 (51.6)

Table II: Oral hygiene status of participants by gender, age group and type of blindness

Variables	OHI-S score (%)				p-value
	Good	Fair	Poor	Very poor	
Sex					
Male	18 (32.1)	22 (39.3)	11 (19.7)	5 (8.9)	0.863
Female	10 (28.6)	14 (40.0)	9 (25.7)	2 (5.7)	
Age (years)					
13 - 15	15 (35.7)	17 (40.5)	9 (21.4)	1 (2.4)	0.320
> 15	13 (26.5)	19 (38.8)	11 (22.5)	6 (12.2)	
Type of blindness					
Blind	13 (29.5)	17 (38.6)	9 (20.5)	5 (11.4)	0.650
Low vision	15 (31.9)	19 (40.4)	11 (23.4)	2 (4.3)	

*significant at p-level<0.05

Dental caries experience

Table III summarizes the DMFT scores of the students in relation to sex, age group and type of blindness. Mean DMFT score for the total students was 0.80 (SD 1.62). Almost three-quarter (71.4%; n=65) of the students were caries free (DMFT 0). Among the male students, 78.6% (n=44) were caries free, 21.4% (n=12) had DMFT score between 1 to 8. A lower percentage (60%; n=21) of sound teeth was observed in female students when compared to their male counterpart. It was also noted that a significantly higher percentage of female students (40%) had caries experience compared to male (p<0.05). Similarly, female students had a significantly higher mean DMFT score than their male counterpart (p<0.05) (Table IV).

The younger age group (13 to 15 years old) demonstrated higher percentage of caries free condition (73.8%) compared to 69.4% in the older students (p>0.05). With regards to the type of blindness, 75% (n=33) of

Table III: Caries experience of participants by Gender, Age group and Type of blindness

Variables	DMFT score (%)		p-value
	Caries free (score 0)	With caries experience (score 1 – 8)	
Sex			
Male	44 (78.6)	12 (21.4)	0.048*
Female	21 (60.0)	14 (40.0)	
Age (years)			
13 - 15	31 (73.8)	11 (26.2)	0.409
> 15	34 (69.4)	15 (30.6)	
Type of blindness			
Blind	33 (75.0)	11 (25.0)	0.310
Low vision	32 (68.1)	15 (31.9)	

*significant at p-level<0.05

Table IV: Mean OHI-S and DMFT sores of participants

Variables	Mean OHI-S score (SD)	p-value	Mean DMFT score (SD)	p-value
Sex				
Male	2.05 (0.94)	0.808	0.55 (1.32)	0.043*
Female	2.08 (0.88)		1.06 (1.53)	
Age (years)				
13 - 15	1.90 (0.82)	0.178	0.67 (1.32)	0.449
> 15	2.20 (0.98)		0.81 (1.51)	
Type of blindness				
Blind	2.14 (0.98)	0.254	0.75 (1.48)	0.571
Low vision	2.00 (0.86)		0.74 (1.37)	

*significant at p-level<0.05

blind students were caries free (DMFT score 0) while the percentage of low vision students was a bit less (68.1%) than blind subjects. A higher percentage of DMFT score of 1 to 8 was found within low vision students (31.9%). Similar to sex and age group, no significant difference was noted in relation to types of blindness among the students (p>0.05).

DISCUSSION

The aim of this study was to assess the oral health status of a group of visually impaired school children in Kuala Lumpur. Findings revealed that about thirty percent of the children had poor and very poor oral hygiene status. It was also noted that female, older age group (>15 years old) and totally blind students experienced poorer oral hygiene compared to their counterparts. Although no significant associations were reported, it should be taken into consideration that a considerable proportion of totally blind students (31.9%) had poor and very poor oral hygiene. Factors like lack of assistance during toothbrushing, poor manual-visual coordination and less concern of their appearance may contribute to the suboptimal oral hygiene status (21). Thus further research need to be carried out to explore such contributing factors linking to the unsatisfactory condition.

In contrast to our findings, poorer oral hygiene and high prevalence of dental caries were frequently reported among visually impaired children globally (11,22). Since proper oral care is not easy to those with visual impairment, it was reported that there might be an increased in periodontal disease and dental caries due to the accumulation of dental plaque which is one of the main risk factors for these two oral diseases (23). Visually impaired children tend to have problems in making sure whether debris has been removed and to notice gums bleeding or any black spot within teeth. In addition, following oral hygiene instructions properly is also a major challenge for this special group (24).

The mean DMFT score observed in this study was comparable to studies in Sudan and India (11,18). However, higher caries prevalence and mean DMFT score were reported among visually impaired schoolchildren in Turkey (25) in which only 26.4% of the children were caries free. Differences in the percentage of caries free within regions may be due to variations in dietary habits and accessibility to sugary snacks of these populations. Shetty et al in 2010 demonstrated a high percentage of caries experience in visually impaired students in South India and this condition could be due to high consumption of sweets and in between snacking, plus daily serving of sweet dish at school (26). This study also found that the prevalence and mean score of dental caries was significantly higher in female than male students (p<0.05). It may be suggested that early eruption of teeth among girls compared to boys lead to increase risk in dental caries (22).

Although several reports have highlighted better oral health status among sighted students as compared to partial and totally blind students, our study has concluded otherwise. A study conducted among 16-year-old students in six government secondary schools demonstrated a mean DMFT of 2.76 (SD 3.25) with rural students had significantly greater mean numbers of decayed and missing teeth (27). Findings from a study carried out in Penang island showed that 80.8% of the 16 years old schoolchildren had DMFX of ≤ 2. Only 15% had good oral hygiene as measured by plaque score (28). A nationwide survey, the National Oral Health Survey of Adults, NOHSA, was conducted every ten years to assess the oral health status, impacts and treatment needs among adults' population in Malaysia. Findings from the recent NOHSA in 2010 showed that dental caries prevalence for the age group of 15 to 19 years was 59.0% with a mean DMFT of 2.28 (29). In contrast, visually impaired students in our study exhibited better oral health status, with lower mean score of DMFT (0.8) and lower percentage of caries prevalence (28.6%). As the present study was a single school-based survey, sample population may not be representative of all blind students in Malaysia. However, results can serve as baseline information for future research in the field.

One of the limitations noted in this study was the small sample size. A study that include a wider age range of visually impaired schoolchildren is essential in the future. Risk factors associated with oral hygiene and dental caries of this disadvantaged group like dietary behaviour and oral hygiene practices can also be further explored. The OHI-S for scoring oral hygiene was relatively easy to use and require less time, but nevertheless over- or underestimation of debris and calculus tend to occur. Although it is not recommended in epidemiological studies, the use of plaque-disclosing gel or solution can assist in visualizing the extend of dental plaque on tooth surfaces thus provide a more accurate results.

CONCLUSION

Visually impaired children in this study showed low prevalence of dental caries and fair oral hygiene status. Male students demonstrated significantly better oral

health status than female in relation to prevalence and mean score of dental caries. Regular oral health education and examination are recommended to improve the oral health conditions of the totally blind group.

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REFERENCES

1. Centers for Disease Control and Prevention. Blindness and vision Impairment. [Last accessed on 26th April 2019]. URL available at: https://www.cdc.gov/healthcommunication/ Blindness.html
2. World Health Organization. Blindness and vision impairment. [Last accessed on 26th April 2019]. URL available at: https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment.
3. Bourne RRA, Flaxman SR, Braithwaite T, Cicinelli MV, Das A, Jonas JB, et al. Vision Loss Expert Group. Magnitude temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: a systemic review and meta-analysis. Lancet Glob Health. 2017;5(9):888-97.
4. Zainal M, Ismail SM, Ropilah AR, Elias H, Arumugam G, Alias D, et al. Prevalence of blindness and low vision in Malaysian population: results from the National Eye Survey 1996. Br J Ophtalmol. 2002;86(9):951-6.
5. Zainal M, Masran L, Ropilah AR. Blindness and visual impairment amongst rural Malays in Kuala Selangor, Selangor. Med J. Malaysia. 1998;53(1):46-50.
6. Reddy SC, Tajunisah I, Low KP, Karmila AB. Prevalence of eye diseases and visual impairment in urban population – a study from University of Malaya medical Centre. Malays Fam Physician. 2008;30(1):25-8.
7. Patel DK, Tajunisah I, Gilbert C, Subrayan V. Childhood blindness and severe visual impairment in Malaysia: a nationwide study. Eye (Lond). 2011;25(4):436-42.
8. Bimstein E, Jerrell RG, Weaver JP, Dailey L. Oral characteristics of children with visual or auditory impairments. Pediatr Dent. 2014;36(4):336-41.
9. Bekiroglu N, Acar N, Kargul B. Caries experience and oral hygiene status of a group of visually impaired children in Istanbul, Turkey. Oral Health Prev Dent. 2012;10(1):75-80.
10. Nandini NS. New Insights into Improving the Oral Health of Visually Impaired Children. J Indian Soc Pedod Prev Dent. 2003;21(4):142-3.
11. Tagelsir A, Khogli AE, Nurelhuda NM. Oral health of visually impaired school children in Khartoum State, Sudan. BMC Oral Health. 2013;13(1):33.
12. 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(2):107-13.
13. AlSarheed M, Bedi R, Alkhatib MN, Hunt NP. Dentist's attitude and practices towards provision of orthodontic treatment for children with visual and hearing impairments. Spec Care Dentist. 2006;26(1):30-6.
14. Jain A, Gupta J, Aggarwal V, Goyal V. To evaluate the comparative status of oral health practices, oral hygiene and periodontal status amongst visually impaired and sighted students. Spec Care Dentist. 2013;33(2):78-84.
15. Shahabudin S, Hashim H, Omar M. The effectiveness of dental health education tools for visually impaired students in Bukit Mertajam. AIP Conference Proceedings 2016.
16. Mohd-Dom TN, Omar R, Abdul-Malik NA, Saiman K. Self-Reported Oral Hygiene Practices and Periodontal Status of Visually Impaired Adults. Global J of Health Sci. 2010;2(2):184-191.
17. Fleiss JL. Statistical methods for rates and proportions. 1981. New York: Wiley.
18. Prashanth ST, Bhatnagar S, Das UM, Gopu H. Oral health knowledge, practice, oral hygiene status, and dental caries prevalence among visually impaired children in Bangalore. J Indian Soc Pedod Prev Dent. 2011;29(2):102-105.
19. Greene JC, Vermillion JR. The Simplified Oral Hygiene Index. J Am Dent Assoc. 1964;68: 7-13.
20. World Health Organization. Oral health surveys: Basic methods 5th Edition. Geneva. 2013.
21. Reddy K, Sharma A. Prevalence of oral health status in visually impaired children. J Indian Soc Pedod Prev Dent. 2011;29(1):25-7.
22. Liu L, Zhang Y, Wu W, He M, Lu Z, Zhang K, Li J, Lei S, Guo S, Zhang Y. Oral health status among visually impaired schoolchildren in Northeast China. BMC Oral Health. 2019;19(63).
23. Maciel MAS, Cordiero PM, d'Avila S, Godoy GP, Alves RD, Lins R. Assessing the oral condition of visually impaired individuals attending the Paraiba Institute of the Blind. Rev Odonto Cienc. 2009;24(4):354-60.
24. Gautam A, Bhambal A, Moghe S. Effect of oral health education by audio aids, Braille & tactile models on the oral health status of the visually impaired children of Bhopal city. J Oral Biol Craniofac Res. 2018;8(3):168-170.
25. Bekiroglu N, Acar N, Kargul B. Caries experience and oral hygiene status of a group of visually impaired children in Istanbul, Turkey. Oral Health Prev Dent. 2012;10(1):75-81.
26. 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(3):213-216.
27. Esa R, Ai LO, Humphris G, Freeman R. The relationship of dental caries and dental fear in Malaysian adolescents: a latent variable approach. BMC Oral Health. 2014;14(19).
28. Raman R, Woon TK, Mamat M, Ishak A, Khan AR. Oral health awareness, behaviour and status among Malaysian 16-year-old school students in Penang. Malaysian Dental Journal. 2012;34(2):45-53.
29. Oral Health Division, Ministry of Health Malaysia. National oral health survey of adults 2010 (NOHSA 2010). Putrajaya. 2013.