

ORIGINAL ARTICLE

Oral Health Status of Visually Impaired Children and Oral Health Knowledge, Attitude and Practice of their Caregivers at Hospital Universiti Sains Malaysia: A Preliminary Study

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ABSTRACT

Introduction: Oral health status among visually impaired (VI) children have shown to be poorer when compared with their normal peers. This preliminary study aimed to determine the oral health status of VI children and knowledge, attitudes and practices of their caregivers. **Methods:** A preliminary, cross sectional study were conducted on VI children and their caregivers attending Ophthalmology clinic Hospital USM. The assessment of oral hygiene was done using Sillness-Loe plaque index and dental caries using DMFT/dft index. Self-administered, validated questionnaires on knowledge, attitudes and practice towards a child's oral health was distributed to the caregivers. **Results:** A total of 27 VI children along with their caregivers participated in this study. The mean age of VI children and their caregivers was 11.4(3.05) and 41.7(7.10) respectively. The children showed a fair oral hygiene status. The median(IQR) for caries experience for deciduous teeth (dft) and permanent teeth (DMFT) was 0.0(5.00) and 1.0(4.00) respectively. Caries prevalence among VI children was high at 85.2% (95% CI:70.86% - 99.51%). The caregivers showed a relatively good attitude and practice towards their child's oral health with mean(SD) score of 23.2(2.95) out of 28 and 12.8(2.15) out of 19 respectively in comparison to low oral health knowledge of 5.5(1.50) out of 11. **Conclusion:** The oral hygiene status was fair with high prevalence of dental caries. Based on the score, although the caregivers showed to have minimal understanding on children's oral health, their attitude and practice towards children's oral health are relatively high.

Keywords: Oral hygiene, Knowledge, Visual impairment, Children, Caregivers

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INTRODUCTION

Visual impairment (VI) or vision loss, can be defined as the decrease in the ability to see to an extent that it might cause a problem that is not treatable even by using glasses (1). Based on the International Classification of Disease (ICD), visual impairment can be classified into near normal vision (6/6 – 6/18), low vision (6/24 – 2/60) and near blindness (1/60 – No perception of light-NLP) (2). It is worth mentioning that the main causes differ between children with only VI and those with multiple disabilities (3).

In 2018, it was reported by WHO that about 1.3 billion people worldwide live with some form of visual impairment whereby about 188.5 million people suffer

from mild VI, and 217 million suffer from moderate to severe vision impairment. Southeast Asia recorded among the highest prevalence of blindness and of moderate to severe visual impairment (4). It was estimated that the total number of blind children around the world was at 1.4 million (5). In Malaysia, a survey conducted nationwide by the National Eye Survey (NES) in 2014 reported that approximately 113,000 people were blind, and 413,000 Malaysians were visually impaired (6).

Routine habits such as brushing with fluoridated toothpaste, replacing worn out toothbrush, mouth rinsing, practicing healthy diet and regular dental visits are basically not a challenge for normal children as compared those with visually impaired (7). VI may disrupt people from performing their normal daily activities such as oral health care (8). Evidenced by the study done among VI children shows that they have relatively poorer oral hygiene compared to normal sighted peers (9). The prevalence of dental caries among VI children in India were relatively higher at 40% as

compared to their normal peers at only 11.5% (10). Various factors contributed towards poorer oral health status among VI children throughout the world. Some of the factors are difficulty to visualize plaque that's present on tooth surfaces (11), the absence of hand-eye coordination, inadequate supervision by parents or caregivers and child's ignorance towards their appearance (12) and lacking of manual skills for effective tooth brushing (13). Conventional methods of teaching oral hygiene is mainly involve the usage of visual interaction (7, 14) such as utilizing disclosing agents to visualize plaque, demonstration of effective tooth brushing technique and many more. Unfortunately, for the VI children, utilizing these methods will not benefited them as they have not been specifically tailored for the VI children who are very dependent on their tactile sensation (15).

Therefore, due to physical limitation, VI children are heavily dependent on their caregivers for general and oral health care (16). Caregivers' oral health awareness has an important impact on their children's oral health that leads to good oral health status among children (17). It has been reported that caregivers that demonstrate better knowledge of oral health, attitude and behaviour tend to reflect on their children good oral health status (18). To the best knowledge of the researcher, there was very little information pertaining to the oral health status, dental health care and needs of the VI children in Malaysia. This preliminary study aimed to determine the oral health status of VI children and knowledge, attitudes and practices of their caregivers.

MATERIALS AND METHODS

A preliminary, cross-sectional study was conducted at Hospital Universiti Sains Malaysia (Hospital USM) Paediatric Ophthalmology Clinic and Dental Clinic, Kubang Kerian, Kelantan from February to early March 2020. Convenient sampling method was used to select participants for this study which included VI children along with their caregivers. In this study, VI children, aged between 7-18 years were included since at this age range they are still under the category of paediatric patients who are under the care of their caregivers and as defined by WHO (19). The sample size was calculated based on single proportion formula in relation to the prevalence of oral hygiene status (20), caries experience (21), caries prevalence (22), and oral health knowledge, attitude and practice (23) at the precision of 10%. Based on the biggest sample size calculated and after considering 20% of non-response rate and the available resources, a sample size of 82 participant was needed.

Data collection

Prior to the conducting of the study, a letter requesting permission for the usage and collection of patient data along with other available facilities was sent to the Director of Hospital USM. Ethical approval to conduct

this study was obtained from the Human Research Ethics Committee 'Universiti Sains Malaysia (Reference code: USM/JEPeM/19120856)'. Information on socio-demographic characteristics were obtained from the consented participant and are recorded in the patient's profile sheet which was attached along with the oral health knowledge, attitude and practice questionnaire. The clinical oral examination was carried out by a single examiner who was calibrated towards an experienced dental public health specialist prior to data collection. The Cohen's kappa score obtained were 0.75 for oral hygiene, 0.85 for dental caries, and 0.80 for both missing and filled tooth and considered as substantial agreement.

The assessment of oral hygiene status was based on the Sillness-Loe plaque index, 1964. The assessment was done for both soft debris and mineralized deposits on six index teeth which included right maxillary lateral incisor, right maxillary first molar, left maxillary first premolar, left mandibular first molar, left mandibular lateral incisor and right mandibular first premolar. Missing teeth are not substituted and each of the four surfaces of the teeth (buccal, lingual, mesial and distal) is given a score of 0: surface is literally free of plaque, 1: plaque is made visible on the point of the probe after it has been moved across the tooth surface, 2: gingival area is covered with a thin to moderately thick layer of plaque and 3: heavy accumulation of soft matter. The score is then added up from the four surfaces of the tooth and then divided by four to give the plaque index for the tooth. Finally, the index for the patient is obtained by summing the indices for all six teeth and dividing by six. The oral hygiene of each VI children was classified as excellent (0.0), good (0.1 – 0.9), fair (1.0 – 1.9) and poor (2.0 – 3.0).

The dental caries experience and prevalence of the VI children were assessed using the DMFT/dft index for both permanent and deciduous teeth respectively (19) using WHO No 5 explorer and mouth mirror. The probe is used to remove the debris. Each of the decay (D/d), missing (M) and filled (F/f) component were recorded for evaluation. Total score of each component was the value of DMFT/dft score for each VI children, ranging from 0 to 28 for permanent teeth and 0 to 20 for deciduous teeth.

A validated Bahasa Malaysia "oral health knowledge, attitude and practice" (OHKAP) questionnaire by Ngah et al., 2019 (24) was being self-administered to the caregivers. The questionnaire consists of 25 OHKAP questions which contains four parts which includes eight questions on sociodemographic profile, 11 questions on knowledge, seven questions on attitude, and seven questions on practice.

Part 1, which consist of eight questions on sociodemographic profiles of the VI children and their

caregivers which include sex, age, ethnicity, education level, household income, source of oral health information and vision acuity level of the VI children.

Part 2, which contained 11 questions to assess the caregiver's oral health knowledge included items such as sugary drinks are best limited to mealtime; what is the best way of consuming a bag of sweets by children; most medicine is sugar free; does fluoride strengthen the teeth and is fruity drinks safe for kids. Besides that, it also include item such as at what age do you think that children should brush their teeth; does cleaning your child's teeth after each meal helps prevent decay; frequency of tooth brushing; amount of toothpaste needed to brush children teeth; at what age children should be taken to visit the dentist and reason for visiting the dentist. Each correct answer was given '1' mark and wrong answer were given '0' mark. The score for knowledge was between '0' and '11'.

Part 3, which consisted of seven questions to assess the caregiver's attitude towards oral health; there is no need to be concerned about baby teeth; is it worthwhile to get cavities in baby teeth filled; regular visit to the dentist is important; will you get your child decayed back permanent tooth filled or taken out; will you get your child decayed front permanent teeth filled or taken out; brushing twice a day for 2 – 3 minutes keeps gum healthy; and child brushing habits. Scoring of the first 6 questions involved Likert scale and final question involved the selection of best answer whereby marks are given based on answer selected. The scores for attitude was between '6' and '28'.

Part 4, which was composed of seven questions to assess the respondents' practice of oral hygiene including frequency of brushing among children; has your child started using toothpaste; fluoride content in toothpaste; amount of toothpaste that your child usually uses during tooth brushing; what drink do you usually give to your child before bed or during the night; consumption for sugary food between main meals in a day and consumption for sugary food between meals during the weekends. Every correct answer was given '1' mark and wrong answer was given '0' mark. For likert scale questions scoring are similar to that of attitude section. The scores for practice was between '1' and '19'.

Data were entered and analysed using IBM SPSS (Statistical Package for the Social Sciences) Version 24.0. Descriptive analysis was carried out to obtain the frequency (n) and percentage (%) for categorical variables. The numerical variables were presented as mean and standard deviation (SD) for normally distributed data or median and interquartile range (IQR) for skewed data. The prevalence was calculated at 95% confidence interval (CI).

RESULTS

Due to limited number of VI children attended the Paediatric Ophthalmology Clinic, Hospital USM and COVID-19 pandemic during the data collection period, a total of 27 VI children along with their caregivers were able to be recruited in this study. Table I shows the socio-demographic profiles of the VI children and their caregivers. The mean (SD) age of the caregivers was 41.7(7.10) years. Majority of the caregivers were mothers (59.3%) and Malay ethnicity (92.6%). Most of the caregivers received secondary level of education (48.1%). The median (IQR) monthly household income was MYR 2000.00 (MYR 3200.00) with majority from the low-income group (70.4%). The results also show that slightly more than half of the parents/caregivers (51.9%) had received oral health education from their dentists or healthcare providers. As for the VI children,

Table I: Socio-demographic profiles of the VI children (n=27) and their caregivers (n=27)

Variables	n (%)
Caregivers	
Father	9 (33.3)
Mother	16 (59.3)
Others (relatives)	2 (7.4)
Age	41.7(7.10) ^a
Race	
Malay	25 (92.6)
Chinese	1 (3.7)
Indian	1 (3.7)
Education level	
Degree/Master/PHD	4 (14.8)
Diploma or equivalent	3 (11.1)
Secondary school	13 (48.1)
Primary school	7 (25.9)
Household income per month (MYR)	2000.00 (3200.00) ^b
High income	2 (7.4)
Middle income	6 (22.2)
Low income	19 (70.4)
Source of oral health education	
None	4 (14.8)
Doctor, nurses, healthcare worker	14 (51.9)
Television, radio	6(22.2)
Newspaper, article	2(7.4)
VI Children	
Sex	
Boy	16 (59.3)
Girl	11(40.7)
Age	11.4(3.05) ^a
Race	
Malay	25 (92.6)
Chinese	1 (3.7)
Indian	1 (3.7)
Vision acuity	
Near normal vision (6/6 – 6/18)	16 (59.3)
Low vision (6/24 – 2/60)	10 (37.0)
Near blindness (1/60 – NLP)	1 (3.7)

^a mean(SD)

^b median(IQR)

most them were boys with the mean age at 11.4(3.05) years. Slightly more than half of them had near normal vision 6/6 – 6/18 (55.3%) and with one of the participants had visual acuity of near blindness of 1/60 - NLP (3.7%).

Oral hygiene and dental caries

As shown in Table II, the mean plaque score of VI children was 1.5(0.54) with a fair (85.2%) oral hygiene status. As for the dental caries, the median DMF/dft among the VI children was 1.0 and 0.0 respectively. Most of the score for DMFT/dft contributed by decay (D/d) component followed by the filled (F/f) component. The caries prevalence was 85.2% (95% CI: 70.86% - 99.51%).

Caregivers oral health knowledge

Majority (96.3%) of the caregivers knew that brushing and rinsing their child’s teeth after every meal is important in order to prevent dental decay. Most of them also knew that their child’s teeth need to be

Table II: Oral Hygiene, dental caries experience and prevalence of VI children (DMFT/dft) (n=27)

Oral hygiene	n (%)	Min - Max
Status		-
Excellent	0(0)	-
Good	1 (3.7)	-
Fair	23 (85.2)	-
Poor	3(11.1)	-
Plaque score	1.5 (0.37) ^a	-
Dental caries experience		
Permanent teeth ^b		
DMFT score ^d	1.0 (4.0) ^e	0 – 24
Sound	456 (86.0)	5 – 28
Caries (D)	40 (7.6)	0 – 22
Missing (M)	7 (1.3)	0 – 3
Filled (F)	27 (5.1)	0 – 4
Deciduous teeth ^c		
dft score ^d	0.0(5.0) ^d	0 – 11
Sound	82 (53.95)	0 – 15
caries (d)	65 (42.76)	0 – 11
filled (f)	5 (3.29)	0 – 4
Caries prevalence (n=27)	85.2 (70.86% - 99.51%) ^e	-
Mixed dentition (n=16)	87.5(69.30% - 100.00%) ^e	-
Permanent dentition (n=11)	81.8(54.64% - 100.00%) ^e	-

^a mean(SD)
^b total permanent teeth 523(100)
^c total deciduous teeth 152(100)
^d Skewed data
^eMedian (IQR).
^fPrevalence at 95% confidence interval (CI)

brushed at least twice daily (88.9%) and that the main reason for taking their children to the dentist was for a routine dental check-up (82.5%). The caregivers knew that fluoride helps in strengthening the enamel layer of the teeth (66.7%) however, slightly more than half (55.6%) of caregivers knew that sugary snacks/drinks are best limited to mealtimes. Besides that, 55.6% of them knew that fruits drinks designed especially for children are not safe for their children teeth and 51.9% knew that most of the liquid medicine contain sugar. Only 14.8% of the caregivers knew that they should start taking care of their child’s oral hygiene right after they were born and most of the caregiver’s (81.5%) didn’t know the correct amount of toothpaste that needed to be applied on the toothbrush. Majority of the caregivers didn’t know that they should take their child for routine dental check-up as early as 0 – 12-month-old (88.9%). Only one caregiver knew that it is much better to consume the entire amount of sweets that their children have at one particular moment rather than consuming it in small amount but at a much regular interval. Caregivers oral health knowledge are summarised in Table III.

Caregivers oral health attitude

Table IV summarised caregivers oral health attitude. Most of the caregiver’s strongly agreed (48.1%) that baby teeth need to be concerned and most of them also agreed that it is worthwhile to fill the carious baby teeth even though those teeth fall out eventually. About 59.3% of the caregiver’s strongly agreed that regular dental visit is very important and 63% of them strongly agreed that brushing their teeth 2 – 3 minutes help keep their gums healthy. The caregiver’s agreed that it is better to get their back or front permanent teeth restored rather than to extract it. Finally, less than half (44.4%) of the caregivers mention that their children needs them to help in brushing their teeth at a very young age even though their children might insist on doing it themselves. However, 29.6% of children brush their own teeth right from a very young age.

Caregivers oral health practice

As shown in Table V, all the caregivers (100%) claimed that their children have started using toothpaste however, only 62.9% stated that their children brush their teeth or have them brush for them twice or more in a day. There were caregivers who claims that their children have only brush their teeth once a week (7.4%) and less than once a week (3.7%).

Majority (88.9%) of them knew that the toothpaste used by their children contain fluoride however, in contrast only a small number of the caregivers (18.5%) knew that the correct amount of toothpaste (pea size) should be applied on the toothbrush. Eighty nine percent of the caregiver’s stated that their children only drink plain water / mineral water or do not take any liquid drinks right before bedtime and the remaining noted that their children do consumed sugary liquid drinks before

Table III: Caregivers Oral health knowledge (n=27)

Items	n(%)
Sugary snacks / drinks are best limited to mealtimes	15(55.6)
Yes	12(44.4)
No	0(0)
Don't know	
If your child had a bag of sweets, would it be better for his/her teeth to eat them	
All in one go	1(3.7)
A few now / rest later	23(85.2)
Do not know	3(11.1)
Fruit drinks designed specially for children are safe to teeth	
Yes	
No	8(29.6)
Do not know	15(55.6)
	4(14.8)
Most medicines are sugar-free	
Yes	14(51.9)
No	3(11.1)
Do not know	10(37.0)
At what age do you think that you should start to take care of your child's oral hygiene	
At birth	4(14.8)
When first teeth come through	17(63.0)
1-2 years	2(7.4)
Over 2 years	3(11.1)
Do not know	1(3.7)
You should brush your child's teeth after each meal to prevent decay	
Yes	26(96.3)
No	1(3.7)
Do not know	0(0.0)
Number of time children's teeth need to be brushed	
Once	2(7.4)
Twice	11(40.8)
Three times	13(48.1)
Never	0(0.0)
Do not know	1(3.7)
The proper amount of toothpaste used for each brushing of a child's teeth	
Blob, the size of a pea	5(18.5)
Brush head length	11(40.8)
Whole brush head length	10(37.0)
Does not matter	0(0.0)
Do not know	1(3.7)
Fluoride strengthens tooth enamel	
True	18(66.7)
False	0(0.0)
Do not know	9(33.3)
At what age should you start taking your child to the dentist	
0-12 months	3(11.1)
13-24 months	8(29.6)
25-36 months	1(3.7)
When at school	9(33.3)
When they have a toothache	2(7.4)
Do not know	4(14.8)
Reason for you to take your child to the dentist	
Because they have a toothache	1(3.7)
For a check up	23(85.2)
To get them used to go	2(7.4)
Do not know	1(3.7)
Others	0(0.0)
Knowledge score	5.5(1.50) ^{a,b}

^a mean(SD)

^b Min – Max, 0 – 11

bedtime. 51.9% of the caregivers answered that their children rarely had something to eat between meals on a daily basis or during the weekends.

DISCUSSION

This study aimed to determine the oral health status of the VI children and their caregivers oral health KAP.

Table IV: Caregivers oral Health Attitude (n=27)

Items	n(%)
There is need to be concerned about baby teeth	
Strongly agree	13(48.1)
Agree	12(44.4)
Not sure	1(3.7)
Disagree	1(3.7)
Strongly disagree	0(0)
It is worthwhile to get cavities in baby teeth filled even though those teeth fall out anyway	
Strongly agree	6(22.2)
Agree	11(40.7)
Not sure	7(25.9)
Disagree	3(11.1)
Strongly disagree	0(0)
Regular visit to the dentist is very important	
Strongly agree	16(59.3)
Agree	10(37)
Not sure	1(3.7)
Disagree	0(0)
Strongly disagree	0(0)
Brushing my teeth twice a day for 2 – 3 minutes will keep the gums healthy	
Strongly agree	17(63.0)
Agree	9(33.3)
Not sure	0(0)
Disagree	1(3.7)
Strongly disagree	0(0)
If your child had a bad back tooth and it was not a baby tooth, but a second tooth, would you rather it was filled or taken out?	
Restoration	17(63.0)
Extraction	5(18.5)
Don't know	5(18.5)
If your child had a bad front tooth and it was not a baby tooth, but a second tooth, would you rather it was filled or taken out?	
Restoration	16(59.3)
Extraction	6(22.2)
Don't know	5(18.5)
Some children insist on brushing their own teeth from a very early age. Does your child?	
Brush his/her own teeth	8(29.6)
Brush their teeth with the help of their parent	12(44.4)
Brushes their own teeth/sometime with their parents help	7(25.9)
Attitude score	23.2(2.95) ^{a,b}

^a Mean (SD)

^b Min – Max = 6 – 28

A total of 27 VI children were being recruited during data collection period due to the global pandemic of COVID-19, whereby Universiti Sains Malaysia has decided that all clinical data collection procedures should not be continued with immediate effect starting from 18 March 2020 onwards for the safety of the population and control of the outbreak. Therefore, this study is considered as a pre-liminary study.

Majority of the VI children were male with the near normal vision to low vision category. These findings are opposite to the findings done in Sudan among a group of VI children whereby half (55.4%) of the participants were blind (25). A study done in Malaysia, stated that the prevalence of low vision and blindness regardless of age group was at 2.44% (95% CI 2.18 to 2.69%) and 0.29% (95% CI 0.19 to 0.39%) respectively (26). This may be due to the fact that in Malaysia, majority of the cases among VI children are caused by retinal disorders (27) which are predominantly genetic factor. On the other hand, in poorer developing countries the principal

Table V: Caregivers oral Health Practice (n=27)

Items	n(%)
How often does your child brush his/her teeth or have them brushed?	
Less than once a week	1(3.7)
At least once a week	2(7.4)
Once a day	7(25.9)
Twice a day	12(44.4)
More than twice a day	5(18.5)
Has your child started using toothpaste?	
Yes	27(100)
No	0(0)
Does the toothpaste your child uses contain fluoride?	
Yes	24(88.9)
No	0(0)
Don't know	3(11.1)
The amount of toothpaste that your child usually uses during tooth brushing	
Pea size	5(18.5)
Half of the toothbrush head	15(55.6)
Entire toothbrush head	7(25.9)
Not important	0(0)
Don't know	0(0)
What drink do you usually give to your child before bed or during the night?	24(88.9)
Plain water or nothing	3(11.1)
Sugary drinks or don't know	
How often does your child have sugary food between main meals (breakfast, lunch and dinner) in a day?	2(7.4)
Most of the time	8(29.6)
Several time in a day	3(11.1)
Once a day	14(51.9)
Rarely	0(0)
Never	0(0)
Don't know	
How often does your child have sugary food between main meals (breakfast, lunch and dinner) during the weekend?	1(3.7)
Most of the time	9(33.3)
Several time in a day	3(11.1)
Once a day	14(51.9)
Rarely	0(0)
Never	0(0)
Don't know	
Practice score	12.8(2.15) ^{a,b}

^a Mean(SD)

^b Min – Max = 1 - 19

cause of blindness was found to be the presence of congenital cataracts, vitamin A deficiency, measles and rubella (28). A study has also mention that poorer income country has a higher percentage of untreated cataract cases that eventually leading towards higher number of blindness (29).

Most of the primary caregivers were mothers (66.7%) at the mean age of 41.7 years old which was comparable with a study done in Kelantan whereby 90.2% (30) and 89.1% (31) of the caregivers were also mothers. Therefore, a significant contribution of mothers in oral health care of their child should not be overlooked (32). Most of them were Malays (92.6%) reflecting the majority of Malays in Kelantan (33). The mean household income of the primary caregivers was MYR3967 at the ranged of MYR400 per month to MYR25000 per month. Most of them has a monthly household income of less than MYR4360 that fall under, B40 category (33) whereby 22.2% of the participants earned a household income of MYR1000 or below. These indicated that the VI children were in the category of the low socio-economic status.

Most of the caregiver's received the oral health education mainly from doctor's/nurses/healthcare personnel. Study in Japan noted that students who obtained oral health information from the dentist shows better oral health behaviour (34).

The high percentage of fair oral hygiene cases in our study may be due to the fact that majority of the VI children were having near normal vision (59.3%). Solanki et al., 2014, stated that blind children have a huge impact on motor and dexterity skills. Poor oral hygiene status was observed in other study (35) that were reported due to level of visual acuity (majority are blind), besides other factor such as inadequate supervision of caregivers, short attention span and limited motor skills which could cause difficulties in tooth brushing.

High caries prevalence was noted among the VI children at 85.2%. Although the caries prevalence was high, it is still slightly lower than the prevalence of caries noted in the study done by Shetty et al., 2010 among a group of blind children at 98.5%. Besides that, their study also noted a much higher mean dft and DMFT score at 7.26 and 4.87 respectively (12) as compared to our current study. This may be due to the decreased manual dexterity among blind children as mentioned in the study. This finding clearly suggest that the level of visual acuity also plays a major role in reflecting the outcome of oral health status.

In the present study, the 'd' and 'D' components accounted for a high proportion of the mean dft and DMFT at 42.8% and 7.6% respectively. The high caries component could be contributed due to the consumption of sugary food in between their main meals (breakfast, lunch and dinner) including the weekends as reported by their caregivers. Moderate level of understanding in relation to oral health knowledge among caregivers may also be one of the contributing factors.

Despite the consumption of sugary food or drinks between the meals, slightly more than half (55.6%) of the caregivers knew that sugary food and drinks should be limited to mealtimes only. Although this finding can be assumed as a positive outcome that caregivers understand the role of sugar exposure in their child's diet towards oral diseases, however, a study done elsewhere, showed a much more convincing result as 78% knew that sugary foods and drinks should be limited to mealtimes (36). In addition, 85.2% of the caregivers said that sweets or snacks are better given to their children little by little instead of at one particular moment which contradicts the answer given on sugary food and drinks should be limited to mealtimes. This clearly suggests that majority of the caregivers do not know or understand the purpose of limiting sugar exposure towards their VI children in prevention of dental caries and periodontal diseases. Studies have reported that the length of teeth exposed

to sugar aggravate the progression of dental caries (37).

Slightly more than half (55.6%) of the caregivers knew that fruit flavoured drinks is not healthy for children. Study done by Correia et al., 2017 in London noted that 65.2% of the respondents were aware that fruit juice has the potential to cause dental caries (38). This may indicate that a significant number of caregivers of VI children (44.4%) in this study believed that fruit flavoured drinks are healthy, when in reality, is cariogenic due to the presence of fermentable carbohydrates. Each time sugar is consumed, cariogenic bacteria eg. *Streptococcus mutans* produces acid which indirectly reduces the pH of the plaque. Fall in pH below the critical level of pH 5.5 will initiated the demineralization process on the tooth enamel (39).

Finding from our study also revealed that only 14.8% of the caregivers knew that they should start taking care of their children oral hygiene at birth even before the teeth erupt compared to Mani et al., 2012 who showed 81.4% parents aware that it should be started before the teeth have erupted into the oral cavity (30). This may be the reason that can be related to the high decay 'd' component in the deciduous teeth whereby caregivers are not been informed regarding the necessary measure to be taken for their children oral care as well as the proper technique that is required. It was very encouraging to note in this study that almost all caregiver (96.3%) were very well aware of the fact that that their child's teeth must be brushed after each meal to prevent dental caries and 88.9% of the caregiver's reported that children need to brush their teeth twice or more daily. The mean knowledge score of the caregivers was only 5.5 out of 11.

Basically, in Malaysia, the government has undertaken various measures towards promoting oral health such as through the school dental services (started from 1950), oral health care for antenatal mothers' program (since 1970s) and other health promotion activities/carnival intended to cater for all age groups. Individuals in this study should have at least been to one health promotion program considering that the lowest education level of the caregivers was primary school. Oral health information can be easily obtained through various sources such as during routine dental check-up by the dentist, joining health promotion programs, internet, reading materials and even as easy as taking the time to read the label of the toothpaste or any dental aids. The key is to create awareness among the caregivers regarding the importance of oral health care.

In this study, the mean score of the caregiver's attitude towards oral health is above average at 23.2 out of 28. This is significantly better when compared to the study done by Shah et. al 2017 with lesser percentage of good attitude (48.3%) despite the same study noted that the caregivers oral health knowledge score shows a more

satisfactory outcome (40). Sometimes, a person good oral health knowledge may not necessarily translate to good oral health attitudes or practice and vice versa. Amin and Harrison, 2009 stated that cultural and believe have been mentioned in the literature contributed to the greatest barrier towards improvement in attitudes and oral health practices among the public (41).

Perception towards the significance of taking care of primary teeth vary among parents. Most (82.5%) of the VI children caregiver's in this study agreed (strongly agreed= 48.1%, agreed= 44.4%) that there is need to be concerned about baby teeth baby teeth which was in agreement with findings reported by Al-Zahrani et al., 2014 (17). However, there are several studies that stated the less favourable perception among mothers in where 53.3% and 43.6% respectively agreed that primary teeth are not significant and more care should be taken to the permanent teeth instead (42). It is very important for caregivers to value the function of deciduous dentition as for mastication, phonation and the development of jaws and muscles of the face as well as aesthetic of their child (43) and maintains the space for the permanent tooth that would prevent crowding (44).

In relation to the frequency and duration time of tooth brushing, 96.3% of the caregiver's in this study agreed that brushing their teeth twice a day for 2 – 3 minutes will keep the gums healthy which was in accordance to the professional recommendation (45). In this current study, 44.4% of the caregiver's helped in brushing their children's teeth in the early age and 25.9% of the caregivers mentioned that their children occasionally do it by themselves but sometimes with the help of their caregivers. The findings are comparable to the finding in the study done by Mani et al., 2010 in Kelantan whereby 59% of the parents agreed that cleaning their child's teeth need to be done by their mother (46).

According to American Academy of Paediatrics (AAPD), toothbrushing should be helped by parents involving dispensing correct amount of toothpaste and assisting in toothbrushing procedure (47). Once children reached the age of 6 years old and have gained good manual dexterity, they will then be allowed to brush their teeth on their own. However, we need to understand that children with more severe VI or blindness might require assistant in relation to oral hygiene care for a much longer period of time until they have gain full and acceptable skills to do it by themselves.

There are certain practice in a community that exist for a period of time that subsequently may even override the information that have been obtained from brochures, books, advertisement on other source of health information. A study done in India noted that all the VI children that participated in the study practises brushing once daily and mentioned that it is custom in India that most people only brushed their teeth in the morning,

therefore their practice is often followed by their children (48). Therefore, it is crucial to advise the VI children and their caregivers regarding the importance of brushing their teeth before going to bed as well as avoiding any sugary food or drinks after brushing their teeth at night.

On the bright side, finding from this study noted that all of the VI children have been using toothpaste. This was not the case in study done by Al-Sinaidi, 2013 whereby majority (88.5%) of the study sample did not use toothpaste (49). The average score for oral health practice suggested that it is above average. On the other hand, it is worth mentioning that there is certain practice that are not reflecting the true score among the caregivers such as most of the caregivers do not know the correct amount of toothpaste that should be used for children. The CDC recommended for children aged less than 3 years should use a smear the size of a rice grain, and children aged more than 3 years should use no more than a pea-sized amount (0.25 g). Used of toothpaste more than the recommended amount especially during the early years of child's development would lead to possibility of ingestion (excessive exposure to fluoride) and wastage among children. Sugary food intakes in between meals among VI children in our study has also indicated average awareness among caregivers' practice towards oral health. However, in this millennium it is difficult for parents to control their children from sugary foods/drinks due to free access obtained from their close family members, friends and even buying on their own pocket money (50).

In Malaysia, access to very low cost of government health care facilities including oral health care services has also play a major role in allowing caregivers to bring their child for routine dental check-up. However, disparities in health services have always been a major issue around the world especially among the disadvantage group of population.

This is a preliminary, cross sectional study. Although the results are limited by its small size, the results from this study has provide a based line data on the oral health status of the VI children as well as the oral health knowledge, attitude, and practice of their primary caregivers. Further research in a larger number of caregivers of VI children at different visual acuity level including the blind children is recommended. With a bigger sample size, the significant correlation between oral health status of VI children and their caregiver oral health knowledge, attitude and practice would reflect the crucial role on primary caregiver in oral health care of their children towards the improvement of the VI children oral health status.

CONCLUSION

The oral hygiene status was fair with high prevalence of dental caries. Based on the score, although the

caregivers showed to have minimal understanding on children's oral health, their attitude and practice towards children's oral health are relatively high.

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