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Is the burden of dental caries higher in a private kindergarten compared to the national prevalence?

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Abstract

Background and Aim: Currently, the dental caries prevalence and experience among Malaysian preschoolers remains high. This study aimed to investigate the caries prevalence, experience and oral hygiene status among children attending a private kindergarten and to compare the findings with the general population. Additionally, the oral health knowledge, attitude and behaviour were assessed. **Methods**: This pilot study was conducted involving 100 preschool children aged 4-6 years in a private kindergarten. Caries parameters and plaque scores were assessed through oral examinations, while a questionnaire evaluated oral health knowledge, attitude and behaviour. **Results**: Overall, 87% children participated and the prevalence of dental caries was 56.3%. The mean of decayed, missing, filled teeth and dmft were 2.14, 0.22, 0.07 and 2.43. The mean plaque score was 20.5% (overall) and 16.5% (anterior). The overall oral hygiene status was: 50.6% (excellent), 21.8% (good), 3.4% (fair) and 24.1% (poor). Majority had knowledge regarding dental caries (77.5%). However, less than 37.5% knew the adverse effects of dental plaque and fizzy drinks on the teeth. More than half (52.5%) had regular dental visits, 82.5% brushed their teeth frequently and had good diet behavior. **Conclusion**: This study highlighted a positive trend in oral health among children in a private preschool, despite the lack of attention from government-funded oral health programmes. While the overall caries prevalence is lower than national average, it is important to note instances of elevated caries levels among some individuals. Nevertheless, further oral health programmes are essential, with particular emphasis on private kindergarten settings.

Keywords: *Dental caries, plaque score, preschool children, private kindergarten*

Introduction

A new definition of oral health was approved by the FDI World Dental Federation General Assembly in 2016. The optimum oral health is defined as multifaceted which includes the ability of a person to perform their daily activities with confidence and without pain, discomfort, and disease of the craniofacial complex. These include the ability to speak, smile, smell, taste, touch, chew, swallow, and convey a range of emotions through facial expressions.

Even though most of the oral or dental diseases are not life-threatening, the consequences of poor oral health often can be severe enough to affect the quality of life (World Health Organisation, 2023). More importantly, almost everyone is affected once by any oral condition or pathology at some time in their lives.

Dental caries ranks among the most prevalent chronic diseases affecting young children worldwide. Whilst epidemiological studies in the first half of the 20th century reported a significant decline in caries prevalence in highly industrialized nations, the problem persists among preschool children in both developed and developing countries today. The latest national oral health survey of preschool children in Malaysia revealed a persistently high caries prevalence, with 71.3% of 5-year-old children affected (NOHPS 2005, 2015).

Over the years, several preventive programmes have been implemented by the Ministry of Health (MOH), Malaysia to reduce the dental caries prevalence in children. Karim et al. (2020) stated that implementation of water fluoridation in Malaysia was one of the initiatives which started in 1969 after the success of a caries prevention programme with water fluoridation in Johor. Furthermore, a study by Razak et al. (2010) reported that tooth brushing demonstration intervention increased the frequency of tooth brushing among preschool children in Kuala Lumpur. Another study by Ismail et al. (2013) reported that a storybook intervention improved preschool children's knowledge of oral health and tooth brushing effectiveness in Selangor.

Most of the above-mentioned intervention programmes predominantly targeted government-funded preschools, inadvertently overlooking the oral health needs of children attending private preschools. To address this disparity, this study aimed to investigate the caries prevalence, experience and oral hygiene status in a private preschool and to compare the findings with the general population. Additionally, the knowledge, behaviour, and attitudes related to oral health among children enrolled in a private preschool were also assessed.

Methodology

This is a pilot study using a convenient sampling method. The target population of this study consists of preschool children from Little Caliphs Kindergarten in Bandar Saujana Putra (BSP). BSP is a rapidly developing township in Kuala Langat District in Selangor comprising mainly of the middle-income group. The children were between 4 to 6 years of age. A total number of 100 students were enrolled, however 87 students (87%) participated during the study period. Ethical approval was obtained from the Research Management Committee, MAHSA University prior to the study (RMC/OCT/2023/EC05). Only children whose parents provided written consent were included in the study.

Data collection was divided into 2 parts: First the clinical examination of visual plaque score and dmft value were done by a team of trained dentists using disposable mouth mirrors and suitable light sources. The plaque score was assessed by employing the Visual Plaque Index (VPI) proposed by Ainamo and Bay (1975), a dichotomous index relying solely on visual

inspection with the naked eye. In addition, the O'Leary plaque index was used to categorise the plaque scores. Data were analysed using the Statistical Package for Social Sciences (SPSS) Version 22 software (SPSS Inc., Chicago, IL, USA). Descriptive statistics (mean and standard deviation, frequency and percentage) were used to describe the socio-demographic data of the participants and the clinical data.

The second part consists of the questionnaire which were adapted from Petersen et al. (2000) and Stenberg et al. (2000). The questionnaire was then simplified and translated to Malay language for ease of understanding and validated by two dental public health specialists and pretested. The questionnaire was self-administered and guided by the teachers. It comprised of 5 sections as stated below:

Section 1 (Socio-demographic background): name, age and gender of respondents was collected. For Section 2 (Knowledge), a total of 8 questions to assess the respondents' oral health knowledge which consists of the effects of brushing and using fluoride on teeth, the definition of dental plaque and its effects, the effect of sweets, sticky and carbonated drinks on teeth. In Section 3 (Attitude), 2 questions were asked to assess the respondents' attitude towards oral health which consists of regularity of dental visits. Followed by Section 4 (Practice), a total of 4 questions were used to assess the respondents' oral hygiene habits on toothbrushing in terms of frequency, duration, timing and practice of oral hygiene. Lastly, in the Section 5 (Habit) which was composed of 3 questions to assess the respondents' dietary habits on sweet, sticky foods, and carbonated drinks.

RESULTS

In this study, a local private preschool was targeted, with a total enrollment of 100 students. The response rate for part 1 clinical examination was 87%, (87 out of the 100 students). Out of these participants, all were of Malay ethnicity, comprising 52.9% males and 47.1% females. The age distribution for 4, 5 and 6-year-olds were 16.1%, 39.1% and 44.8% respectively. In Table 1, the prevalence of dental caries among the children in our study was found to be 56.3%. The mean values for decayed (d), missing (m), and filled (f) teeth were 2.14, 0.22 and 0.07 respectively. Additionally, the sum of decayed, missing, and filled teeth (dmft) yielded a mean value of 2.43. Further analysis of treatment needs based on the dmft value revealed that 58.6% of the children were required to seek for dental treatment immediately.

Table 1: Caries status, experience (dmft) and treatment need in 4- to 6-year-old preschool children

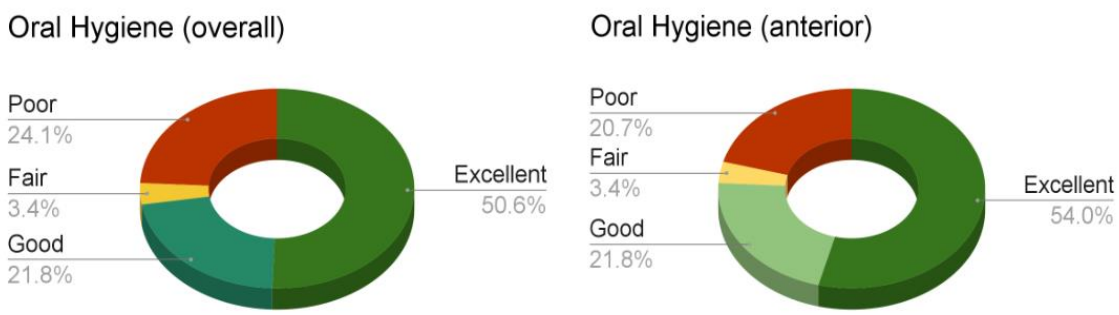
Caries status	Caries prevalence (dmft>0)		Caries free (dmft=0)	
	49 (56.3%)		38 (43.7%)	
d, m, f, dmft value	Mean	SD	CI: lower	CI: upper
d	2.14	2.97	1.51	2.77
m	0.22	0.75	0.06	0.38
f	0.07	0.33	0.00	0.14
dmft	2.43	3.11	1.76	3.09
Treatment need	n		Percentage %	
No treatment required	36		41.4	
Treatment required	51		58.6	

The distribution of plaque score values among the participants for overall dentition (comprising a total of 20 teeth) was 16.4 and anterior dentition (comprising a total of 12 teeth) was 7.9 shown in Table 2. Further interpretation was done for their oral hygiene levels into 4 categories as shown in Figure 1.

Table 2: Plaque score in 4- to 6-year-old preschool children

Plaque score	Mean	SD	Confidence Interval 95% (CI)	
	n (%)	n (%)	Lower n (%)	Upper n (%)
Overall (20 teeth)	16.44 (20.5)	17.56 (21.95)	12.69 (15.87)	20.2 (25.22)
Anterior (12 teeth)	7.93 (16.52)	10.05 (20.93)	5.79 (12.06)	10.07 (20.98)

Figure 1: Oral Hygiene level in 4- to 6-year-old preschool children



Further analysis, investigating the association between gender and age with plaque score and treatment need, revealed no significant associations were observed, as indicated by p-values exceeding 0.05. Additionally, a small positive correlation was identified between age and both plaque score and dmft value.

For the questionnaire, the response rate for the questionnaire was 40% (40 out of 100), with responses solely obtained from 6-year-old participants due to their comprehension and ability to provide answers.

Table 3: Knowledge score of oral health

Knowledge	Correct		Wrong	
	n	%	n	%
Q1:Fluoride strengthens the teeth	33	82.5	7	17.5
Q2:Consuming sweet food causes dental caries	31	77.5	9	22.5
Q3:Dental plaque can lead to dental caries	15	37.5	25	62.5
Q4:Dental plaque sticks on the tooth surface	36	90	4	10
Q5:Dental plaque consists of food debris & bacteria in mouth	40	100	0	0
Q6:Dental caries causes tooth decay	40	100	0	0
Q7:Sugar is the cause of dental caries	39	97.5	1	2.5
Q8:Fizzy drinks affect the teeth adversely	21	52.5	19	47.5

Based on Table 3, the top two questions that were correctly answered were questions number 5 and 6 in which all the respondents (100%) knew that dental plaque consists of food debris and bacteria in the mouth and dental caries cause tooth decay. Whereas the top question that was wrongly answered was question 3 in which more than half of the total respondents (62.5%) did not know that dental plaque can lead to dental caries. Approximately more than half of the respondents answered question 8 correctly in which 52.5% knew that fizzy drinks affect the teeth adversely. Based on the data presented in the knowledge score of oral health, there were only 3 questions on sweet food, dental plaque and fizzy drinks (Questions 2, 3 and 8) which were scored below 80%. This showed that the respondents had good understanding and knowledge towards oral health. Almost all the respondents (97.5%) understood that sugar can lead to dental caries (Question 7). The preschool should strengthen the children's knowledge towards dental plaque since it showed that most respondents had answered question 3 about dental plaque incorrectly

Table 4: Attitude towards oral health

Attitude	Respondent (n)	Percentage (%)
Q1. Frequency of dental visits		
Once every 6-12 months	21	52.5
Infrequent (when pain, never, not sure)	19	47.5
Q2. History of last dental visit		
Within the last 12 months	17	42.5
More than 1 years ago	23	57.5

Table 4 presented the attitude towards oral health. For the frequency of dental visits, it is worth noting that more than half of the respondents (52.5%) had regular dental visits every 6-12 months. Regarding the history of last dental visit, less than half of the respondents (42.5%) visited their dentist within the last 12 months and 57.5% visited the dentist more than 1 year.

Table 5: Practice towards oral health

Practice	Respondent (n)	Percentage (%)
Q1. Frequency of tooth brushing		
Less than twice per day	22	55
More than twice per day	15	37.5
Not sure	3	7.5
Q2. Time spent toothbrushing		
Less than 2 minute	15	37.5
2 minutes or more	23	57.5
Not measured	2	5
Q3. Items used for toothbrushing		
Toothbrush and toothpaste	35	87.5
Mouthwash	2	5
Not sure	3	7.5
Q4. Time of day when brushing teeth		
Morning	34	85
Before sleeping	6	15

Table 5 presents the data on the practices of these children in maintaining their oral health. A huge majority of the children (90%) were actively brushing their teeth at least once per day and nearly half (45%) were correctly brushing their teeth twice per day. More than one-third (37.5%) brushed more than twice per day. Only a minority of the children (17.5%) brushed their teeth with the correct amount of time, which is 2 minutes. The toothbrush and toothpaste remained to be the most preferred and used tool for brushing as almost the entirety of the children attested to using toothbrush and toothpaste (87.5%). Most of the children (72.5%) brushed their teeth in the morning and only one child had mentioned brushing teeth twice per day, morning and night.

Table 6: Behavior towards oral health

Behavior	Respondents (n)	Percentage (%)
Q1. Frequency of eating sweet food per day		
Less than once per day	22	55
1-4 times per day	4	10
4-6 times per day	7	17.5
More than 6 times per day	5	12.5
Not answered	2	5
Q2. Frequency of taking candy/ chocolates/ sweets		
Rarely	10	25
Once per week	11	27.5
Twice per week	13	32.5
3-5 times per week	3	7.5
Not answered	3	7.5
Q3. Frequency of taking soft drinks		
Rarely	23	57.5
Once per week	11	27.5
Twice per week	1	2.5
3-5 times per week	3	7.5
Not answered	2	5

From Table 6, we can deduce that generally, the children in this kindergarten have positive dietary habits. The majority of these children take a very small amount of sweet food per day as presented in Table 6. As for the frequency of consuming sweet food per day, more than half of the children had reported to be taking none per day (55%) and 1-4 times per day (10%). The children have also reported that more than half rarely consume sweets (25%) or only take them once per week (27.5%). The majority of these children (57.5%) had also exhibited

behaviours in which they rarely take soft drinks in their diet. In terms of frequency of sweet snacking, more than half of the children (55%) had reported that the frequency where they take sweet food is less than once per day. Whereas a small proportion of the children (12.5%) reported to be eating sweet food more than 6 times per day.

DISCUSSION

The present pilot study was carried out using convenient sampling on a sample of preschool children from a middle-class township in Selangor. For the clinical examination 87 (87%) children were examined and the rest were absent during the study period. All were Malays comprising 52.9% males and 47.1% females. In the last National Survey of preschool children, Malays also accounted for 69.2% of the total sample (Oral Health Division, MOH, 2017). Most children were aged between 5 to 6 years. Future studies should include all ethnic groups and a larger sample of private kindergartens. For comparison, our study used the national survey on 5-year-old preschool

children which is conducted every 10 years (NOHPS, 2007, 2017).

In terms of the prevalence of dental caries among the children, it was found to be 56.3%, which was lower than the national average of 71.3%. The mean values for d, m, and f were found to be 2.14, 0.22 and 0.07 respectively. Additionally, the dmft yielded a mean value of 2.43 which was also lower than the national average (Oral Health Division, MOH, 2017) of 4.83. Further analysis of treatment needs based on the dmft value revealed that 58.6% of the children in this study were required to seek for dental treatment immediately. However, almost two-thirds (65.0%) of the 5-year-

olds required treatment for dental caries in the national sample (NOHPS, 2017). Comparatively, a much lower prevalence (23.7%) of 5-year-old children in England had experience of obvious dentinal decay in their last national survey (NDEP 2022). Similarly, the prevalence of caries among 5-year-olds in Hong Kong (51%), was slightly lower (Dental Service Head Office, Department of Health, 2012). A current study in Hong Kong among 5-year-olds reported a similar prevalence of 55% (Duangthip et. al 2019).

In terms of oral hygiene or oral cleanliness, our findings revealed a generally positive trend, with most children exhibiting low mean plaque scores indicative of satisfactory oral hygiene practices. Specifically, a significant proportion of children demonstrated excellent oral hygiene (anterior teeth, 54.0%), reflecting a commendable level of adherence to oral hygiene routines. However, a substantial minority of children exhibited poor oral hygiene, representing approximately one-fifth (anterior teeth, 20.7%) of the study population. This spike in poor oral hygiene among a subset of participants highlights the presence of a vulnerable subgroup with distinct oral health needs. In comparison, 40.1% of the preschool children in the national survey had good oral hygiene (‘no visible plaque’), 52.7% had ‘little plaque’ while only 7.2% had ‘substantial plaque’ in their anterior teeth. Although the indices for oral hygiene were not similar, the plaque were detected by visual examination for both studies. Findings from the England and Hong Kong surveys showed a much lower level of cleanliness (NDEP 2022; Dental Service Head Office, Department of Health, 2012). Similar plaque score index that is the Visual Plaque Index (VPI) was used for all these studies (Ainamo & Bay, 1975).

In this study, no significant associations were observed between gender and age with plaque score and treatment need ($p<0.05$). However, a small positive correlation was identified between age and both plaque score and dmft

value. These findings suggest that there appears to be a subtle relationship between age and oral health parameters, with older children exhibiting slightly higher plaque scores and dmft values. However, the findings from the national survey showed lower prevalence of good oral hygiene and higher prevalence of 'substantial plaque' among males as compared to females (NOHPS 2015).

Moving on to the questionnaire survey, with regards to the attitude towards oral health, the students understood that they needed to visit the dentist within a 6-12 months' interval. However, more than half of the preschool children's last dental visit was more than 1-2 years. The discrepancy showed that their understanding and actions were different. Despite understanding the recommendation to visit the dentist every 6-12 months, the participants' actions, as reflected in their dental visit history, revealed that many had their last dental check-up 1-2 years ago. This discrepancy highlights a gap between knowledge and practice among the preschool children and their caregivers. Regular dental visits for children should be at every 6 months of duration for early detection and early lesions can be quickly restored without much discomfort (MYHEALTH MOH Malaysia, 2024; NICE, 2004).

The questionnaire also revealed that most of the preschool children understood that toothbrushing needs to be done twice daily. However, this discrepancy could be due to the question not providing the best answers in the multiple choice. Notably, 40% of the children spent more than 2 minutes on brushing their teeth, which is commendable if brushing is done effectively. Increasing brushing time to 2 minutes increase plaque removal providing significant oral health benefits (Creeth et al., 2009). Although there are no specific studies addressing why children prefer brushing their teeth during the daytime, it is plausible that cultural influences, such as the widely known kindergarten song *'Bangun Pagi Gosok Gigi*,' may play a role in shaping this behavior by reinforcing the importance of morning oral hygiene routines. However, more than six (66%) out of 10 children in Hong Kong brushed their teeth at least twice daily (Duangthip et al., 2019).

Overall, the snacking pattern of these preschool children showed that most of the children rarely consume sweets. Soft drinks that are stereotypically to be favorites of preschool children seems to be deeply unpopular among this sample size as most (57.5%) reported that they rarely drink any form of soft drinks within one week in their diet.

This study had several limitations. First, it may be limited by its sample size, as the number of participants and single ethnicity included may not be representative of the entire population of the private preschool children. Furthermore, the small sample for the questionnaire may affect the findings and future studies should include parents as proxy for the questionnaire. Second, inter-reliability and intra-reliability tests were not performed prior to the clinical examination for plaque score and dmft index. However, standardisation of the criteria for the indices was discussed in detail with all the examiners for the specific indices. Nevertheless, this pilot study can be a baseline for future larger studies addressing these limitations.

CONCLUSION AND RECOMMENDATIONS

In conclusion, the findings of this study presented a positive trend among preschool children towards oral health in comparison to the national average despite the lack of attention from government-funded oral health programmes. This study also highlighted the satisfactory oral hygiene status, knowledge,

diet behaviour and attitude. While the caries prevalence observed in this study was notably lower than the national average as reported in NOHPS 2015, it's important to note instances of elevated caries levels detected among some individuals. Nevertheless, further oral health programmes are essential, with a particular emphasis on private kindergarten settings.

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