



Association between Oral Health Behavior and Caries Status of Primary Teeth among Early Primary School Children in Phra Nakhon and Dusit District, Bangkok, Thailand

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Abstract

Oral health is an important part of the overall health of children. Globally, dental caries is the most common oral health problem among school children and is a costly diet- and behavior-related disease. The aim of this study is to identify the association between oral health behavior and the caries status of primary teeth among early primary school children in Bangkok, Thailand. The study utilized secondary data from dental chart records in the School Oral Health Promotion Program, Department of Community Dentistry, Mahidol University. The data were analyzed by multivariable logistic regression. One hundred and ninety-one early primary school children participated in the study. The mean age of the participants was 7.51 years (SD = 1.22). The prevalence of dental caries in primary teeth was 75.9%. Logistic regression analysis revealed that both sweet foods and beverages consumption and fluoride toothpaste use were significantly associated with the dmft level in two models, with the adjusted odds ratio of 3.076 (95% CI = 1.661-5.696) and 0.468 (95% CI = 0.218-1.005), respectively. Thus, dental caries remains a major oral health problem in school children. Understanding these oral health issues and the associated factors can be helpful in designing appropriate interventions and policies for oral health promotion in schools to reduce oral health problems.

Keywords: *Oral Health Behavior, Oral Health Status, Caries Status, Dental Caries, Primary Teeth, Primary School Children*

1. Introduction

Oral health significantly contributes to both health and quality of life, as oral health problems can impact many functions such as eating, swallowing, breathing, speaking, and the ability to socialize (World Health Organization, 2023). According to the Global Burden of Disease Study 2019 (2020), untreated dental caries in permanent teeth is the most common oral health condition and the prevalence of dental caries is increasing, as shown by similar findings on primary teeth. Dental caries is a costly diet- and behavior-related disease (U.S. Department of Health and Human Services, 2000). Globally, the increase in dental caries prevalence affects children as well as adults, especially school children (Bagramian, Garcia-Godoy, & Volpe, 2009).

According to a report from the Centers for Disease Control and Prevention (2019), the prevalence of dental caries in primary teeth was 23% among children aged 2 to 5 years and 52% among children aged 6 to 8 years in the United States. In Thailand, dental caries is the most common oral health problem among



school children. The report of the 8th National Oral Health Survey 2017 (2018) found that the prevalence of dental caries was 75.6% for 5- to 6-year-old children and 52.0% among 12-year-old children.

School is an ideal and important setting for oral health promotion, where a supportive environment and oral health services can be provided to children who have a high risk of dental problems (World Health Organization, 2003). Oral health promotion in schools is therefore strongly recommended by the World Health Organization to improve the health of the students, school personnel, families, and other members of the community (Jürgensen & Petersen, 2013; Petersen, 2003).

The Department of Community Dentistry, Mahidol University has a role in promoting oral health in schools through the cultivation of dental students by enabling them to practice and serve the community in controlling oral diseases and promoting oral health in the course “School Oral Health Promotion Program.” Fifth-year dental students are divided among four primary schools to survey the oral health as well as identify problems and related factors concerning the oral health status of school children and provide a school-based prevention program, which includes preventive treatments, interventions, and health promotion activities.

Most previous studies have focused on the relationship between oral health behavior and oral health status in adults. In Thailand, the studies on school children, particularly in an academic setting are limited. The aim of this study is to identify the association between the oral health behavior and caries status of primary teeth among early primary school children in Bangkok, Thailand within the academic setting of Mahidol University.

2. Objectives

- 1) To investigate the prevalence of caries status in primary teeth among early primary school children in Bangkok, Thailand.
- 2) To identify the associations among socio-demographic characteristics, oral health behavior, and the caries status of primary teeth.

3. Materials and Methods

3.1 Participants

This study included the total population of early primary school children in Grades 1 to 3 who participated in the School Oral Health Promotion Program in four public primary schools in Bangkok, Thailand during the academic year 2023.

A secondary data review of 258 dental chart records was conducted, and 67 were excluded due to incomplete or missing data. The remaining records were then analyzed.

3.2 Measurement tools

This study used secondary data from the dental chart records of the “School Oral Health Promotion Program” during the academic year 2023, Department of Community Dentistry, Mahidol University, Thailand, and modified some parts of these dental chart records by using ID numbers instead of names and a checklist for oral health behavior.

The body mass index (BMI) is a person’s weight in kilograms divided by the square of their height in meters. For children, the interpretation of BMI depends on age and sex based on CDC growth charts. BMI is classified as ‘underweight,’ ‘healthy weight,’ ‘overweight’ and ‘obesity’ (Centers for Disease Control and Prevention, 2022).

Dental caries was detected using a mouth mirror and explorer to examine tooth surfaces for visible caries. The decayed, missing, and filled teeth were recorded in dental charts, and calculation of the total number of these in dmft for primary teeth was done.



Regarding oral health behavior, each child was interviewed using a face-to-face questionnaire for caries risk assessment (Oral Health Services Research Centre, 2009). The history of sweet foods and beverages consumption, tooth brushing, and fluoride toothpaste use was recorded.

3.3 Data collection

The data were collected by the fifth-year dental students who received similar professional training. The dental students collected the primary data by the same criteria through oral examinations and recorded their findings in dental charts. Each school child had their history taken, underwent examination for dental caries, and was interviewed about their oral health behavior.

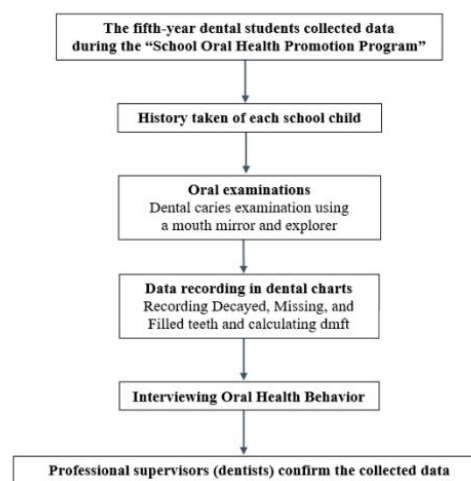


Figure 1 Flow chart of data collection

3.4 Data analysis

Descriptive statistics were performed to analyze the data. Categorical variables of socio-demographic characteristics (age, gender, education level, underlying disease, and body mass index), oral health behavior (sweet foods and beverages consumption, tooth brushing, fluoride toothpaste use), and caries status of primary teeth were presented as frequency and percentage. The continuous variables of the caries scores (dmft) were presented as means and standard deviations.

Binary logistic regression was used to identify factors that predict caries status of primary teeth. All variables were significant at p -value < 0.05 , and variables having p -value < 0.2 were considered for inclusion in multivariable logistic regression, which was used to identify the factors that predict the caries status of primary teeth with the control of each independent variable. The statistical package SPSS software version 29 (IBM, Armonk, USA) was used to analyze the data.

4. Results and Discussion

4.1 Results

The participants comprised 191 early primary school children. Socio-demographic characteristics and distribution of oral health behavior and caries status of primary teeth are shown in Table 1. Most of the children were females (55.5%). The ages of the children classified by dental age included 6–7 years old, defined as primary dentition (53.4%), and 8–11 years old considered as mixed dentition (46.6%). Education levels ranged from Grades 1 to 3. The majority were in Grade 1 (51.8%).



Health conditions are shown in Table 1. Most of the children did not present underlying diseases, as only 9.9% presented underlying diseases such as asthma, allergy, G6PD, and impaired hearing. The body mass index (BMI) of the children was classified using CDC growth charts. The results showed that most children were of healthy weight (54.5%). About 61.3% had more than two times per day of sweet foods and beverages consumption, and 90.1% brushed their teeth at least two times per day and 80.1% used fluoride toothpaste. For the dmft index in primary teeth, more than half of the children had high caries status. The prevalence of caries in primary teeth was 75.9%, and mean dmft was 4.34 (Table 1).

Table 1 Socio-demographic characteristics and distribution of oral health behavior and caries status of primary teeth (n = 191)

Characteristics	Number (n)	Percent (%)
Age (years)		
6–7 (primary dentition)	102	53.4
8–11 (mixed dentition)	89	46.6
Gender		
Male	85	44.5
Female	106	55.5
Education level		
Grade 1	99	51.8
Grade 2	46	24.1
Grade 3	46	24.1
Underlying disease		
Not present	172	90.1
Present	19	9.9
Body mass index (BMI)		
Underweight	53	27.7
Healthy weight	104	54.5
Overweight	11	5.8
Obesity	23	12.0
Sweet foods and beverages consumption		
More than 2 times per day	117	61.3
At most 2 times per day	74	38.7
Tooth brushing		
At least 2 times per day	172	90.1
Less than 2 times per day	19	9.9
Fluoride toothpaste use (at least 1000 ppm)		
Yes	153	80.1
No	38	19.9
Caries status of primary teeth		
Low (dmft = 0)	65	34.0
Moderate (dmft = 1.0–4.0)	29	15.2
High (dmft > 4.0)	97	50.8
Caries prevalence (dmft)	145	75.9
Mean dmft ± SD		4.34 ± 3.970

Table 2 shows the results from binary logistic regression to identify factors that are related to the caries status of primary teeth (dmft). Education level, sweet foods and beverages consumption, and fluoride toothpaste use were significantly related to dmft level with p-value = 0.021 (OR = 2.344, 95% CI = 1.135-4.838), p-value < 0.001 (OR = 2.849, 95% CI = 1.557-5.215), and p-value = 0.041 (OR = 0.462, 95% CI = 0.220-0.970), respectively.

Table 2 Factors related to caries status of primary teeth (dmft) (n = 191)

Characteristics	dmft		OR (95% CI)	p-value ^a
	Low-Moderate	High		

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Age (years)				
6–7 (primary dentition)	52	50		
8–11 (mixed dentition)	42	47	0.827 (0.659-2.056)	0.601
Gender				
Male	39	46		
Female	55	51	0.786 (0.444-1.393)	0.410
Education level				
Grade 1	55	44		0.070
Grade 2	16	30	2.344 (1.135-4.838)	0.021*
Grade 3	23	23	1.250 (0.620-2.519)	0.533
Underlying disease				
Not present	82	90		
Present	12	7	0.531 (0.200-1.415)	0.206
Body mass index (BMI)				
Underweight	28	25		0.860
Healthy weight	50	54	1.210 (0.624-2.346)	0.573
Overweight	6	5	0.933 (0.253-3.437)	0.917
Obesity	10	13	1.456 (0.544-3.899)	0.455
Sweet foods and beverages consumption				
More than 2 times per day	46	71	2.849 (1.557-5.215)	<0.001*
At most 2 times per day	48	26		
Tooth brushing				
At least 2 times per day	83	89	1.474 (0.565-3.845)	0.427
Less than 2 times per day	11	8		
Fluoride toothpaste use (at least 1000 ppm)				
Yes	81	72	0.462(0.220-0.970)	0.041*
No	13	25		

^aBinary logistic regression

*Significant difference at $p < 0.05$

Table 3 Factors related to caries status of primary teeth (dmft) (n = 191); Multivariable logistic regression

Characteristics	Model 1 ^a		Model 2 ^b	
	Adjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Age (years)				
6–7 (primary dentition)				
8–11 (mixed dentition)				
Gender				
Male				
Female				
Education level				
Grade 1		0.152		
Grade 2	2.113 (0.992-4.499)	0.052		
Grade 3	1.270 (0.611-2.639)	0.522		
Underlying disease				
Not present				
Present				
Body mass index (BMI)				
Underweight				
Healthy weight				
Overweight				
Obesity				
Sweet foods and beverages consumption				
More than 2 times per day	2.903 (1.554-5.421)	< 0.001*	3.076 (1.661-5.696)	< 0.001*

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At most 2 times per day				
Tooth brushing				
At least 2 times per day				
Less than 2 times per day				
Fluoride toothpaste use (at least 1000 ppm)				
Yes	0.446 (0.206-0.967)	0.040*	0.468 (0.218-1.005)	0.039*
No				

*Significant difference at $p < 0.05$

^aModel 1 adjusted for education level, sweet foods and beverages consumption, and fluoride toothpaste use

^bModel 2 adjusted for sweet foods and beverages consumption and fluoride toothpaste use

Based on the multiple logistic regression, education level, sweet foods and beverages consumption, and fluoride toothpaste use, were considered for inclusion.

Table 3 shows that in Model 1, only sweet foods and beverages consumption, and fluoride toothpaste use affected the dmft level (adjusted OR = 2.903, 95% CI = 1.554-5.421 and adjusted OR = 0.446, 95% CI = 0.206-0.967), respectively. Children who consume sweet foods and beverages more than twice daily were 2.903 times more likely to have high dmft levels compared to children who consume sweet foods and beverages a maximum of twice daily. Meanwhile, children who use fluoride toothpaste have a 0.446 times lower chance of having high dmft levels compared to children who do not.

In Model 2, all variables that were significant at p -value < 0.05 in Model 1 were considered. The results revealed that sweet foods and beverages consumption and fluoride toothpaste use were still significantly associated with the dmft, with adjusted OR of 3.076 (95% CI = 1.661-5.696) and 0.468 (95% CI = 0.218-1.005), respectively (Table 3).

4.2 Discussion

This study focused on the association between socio-demographic characteristics, oral health behavior, and caries status of primary teeth among early primary school children in Bangkok, Thailand under an academic setting through use of secondary data from the Department of Community Dentistry, Mahidol University. The results revealed that the prevalence of dental caries was higher in primary teeth, with 75.9% (mean dmft 4.34). This is consistent with the findings of the 8th Thailand National Oral Health Survey in 2017 which reported a prevalence of dental caries in primary teeth of 75.6% among 5- to 6-year-old children, with mean dmft of 4.5 (Dental Health Division, 2018). Similar findings have been observed in several previous studies on the prevalence of dental caries among school children. For instance, Veiga, Pereira, and Amaral (2014) found a high dental caries prevalence among 605 school children aged 6 to 12 years old from 27 public primary schools in Portugal, with 72.1% (mean dmft 3.01).

In this study, sweet foods and beverages consumption, and fluoride toothpaste use were significantly associated with caries status of primary teeth (dmft) in both models. Similar to this study, sweet foods and beverages consumption in terms of oral health behaviors also showed an association with dmft. Ferrazzano et al. (2016) found that higher consumption of sugary foods and soft drinks was significantly associated with increased dmft in 5-year-old children. Furthermore, Kapil et al. (2023) found an association between dietary habits with sugar consumption and dmft level among children aged 6 to 12 years from India, which had a significant correlation with the prevalence of dental caries. All of these findings are consistent with previous studies. For instance, ElSalhy et al. (2013) found that children who consumed sweets or soft drinks more than once a day had a significantly higher caries experience than those who consumed them less frequently.

The age and education level of children also have a relation to dental caries, likely due to the exposure time to factors that affect caries within the oral cavity. Conversely, some studies found a significant relationship between the education level of parents and caries experience in children. Pakkhesal et al. (2021) found a significant association between the dmft index and parents' education level, in line with the findings of Youssefi1 and Afroughi (2020), who reported a significant association between caries prevalence, children's age, and the education of the mother. Additionally, they found that the caries prevalence of permanent teeth was significantly associated with the children's age directly. On the other hand, as age increased, caries prevalence of primary teeth among children significantly decreased. This may be due to the

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early loss of primary teeth, resulting in a reduced number of primary teeth and the early eruption of permanent teeth, which leads to increased exposure to factors influencing dental caries. Nevertheless, the results showed that age and education level were not significantly associated with children's caries status in this study.

In addition, Khan et al. (2021) found that tooth brushing behaviors in terms of toothbrushing technique, duration, pattern, and frequency significantly influenced plaque score changes and caries status. The results of this study indicate a significant association between fluoride toothpaste use and dental caries, consistent with the review by Marinho et al. (1996), in which seventy-four studies were included, and the results showed that children aged 5 to 16 years old who brush their teeth with fluoride toothpaste had a lower prevalence of dental caries, particularly when brushing twice a day.

However, there was no association found between other oral health behaviors and caries status in this study. This is possibly because other health behavior factors, such as toothbrushing duration and technique, were not considered due to the limited availability of secondary data in this study.

5. Conclusion

The results of this study revealed oral health problems among early primary school children in Bangkok, Thailand, with a high prevalence of dental caries, particularly in primary teeth, reported at 75.9%. Dental caries remains a major oral health problem in school children, influenced by various factors. Regarding the caries status in primary teeth (dmft), both sweet foods and beverages consumption and fluoride toothpaste use were significantly associated with it in both models of multivariable logistic regression analysis.

Therefore, schools are an important setting for oral health promotion, particularly through the involvement of schoolteachers. They can provide oral health education and encourage practices that improve the oral health conditions of children. The results of this study may guide the design of appropriate implementations or interventions, as well as policies in terms of the public and school sectors. They can also serve as a database for improving School Oral Health Promotion Programs aimed at reducing oral health problems in school children.

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