

ANALYSIS OF CHILDREN'S BEHAVIOR AND DENTAL CARIES IN BANJARMASIN CITY'S URBAN AREA

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ABSTRACT

Background: The elevated prevalence of pediatric dental caries is closely linked to oral health-related behaviors, including high dietary sugar intake, inadequate oral hygiene practices, and insufficient fluoride exposure.

Purpose: This study aimed to identify the behavioral determinants associated with dental caries occurrence among elementary school children in the urban area of Banjarmasin City. **Methods:** A cross-sectional study was conducted among 375 children aged 10–12 years in Banjarmasin City, selected via a multistage random sampling technique. Oral health behaviors were assessed using structured questionnaires, while caries experience was clinically evaluated using the Decayed, Missing, and Filled Teeth (DMFT) index. Non-parametric analyses, specifically the Mann–Whitney U test, were utilized to assess differences in mean DMFT scores across gender, parental income status, and sugary food consumption frequency. The Kruskal–Wallis test was performed to compare mean DMFT scores across age groups, toothbrushing frequency, toothbrushing timing/duration, and frequency of dental visits. **Results:** The statistical analysis revealed no significant differences in the mean DMFT scores across the evaluated variables ($p > 0.05$), except for the variable frequency of tooth brushing ($p = 0.045$) and tooth brushing time ($p = 0.000$). **Conclusion:** Cases of tooth decay in children in urban areas of Banjarmasin city are still quite high, so intervention is needed, especially in improving good and correct tooth brushing behavior.

Keywords: Behavior; Children; Dental caries

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INTRODUCTION

For a long time, dental caries has been a significant oral health issue¹. The World Health Organization (WHO) reports that between 60 and 90% of children suffer from dental caries, which is harmful not just to dental health but also to general health and quality of life, particularly in poor nations^{2–4}. According to the 2023 Indonesian Health Survey, 63.8% of children between the ages of 10 and 14 still have dental caries. One of the Indonesian provinces with a high dental caries prevalence is South Kalimantan (59.56%), especially among children between the ages of 10 and 14⁵.

Dental caries can affect individuals of all age groups, with a disproportionately higher negative impact observed in pediatric populations. Initiated by enamel demineralization, this multifactorial condition may progress to cavitated lesions, extensively compromising the entire tooth structure and potentially leading to tooth loss. Consequently, this pathological process can severely diminish the quality of life in children and adolescents, precipitating chronic pain, masticatory dysfunction, sleep disturbances, and premature tooth loss^{6,7}. Despite substantial advances in primary preventive strategies, dental caries remains the most prevalent chronic disease globally, imposing a significant financial burden on healthcare systems. Mitigating this issue necessitates an accurate assessment of its current epidemiological burden and the establishment of comprehensive dental care programs⁸.

The high prevalence of pediatric dental caries is closely associated with behavioral factors in oral health management, notably excessive dietary sugar intake, inadequate oral hygiene practices, and insufficient fluoride exposure⁹. Brushing teeth with fluoride toothpaste is a cost-effective and most commonly used method to control dental caries. Brushing twice a day has been shown to be better than brushing once a day, and for young children, it should be supervised. Toothbrushing with fluoridated toothpaste represents the most widely utilized and cost-effective preventive measure against dental caries. Evidence demonstrates that a twice-daily toothbrushing regimen yields superior outcomes compared to once-daily application, with parental or adult supervision recommended for young children. Furthermore, supervised toothbrushing in a school-based setting offers greater efficacy than unsupervised practices at home¹⁰.

The purpose of this study was to determine behavioral factors related to the incidence of dental caries in elementary school children in the urban area of Banjarmasin City. This study is the first study in Banjarmasin City that examines the study of dental caries in children with a fairly large area coverage, especially in the urban area of Banjarmasin City, so that it can be useful as a source of initial data related to the severity of dental caries in elementary school children in the urban area of Banjarmasin, which can be used as a basis for making dental and oral health policies, especially in elementary school children.

This study aimed to examine the behavioral determinants associated with the incidence of dental caries among elementary school students in the urban area of Banjarmasin. As the pioneering large-scale epidemiological investigation covering the metropolitan region of Banjarmasin, this research provides baseline data regarding the severity of pediatric dental caries. Consequently, these findings offer empirical evidence to inform the formulation of targeted oral health policies and preventive strategies for school-aged children.

MATERIALS AND METHODS

A cross-sectional study was conducted between May and August 2024 targeting school children aged 10–12 years in the urban area of Banjarmasin. Ethical approval for this study was granted by the Ethics Committee of the Faculty of Dentistry, Lambung Mangkurat University (No. 020/KEPKG-FKGULM/EC/VIII/2024). The central hypothesis posits that behavioral factors—specifically the consumption of cariogenic foods, the frequency and timing of toothbrushing, and the regularity of dental visits—significantly influence the incidence of pediatric dental caries.

The proportion estimation sample size employed in the study was determined by applying certain factors, specifically the two-tailed 5% statistical significance level, the precision of 5%, and the prevalence of dental caries of 37.2%. The minimum sample size, as determined by these standards, was 353. The final sample size was established at 375 samples because the expected dropout rate was 5%. Multistage random sampling was the sampling method employed in this investigation. Children between the ages of 10 and 12 who attended school in Banjarmasin City's urban area, did not have special needs, and had given their parents' written approval prior to the study's conduct were eligible to participate.

Children's oral health-related behaviors were evaluated using a 13-item structured questionnaire. Psychometric evaluation of the instrument demonstrated acceptable internal consistency, with a Cronbach's alpha coefficient of 0.713. A mouth mirror and probe were used to directly examine each child's oral cavity to calculate the DMFT index, measuring dental caries prevalence.

Descriptive and inferential statistical analysis are the methods employed. The characteristics of the respondents are described using descriptive analysis, which includes mean value, standard deviation, frequency, and presentation. The difference in the average dmft index according to gender, economic level, and sweet food habits was evaluated using inferential analysis of the Mann Whitney test. The difference in the average dmft index according to age, brushing frequency, brushing duration, and dental visits was evaluated using the Kruskal Wallis test.

RESULTS

The demographic and clinical characteristics of the study participants are summarized in Table 1. There were 375 participants in all, 52.80% of whom were female and 47.47% of them were 11 years of age or older. At 52.53%, the parental income level is primarily low. Only 25.87% of respondents brush their teeth at the proper times, which are after breakfast and before bed, despite the fact that 73.60% of respondents already brush their

teeth twice a day. 42.93% of respondents have never gone to a dentist for a dental and oral health examination, while 69.87% of respondents have decent eating habits.

Table 1. Respondent characteristics

Characteristics	frequency	(%)
Gender		
Male	177	47,20
Female	198	52,80
Age		
10 Years	99	26,40
11 Years	178	47,47
12 Years	98	26,13
Parents Income Level		
High	178	47,47
Low	197	52,53
Frequency of Tooth Brushing		
1 Time a Day	70	18,67
2 Times a Day	276	73,60
>2 Times a Day	29	7,73
Time of Tooth Brushing		
When Bathing	150	40
Before Breakfast and Before Bed	128	34,13
After Breakfast and Before Bed	97	25,87
Visit to Dentist		
Never	161	42,93
<1 Time a Year	103	27,47
>1 and <2 Times a Year	64	17,07
>2 Times a Year	47	12,53
Habit of Eating Sweets		
Good	262	69,87
Bad	113	30,13
Total	375	100

The DMFT index had an average value of 2.00, with an average Decayed value of 1.95, Filled of 0.05, and Missing of 0.13. The Decayed component had the highest average value (1.95), indicating that respondents had an average of two cavities per person. Table 2 provides a thorough synopsis of the DMFT score evaluation.

Tabel 2. DMFT Score

Variabel	Mean	Standar Deviasi
Decay	1,95	2,12
Missing	0,13	0,51
Filling	0,05	0,37
Indeks DMFT	2,00	2,01

Table 3 illustrates the respondents' behavioral profiles and clinical characteristics stratified by Decayed (D) index scores. Statistical analysis revealed significant variations in mean decayed values across several parameters, including parental income level ($p = 0.0034$), frequency of toothbrushing ($p = 0.003$), and timing of toothbrushing ($p < 0.000$). Specifically, higher mean decayed scores were observed among children from lower-income households (2.15), those who brushed their teeth only once daily (2.43), and those who brushed exclusively during bathing (2.18).

Table 4 illustrates the analysis of differences in the average missing values based on behavioral factors and respondent characteristics. Statistical analysis indicated no significant differences in the mean Missing (M) index values across all evaluated variables ($p>0.05$). The highest average missing value was found in male respondents at 0.17, parents with low incomes at 0.15, respondents aged 11 and 12 years at 0.13, frequency of brushing teeth only 1 time at 0.20, time brushing teeth while bathing at 0.16, never visiting a dentist at 0.14, and good sweet eating habits at 0.13.

Analysis of differences in average filling values based on behavioral factors and respondent characteristics is depicted in Table 5. Statistical analysis revealed no significant differences in the mean Filled (F) index values across all evaluated variables ($p>0.05$). The highest average filling values were found in females, respondents with low parental income, respondents aged 12 years, frequency of brushing teeth >2 times a day, brushing time before breakfast and before bed, respondents who visited the dentist >2 times a year, and who had good sweet eating habits.

Analysis of differences in DMFT values based on behavioral factors and respondent characteristics is depicted in Table 6. Statistical analysis revealed no significant differences in the overall mean Decayed, Missing, and Filled Teeth (DMFT) scores across all evaluated variables ($p>0.05$), except for the variable frequency of brushing teeth ($p=0.045$) and time of brushing teeth ($p=0.000$). The highest average DMFT value was found in the female gender at 2.04, low parental income level at 2.08, respondents aged 11 years at 2.22, frequency of brushing teeth only 1 time a day at 2.43, time of brushing teeth while bathing at 2.51, never visiting a dentist at 2.10, and having bad sweet food habits.

Table 3. Analysis of differences in average decay based on behavioral factors and respondent characteristics

Variabel	Decay		
	Mean	SD	<i>p value</i>
Gender			
Male	1,89	1,95	0,959
Female	2,01	2,26	
Age			
10 Years	1,76	2,15	0,034
11 Years	2,12	2,08	
12 Years	1,80	2,13	
Parents Income Level			
High	2,22	2,30	0,071
Low	1,60	1,67	
Frequency of Tooth Brushing			
1 Time a Day	2,63	2,43	0,003
2 Times a Day	1,80	2,04	
>2 Times a Day	1,72	1,77	
Time of Tooth Brushing			
When Bathing	2,51	2,18	0,000
Before Breakfast and Before Bed	1,59	2,02	
After Breakfast and Before Bed	1,56	1,97	
Visit to Dentist			
Never	2,09	2,24	0,563
<1 Time a Year	1,86	2,05	
>1 and <2 Times a Year	1,89	2,08	
>2 Times a Year	1,72	1,90	
Habit of Eating Sweets			
Good	1,90	2,24	0.088
Bad	2,05	1,82	

Table 4. Analysis of differences in average missing based on behavioral factors and respondent characteristics

Variabel	Mean	SD	<i>p value</i>
Gender			
Male	0,17	0,63	0.333
Female	0,09	0,37	
Age			
10 Years	0,10	0,48	0,062
11 Years	0,15	0,53	
12 Years	0,11	0,45	
Parents Income Level			
High	0,13	0,51	0,888
Low	0,13	0,57	
Frequency of Tooth Brushing			
1 Time a Day	0,20	0,71	0,632
2 Times a Day	0,12	0,47	
>2 Times a Day	0,03	0,19	
Time of Tooth Brushing			
When Bathing	0,16	0,57	0,419
Before Breakfast and Before Bed	0,08	0,35	
After Breakfast and Before Bed	0,13	0,59	
Visit to Dentist			
Never	0,14	0,50	0,644
<1 Time a Year	0,12	0,53	
>1 and <2 Times a Year	0,09	0,43	
>2 Times a Year	0,13	0,61	
Habit of Eating Sweets			
Good	0,13	0,51	0,387
Bad	0,12	0,51	

Table 5. Analysis of differences in average filling based on behavioral factors and respondent characteristics

Variabel	Mean	Filling SD	P value
Gender			
Male	0,03	0,21	0,621
Female	0,06	0,48	
Age			
10 Years	0,03	0,24	0,848
11 Years	0,06	0,47	
12 Years	0,07	0,33	
Parents Income Level			
High	0,01	0,11	0,122
Low	0,08	0,64	
Frequency of Tooth Brushing			
1 Time a Day	0	0	0,123
2 Times a Day	0,05	0,42	
>2 Times a Day	0,10	0,41	
Time of Tooth Brushing			
When Bathing	0,02	0,18	0,117
Before Breakfast and Before Bed	0,09	0,58	

Variabel	Mean	Filling SD	P value
After Breakfast and Before Bed	0,02	0,20	
Visit to Dentist			
Never	0,04	0,48	
<1 Time a Year	0,02	0,20	
>1 and <2 Times a Year	0,05	0,28	0,508
>2 Times a Year	0,11	0,38	
Habit of Eating Sweets			
Good	0,06	0,44	
Bad	0,02	0,13	0,587

Table 6. Analysis of differences in average DMF-t based on behavioral factors and respondent characteristics

Variabel	Mean	DMFT SD	P value
Gender			
Male	1,96	1,88	
Female	2,04	2,13	0,787
Age			
10 Years	1,92	2,13	
11 Years	2,08	1,90	0,137
12 Years	1,77	1,91	
Parents Income Level			
High	2,22	2,18	
Low	1,84	1,73	0,092
Frequency of Tooth Brushing			
1 Time a Day	2,43	2,22	
2 Times a Day	1,91	1,98	0,045
>2 Times a Day	1,90	1,66	
Time of Tooth Brushing			
When Bathing	2,51	2,03	
Before Breakfast and Before Bed	1,62	1,95	0,000
After Breakfast and Before Bed	1,72	1,89	
Visit to Dentist			
Never	2,10	2,11	
<1 Time a Year	1,85	1,90	
>1 and <2 Times a Year	1,98	2,04	0,440
>2 Times a Year	2,02	1,89	
Habit of Eating Sweets			
Good	1,96	2,14	
Bad	2,10	2,82	0,114

DISCUSSION

Children's dental caries in Banjarmasin City's urban areas

The results of the DMFT index examination found that the component with the highest score was the decay component, or the condition of cavities. Tooth decay in children, as in adults, is increasing worldwide and is one of the main health challenges in society¹. Children exhibiting elevated decay index scores experience extensive dental destruction, which can severely compromise their somatic growth and overall development. As a leading chronic pediatric condition, dental caries adversely impacts speech articulation, self-esteem, daily activities, and dietary intake due to persistent pain and discomfort. Consequently, this pathology increases the risk of childhood

underweight status and impaired cognitive development. Despite notable scientific advancements and its preventable nature, dental caries remains a critical public health challenge. The World Health Organization recognizes dental caries as a priority chronic non-communicable disease requiring global prevention and management strategies ¹.

One of the numerous factors contributing to children's high rates of tooth decay is parents' ignorance of dental and oral hygiene, particularly when it comes to brushing their children's teeth. Furthermore, parental concern regarding pediatric oral health remains inadequate, particularly concerning routine dental examinations. The widespread perception of dental care as financially prohibitive, along with dental anxiety and fear associated with clinical evaluations, primarily drives this low engagement ¹¹.

The effect of age on dental caries

The present study revealed that the prevalence of dental caries among children aged 10–12 years in urban Banjarmasin is consistent with the findings of the 2018 Indonesian National Basic Health Research. On average, children in this cohort exhibited two decayed teeth. These findings align with previous research by Brito et al., which reported that 57.6% of 12-year-old children presented with a DMFT score ≥ 1 ¹².

The high susceptibility to dental caries among pediatric populations is largely attributable to inadequate literacy regarding oral hygiene behaviors, particularly correct toothbrushing techniques. Although the present study demonstrates the therapeutic benefit of a twice-daily toothbrushing regimen among children aged 10–12 years, a substantial proportion fails to adhere to optimal timing. These observations align with national epidemiological data from the Indonesian Basic Health Research (Riskesdas), which revealed that while 75.7% of children aged 10–14 years reported brushing their teeth twice daily, merely 5.3% performed the practice at the clinically recommended times ⁵.

The effect of gender on dental caries

No statistically significant difference in caries incidence was observed in relation to gender. This finding aligns with the research conducted by Monisha et al. in India, which similarly reported no age-related variations in caries incidence. The absence of a difference in caries incidence based on gender in children is because children are still unable to take responsibility for their own dental and oral hygiene and are not yet able to choose their own eating habits. This shows that the greatest risk factor for caries incidence in children is still directly influenced by parents ¹³.

The effect of parental income on dental caries

The analysis demonstrated no statistically significant association between parental income levels and the incidence of pediatric dental caries. This finding concurs with the study conducted by Hidayati et al., which similarly reported that socioeconomic status, as measured by parental income, did not significantly influence caries occurrence. This is because children with parents with low or high income categories are still at risk of experiencing dental caries ¹⁴.

Although there was no significant difference in incidence based on parental income status, the analysis revealed that children from lower-income households exhibited a higher mean DMFT index compared to those from higher-income families. These findings suggest that while pediatric populations across all socioeconomic strata remain susceptible to dental caries, children from lower socioeconomic backgrounds are particularly vulnerable to developing more severe lesions. Consequently, early-stage preventive interventions are essential to mitigate disease progression and prevent extensive structural damage ¹⁵.

The effect of tooth brushing habits on dental caries

The findings identified toothbrushing behavior as a significant determinant influencing DMFT scores among children. Specifically, those who adhered to a twice-daily toothbrushing routine at optimal times—after breakfast and prior to bedtime—exhibited significantly lower DMFT scores compared to their peers. These results concur with the findings of Sun et al., who reported that children brushing at least twice daily experienced a markedly lower increment in caries progression than those brushing less frequently ¹⁶. Children who brush their teeth less than twice daily demonstrate significantly poorer oral hygiene compared to those maintaining a higher toothbrushing frequency. Inadequate oral hygiene markedly elevates the risk of developing secondary or new carious lesions over a 30-month period. These observations are consistent with previous literature reporting a similar association between substandard oral hygiene practices and increased caries susceptibility ^{17,18}.

The effect of visits to the dentist on dental caries

The present study revealed that the majority of participating children had no prior history of dental visits. This finding strongly aligns with national epidemiological data from the Indonesian Basic Health Research (Riskesmas), which indicated that 94.1% of 12-year-old children had never received care from a dental health professional. Reported barriers to utilization included the absence of symptoms (65.5%) and the perception that professional care was unnecessary (52.9%), while a minor proportion relied on self-medication (19.3%) and only 0.5% actively sought formal dental treatment⁵. Furthermore, these findings concur with research conducted by Qu et al. in Chengdu, China, which reported that 53.5% of pediatric participants had no history of professional dental visits¹⁹. The underutilization of pediatric dental services is primarily driven by limited parental health literacy and low perceived necessity regarding oral care. This pattern is substantiated by Nurjanah, who demonstrated that parents preferentially rely on home-based preventive behaviors—such as meticulous toothbrushing and dietary sugar restriction—over clinical consultations. Consequently, professional dental surveillance remains severely neglected, with the study reporting that merely 14% of parents scheduled routine dental examinations for their children¹¹.

The effect of sweet eating habits on dental caries

The analysis revealed no statistically significant association between the frequency of sugary food consumption and caries occurrence. This finding concurs with the study by Sowwan et al., which similarly reported no significant relationship between dietary sugar intake habits and dental caries experience. This is likely because, although children do not have sweet eating habits, children have poor brushing habits. Systematic brushing can suppress bacterial activity in dental plaque and stop the development of early injury, so brushing is considered one of the most cost-effective measures for preventing tooth decay and tooth loss in primary teeth^{20,21}.

The incidence of tooth decay in children in urban areas of Banjarmasin City is still quite high; this is due to poor dental and oral health behavior in children, especially related to good and correct tooth brushing behavior.

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