



# Dental Caries and Tooth Brushing Practices among Students Elementary School

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## ABSTRACT

Dental caries is a disease that often occurs in mid-childhood (10-12 years), which is a vulnerable period marked by the transition of milk teeth to the growth of permanent teeth. Rikesdas West Sumatra reported the experience of dental caries in 41.74% of children aged 10-14 years, with a prevalence rate in Padang City of 36.71% with the number of sufferers around 6,154 children. This quantitative research aims to determine the prevalence of dental caries and tooth brushing practices among students at SDN 27 Sungai Sapih Kuranji, Padang City. An analytical observational approach was applied, with a total of 100 students selected as respondents using total sampling techniques. Next, the data was collected from November 2022 to February 2023 and analyzed using the Spearman test, then processed using a computerized program. The results showed that the majority showed moderate tooth brushing behavior (82%), while the incidence of dental caries was relatively low (45%). Basically, a significant relationship was found between dental caries and tooth brushing practices among respondents ( $p = 0.001$ ). Collaboration between dental health professionals and schools is recommended to educate students about the importance of dental and oral care, emphasizing correct toothbrushing techniques, to increase knowledge and practice of oral hygiene.

**Keywords:** Tooth Brushing Behavior; Dental Caries; Students

## ABSTRAK

Karies gigi merupakan penyakit yang sering terjadi pada pertengahan masa kanak-kanak (10-12 tahun), yaitu masa rentan yang ditandai dengan peralihan gigi susu ke tumbuhnya gigi permanen. Rikesdas Sumbar melaporkan pengalaman karies gigi pada 41,74% anak usia 10-14 tahun, dengan angka prevalensi di Kota Padang sebesar 36,71% dengan jumlah penderita sekitar 6.154 anak. Penelitian kuantitatif ini bertujuan untuk mengetahui prevalensi karies gigi dan praktik menyikat gigi pada siswa di SDN 27 Sungai Sapih Kuranji Kota Padang. Pendekatan observasional analitik yang diterapkan, dengan keseluruhan 100 siswa dipilih sebagai responden dengan menggunakan teknik total sampling. Selanjutnya data dikumpulkan pada bulan November 2022 hingga Februari 2023 dan dianalisis melalui uji Spearman, kemudian diolah dengan program komputerisasi. Hasil penelitian menunjukkan mayoritas menunjukkan perilaku menyikat gigi sedang (82%), sedangkan kejadian karies gigi relatif rendah (45%). Pada dasarnya ditemukan hubungan yang signifikan antara karies gigi dan praktik menyikat gigi pada responden ( $p = 0,001$ ). Kolaborasi tenaga kesehatan gigi dengan sekolah direkomendasikan untuk mendidik siswa tentang pentingnya perawatan gigi dan mulut, menekankan teknik menyikat gigi yang benar, untuk peningkatan pengetahuan dan praktik kebersihan mulut.

**Kata Kunci :** Perilaku Menyikat Gigi; Karies Gigi; Pelajar



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## 1. Introduction

Dental caries is a tissue disease characterized by progressive damage, beginning with enamel erosion and extending to dentin, and in severe cases, to the pulp. This can be triggered by several factors, including inadequate oral and dental hygiene, improper tooth-brushing techniques, and the use of inappropriate toothpaste[1].

The *World Health Organization* (WHO) considers dental caries a global public health concern, ranking as the most prevalent non-contagious condition in the 2015 *Global Burden of Disease study*. Generally, it has caused permanent tooth decay in 2.3 billion people and ranked 12th for primary tooth damage in 560 million children [2].

The vulnerability to dental caries is prominent during mid-childhood, specifically around 10-12 years of age when milk teeth begin to fall out, and permanent teeth emerge. This transitional period, known as the mixed dentition stage, presents variations in dental conditions. Newly grown teeth are immature and more susceptible to damage due to sugary diets and inadequate brushing practices, leading to food debris accumulating in cavities [3].

The 2018 West Sumatra Basic Health Research (Rikesdas) revealed that 41.74% of children aged 10-14 years experienced dental caries. In Padang City, approximately 6,154 children, or 36.71% of the population, were affected by dental caries, indicating a significant oral health concern. This data showed a low level of attention to oral health among children and parents [4].

To promote community dental health and maintain oral hygiene, daily tooth brushing is crucial. The 2018 Rikesdas data showed that 96.25% of 10-14-year-olds in West Sumatra Province brushed their teeth daily, while only 0.92% exhibited proper brushing behavior. In Padang City, 97.85% of children reported daily tooth brushing, but only 2.51% adhered to recommended practices.

A study was conducted by Lendrawati in 2015 concerning the relationship between dental health maintenance and dental caries status among class 1 students at Muhammadiyah Middle School in Padang Timur District, Padang City. The results showed that good, medium, and poor maintenance habits were found in 54.2%, 35%, and 10.8% of the total population, respectively. Students who effectively maintained good dental health exhibited low caries status, while those with poor maintenance patterns had higher rates of caries. This confirms dental health maintenance on caries status, revealing a direct correlation between the two factors [5].

Based on the provided explanations, this study aimed to investigate dental caries prevalence and the practice of tooth brushing among students at 27 Sungai Sapih Public Elementary School in Kuranji, Padang City.

## 2. Methods dan Materials

This analytic quantitative study adopted an observational or data collection approach that used a *cross-sectional design* to assess tooth brushing behavior and the presence of dental caries in children. The examined population was 100 students in grades 5 and 6 at the State Elementary School located at 27 Sungai Sapih, Kuranji, Padang City. The total sampling technique was implemented in selecting all members of the population as respondents or samples.

The tools used were writing instruments, examination sheets, questionnaires, dental probes, mouth mirrors (for accessing hard-to-reach areas), as well as gloves and masks for personal protective measures. Additionally, the materials applied in this study included alcohol and sterile cotton.

### 2.1 Work Steps

Ethical approval was obtained from Baiturrahmah University to conduct investigations at 27 Sungai Sapih Public Elementary School in Kuranji, Padang City, and permission was also sought from this Elementary school. The inclusion and exclusion criteria were carefully evaluated for the entire population to be used as subjects. Subsequently, the aims and objectives of this study were explained to all potential subjects and each was instructed to fill out the *informed consent* form. To enhance the understanding of respondents concerning

the study process, appropriate educational sessions were conducted. A dental caries examination was performed to identify the presence or absence of this condition among the students, and questionnaires were distributed to assess their brushing behavior. Once the filling of the questionnaires was completed, the provided data were collected and processed, then presented in a tabular form.

The data analysis aspect included the assessment of variable characteristics using SPSS, and the *Spearman rho statistical test* was performed to determine the relationship between tooth brushing behavior and dental caries.

### 3. Results

#### 3.1 Characteristics of Respondents

The results presented in Table 1 showed the frequency distribution of age and gender characteristics among children at 27 Sungai Sapih Kuranji Public Elementary School, Padang City.

Table 1. Distribution of respondent characteristics by age

Characteristics of Respondents	<i>f</i>	%
<b>Age</b>		
9 years	3	3
10 years	5	5
11 years old	43	43
12 years old	47	47
13 years old	2	2
<b>Total</b>	<b>100</b>	<b>100.0</b>

Table 1 reveals that out of the 100 respondents, 47 (47%) were 12 years old, making it the most common age among the students.

Table 2. Distribution of respondent characteristics based on gender

Characteristics of Respondents	<i>f</i>	%
<b>Gender</b>		
Man	60	60
Woman	40	40
<b>Total</b>	<b>100</b>	<b>100.0</b>

Table 2 shows that 60 individuals (60%) were male, which was the predominant gender among the students.

#### 3.2 Univariate Analysis

The frequency distribution of tooth brushing behavior among the students can be seen in Table 3.

Table 3. Frequency Distribution of Tooth brushing Behavior

Tooth Brushing Behavior	<i>f</i>	%
Good	15	15
Moderate	82	82
poor	3	3
<b>Total</b>	<b>100</b>	<b>100.0</b>

Table 3 indicates that 82 (82%) out of the 100 respondents exhibited moderate tooth-brushing behavior.

The results presented in Table 4 showed the frequency distribution of dental caries among the students.

Table 4. Frequency Distribution of Dental caries

Dental Caries	<i>f</i>	%
Very low	55	55
Low	25	25
Moderate	17	17
High	2	2
Very high	1	1
<b>Total</b>	<b>100</b>	<b>100.0</b>

Based on Table 4, 55 (55%) out of the 100 respondents had very low dental caries.

### 3.3 Bivariate Analysis

The results presented in Table 5 showed the relationship between dental caries and tooth brushing practices among the students at 27 Sungai Sapih Public Elementary School in Kuranji Padang City.

Table 5. Relationship between Dental Caries and Tooth Brushing Practices

Tooth Brushing Behavior	Dental Caries										P-value	
	Very low		Low		Moderate		High		Very high		Total	
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%
Good	10	67	3	20	2	13	0	0	0	0	15	100
Moderate	45	55	22	27	12	15	2	2	1	1	82	100
Poor	0	0	0	0	3	100	0	0	0	0	3	100
<b>Total</b>	<b>55</b>	<b>55</b>	<b>25</b>	<b>25</b>	<b>17</b>	<b>17</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>100</b>	<b>100</b>

Table 5 showed that among the 15 students with good and 82 with moderate brushing behavior, the majority, namely 10 (67%) and 45 (55%) individuals, experienced very low caries respectively. In contrast, all 3 students with bad tooth brushing behavior (100%) had moderate dental. The statistical analysis, using the *Spearman rho* test, yielded a *p-value* of 0.001 ( $p < 0.05$ ), indicating a significant relationship between dental caries and tooth brushing practices among the students at 27 Sungai Sapih Public Elementary School in Kuranji, Padang City.

In terms of age and gender characteristics, this study revealed that among the 100 respondents from 27 Sungai Sapih Kuranji Public Elementary School Padang City, 47 individuals (47%) were 12 years old, while 60 individuals (60%) were male.

The recorded results were in line with a previous investigation conducted by Ayuningtyas concerning the Relationship between the Tooth Brushing Habits and the Occurrence of Dental Caries in Class 4 students at DN Puspipstek South Tangerang School [6]. Furthermore, it was observed that more than half of the respondents (68.5%) were >12 years old, with a predominantly male population (56.2%). This observation was different from those reported by Permatasari and Andhini regarding the Relationship between Tooth Brushing Behavior and Child Snacking Patterns with the Incidence of Dental Caries among Students at Public Elementary School located in 157 Palembang, where the majority of patients were female (57%) [7].

Given the age of the respondents, ranging from 9-13 years, efforts to maintain dental and oral health should be carried out from an early age. The elementary school period is the ideal time for children to develop their motor skills, including the practice of tooth brushing. Good habits cannot be cultivated overnight, but gradually over the years as a child grows. Those in this age group are naturally inquisitive and eager to explore the environment, making the children highly receptive to guidance, direction, and the instillation of positive behaviors. The cognitive development theory by Piaget suggests that the intellectual abilities of children aged 6-12 are sufficient to become the basis for various skills capable of developing their mindset or reasoning

power. Therefore, instilling knowledge at this stage tends to raise awareness and initiate behaviors consistent with the knowledge acquired [8].

According to Table 2, more caries were found in males compared to females because gender variations could affect the behavior patterns of children in maintaining oral hygiene and aesthetic preferences [6].

The obtained results showed that out of 100 respondents, the majority (82%) exhibited moderate tooth brushing behavior among the students at 27 Sungai Sapih Kuranji Public Elementary School in Padang City. These was in accordance with the study conducted by [2], which explored the relationship between tooth brushing and caries in students at SD X in West Jakarta, where 35.4% of the population had poor brushing habits. Similar observations were reported by Ruslan & Jayanti (2022) concerning the relationship between teeth brushing behavior and dental maturity in elementary school students. Furthermore, most students with tooth brushing behavior (11.86 %) were found to be in the unfavorable category [9].

Maryani [10] also investigated the relationship between tooth brushing behavior and dental caries incidence among grades 1 and 2 students at Tanggulangrejo Elementary School in Tempuran District, Magelang Regency. The results showed that 34.0% of the total students fell into the moderate category in terms of brushing behavior. The study by [11] provided a description of tooth brushing patterns and dental caries incidence among elementary school children and identified 50% of these subjects with a bad pattern of brushing. Similarly, Damma [12] examined tooth brushing behavior in First Grade Elementary School students with dental caries in the Rendang Karangasem Health Center Bali. The reported results indicated the exhibition of bad brushing behavior among 81.5% of the students. Brushing is an essential activity that aids the removal of food debris, plaque, and harmful microorganisms from the teeth and mouth. The habit of tooth brushing is integral to maintaining dental and oral hygiene. [2] Good and correct brushing behavior is often carried out diligently, thoroughly, and regularly. This serves as an important routine in maintaining healthy teeth and eliminating bacteria and food residue when a toothbrush is used appropriately [13,14].

The results showed that many students belonged to the moderate brushing category, where brushing was mostly performed during bathing routines and very rarely at night before bedtime or after meals. Although it is crucial for children to brush at these periods to remove food residues capable of causing damage to the teeth. The study by Maryani [10] emphasized the importance of proper timing for tooth cleaning, the use of suitable tools, and the continuous practice of effective cleaning. The cleaning of teeth should be executed ideally after meals and before bedtime. Brushing after eating aids in the removal of food remains attached to tooth surfaces, preventing the formation of dental plaque, a breeding ground for caries-causing bacteria. Nighttime tooth brushing helps mitigate interactions between food residues and bacteria, supporting consistent saliva production during sleep [11].

Based on the analysis in this study, tooth brushing among the students fell in the moderate category. This behavior creates significant implication on dental and oral health. Therefore, it is important to educate students about proper tooth brushing behavior to improve their oral hygiene.

The results showed that out of the 100 respondents, the majority experienced very low levels of dental caries (55%). These were consistent with the study by Yogie [2], which investigated the relationship between tooth brushing habit and caries in students at SD X in West Jakarta in 2019, and identified dental caries in 40.4% of the sample. Similarly, Saragih [11] described tooth brushing patterns and caries incidence in elementary school children, where the entire population (100%) had dental caries.

Dental caries is characterized by the deterioration of hard tissue, including enamel, dentin, and cementum. This demineralization of hard tooth tissue damages the organic matter, leading to bacterial invasion, pulpal death, and the spread of infection to the periapical tissue, subsequently causing pain [15]. Caries often results from the interaction of bacteria with the tooth surface, the presence of plaque or biofilm, and the production of lactic and acetic acids, leading to the demineralization of dental hard tissues [16]. Dental caries or cavities, manifest as enamel and dentin damage due to bacterial metabolic activity in plaque, initiating demineralization triggered by interactions between microbial byproducts, saliva, and food residues [10,17].

The incidence of caries can be influenced by factors such as the practices of improper tooth brushing during morning and afternoon showers instead of after breakfast and before bedtime. Brushing before sleeping is very effective in reducing dental caries. High caries prevalence is also attributed to dietary habits

characterized by the frequent consumption of sugary and sticky foods with insufficient fiber content. Neglecting oral hygiene may contribute to dental issues. These observations emphasize the need for dental care and hygiene education [11,18].

Severe caries have various consequences, affecting the quality of life for the children. This can lead to pain, discomfort while eating, disrupted sleep, increased hospitalization risks, higher treatment costs, and missed school days due to decreased academic performance. Children experiencing toothaches often struggle in tests compared to those without pains. Dental caries also influence nutrition, growth, and weight gain in children [1,19].

Based on the results, most students experienced very low levels of dental caries. In this context, several contributing factors include frequent consumption of sweet foods, which can lead to tooth decay, as well as inadequate brushing habits. Therefore, it is essential to educate students about strategies for preventing caries, such as reducing the consumption of sweet foods and adopting proper and timely brushing practices.

#### 4. Discussions

The results showed that among 15 and 82 students with good and moderate brushing behavior, the majority experienced very low levels of caries, namely 10 (67%) and 45 individuals (55%), respectively. Conversely, the entire 3 students with bad tooth brushing behavior had moderate dental caries (100%). The statistical analysis using the *Spearman rho* test yielded a value of  $p = 0.001$  ( $p < 0.05$ ), indicating a significant relationship between dental caries and brushing practices.

In line with the results, the study by Yogie and Ernawati [2] explored the relationship between tooth brushing and caries in students at SD X in West Jakarta, revealing a correlation between tooth brushing behavior and dental caries. Similarly, in 2019, Maryani [10] investigated the relationship of tooth brushing behavior with dental caries incidence in grades 1 and 2 students at Tanggulangrejo Elementary School Tempuran District, Magelang Regency and discovered a connection between the two factors. In 2021, Saragih [11] described tooth brushing patterns and the incidence of caries in elementary school children to have a significant relationship.

The existence of a relationship confirmed between tooth brushing behavior and caries incidence was attributed to improper brushing behavior, which could leave food residues on the teeth. This would provide a conducive environment for microbial growth that could jeopardize dental and oral health, leading to dental caries [20]. As Damma and Prasad have suggested, improper tooth brushing behavior in children, including incorrect technique and irregularity, contributes to the development of caries [12]. Additionally, the study by Saragih [11] showed that the timing of tooth brushing is crucial, emphasizing brushing before bedtime to be particularly effective in reducing dental caries.

The analysis results revealed the influence of tooth brushing behavior on the incidence of dental caries in children. These indicated that bad behavior, such as improper brushing promoting bacterial growth on food residues, tended to trigger caries formation. Therefore, it is important to educate students about proper brushing practices to minimize dental caries incidence.

#### 5. Conclusions

In conclusion, most of the examined students exhibited moderate tooth brushing behavior, namely 82 individuals (82%). Moreover, the prevalence of dental caries was predominantly very low, with 55 individuals (55%) falling into this category. Importantly, this study identified a significant relationship between dental caries and brushing practices among the students at 27 Sungai Sapih Public Elementary School in Kuranji, Padang City.

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## 6. Conflicts of Interest

The authors declare that there are no conflicts of interest to disclose concerning this study.

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