

The Relationship Between Snacks Consumption, Knowledge, and Tooth Brushing Actions on Dental Caries and Debris Index in 5th Grade Students of Muhammadiyah Meruyung Elementary School, Depok

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ABSTRACT

Dental hygiene (debris index) and dental caries are common in school-age children, dental caries is damage to the hard tissues of the teeth caused by acids present in carbohydrates through the intermediary of microorganisms present in saliva. The purpose of the study was to relate knowledge, consumption of snacks and tooth brushing actions to dental caries and debris index in 5th grade students of SD Muhammadiyah Meruyung Depok. The type of research used was analytical observational with cross sectional design. The population in this study were students of SD Muhammadiyah Meruyung Depok with a total of 90 students in grade 5. The sample in this study was 90 students taken by total sampling. the instrument used was a questionnaire. Data analysis was carried out by univariate analysis, bivariate analysis (chi-square test) and multivariate analysis (logistic regression). The results showed that there was a significant relationship between knowledge of snack consumption, snack consumption habits and tooth brushing actions on the incidence of dental caries. There is a significant relationship between snack consumption, snack consumption habits and tooth brushing actions on the debris index in students of SD Muhammadiyah Meruyung Depok. Of the three independent variables, it is known that the snack consumption variable has a significant contribution to the occurrence of dental caries with a p-value = 0.007 <0.0, which

means that respondents with poor snack consumption habits will be at risk of 96.539 times developing dental caries compared to respondents who consume good snacks, known as the 95% C.I. value for EXP (B) (1.049-15.374). Of the three independent variables, it is known that the variable of tooth brushing action has a significant contribution to the debris index score with a p-value = 0.000 <0.05, which means that respondents with poor tooth brushing action will have a risk of 543,054 suffering from debris index compared to respondents with good tooth brushing action, known 95% C.I. for EXP (B) (26,498-11129,274).

Keywords: Snack consumption, knowledge, action, dental caries, debris index

INTRODUCTION

Dental and oral diseases continue to demand attention due to their enduring impact on a significant number of individuals, particularly school-age children. Dental and oral hygiene plays a pivotal role in influencing the occurrence of these diseases. Inadequate dental hygiene and a high debris index significantly elevate the risk of dental caries, a condition that necessitates proactive prevention^[1]. Dental hygiene and debris index imbalances frequently manifest in school-age children. Dental caries, characterized by the erosion of tooth tissues

caused by acids resulting from carbohydrate consumption and microorganisms present in saliva, is prevalent among this demographic [2]. Dental hygiene and debris index discrepancies, along with dental caries, pose substantial health challenges for school-age children, typically aged between 6 and 12 years [3]. Given the natural tooth development and transition phase during this age range, intensified care becomes imperative.

The abundance of snack options available in schools, particularly those laden with cariogenic ingredients and packaged attractively, piques the interest of students. Consequently, students often indulge in sweet and sticky snacks readily available in the vicinity of their schools. Prolonged consumption of such snacks can lead to dental caries. Furthermore, many students employ incorrect tooth-brushing techniques, further jeopardizing their dental health [4]. Dental caries refers to the deterioration of dental tissues, encompassing tooth enamel, dentin, and tooth bone.

Notably, the prevalence of dental caries in Indonesia has seen an upward trajectory. According to Riskesdas (2018), nearly all Indonesian provinces reported increased caries rates in 2018. In DKI Jakarta province, the average caries prevalence stood at 41.3% among individuals aged 10-14, with a proportion of 44.4%. Additionally, 80% of the population habitually consumed sweet foods daily, while only 4.8% practiced restraint in this regard. Thus, a staggering 95.2% of the population continued to consume sweet foods regularly [5].

Dental caries arises from a complex interplay of various factors, primarily the three main components: teeth, saliva, microorganisms, and substrates, with time serving as an additional contributing factor [6]. Furthermore, dental caries is subject to indirect external influences, encompassing behavioral, environmental, healthcare, and hereditary factors [7]. In particular, the development of dental caries can be attributed to inadequate oral cleanliness and

improper brushing practices, such as brushing during morning and afternoon showers, neglecting the crucial brushing after breakfast and before bedtime [8]. Conversely, brushing teeth before retiring for the night has proven highly effective in mitigating the risk of dental caries [9].

Given the significance of dental function, it is imperative to commence consideration of children's dental health from a young age. Alongside dietary factors, meticulous tooth brushing stands as a pivotal measure in preventing dental caries [10]. Tooth brushing serves as a fundamental practice to uphold oral hygiene and avert dental caries [11]. The act of brushing teeth should adhere to proper techniques, ensuring comprehensive coverage of all tooth surfaces, and it should be timed strategically - specifically, after breakfast and before bedtime [12]. Brushing post-meals effectively eliminates residual food particles clinging to tooth surfaces, thus impeding potential interactions between food debris and bacteria, particularly during the night when saliva production decreases [13]. Notably, despite the ubiquity of tooth brushing, misconceptions and errors in both comprehension and execution persist [14].

In a preliminary study conducted in March 2022, examinations were carried out on several fifth-grade elementary school students, revealing that out of 10 students examined, 8 were found to have dental caries. Additionally, these students did not engage in the practice of brushing their teeth after consuming cariogenic snacks at school, resulting in a high debris index. Given this context, the researcher has developed an interest in investigating the correlation between knowledge levels, snack consumption habits, and tooth-brushing behaviors in relation to the prevalence of dental caries among students at Muhammadiyah Meruyung Depok Elementary School.

MATERIALS & METHODS

This research employed an analytical observational approach with a cross-

sectional design, involving a randomly selected group of 90 fifth-grade students from SD Muhammadiyah Meruyung Depok who met the inclusion criteria.

The dependent variables in this study encompassed dental caries and debris index in students, while the independent variables included snack consumption, knowledge levels, and tooth-brushing behaviors. The snack consumption variable was assessed through a questionnaire comprising 10 questions with a scoring range of 0-10. Similarly, knowledge and tooth-brushing practices were evaluated using a questionnaire featuring 10 questions with a scoring range of 0-10.

Data collection for this study involved the use of questionnaires administered to the students based on their specific circumstances. Informed consent was provided by the research team prior to the questionnaire distribution. Once the students agreed to participate as respondents, they proceeded to sign the consent sheet.

Data analysis encompassed univariate analysis (frequency distribution), bivariate analysis (chi-square test), and multivariate analysis (logistic regression).

RESULT

This research was conducted on 90 respondents of grade V students of SD Muhammadiyah Meruyung Depok, with the following results:

Table 1. Distribution of Knowledge Variable

Variable	Total	Frequency
Pengetahuan		
Good	44	48.9
Sufficient	45	50.0
Poor	1	1.1
Snack Consumption		
Good	2	2.2
Sufficient	69	76.7
Poor	19	21.1
Tooth Brushing Action		
Good	1	1.1
Sufficient	60	66.7
Poor	29	32.2
Incidence of Dental Caries		
No Caries	20	22.2
Caries	70	77.8
Debris Index		
Moderate	53	58.9
Poor	37	41.1

According to the table above, it is evident that 45 students (1.1%) possess adequate knowledge. Furthermore, 69 students (76.7%) exhibit healthy snack consumption habits, while 60 students (66.7%) maintain proper tooth-brushing practices. Unfortunately, a significant number of students, specifically 70 (77.8%), are afflicted by dental caries. Additionally, 53 students (58.9%) fall into the category of having a moderate debris index status. These statistics underscore the relevance of investigating the relationship between knowledge, snack consumption habits, and dental caries among students at SD Muhammadiyah Meruyung Depok.

Table 2. Relationship between independent variables and the incidence of dental caries

Independent variable	No Caries		Caries		p
	N	%	N	%	
Knowledge					
Good	13	14.4	31	34.4	0.031
Sufficient	6	6.7	39	43.3	
Poor	1	1.1	0	0.0	
Snack Consumption					
Good	0	0.0	2	2.2	0.020
Sufficient	20	22.2	49	54.4	
Poor	0	0.0	19	21.1	
Tooth Brushing Action					
Good	1	1.1	0	0.0	0.001
Sufficient	19	21.1	41	45.6	
Poor	0	0.0	29	32.2	

Table 2 reveals that the majority of respondents exhibited adequate knowledge, with an incidence of caries affecting 39 individuals (43.3%). The statistical analysis yielded a p-value of 0.031, which is less than the significance level of 0.05. Consequently, it can be deduced that a significant correlation exists between knowledge of snack consumption and the prevalence of dental caries among students. Moreover, most respondents displayed moderate snack consumption habits, with 49 cases (54.4%) experiencing caries. The statistical examination produced a p-value of 0.020, also below the 0.05 significance threshold, leading to the conclusion that there is a noteworthy relationship between snack consumption patterns and the occurrence of dental caries among students. Additionally, the majority of respondents demonstrated moderate tooth-brushing practices, coinciding with the incidence of

caries in 41 cases (45.6%). Statistical analysis yielded a p-value of 0.001, further reinforcing the conclusion that a significant correlation exists between the act of tooth brushing and the prevalence of dental caries among students at SD Muhammadiyah Meruyung Depok.

Table 3. Relationship between Knowledge of Snack Consumption and Debris Index Score

Independent variable	Debris index				p
	Moderate		Poor		
Knowledge	N	%	N	%	
Good	44	48.9	0	0.0	0.000
Sufficient	8	8.9	37	41.1	
Poor	1	1.1	0	0.0	
Snack Consumption					0.015
Good	0	0.0	2	2.2	
Sufficient	46	51.1	23	25.6	
Poor	7	7.8	12	13.3	
Tooth Brushing Action					0.017
Good	1	1.1	0	0.0	
Sufficient	41	45.6	19	21.1	
Poor	11	12.2	18	20.0	

Table 3 illustrates that the majority of respondents exhibited a good level of knowledge, with the next most prevalent category being a moderate debris index, affecting 44 students (48.9%). The statistical analysis yielded a p-value of 0.000, which is less than the significance

level of 0.05. Consequently, it can be confidently concluded that a significant association exists between knowledge of snack consumption and the debris index score among students at Muhammadiyah Meruyung Depok Elementary School.

Moreover, most respondents demonstrated moderate snack consumption habits, with 46 cases (51.1%) experiencing caries. The statistical examination produced a p-value of 0.015, once again falling below the 0.05 significance threshold. This leads to the conclusion that there is a noteworthy relationship between snack consumption patterns and the debris index score in students.

Additionally, the majority of respondents displayed moderate tooth-brushing practices, in alignment with a moderate debris index affecting 41 individuals (45.6%). Statistical analysis yielded a p-value of 0.017, further reinforcing the conclusion that a significant correlation exists between the act of tooth brushing and the debris index score among students at Muhammadiyah Meruyung Depok Elementary School.

Table 4. The relationship between knowledge, snack consumption and tooth brushing actions on the incidence of dental caries in students

Variable	B	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
						Lower	Upper
Knowledge	.311	.315	1	.575	1.365	.461	4.045
Snack Consumption	18.385	.000	1	.007	96.539	1.049	15.374
Tooth Brushing Action	35.638	.000	1	.096	30.000	.000	.
Constant	-107.934	.000	1	.996	.000		

Table 4 reveals that among the three independent variables, the snack consumption variable emerges as a significant contributor to the onset of dental caries, as evidenced by a p-value of 0.007, which is less than the threshold of 0.05. Interpreting the table, it can be deduced that respondents with poor snack consumption

habits are at a considerably higher risk—96.539 times higher—of developing dental caries compared to respondents who consume snacks of good quality. This is substantiated by the 95% Confidence Interval (C.I.) value for EXP (B) falling within the range of 1.049 to 15.374.

Table 5. The relationship between knowledge, snack consumption and tooth brushing actions on the debris index in Muhammadiyah Meruyung Depok Elementary School students.

Variable	B	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
						Lower	Upper
Knowledge	2.599	5.619	1	.018	13.453	1.569	115.374
Snack Consumption	1.268	1.881	1	.170	3.553	.580	21.753
Tooth Brushing Action	6.297	16.701	1	.000	543.054	26.498	11129.274
Constant	-19.812	11.875	1	.001	.000		

Table 5 illustrates that among the three independent variables, the tooth-brushing variable emerges as a significant contributor to the debris index score, as evidenced by a p-value of 0.000, which falls below the significance threshold of 0.05. Analyzing the table, it becomes apparent that respondents with subpar tooth-brushing habits face a substantial risk-543,054 times higher-of having an elevated debris index score compared to respondents who maintain good tooth-brushing practices. This conclusion is supported by the 95% Confidence Interval (C.I.) value for EXP (B), which falls within the range of 26,498 to 11,129,274.

DISCUSSION

The findings highlight a significant correlation between knowledge regarding snack consumption and the incidence of dental caries among students at SD Muhammadiyah Meruyung Depok. It is worth noting that dental caries represents a process of demineralization affecting enamel, dentin, and cementum, driven by the metabolic activity of microorganisms^[15]. Typically, children entering school age are at heightened risk of dental caries due to their inclination to indulge in snacks and beverages as they please^[16]. In this context, knowledge, particularly knowledge concerning snack consumption, emerges as a critical determinant of an individual's dental caries status. An individual's knowledge significantly influences their health-related behavior, enabling those with well-informed insights to adopt appropriate attitudes and behaviors when facing health challenges^[17].

The outcomes of this study align with research conducted by Khulwani et al^[18], which affirms a noteworthy association between oral health knowledge and the caries status of students at SMP Negeri 1 Selogiri, Wonogiri Regency.

The results indicate a significant association between snack consumption habits and the incidence of dental caries among students at SD Muhammadiyah Meruyung Depok. It's

important to note that snacking habits have a direct impact on dental caries. The activity of dental caries can intensify due to the consumption of sugars that readily adhere to tooth surfaces. Increased sugar intake correlates with a higher likelihood of dental caries development. Conversely, a balanced diet rich in fiber, fruits, and vegetables can fortify and nourish teeth while preventing oral diseases, as highlighted by Eni^[19].

Daries involves the deterioration of the hard tissues of teeth, characterized by the initiation of demineralization or dissolution in the outer layer of the tooth (enamel). Left untreated, the caries process can persist and potentially serve as a source of infection, impacting not only the tissues surrounding the teeth but also other organs such as the kidneys and heart. This underscores the importance of addressing dental caries to prevent potential complications^[20].

These findings align with the research conducted by Keumala^[21], which underscores a significant relationship between diet and dental caries among grade V and VI elementary school students at Kayee Leue State Elementary School, Ingin Jaya District, Aceh Besar Regency.

The findings demonstrate a significant correlation between the practice of brushing teeth and the occurrence of dental caries among students at SD Muhammadiyah Meruyung Depok. It is crucial to understand that inadequate teeth maintenance can lead to various dental ailments, including dental caries. The etiology of oral and dental diseases is multifaceted, influenced by factors such as the environment, individual behavior, and the accessibility of oral healthcare services^[22].

Despite the advancements in oral healthcare in recent years, the prevalence of dental caries, or cavities, in children's teeth remains a notable clinical challenge, as highlighted by^[23]. Many oral diseases afflicting individuals in Indonesia are fundamentally linked to oral hygiene practices^[24].

Practicing good oral hygiene stands as the foremost preventive measure advocated for

maintaining oral health. This practice reflects an individual's commitment to preventive healthcare, often realized through regular tooth brushing, as emphasized by [25]. Tooth brushing plays a pivotal role in plaque and debris removal, the elimination of food residues adhering to teeth, the stimulation of gingival tissue, and the mitigation of undesirable bad breath. Inadequate brushing techniques, on the other hand, carry the risk of precipitating dental caries.

The findings of this study align with the research conducted by Hasiru et al [26], affirming the existence of a relationship between oral hygiene practices and the incidence of dental caries.

The results have revealed a significant association between knowledge about snack consumption and the debris index score among students at SD Muhammadiyah Meruyung Depok. It's important to understand that knowledge represents the process of acquiring insights into the truth, which guides our understanding of what needs to be known and what actions to take. Knowledge represents the outcome of understanding and typically follows the perception of a specific subject. Knowledge, particularly within the cognitive domain, holds immense importance in shaping an individual's actions. Without knowledge, individuals lack the foundation for making informed decisions and determining their course of action in addressing various challenges. The observed debris index scores among respondents can be attributed to the fact that many of them still lack awareness regarding the importance of oral health maintenance. This deficit in knowledge among respondents inevitably influences students' behavior towards oral health maintenance and, consequently, has repercussions on oral health, particularly concerning issues like snack consumption.

These findings align with research conducted by Wulandari et al [27], which affirms that knowledge, attitudes, and community actions are interconnected with oral hygiene status. The results have

revealed a significant connection between students' snack consumption habits and their debris index scores at SD Muhammadiyah Meruyung Depok. It's crucial to understand that certain snacks like bread and biscuits can exacerbate the occurrence of dental caries. Among nutritional factors, sugar plays a central role in the development of caries as it is highly fermentable in the mouth. Frequent sugar consumption correlates with an increased likelihood of debris accumulation. Conversely, a well-balanced diet rich in fiber, fruits, and vegetables not only fortifies and nourishes teeth but also serves as a preventive measure against oral cavity diseases, as emphasized by [28].

The results have unveiled a significant correlation between the practice of tooth brushing and the debris index scores among students at SD Muhammadiyah Meruyung Depok. It's essential to understand that proper and effective tooth brushing entails a method that thoroughly cleans the entire tooth surface while avoiding harm to the soft tissues within the mouth. This process should be carried out systematically, moving from one side to the other in a regular sequence. The primary purpose of tooth brushing is to eliminate food debris adhering to the tooth surfaces, including the areas between the teeth and the gums, as well as to hinder the proliferation of bacteria within the oral cavity, as explained by [29].

Further elaborates that the correct technique for brushing teeth involves employing vertical or circular motions for the front teeth, circular motions for the lateral teeth, back-and-forth movements for the chewing surfaces, and gentle prying motions to clean the interior and rear of the teeth. The ultimate goal of tooth brushing is to effectively remove food residues and to impede the growth of bacteria within the mouth. Incorrect brushing practices can exacerbate the debris index score, underscoring the importance of proper technique.

CONCLUSION

Among the three independent variables, it is evident that the snack consumption variable significantly contributes to the occurrence of dental caries, as indicated by a p-value of 0.007, which is less than the threshold of 0.05. Examining the table above, we can infer that respondents with poor snack consumption habits face a substantial risk-96.539 times higher-of developing dental caries compared to respondents who consume healthy snacks. This is supported by the 95% Confidence Interval (C.I.) value for EXP (B), ranging from 1.049 to 15.374. Similarly, among the three independent variables, it is apparent that the tooth-brushing variable plays a significant role in determining the debris index score, as demonstrated by a p-value of 0.000, which is less than the 0.05 threshold. Analyzing the table, it can be deduced that respondents with inadequate tooth-brushing practices are at a heightened risk-543,054 times higher-of suffering from a high debris index score in comparison to respondents who maintain proper tooth-brushing actions. The 95% Confidence Interval (C.I.) value for EXP (B) falls within the range of 26,498 to 11,129,274, further reinforcing this association.

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