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Effect of Cariogenic Food Consumption on Caries Rate and Plaque Index: A Cross-Sectional Study

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Abstract:- Islamic boarding schools are places where students can study religion and live as if they were at home. Regarding food consumption, Islamic boarding school students have the habit of purchasing sugary (cariogenic) foods outside the boarding school. Based on the results of the dental caries examination at the Darussalam Islamic Boarding School, Semarang Regency, 5% of students were caries-free, and 10% had an excellent OHIS. This study aimed to determine the relationship between cariogenic food consumption and caries rates and plaque index in Islamic boarding school students aged 7-11 in Semarang Regency. This type of research is observational with a cross-sectional approach. The number of samples was 136 Islamic boarding school students, aged 7-11, in Semarang Regency. The research instrument used was a cariogenic questionnaire that had been tested for reliability with Cronbach's Alpha > 0.60, namely R = 0.725. The Kendall Tau test was used to analyze the data. The statistical tests showed that cariogenic food and caries condition (DMF-T) consumption was 0.000, whereas cariogenic food and plaque index was 0.000. This indicates a significant relationship between cariogenic food consumption, caries condition (DMF-T), and plaque index in Islamic boarding school students in Semarang Regency. Therefore, it is hoped that students can reduce their consumption of cariogenic foods in order to be free from plaque and caries.

Keywords:- *cariogenic food consumption, dental caries, plaque index.*

I. INTRODUCTION

Caries is a dental and oral disease that affects many Indonesian people. The Basic Health Research Report shows that as many as 93% of Indonesia's population has caries problems. Central Java has a prevalence of broken teeth, cavities, and pain of 43.4% [1].

Etiologically caries is tooth surface damage due to interactions between carbohydrates, bacteria, susceptibility to caries, and time factors. Food debris in the oral cavity, especially carbohydrates, can invite bacteria to convert sugar into acid. The acid that builds up with bacteria can form a sticky layer called plaque. The acid that continues to form from plaque can cause demineralization of tooth enamel, which can cause lesions and lead to infection of the hard tooth tissue called caries [2].

Sugar and biofilm play a significant role in the formation of caries. Exposure to stable sugars in the oral cavity can cause an imbalance of microbes in the oral cavity, causing the pH of the oral cavity to become acidic [3]. Therefore cariogenic diet has a major role in the etiopathogenesis of caries.

Based on age category, children aged 3-4 years had a prevalence of caries problems of 36.4%, children aged 5-9 years had a prevalence of 54%, and children aged 10-14 years had a prevalence of caries of 41.4%. [1]. Based on these data, it can be concluded that children have a greater tendency to have caries at the age of more than five years.

Adolescents attending Islamic boarding schools tend to have poorer oral health behavior than public school adolescents [4]. This is partly due to the age at which children require the role of parents to supervise dental hygiene and health [5]. However, the time for parents to meet and supervise is also reduced after entering the school period. Islamic boarding schools are religious institutions that provide boarding-based Islamic religious education. This method of studying and living together deprives parents of the ability to supervise their children's oral hygiene and health [6].

This lax monitoring encourages children to be less choosy, so they consume cariogenic foods unknowingly and uncontrolled. Previous research revealed that many Islamic boarding school students still experience oral health issues caused by infrequent teeth cleaning [7].

Based on the results of dental caries examination at the Darussalam Islamic Boarding School, Semarang Regency, there were 5% who were free of caries and 10% with good OHIS. This shows that only a few students pay attention to dental hygiene and health.

This study aimed to determine the relationship between consuming cariogenic foods on caries rates and plaque index in Islamic boarding school children aged 7-11 years in Semarang Regency.

II. METHODS

This type of research is an observational study with a cross-sectional approach. The number of samples was 136 Islamic boarding school children aged 7-11 years in Semarang Regency. The research instrument used was a cariogenic questionnaire that had been tested for reliability with Cronbach's Alpha > 0.60, namely R = 0.725. Data analysis was analyzed using the Kendall Tau test.

This study used ethically appropriate information from the Health Research Ethics Committee of the Semarang Ministry of Health Polytechnic with No. 0538/ea/kepk/2022.

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III. RESULTS AND DISCUSSION

The research results are divided into several stages as follows:

A. Analysis test of consuming cariogenic food

Category	Number of Respondents	Percentage (%)
Good	40	29.4
Moderate	64	47.1
Low	32	23.5

Table 1: Results of the Cariogenic Questionnaire Assessment for Islamic Boarding School Students aged 7-11

Table I shows that the habit of consuming cariogenic foods as measured through a questionnaire is at a sufficient level. It can be seen that 64 Islamic boarding school children are in the moderate category (47.1%) in consuming cariogenic foods.

B. Dental caries rate analysis test (DMF-T)

Category	Range	Number of Respondents	Percentage (%)
Very high	>6.6	12	8.8
High	4.5-6.6	24	17.6
Moderate	2.7-4.4	56	41.2
Low	1.2-2.6	24	17.6
Very low	0.0-1.1	20	14.7

Table 2: State of Dental Caries in Islamic Boarding School Students Aged 7-11 Years

Table II shows that most Islamic boarding school students in Semarang Regency aged 7-11 years have moderate dental caries, namely 56 people (41.2%).

C. Index Plaque Analysis Test

Category	Number of Respondents	Percentage (%)
Good	40	29.4
Moderate	76	55.9
Low	20	14.7

Table 3: Plaque Index Scores for Islamic Boarding School Students Aged 7-11 Years

Table III shows that Islamic boarding school students aged 7-11 years in Semarang Regency have a moderate index. This is demonstrated by the majority of students, namely as many as 76 people (55.9%) belonging to the moderate plaque index with a range of 1.8-3.4.

D. Correlation between consumption of cariogenic foods and DMF-T condition

Test Description	Test Value
Correlation coefficient	0.848
Significance value	0.000

Table 4: Test Results for Correlation between Consumption of Cariogenic Foods and Conditions of DMF-T in Islamic Boarding School Students Aged 7-11

Based on Table IV, it is known that the significance value shows the number of 0.000 < 0.05. These results indicate a significant relationship between cariogenic food consumption and caries condition (DMF-T) in Islamic boarding school students in Semarang Regency. The correlation coefficient value shows the number of 0.848 (0.76-0.99), so it can be concluded that cariogenic food consumption and DMF-T conditions have a strong relationship.

E. Correlation between consumption of cariogenic foods and plaque index

Test Description	Test Value
Correlation Coefficient	0.911
Significance value	0.000

Table 5: Test Results for Correlation between Consumption of Cariogenic Foods and Plaque Index for Islamic Boarding School Students Aged 7-11

Based on Table V, it is known that the significance value indicates the number of 0.000 < 0.05. These results suggest a significant relationship between cariogenic foods consumption and the condition of index plaque in Islamic boarding school students in Semarang Regency. The correlation coefficient value shows the number of 0.911 (0.76-0.99), so it can be concluded that the consumption of cariogenic foods and the state of plaque has a very strong relationship.

Cariogenic food plays a major role in the formation of dental caries in children [8]. Cariogenic foods include candy, foods containing carbohydrates, and soft drinks. Sugar or sucrose left in the oral cavity can invite oral bacteria to carry out metabolism and produce acid. If this continues, the acid will accumulate on the teeth' surface, forming a sticky layer called plaque [15]. Then the acid will continue to develop and cause tooth demineralization, causing infectious lesions of the hard tooth tissue and leading to cavities [2].

Caries on the teeth is correlated with the frequency of eating cariogenic foods [9]. This indicates that the more often a person consumes cariogenic foods, the greater his risk of developing caries on his teeth [17]. Frequent eating of cariogenic meals exposes the teeth to sugar for a longer time, which can accelerate the growth of caries-causing bacteria.

Sugar is the leading cause of caries in human teeth. A study in an intra-oral caries model showed that teeth exposed to sugar 3-10 times per day for five days with the same amount of sugar resulted in increased demineralization [10]. This shows that the frequency of sugar intake affects the development of caries [16] [18]. Therefore, the cariogenic diet should emphasize reducing the frequency rather than the amount of sugar intake, especially in students. WHO issued guidelines to reduce added sugar daily to 5-10% of total energy intake. Besides that, this must also be accompanied by not consuming sugar-containing snacks between two meals [11].

Children's caries status is influenced by their awareness of cariogenic foods [12]. Knowledge is the basic thing that can determine a person's actions as a form of habit. Therefore, knowledge about cariogenic food in Islamic boarding school students is needed in order to create a habit of maintaining a cariogenic diet as a preventive measure for keeping teeth healthy.

The habit of brushing teeth has a relationship with the incidence of caries [13]. Brushing your teeth can easily help remove plaque that has a soft consistency. The habit of brushing your teeth according to the direction of the Ministry of Health, namely in the morning after breakfast and at night before going to bed is needed to avoid dental and oral health problems [14]. Students with an education system based on a dormitory environment must be able to apply healthy living habits, mainly because they are in a close-knit social environment and live together, so it will be easier to influence other students.

IV. CONCLUSIONS

Based on the research that has been done, it can be concluded that there is a significant relationship between the consumption of cariogenic foods, caries, and plaque in Islamic boarding school students in Semarang Regency. It can be concluded that consuming cariogenic foods can increase the number of plaque and caries cases in students.

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