The Correlation between Caries Status and Caries Risk Assessment with Body Mass Index in Children Living in Coastal Areas

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ABSTRACT

Background: *Indonesia is experiencing a double nutritional problem, undernutrition problem and overnutrition problem. More nutritional problems are caused by economic progress in certain levels of society accompanied by a lack of knowledge about nutrition, balanced menus and health. Excess body weight has an effect on oral health. Underweight individuals have a risk of experiencing hyposalivation and caries. Changes the condition of the oral cavity that occur in the BMI category are related to the rate of saliva flow. BMI is positively correlated with salivary gland size. Salivary flow greatly influences the attachment of bacteria to the tooth surface. The aim of this research is to determine the relationship between BMI, status caries and caries risk assesment in children living in coastal areas*

Method: *The type of the research used analytical observational with a cross sectional approach. BMI is calculated by comparing body weight to height squared. The prevalence of caries is calculated using the decayed, missing, filled-teeth index (def-t or DMF-T) found in children's teeth and the results are divided by the number of samples examined. Caries risk assessment is carried out using the CAMBRA method.*

Result: *22.8% of children with underweight BMI had a caries index of 4.34 and 50% had a high risk of caries. The results of the Spearman correlation test between BMI and the caries index obtained a significance value of 0.046, so it can be concluded that there is a relationship between BMI and the caries index, with a low level of correlation strength and a relationship in the opposite direction. The results of the correlation test between BMI and caries risk assessment obtained a significance value of 0.070, so it can be concluded that there is no relationship between BMI and caries risk, with a sufficient level of correlation strength and a relationship in the opposite direction*

Conclusion: *There is a significant relationship between Body Mass Index and the caries index. There is no significant relationship between Body Mass Index and caries risk assessment using the CAMBRA method in children living in coastal areas*

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INTRODUCTION

The nutritional status of children aged 5-18 years is grouped into 3 age of groups, those are 5-12 years, 13-15 years and 16-18 years. The nutritional status indicators used by this age group are based on anthropometric measurements of body weight (BB) and height (TB) presented in the form of height index by age (TB/U) and body mass index by age (BMI/U).[1,2]

Based on RISKESDAS in 2018, the prevalence of obesity in school-age children (5-12 years) in Indonesia is quite high, almost 10.8%.[3] Individuals, who have overweight and obese have the potential to develop xerostomia and an increased risk of caries. Severe periodontal disease is also more common in patients who are overweight than individuals with normal BMI. Underweight individuals are also at risk of hyposalivation and caries. Changes in the state of the oral cavity that occur in the BMI category are related to the rate of saliva flow.[4]

Underweight children are also more likely to develop dental caries because they don't chew much when they don't eat, causing reduced saliva secretion. When saliva secretion decreases, the capacity of the saliva buffer capacity decreases, thereby disrupting the pH of the oral cavity and causing teeth to be more susceptible to cavities/caries[4]. Lower Body Mass Index (BMI) can affect in child's growth and development. It can caused by poor oral hygiene. Poor oral hygiene can trigger dental caries. Children who have the highest dental caries are included in the category of low Body Mass Index (BMI)[5]. This is because children who experience dental caries will feel pain and impaired chewing function, resulting in a lack of nutritional intake in children[5,6].

Previous research stated that coastal areas are environments with complex economic problem and limited healtd service levels [7,8,9]. Research with 150 respondents found 3,3% very thin, 16,7% thin, 77% normal, 1,5% obese and 1,5% very obese.[9]

The purpose of this study is to find out the relationship between BMI and caries in children living in coastal areas, After this research, it can be known how to increase the ideal BMI so that healthy and caries-free children's teeth can be obtained. Growth status parameters use anthropometry which is used to assess nutritional status by measuring physical dimensions and body composition, and can provide information about the history of past nutritional status.

RESEARCH METHOD

The type of research is observational analytical research with the cross sectional method. The population of this study is students of SDN 248 Kenjeran Surabaya who live in coastal areas.

BMI measurement is carried out by comparing body weight (kg) to square height (m^2). Use a stadiometer or measuring tape without shoes to measure height. Use a calibrated scale, without shoes and heavy clothing to measure the body weight. Then calculate the BMI using the formula. Classify the result based on WHO standard.[7]

The nutritional status indicators used by this age group are based on anthropometric measurements of body weight (BB) and height (TB) presented in the form of height index by age (TB/U) and body mass index by age (BMI/U). Body mass index is calculated based on the following formula [1]:

$$\text{BMI} = \frac{\text{body weight (Kg)}}{\text{Height square (meter)}}$$

DMF-T measurement is done by adding the holes (D), missing teeth (M) and patched teeth (F), then the number obtained is divided by the number of samples examined. While def-t is by adding the teeth that are holes (d), teeth lost due to caries (m) and teeth that are patched due to caries (f), and the result is divided by the number of samples examined[11]. CAMBRA is a risk assessment tool used for the prevention and treatment of caries at the earliest stages, before permanent damage to the teeth occurs. Each individual will be assessed according to his or her disease indicators, risk factors, and protective factors to address current and future caries risk[12]

The data analysis used in the results of this study is a spearman rank correlation coefficient test. The correlation test in this study was carried out to determine the relationship between the nutritional status of body mass index measurements and dental caries in pediatric patients in coastal areas.

RESULTS

The results of the study are divided into two parts, namely the results of univariate analysis and bivariate analysis. Univariate analysis is the characteristic of respondents regarding Body Mass Index (BMI) and caries risk assessment using the CAMBRA method. Meanwhile, bivariate analysis is the result of an analysis carried out using the spearman correlation test to find out whether there is a relationship between variables and the results will be presented in the form of a table.

Table 1-3 shows the distribution of body mass index (BMI), caries index frequency and results of caries risk assessment with CAMBRA in 83 respondents. From the table, it appears that the highest number of respondents is 11 years old, followed by 10, 9 and 12 years old. Meanwhile, a high caries index has a fairly high percentage, which is as many as 71% or 59 respondents. The results of the CAMBRA assessment are contained in table 5. Where as many as 63% of respondents have a high risk of caries.

Table 1. Body Mass Index Frequency Distribution

Age	Underweight		Normal		Overweight		Obesitas		TOTAL	
	n	%	n	%	n	%	n	%	n	%
9	15	18	2	2	1	1	0	0	18	21
10	19	20	2	2	4	3	0	0	25	30
11	12	14	14	16	0	0	1	2	27	32
12	9	10	3	2	1	1	0	0	13	17
Total	55	66	21	25	6	7	1	2	83	100

Table 2. Caries Index Frequency Distribution

Number of subjects	%	Average Caries Index	Criteria
59	71	4,34	High
12	14.5	1,80	Low

12	14.5	0	Very low

Table 3. Caries Risk Assessment with the CAMBRA Frequency Distribution

Number of subjects	%	Risk of caries based on CAMBRA
53	63	High
19	23	Moderate
11	13	Low

Table 4-5 is still a form of univariate analysis, by combining 2 data distribution results, namely BMI category and caries status in table 4 and assessment of BMI category with CAMBRA method in table 5

Table 4. Distribution of BMI categories and Caries Status

IMT Category	def-t score	DMF-T score	N	Caries Index
Underweight	279	81	2	4,34
Normal	101	20	2	1,45
Overweight	30	14	14	0,53
Obesity	1	7	3	0,10
Total	411	122	533	6,42

Table 5. Assessment of BMI category with CAMBRA method

IMT Category	Risk Assessment with CAMBRA							
	High		Moderate		Low		Total	
	n	%	N	%	n	%	n	%
Underweight	37	44	13	16	5	6	55	66
Normal	13	15	4	5	4	5	21	25
Overweight	2	2	2	2	2	2	6	6
Obesity	1	3	0	0	0	0	1	3
Total	53	64	19	23	11	13	83	100

Bivariate analysis with spearman correlation test to determine whether there is a relationship between variables is shown in tables 6 and 7.

Table 6. Results of the Spearman Correlation Analysis Test between BMI and Caries Index

Variable	Rank Spearman Test	
BMI with caries index	p value = 0,046	There is a relationship between BMI and def-t/DMF-T

	r = -0,220	Low and opposite relationships

The significance value of the correlation test results of BMI with caries index was 0.046. The significance value is <0.05, so it can be concluded that there is a relationship between BMI and the caries index, with a relationship in the opposite direction. Opposite direction means that the more the value of a variable increases, the more other variables decrease.

Table 7. Results of Spearman Correlation Analysis Test between BMI and Caries Risk Assessment with Cambra Method

Variable	Rank Spearman Test	
BMI with caries risk	p value = 0,070	There is no association between BMI and caries risk
	r = -0,412	Relationships are sufficient and in opposite directions

The significance value of the correlation test results of BMI with caries risk was 0.070. The significance value > 0.05, so it can be concluded that there is no relationship between BMI and caries risk assessment.

DISCUSSION

This study was conducted to determine the relationship between body mass index and caries index also caries risk assessment in children aged 9-12 years living in coastal areas. In this study, as a whole, there were more children who had a underweight body mass index category, which was 66%, while the normal BMI category was 25%, overweight was 7%, and obesity BMI status was 2%. Balance in food intake is very influential on the growth of children, where this growth will affect to enter the next stage of growth and development [13,14]

Children with a low or thin body mass index have the highest caries index.[15,.] This can be caused because in conditions of underweight or underweight related to a decrease in saliva composition and secretion. Decreased saliva composition and secretion results in a low saliva flow rate. In children with underweight or underweight, it is known to experience a decrease in saliva flow rate, while in normal weight children there is no decrease in saliva flow rate [16,17]

Children who experience caries cause difficulty eating which affects the growth and development of the child and affects the nutritional status of the child. In addition, it is related to impaired chewing function so that it affects food intake. Disruption of eating function in children causes pain and loss of appetite. This led to a decrease in the calculation of Body Mass Index (BMI) [18]

The risk assessment of caries using the CAMBRA method has several assessment factors, namely biological or environmental risk factors, protective factors, biological risk factors-clinical examinations, and disease indicators-clinical examinations[12.] In this study, 63% of children have a high risk of caries, 23% of children have a moderate risk of caries and 13% of children have a low risk of caries.

In this study, the risk of high caries occurred in 50% of children with a thin body mass index, 8% of children with a normal body mass index, 2% with an overweight body mass index and 3% of children with obesity. This high risk of caries is caused by several factors in accordance with the caries risk assessment with the CAMBRA method. The first is biological or environmental risk factors, the frequency of eating outside of the main meal hours is more than three times a day. There was a statistically significant correlation between the prevalence of dental caries and the frequency of consumption of cariogenic foods[18]. The frequency of consumption of cariogenic foods can increase the risk of plaque formation, and trigger the formation of caries. Children with underweight BMI have not been met with food and nutrition intake, which affects the growth and development of children[19,20.]

The measurement of body mass index did not have a significant relationship with the assessment of caries risk. This is because the measurement of caries risk by the CAMBRA method is influenced by biological risk factors that are balanced with protective factors and there are no biological risk factors – clinical examination and disease indicators [12,17]

CONCLUSION

In this study, conclusions were obtained:

In this study, there was a meaningful relationship between body mass index and caries index and there was no significant relationship between body mass index and caries risk assessment of children living in coastal areas.

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