

Relationship Between Nutritional Status Based On Bmi/Age To The Total Number Of Oral Bacteria In Children Aged 5-12 Years (Analytical Study At Sdn Bandarharjo 02 North Semarang)

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ABSTRACT

Background: Unbalanced nutritional intake can affect the occurrence of disorders in the oral cavity, such as disorders of the function and structure of the soft tissues of the mouth, especially at the corners of the lips and tongue so that microbial growth increases due to the decomposition of food. BMI/U is a nutritional status assessment index that is often used to detect nutritional problems in children. Accumulation of bacteria in the oral cavity causes poor oral hygiene and causes the development of microbes that can lead to inflammation. This study aims to determine the relationship between nutritional status based on BMI/AGE and the total number of bacteria in the oral cavity of children aged 5-12 years.

Method: The research method used is observational analytical research with laboratory experiments. The research subjects required were 100 children, aged 5-12 years. The sampling technique used purposive sampling.

Results: From the results of the data analysis, a significance value of 0.028 was obtained ($p < 0.05$).

Conclusion: The conclusion of this study is that there is a unidirectional correlation between nutritional status and the number of bacteria in the oral cavity of children.

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INTRODUCTION

The physical development of school-age children reflects their nutritional status in the first years of life ¹. Fulfillment of nutritional needs is important when children enter school age (6-12 years). Based on SSGI 2022, the prevalence rate of children's nutritional status based on BMI/Age in Central Java reached 20.8% and for the city of Semarang reached 10.4%². The highest prevalence of malnourished children in Semarang is in the North Semarang area with a total of 159 children. Based on the Semarang City Health Office data graph, there are 48 children in Bandarharjo Village, North Semarang, with a total of 26 boys and 22 girls suffering from malnutrition ⁴.

SDN Bandarharjo 02 is one of the SDN in Bandarharjo Village. The majority of parents work as factory workers and housewives. The low income earned by factory workers results in children's food needs not being met. Non-productive housewives cannot help improve the household economy. Based on research by Muslimah (2016), it is emphasized that socio-economic status is determined by education, work, income and living environment. Lack of knowledge, infections due to unhealthy environments, poor economic conditions due to lack of employment, can affect the quantity and quality of food given to children, which can later affect the nutritional status of children ³.

Nutritional status is the level of balance between the food eaten and the nutritional needs required by the body for metabolism ⁵. Calculation of nutritional status can be done by anthropometry using the BMI/Age indicator. An imbalance in the intake of nutrients consumed can affect the occurrence of disorders in the oral cavity, such as disruption of the function and structure of the soft tissues of the mouth, especially at the corners of the lips and tongue, causing the growth of microorganisms due to the decomposition of food ⁶.

In children, the soft tissues of the oral cavity that are often the site of lesions are the lips (30.70%), dorsum of the tongue (14.70%) and buccal mucosa (13.60%). Inadequate nutritional intake can result in growth disorders and disorders in the oral cavity that can become resistance to microbial colonization in the oral cavity ⁸.

Accumulation of bacteria in the oral cavity causes poor oral hygiene and causes the development of microbes which can cause inflammation ¹⁰.

The rough surface of the tongue provides a place for bacteria to grow and as a retention of food debris and if left without being cleaned regularly will cause plaque accumulation on the teeth and debris buildup on the tongue. Bacteria on the tongue play a role in the emergence of compounds that cause bad breath ¹¹.

A group of bacteria that gather together is called a bacterial colony. Bacterial colonies can be counted using a colony counter tool. A colony counter is a microscopic tool that functions to see bacterial colonies found in the media, the tool can work by using a magnifying glass to enlarge the bacterial colonies found in a petri dish ¹².

RESEARCH METHODS

The method used in this study was observational analytic with laboratory experiments. The research design was applied using cross-sectional.

The study population was children aged 5-12 years who attended SDN Bandarharjo 02, North Semarang. The sample was determined by purposive sampling, meaning that the sample was determined based on certain considerations of the criteria determined to be the research sample. A total of 100 child respondents participated as participants in this study with the inclusion criteria of children aged 5-12 years who did not use mouthwash and had a good OHI score. Meanwhile, the exclusion criteria included children who had systemic diseases and were uncooperative during sampling.

The research instruments and materials involved PPE, weight scales, height measurements, patient data sheets, Amies media transport, colony counters, BAP media, patient data sheets and

incubators. Sampling was carried out by swabbing the subject's tongue.

The research process began with the submission of an ethical clearance application, then continued with licensing and coordination at SDN Bandarharjo 02 North Semarang, requesting informed consent and calculating BMI/Age. Before sampling, the subject was asked not to eat or drink for one hour before and to gargle using distilled water for 30 seconds and to take samples using the swab method on the child's tongue until the entire surface of the cotton swab was in contact with the tongue. The sample was put into a cooler box containing dry ice, then dilution and agar media were made and identification and total bacterial counts were carried out.

And the final stage is a hypothesis test using SPSS. The research was conducted at SDN Bandarharjo 02, North Semarang and the IBL FK UNISSULA Microbiology Lab in May 2024.

The data obtained based on the research results were analyzed using SPSS (Statistical Package for the Social Sciences) version IBM 25 using the Spearman Rank correlation test.

RESEARCH RESULT

Penelitian This study was conducted to determine the relationship between nutritional status and total bacteria in the oral cavity of children. The

nutritional status of children is known from the calculation of body weight and height. The calculation results are adjusted to the category and threshold of the child's nutritional status. The method of calculating the total number of bacteria in this study used a colony counter. The subjects of the study were 100 children aged 5-12 years from SDN Bandarharjo 02, North Semarang with inclusion and exclusion criteria.

1. Respondent Characteristics Table

a. Gender

Table 1.1 Characteristic Respondent base on Gender (n = 100)

Gender	Total	%
Male	41	41 %
Female	59	59 %

b. Age

Table 1.2 Characteristic Respondent based on Age (n = 100)

Age	Total	%
10 Years	29	29 %
11 Years	62	62 %
12 Years	9	9%

c. IMT, Z-Score, Ohi-s

Tabel 1.3 Characteristic respondent based on IMT, Z-Score dan OHI-S (n=100)

Category	Mean $\pm$ SD Research subjects	Min	Max
IMT	17.88 $\pm$ 3.92	13.11	29.23
Z- Score	-0.25 $\pm$ 1.37	-3.36	2.33
OHI-S	0.54 $\pm$ 0.30	0.00	1.17

2. Average total bacteria of research subjects

Category	Mean $\pm$ SD	N
Research subjects		
Normal	56.62 $\pm$ 33.04	62
Over weight	285.59 $\pm$ 401.63	22
Malnutrition	153.62 $\pm$ 254.36	16

3. Table of Characteristics of Oral Cavity Bacteria

Category	Bakteri	N
normal nutritional status	Coagulase Negative <i>Staphylococcus</i>	25
	<i>Bacillus sp</i>	10
	<i>Streptococcus sp</i>	1
	Coagulase Negative <i>Staphylococcus</i>	
	<i>Bacillus sp</i>	
	Coagulase Negative <i>Staphylococcus</i>	26
	<i>Bacillus sp</i>	
	Coagulase Negative <i>Staphylococcus</i>	7
	<i>Streptococcus sp</i>	1
	Coagulase Negative <i>Staphylococcus</i>	
Overweight nutritional status	<i>Bacillus sp</i>	
	Coagulase Negative <i>Staphylococcus</i>	14
	<i>Bacillus sp</i>	
	Coagulase Negative <i>Staphylococcus</i>	2
	<i>Staphylococcus</i>	
Malnutrition nutritional status	<i>Bacillus sp</i>	1
	<i>Acinetobacter sp</i>	1
	<i>Streptococcus sp</i>	11
	Coagulase Negative <i>Staphylococcus</i>	
	Coagulase Negative <i>Staphylococcus</i>	12
	<i>Bacillus sp</i>	
	Total	100

4. Spearman correlation test

Parameter	Sig. (p)	Nilai	Interpretasi
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Correlation strength (r)	0.220	0.20 - 0.399	Weak
p value	0.028	P < 0.05	There is a correlation
Direction of correlation	0.220	+ (positif)	In one direction

DISCUSSION

Based on table 4.1, it shows that the subjects in this study were more female than male. The number of female research subjects was 59 people and male subjects were 41 people, and in the age category it showed that the subjects were mostly 11 years old. In BMI, the mean value was 17.88 with a minimum BMI of 13.11 and a maximum of 29.23, for the Z-score category, the mean value was -0.25 with a minimum of -3.36 and a maximum of 2.33. In the OHI-S category, an average of 0.54 was obtained with a minimum total OHI-S of 0.00 and a maximum of 1.17.

In table 4.2, it was found that the average value of total oral bacteria in children with overweight nutritional status tended to be higher compared to children with underweight and normal nutritional status.

In table 4.3 regarding the identification of bacteria in nutritional status samples, 3 types of gram-positive bacteria were found (*Streptococcus* sp, *Coagulase Negative Staphylococcus*, *Bacillus* sp) and 1 type of gram-negative bacteria (*Acinetobacter* sp). The most dominant bacteria found were *Coagulase Negative Staphylococcus*

Bacillus sp. *Bacillus* sp bacteria have rod-shaped characteristics, are included in gram-positive bacteria and are aerobic, while *coagulase negative staphylococcus* bacteria are gram-positive bacteria that have a coccus shape with a chain arrangement and are aerobic ¹³.

The oral cavity consists of normal and pathogenic flora bacteria. Normal flora bacteria have characteristics in each available area that can colonize so that they can prevent various diseases so that the body's defense is created ¹⁴. Normal flora bacteria do not cause disease if their numbers are balanced. However, if the balance of normal flora is disturbed, pathogenic bacteria become pathogenic bacteria that can cause disease due to changes in substrate or movement from their natural habitat ¹⁵. The types of oral bacteria are very diverse, but in this study the results of bacterial identification found 4 types of bacteria. This is because bacterial growth is influenced by several factors such as pH. When the pH in a medium or environment is not optimal, it can interfere with bacterial growth ¹⁶.

Table 4.4 in this study shows a weak correlation but has a unidirectional relationship between nutritional status based on BMI/Age with total oral bacteria. This unidirectional correlation shows that the greater the BMI/A of a child, the total number of bacteria will increase. In line with other studies that show a positive correlation between

body mass index and the number of high bacterial colonies. Similar results were found by Araujo *et al*, in their study, overweight children showed a higher percentage of *Streptococcus* sp compared to normal weight children ¹⁷.

This weak correlation may be caused by several factors, such as oral hygiene and diet in children ¹⁸. Based on this study, it shows that children's oral hygiene is in the good category. This can have a positive impact, including controlling and preventing plaque that can cause problems in the oral cavity. Based on Nurrosyidah's research (2017), maintaining oral hygiene can be done by using a tongue cleanser. The use of this tool has been proven to reduce the number of pathogenic bacteria such as *Porphyromonas gingivalis* ¹⁹.

Children with normal nutrition, secretory Immunoglobulin A (SIgA) can function normally. Immunoglobulin has a defensive role against oral microbes. SIgA controls normal flora by inhibiting bacterial adhesion to the tooth surface and mucosa so that the immune response and defense of the oral cavity are good ²⁰. Based on research by Elkhaira (2019), it was stated that normal flora plays a role in maintaining homeostasis of the oral cavity which can inhibit the growth of pathogenic bacteria, thus having an impact on good oral health ¹⁵.

Other factors such as diet can also affect the number of bacteria in the oral cavity. This is in line with Hamid's research (2017) which shows a

relationship between diet and bacteria that cause tooth decay in children. Regular consumption of cariogenic foods causes food to remain in the mouth. Food residue settles and ferments into acid. This acidic condition is favored by *Streptococcus mutans* and *Lactobacillus* sp, which are the main microorganisms responsible for the decomposition process ²².

Based on the study, it was found that there was no significant relationship between nutritional status and children's oral hygiene status. This finding is in line with a study conducted by Khafaji and Nadia (2019) in the city of Al-Hillah, Iraq, which found that there was no significant relationship between nutritional status and plaque accumulation, gingival index and calculus in children aged 10 years. This indicates that nutritional status does not significantly affect children's oral hygiene conditions ²¹. If your mouth and teeth are well cared for, there will be fewer bacterial infections.

This study states that although the relationship between nutritional status based on BMI/A and the number of bacteria in the oral cavity is weak, there is a significant correlation that should not be ignored. This suggests that good nutrition plays an important role in maintaining oral health. The results of this study have important implications for public health, especially in efforts to improve the nutritional status and oral health of children. Nutrition intervention programs aimed at improving

children's nutritional status can have a positive impact on their oral health. In addition, educating parents about the importance of maintaining oral hygiene and balanced nutrition is also important to prevent oral health problems in children.

The constraints experienced during the research were, when identifying bacteria with gram staining only a few types of bacteria could be identified. This happened because not all bacteria could grow on the media that had been made.

CONCLUSION

There is a positive correlation (unidirectional) between nutritional status and the total number of oral bacteria in children aged 5-12 years at SDN 02 Bandarharjo, North Semarang.

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