An Overview Of The Total Number Of Salivary Bacteria Based On The Nutritional Status Of Children

Welly Anggarani, Danty Algamar**, Yayun Siti Rohmah***, Rizki Amalina*****

** Department of Pediatric Dentistry, Faculty of Dentistry, Sultan Agung Islamic University*
*** Bachelor of Dentistry Degree Program, Faculty of Dentistry, Sultan Agung Islamic University*
**** Department of Maxillofacial Oral Surgery, Faculty of Dentistry, Sultan Agung Islamic University*
***** Department of Oral Biology, Faculty of Dentistry, Sultan Agung Islamic University*

***Correspondence*: welly@unissula.ac.id**

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ABSTRACT

Background: *A person's nutritional status can affect oral health where socio-economic status had a close relationship with the nutritional fulfillment. About 34% of the population of Bandarharjo North Semarang Village is unemployed, which requires monitoring the nutritional status of children in the area. Nutritional status can affect the risk of caries in children, where the lower a person's nutritional status, the higher the risk of caries. This study aimed to determine the total number of salivary bacteria based on the nutritional status of children aged 5-12 years at SDN Bandarharjo 02.*

Method: *This study used descriptive observations, by taking 2-5 ml of unstimulated saliva in 100 children aged 5-12 years who had been measured nutritional status based on BMI/A. The saliva samples obtained were then counted for total bacteria with a colony counter. Data was analyzed using univariate analysis.*

Result: *The results showed that from 100 children aged 5-12 years, the average total number of bacteria was 43.76 ± 43.22 CFU/ml. The total number of bacteria in 22 children with overweight status was 45.95 ± 18.78 CFU/ml, 62 children with normal status 37.51 ± 42.47 CFU/ml, 16 children with thinnes status 64.93 ± 62.04 CFU/ml.*

Conclusion: *Based on the results of the study, he highest total number of bacteria was found in the group of children with thinnes status.*

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BACKGROUND

Oral health is part of overall body health so it is important to maintain oral health.[1] Children's dental health and nutrition have a close relationship, especially in children who are still in the growth and development phase, because good and fulfilled nutrition can support dental health.[2] School-age children are an adolescent group aged 6 to 12 years who are starting to enter puberty, which is vulnerable to nutritional problems.[3]

Anthropometric standard measurements based on the BMI/A index are recommended because it can describe the overall body composition for individuals aged 5-18 years such as muscle, bone, and fat tissue.[4] This measurement uses body weight parameters that have a linear relationship with height based on age.[5] Based on data, the nutritional status of 5-12 year olds in Central Java Province with a prevalence of the underweight category of 2.4% and the thin category of 7.0% and the prevalence of the overweight category of 11.7 and the obese category of 9.7%.[6]

The role of parents is very important in providing nutritional needs for children. There are differences between parents who work and are able to buy healthy and nutritious food ingredients and parents who do not work.[7,8] Nutritional problems in children during growth and development are influenced by socio-economic factors, which if household food access is hampered due to a low economy, then malnutrition in children can occur.[9] Based on the demographics of Bandarharjo, North Semarang Subdistrict, 7,606 of the 22,812 residents are unemployed, 6,465 work as private employees, 3,400 caretakers of households, 939 are self-employed and 855 work as farm/plantation laborers.[10]

One of the factors that affects health status is socioeconomic status, as higher socioeconomic groups are more likely to meet living needs and have access to adequate health care services compared to lower socioeconomic groups.[11] Some studies show that the prevalence rate of dental caries is higher in children from low socioeconomic status. The 2019 study by Ghasemianpour stated that the socioeconomic status of parents plays an important role in the occurrence of dental caries in children.[12] The 2023 study by Wahyuni et al. showed that the dental caries index was higher in children with low socioeconomic status.[13] The 2021 study by Fithriyana also showed that children of parents with low socioeconomic status. have poor dental caries, which is 94.7%.[14] Based on the National Risk Report 2018 data, the percentage of dental problems such as damaged, decayed or painful teeth was: unemployed 44.1%, private employees 41.1%, self-employed 46.0%, farm/plantation laborers 50.0% and domestic helpers 47.3%.[6]

Nutritional status can affect the rate of saliva flow, where the lower a person's nutritional status, the lower the rate of saliva flow. Poor nutritional status can also affect the secretion and composition of saliva, resulting in a decrease in the rate of saliva flow that can affect a person's quality of life.[15] In the oral cavity, the normal salivary microflora is *Streptococcus mutans/viridans*, *Staphylococcus sp*, and *Lactobacillus sp*. Those normal flora microorganisms can turn into pathogens if there are predisposing factors such as oral hygiene, fluoride intake and rate of saliva flow.[16]

The growth of bacteria can be determined by calculating the number of bacterial colonies. The counting of bacterial colonies uses the colony counter because the number of bacteria colonies can reach more than 300. The colony counters use the help of lups to enlarge the bacterial colonies that exists on the petri dish.[17] The purpose of this study was to determine the description of the total number

of salivary bacteria based on the nutritional status of children aged 5-12 years.

RESEARCH METHOD

This research used a descriptive observational study design with a research design using a cross sectional study. The population in this study were 333 children aged 5-12 years who attended SDN Bandarharjo 02, North Semarang District. The sampling technique used was purposive sampling, where the samples were selected based on specific criteria, resulting in a total of 100 children as the study participants.

The research began with the submission of an ethical clearance to the Ethics Committee of Dentistry at Sultan Agung Islamic University, and this research has received ethical approval with number 538/B.1-KEPK/SA-FKG/III/2024. Then coordination with SDN Bandarharjo 02 for licensing and research time, as well as providing Informed Consent sheets. The instruments prepared for this study included digital weight scale, microtoise, name labels, 5ml pipettes, plastic tubes, cooler box with dry ice, petri dish, incubator, and colony counter. Then the materials used were distilled water, research samples, Blood Agar media, and 0.9% NaCl solution.

The research samples were taken by assessing the nutritional status through measurements of body weight and height. From the results of weight and height data, the BMI/A was determined based on the standard anthropometry. Then, unstimulated saliva samples were collected using the suction method, with a volume of 2-5 ml. The collected saliva samples were labelled first then placed in a cooler box with dry ice, then sent to the Integrated Biomedical Laboratories of the Faculty of Medicine, UNISSULA. Then Blood Agar media was prepared using 2% sheep blood. The saliva samples were diluted from 10^{-1} to 10^{-3} using 0.9% NaCl, then plated on petri dishes using the spread plate method, then incubated in an incubator at 37°C for 1x24 hours. Bacterial colony counting was performed using a colony counter by marking bacterial colonies were marked with a pen connected to the counter, then the total count was calculated using the formula (number of colonies/dilution factor (10^{-3})) and obtained in units of CFU/ml. The data analysis used in this study was univariate analysis.

RESULTS

Table 1. Shows the results of 100 research subjects divided into 3 nutritional status groups, namely overweight, normal, and thinnes. The number of research subjects in the overweight status was 22 children, the normal status was 62 children, and the thinnes status was 16 children.

Table 1. Overview of Nutritional Status in Children Aged 5-12 Years

Nutritional Status Groups	N	Percentage (%)
Overweight	22	22%
Normal	62	62%
Thinnes	16	16%
Total	100	100%

Figure 1. Shows the salivary bacteria that grew on Blood Agar Plate media for 1x24 hours, which has the morphological characteristics of round-shaped bacteria with a small size, white in color and has a flat elevation and even edges.

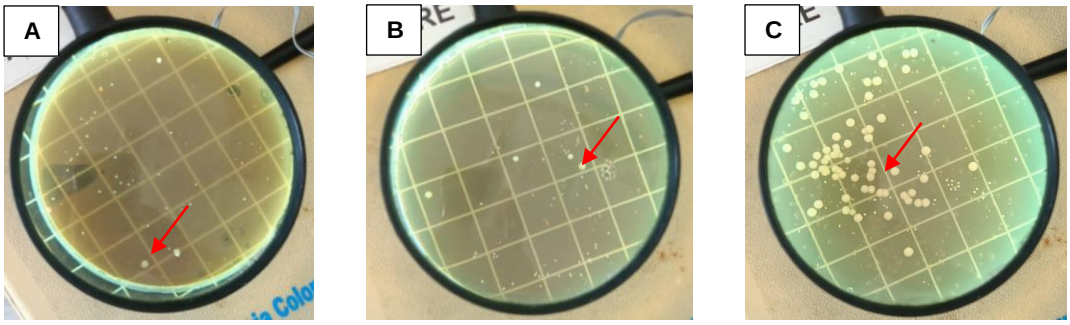

Figure 1. Saliva Bacteria on BAP Media, A. Thinnes status, B. Normal status, C. Overweight status

Table 2. Shows that the mean total number of salivary bacterial colonies from descriptive tests in the overweight status group was 45.95 CFU/ml, the normal status group was 37.51 CFU/ml, the thinnes status group was 64.93 CFU/ml.

Table 2. Mean Total Number of Salivary Bacteria Counts

Nutritional Status Groups	N	Total Salivary Bacteria (CFU/ml) ± SD
Overweight	22	45,95 ± 18,78
Normal	62	37,51 ± 42,47
Thinnes	16	64,93 ± 62,04

DISCUSSION

The bacterial colony counts were performed using the spread plate method, to facilitate the calculation of the total number of bacteria using a colony counter.[17] The morphological difference between bacterial and fungal colonies on the petri dish is that fungal colonies grow relatively slowly on the agar media because it takes 36-48 hours, spread over the entire surface of the agar media, and are shaped like granules or filamentous, with a characteristic yeast-like odor.[18] Then calculated by the formula of the number of colonies divided by the dilution factor 10^{-3}, the number of colonies entered into the formula is the result of the calculation of bacterial colonies from the third level of dilution, then the results are obtained in units of CFU / ml.[19]

According to Table 2, the mean total bacterial count from the 10^{-3} dilution showed that children with thinnes status had a higher number of bacteria compared to children with normal status (64.93 CFU/ml ± 62.04 CFU/ml). This may be due to the difference in body size affecting the size of the salivary glands, resulting in low saliva production, which can lead to decreased salivary flow rate and changes in saliva composition, thereby increasing the number of pathogenic bacteria in children with thinnes status. The decreased salivary flow rate in thinnes children can cause the saliva to become more concentrated, reduce the buffer capacity, and change the saliva pH to a more acidic environment, which supports the growth of cariogenic bacteria.[20]

According to Table 2, the mean total bacterial count from the 10^{-3} dilution showed that children with overweight status had a higher number of bacteria compared to children with normal status (45.95 CFU/ml ± 18.78 CFU/ml). This may be due to children with overweight status

experience an increase in the number of adipocytes in the parenchymal tissue of the salivary glands, leading to a decrease in the salivary flow rate. The decreased salivary flow rate is also associated with dental caries, which can be caused by an unhealthy dietary intake pattern, leading to a more acidic saliva pH and an increase in the number of cariogenic bacteria.[15,21,22] The results of this study emphasize the importance of nutritional status in influencing the microbial ecosystem in the oral cavity. A decrease or increase in nutritional status can affect salivary flow rate and salivary pH, which in turn affects the number and type of bacteria in saliva.[15]

CONCLUSION

Among the 100 research subjects, there were 22 children in the overweight status group, 62 children in the normal nutritional status group, and 16 children in the thinnes status group. The mean number of total salivary bacteria in the overweight status group was 45.95 ± 18.78 CFU/ml, the normal status group was 37.51 ± 42.47 CFU/ml, and the thinnes status group was 64.93 ± 62.04 CFU/ml.

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