

DENTIN
JURNAL KEDOKTERAN GIGI
Vol VII. No 1. April 2023

**CORRELATION OF SALIVARY FLOW RATE IN STUNTING CHILDREN TO
DENTAL CARIES LEVEL**
**The Overview of Elementary School Students in Sungai Tiung, Kecamatan Cempaka,
Banjarbaru**

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ABSTRAK

Background: Stunting is a new issue that has a bad impact on nutritional problems in Indonesia because affects the physical and functional body of the child and increases children's morbidity. Banjarbaru has the highest prevalence of stunting at 5-12 age, number two in South Kalimantan with 12.32%. Previous studies found stunting dental caries index is 8.23 with a very high category compared to normal children in 3.3, which is a moderate category. A poor salivary flow rate of more than 60 seconds has a very high DMF-T rate. **Purpose:** To Analyze the correlation of salivary flow rate in stunting children to the dental caries level at Elementary School Students in Sungai Tiung, Kecamatan Cempaka, Banjarbaru. **Material and Method:** This study used analytic observational research with cross sectional method. The sampling technique in this study was using probability techniques which were taken by cluster random sampling. The minimum number of samples in this study were 51 respondents, that determined with Numerical-Numerical Correlative Analytic samples formula. **Results:** The nutritional status of severe stunting group was 67.93% and the moderate stunting group was 32.07%. The average of salivary flow rate in stunting children was 0.09781 ml/minute which categorized in hyposalivation. The average def-t/DMF-T index in stunting children was 11.32, which is a very high category. The Spearman Correlation Test results obtained the result of sig value $p = 0,000$ ($p < 0.05$) with the direction of the correlation -0.535 level of the strong category. **Conclusion:** There is a correlation between the average value of salivary flow rate in stunting children and the level of dental caries in Elementary School Students in Sungai Tiung, Kecamatan Cempaka, Banjarbaru.

Keywords: Dental Caries, Salivary Flow Rate, Stunting.

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INTRODUCTION

Stunting is one of the problems that adversely affects nutrition problems in Indonesia. This is because stunting affects the physical and functional body of the child and increases the child's pain rate. Stunting is a chronic condition of growth disruption which is described in the z-score TB / U < -2SD (Standard Deviation).^{1,2}

Based on the 2018 Basic Health Research (Riskesdas), the proportion of stunting nutritional status in severe and moderate category in Indonesia was 30.8%. Meanwhile, the prevalence of 5-12 years old stunting children in South Kalimantan is 6.10% for the severe category and 27.31% for the moderate. Banjarbaru has the highest prevalence of stunting status at 5-12 years old children, number two in South Kalimantan with 12.32%. Stunting or growth failure during pregnancy to toddler

can cause various problems in children, one of which is to increase the risk of dental caries.^{4,6}

Dental caries is one of the most common dental and oral diseases encountered in the community. According to the Basic Health Research (Riskesdas) 2018, the proportion of dental and oral problems in Indonesia was 57.6%, including dental caries problems. The proportion of dental caries problems in South Kalimantan is 46.90% and 33.40% in Banjarbaru. According to the research of Fione VR et al (2015), someone with a poor salivary flow rate category characterized by the appearance of saliva with a time of more than 60 seconds and having a DMF-T number of more than 8 is included in the very high category.^{3,4,5}

According to Rahman T et al (2016) research, it is known that stunting can increase the risk of caries formation due to the disruption of salivary secretion.

Based on that result, the caries index in the group of stunted children of kindergarten students in Banjar Sub District was 8.23 and included in the very high category compared to the normal nutritional status group of children which showed a moderate category with an index of 3.3.⁶

The salivary glands in stunted children is atrophy so that salivary secretion is reduced. It causes the function of saliva as a buffer, cleanser, anti-solvent and antibacterial is also reduced. Reduction in salivary secretion results in a decrease in the volume of saliva per minute, which is called the salivary flow rate. If the amount of secreted saliva is small, then all the components contained in saliva are also small. This then results in an increased risk of dental caries.^{6,7}

Based on the description, the problem is the high dental caries in stunting children in Banjarbaru so that further research needs to be carried out with the aim to analyze the correlation of salivary flow rate in stunting children to the level of dental caries in elementary school students in Sungai Tiung, Kecamatan Cempaka, Banjarbaru.

MATERIAL AND METHODS

The initial procedure of the study was to obtain a research permit and ethical clearance issued by the Health Research Ethics Commission of the Faculty of Dentistry, Lambung Mangkurat University No. 029 / KEPKG-FKGULM / EC / I / 2020. This research used an analytic observational research method with cross-sectional approach. The sampling technique in this study was using the probability techniques in the form of cluster random sampling. The population in this study was all students in SD Negeri 1 Sungai Tiung, SD Negeri 2 Sungai Tiung and SD Negeri 3 Sungai Tiung in Kecamatan Cempaka, Banjarbaru, with total of 86 stunting children. The sample size formula used was Numerical-Numerical Correlative Analytic with a minimum sample size of 51 respondents. The inclusion criteria in this study were elementary school students in Sungai Tiung, Kecamatan Cempaka, Banjarbaru, 6-12 years old, children were stunting with dental caries and had grown first molars.

The first examination was measured the child's height using microtoise with a precision of 0.1 cm and calculated using the WHO 2007 z-score so that child respondents with stunting nutritional status with z-score <-2 to <-3 can be taken as the research object. One hour before the study, respondents were asked not to use mouthwash, eat and drink. After that they were instructed to gargle slowly with the aquadest solution to remove debris from the oral cavity. Next process was the dental caries examination which performed using a mouth glass instrument, probe and flashlight. The calculation of dental caries index was done by using the def-t / DMF-T index check sheet. Meanwhile, dental caries index results were categorized into 5 categories, namely very low (0.0-1.1), low (1.2-2.6), moderate (2.7-4.4), high (4.5-6.5) and very high (> 6.6). Saliva collection was done with spitting

method. Respondents were asked to swallow once to remove the remaining water in the mouth. Then they were instructed to sit quietly in an upright position and then wait for 1 minute. After that, they were instructed to let saliva flow passively into the measuring cup through the funnel. Measurement of salivary flow rate was carried out by using salivary flow rate check sheet with 4 categories namely, hyposalivation (<0.1 ml / min), low (0.1-0.25 ml / min), normal (0.25-0, 35 ml / min) and high (> 0.35 ml / min).

RESULTS

The study was conducted to determine the relationship of salivary flow rate in stunting children to the level of dental caries in Elementary School Students in Sungai Tiung, Kecamatan Cempaka, Banjarbaru.

Table 1. Respondent Inspection results based on gender

Gender	Total (n)	Percentage
Male	29	54,8
Female	24	45,2
Total	53	100%

Based on Table 1, it is known that there were more male respondents than female respondents. Male respondents were 29 students (54.8%) and female were 24 students (45.2%).

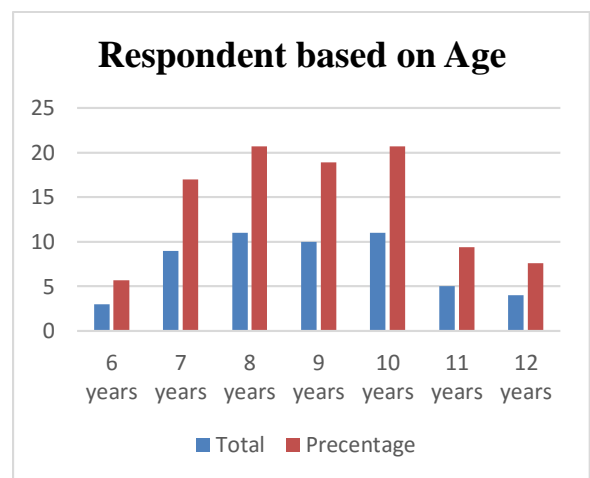


Figure 1. Respondent Data based on Age

Based on Figure 1, the data obtained that the age of respondents ranged between 8 and 10 years old, amounting to 11 respondents each. The least number of respondents were 6 years old, 3 respondents.

Table 2. TB/U examination results

Nutritional Status Stunting	Male	Female	Total (n)	Percentage (%)
Moderate	12	5	17	32,07
Severe	17	19	36	67,93
Total	53		53	100%

Based on Table 2, the data obtained that the number of respondents with severe stunting nutritional status was greater than the moderate. Respondents with severe stunting nutritional status were 36 respondents (67.93%) and moderate were 17 respondents (32.07%).

Table 3. Results of Saliva Flow Rate Inspection in Stunting Children

Nutritional Status Stunting	Salivary Flow Rate			
	Hypo-salivation	Low	Normal	High
Moderate	12	0	5	0
Severe	22	9	3	2
Total		53		

Based on Table 3, the data obtained that in the severe stunting nutritional status group, the highest number of salivary flow rates was the hyposalivation category, as many as 22 respondents. While the least was the high category, which was 2 respondents. The highest salivary flow rate in the moderate stunting group was in the hyposalivation category, with 12 respondents, while at least there were 5 respondents in the normal category.

Table 4. Examination Results of Average Salivary Flow Rates in Stunting Children

Nutritional Status	Salivary Flow Rate		
	Total	Average (ml)	Category
<i>Stunting</i>	5,184	0,09781	Hiposalivasi

Based on Table 4, it is known that the total salivary flow rate data in 53 respondents was 5.184 ml and the average salivary flow rate in stunting children was 0.09781 ml / min with the category of hyposalivation.

Table 5. Examination Results of Average Salivary Flow Rate in Stunting Children

Com-ponen	def-t/DMFT			Rata-Rata def-t/DMF-T	
	def-t	DMF-T	Total	Index Averag e	Cate-gory
Decay	190	391	581		
Exfoliated/Missing	4	9	13	11,32	Very High
Filled	0	6	6		
Total		600			

Based on Table 5, it is found that the most def-t / DMF-T component was D (Decay), which was 581. The least component was F (Filled), as many as 6. The index of dental caries in stunting children had an average def-t / DMF-T of 11.32, which was included in the very high category.

From the results of SPSS statistical analysis with the Spearman Correlation Test, it was known that the significance of $p = 0,000$ ($p < 0.05$), meant that there was a significant relationship between the salivary flow rate in stunting children and the level of dental caries in Elementary School Students in Sungai Tiung, Cempaka Sub District, Banjarbaru. It has the correlation direction - 0,535 which meant that the direction of the relationship was the opposite. In other words. The lower the salivary flow rate, the higher the level of dental caries. The level of significance of the relationship was in the values of 0.51-0.75. In this case, the criterion of relationship level was in the strong relationship category.

DISCUSSION

Stunting children aged 6-12 years are children who are stunted due to unbalanced nutritional intake in the past, since the child is in the womb and increase throughout the school year. The research limitation on stunting children aged 6-12 years is an effort to avoid group of 12-20 years teenagers who have the potential to experience catch up growth, that is growth that will bring children to normal height. In the results of the study, the number of respondents aged 6 years was the least compared to other ages, because based on characteristics of elementary school-age children in Indonesia, the age periode of 7-8 years is students in grades 1 and 2, so respondents aged 6 years are fewer than those who are 7 years. Meanwhile, children aged 7-11 years are the most respondents compared to other ages. Children aged 7-11 years in this case are in the cognitive phase. In this phase, children's cognitive abilities will develop rapidly. If nutrition at this age is not sufficient, stunting children find it difficult to achieve catch up growth. The growth phase allows the recovery of stunting children so that they will be at a normal height. That event may occur at

puberty where they are 12-14 years old, especially in girls during adolescence. One of efforts to prevent stunting is by increasing catch up growth in the first year of life and also the puberty phase to reduce the adverse effects caused by stunting in the future.^{1,8,9,10}

From the results of the study, it was found that the nutritional status of severe stunting consisted of 17 males and 19 females, while the nutritional status of moderate stunting amounted to 12 males and 5 females with a total of 29 males (54.8%) and 24 women (45.2%). In the results of this study, severe stunting in males and females did not have a large difference even though the prevalence of severe stunting was higher in females than in males. Gender can determine the size of a person's nutritional needs. The results of the study by Nasikhah R and Margawati A (2012) also found similar results, which said that stunting children is higher in girls (64.5%) than boys (35.5%). The higher prevalence of stunting among women can be caused by differences in parenting patterns in providing food to children where it is related to environmental conditions, nutrition and growth patterns of boys better than girls. In addition, it is also known that the risk of stunting is higher in females in the second year of life.¹¹

On the other hand, the results of this study showed that children with moderate stunting nutritional status are more likely to occur in males. These results are consistent with research conducted by Adani and Nindya (2017) who also found that stunting was more common in boys with 62.50%. This condition can occur because boys are more prone to malnutrition than girls because a large male body size requires more nutrition than girls and there are risk factors that influence the incidence of stunting in male.^{12,13}

The results of the study of salivary flow rate in the stunting children group is an average of salivary flow rate of 0.09781 ml/min, which in the category of hyposalivation. Saliva is a very important fluid related to biological processes in the oral cavity. Salivary flow rate is an indicator that influences the formation of carious lesions and oral diseases. Salivary flow rate is influenced by various factors. One of the factors that can influence the flow rate of saliva is nutrition.¹⁴

Based on a population of children who have a history of childhood malnutrition, it shows a decrease in the rate of salivary flow. This condition is caused by chronic postnatal malnutrition which affects the growth of the salivary glands which results in atrophy of the salivary glands. Abnormal nutritional status can affect salivary gland secretion and salivary composition so that the flow rate of saliva is reduced.^{14,15}

The result of the dental caries examination in the group of stunting children is an average of def-t / DMF-T index of 11.32, which included in a very high category. The occurrence of dental caries in this case is due to the accumulation of plaque involving the oral cavity bacteria. Bacteria will break down the substrate and produce metabolism that causes acid conditions which continue to

increase. Plaque growth can be related to the quality and quantity of saliva. Decreased salivary flow rates can result in increased plaque growth rates. This is because in this case, saliva has a role in helping to clean the tooth surface from bacteria and fluoride content which can replace minerals in the teeth.¹⁶

In this study, it was known that the condition of malnutrition or, more specifically, stunting, can increase the risk of dental caries. This is as a result of the salivary secretion process disruption where malnourished children, such as stunting, have atrophy salivary glands so that salivary secretions are reduced and cause salivary functions as a buffer, cleaner, anti-solvent, and antibacterial are also reduced.

Stunting can affect the growth and development of the salivary glands. It causes atrophy of the salivary glands which decrease the rate of salivary flow. The development of the salivary glands embryologically begins from the fifth week to the eighth week of intra uterine. The development of the salivary glands consists of three stages. The first stage is the development of salivary glands which is marked by the presence of primordial anlage, the preparation for the formation of branched duct buds. This stage is formed from ciliated epithelial cells, the luminaire layer and the external surface wrapped in ectodermal myoepithelial cells. Furthermore, the second stage is characterized by the appearance of lobules and ductal canalization. Primitive acini and distal ductal regions containing myoepithelium are formed during the seventh week of intra uterine embryonics. Meanwhile, the third stage is marked by maturation of the acini and the intercalary duct accompanied by the loss of the intertactical connective tissue bulge. The development of the salivary glands will continue and increase after post natal. In adolescents who experience puberty, almost no development is detected by duct differentiation. In this case, girls will experience puberty at the age range of 11-12 years whereas in boys, they will experience puberty at the age range of 12-14 years.^{18,19,20}

Dental caries is a process of tooth decay that starts from tooth enamel to the pulp. This process occurs because the multifactors in the oral cavity interact with each other, which causes pH fluctuations in plaque. It can also be influenced by factors such as oral hygiene, diet, fluoride and salivary flow rate. In addition, a number of other important variables such as social class, income, education, knowledge, attitudes and behavior also have an effect in this case.^{21,22}

Decreased salivary flow rate reduces the ability of salivary buffer and self cleansing which can ultimately increase the risk of caries. The caries index in children with stunting nutrition is higher due to decreased salivary flow. Saliva has a very important role in regulating homeostasis in the oral cavity. If there is a decrease in the level of salivary secretion, it will increase the risk of oral infections and dental caries. In this case, salivary

buffericity, cleansing and salivary flow rate work together to influence changes in pH in the oral cavity.^{23,24}

Acidic properties due to changes in pH in the oral cavity support the growth of oral cavities that are acidogenic and asiduric. These bacteria produce acid so that it decreases the pH in the oral cavity continuously and causes increased damage to the teeth. If the pH reaches a critical state (pH 5.5), it will cause dissolution of hydroxyapatite and demineralization, which the solubility of enamel due to Ca^{2+} and PO_4^{3-} subsaturation. If the pH of the oral cavity does not return to normal conditions, demineralization will continue to occur and increase the risk of caries.^{25,26,27}

Based on research that has been done about the connection of the salivary flow rate in stunting children and the dental caries level in Elementary School Students in Sungai Tiung River, Cempaka District, Banjarbaru, the Spearman Correlation Test results was obtained the negative correlation direction. This means the lower the salivary flow rate in stunting children, the higher the dental caries index. The nutritional status of TB / U in stunting children is more often found in children with severe stunting nutritional status compared to moderate stunting. The average salivary flow rate in stunting children is in the hyposalivation category with a rate of 0.09781 ml/min. The average value of dental caries index in stunting children is in the very high category, 11.32.

From the results of the discussion, it can be concluded that there is a relationship between the average salivary flow rate in stunting children and the level of dental caries in Elementary School Students in Sungai Tiung, Cempaka Sub District, Banjarbaru. Therefore, further research with a broader scope needs to be done, such as through past nutrition checks, education and knowledge about maintaining oral hygiene, plaque index and salivary pH in stunting children.

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