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Analysis pH (Potential of Hidrogen) Saliva Child Stunting with Not Stunting in Hulu Sungai North District, South Kalimantan Province

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Abstract: Dental caries remains a major public health concern, particularly among children, with various factors influencing its development, including nutritional statusThis study examines the relationship between stunting and saliva pH as a risk factor for dental caries in children. Conducted in Hulu Sungai Utara District, South Kalimantan Province, it involved 121 elementary school students through total sampling. Data collection included height-for-age measurements to classify stunting and saliva pH analysis using a digital pH meter. Statistical analysis via the Mann-Whitney U test revealed that stunted children had significantly lower saliva pH (mean: 5.794) compared to non-stunted children (mean: 6.927), with a p-value of 0.000 ($p<0.05$). These findings suggest that stunting may impair salivary gland function, leading to decreased saliva pH and increased susceptibility to dental caries. This study underscores the need for targeted interventions to improve dental health and nutrition in stunted populations.

Keywords: Dental Caries; pH; Saliva Stunting

Introduction

Stunting is still a chronic nutritional problem with a fairly high prevalence rate in the world. Currently, in Indonesia, the prevalence rate of stunting still exceeds the regulatory limits *World Health Organization* (WHO) of <20%. Globally, in 2013 it was estimated that 161 million children under the age of 5 suffered from stunting. Collected data on the prevalence of stunted toddlers *World Health Organization* (WHO), Indonesia is included in the third country with the highest prevalence in the Southeast Asia region (Anggraini & Romadona, 2020; Sopianti et al., 2023).

Stunting, or chronic malnutrition in children, occurs when children do not get enough nutrition for their growth and development. Stunting can cause delays in physical growth, reduce endurance, and have a negative impact on children's cognitive abilities and learning achievements (Lutfi et al., 2021; Rahman et al., 2016).

Results of 2018 Basic Health Research (Riskesdas) prevalence *stunting* 36.4 %. In 2019 the prevalence rate *stunting* national 27.67%. Based on data from the 2021 Indonesian Toddler Nutrition Status Survey (SGBI), prevalence *stunting* currently it is still at 24.4%. South Kalimantan ranks 6th in cases *stunting* highest in Indonesia with 30 points, the national target is 14% in 2024 (Noorhasanah et al., 2020; Palimbo et al., 2022; Wati et al., 2022).

The prevalence of stunting in elementary school age children (5-12 years) in Indonesia in 2018 was 6.7%. Based on 2018 Riskesdas data, South Kalimantan

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Province has a stunting prevalence of 6.52%. Hulu Sungai Utara Regency is one of the areas that has a fairly severe prevalence of stunted children in South Kalimantan, namely 9.17% (Kemenkes RI, 2018; Riskesdas Kalsel, 2020)

Apart from the problem of stunting, another big problem in Indonesia is the problem of cavities (dental caries) where 88.8% of Indonesian people have cavities. According to 2018 Riskesdas data, the prevalence of dental caries nationally reached 88.8%, while for South Kalimantan Province it was 46.90% and in North Hulu Sungai Regency it was 44.77% (Ilmi et al., 2020; Nurwati & Setijanto, 2021; Ramadhan et al., 2016).

One of the intrinsic risk factors for caries is the condition of the oral environment *(environment*) namely low saliva pH. The longer the teeth are exposed to low saliva pH, the greater the possibility of dental caries occurring. Salivary pH is one of the causes of dental caries, because if the pH of saliva is acidic, it can cause the enamel and dentin layers to dissolve, which can accelerate the occurrence of dental caries (Fitriati et al., 2017; Suratri et al., 2017).

Saliva very important in maintaining oral health. A good salivary flow rate allows for optimal oral cavity cleaning. *Saliva* also has antimicrobial components and the ability to maintain the pH balance of the oral cavity (*buffer*) when the pH drops it becomes acidic and when the pH rises it becomes very alkaline, so that the process of caries formation can be prevented. Reduced saliva secretion can be caused by a lack of chewing activity which can occur in children who lack food intake. Decreased secretion *saliva* can lead to decreased ability *buffer* from saliva so that the pH of the oral cavity is disturbed so that teeth are more susceptible to caries (Rusmali et al., 2019; Wirawan & Puspita, 2017).

Dental caries can have negative impacts and can affect the quality of life for children. Caries will cause pain and discomfort. This will disrupt children's activities at school. Children experience a decline in their ability to learn. Another impact that arises from caries is that children can experience acute or chronic infections, which can even cause disability. Caries will also affect the quality of the child's sleep and the child's eating patterns because of the pain felt. This condition will affect the child's nutrition, growth and weight gain (Amelia et al., 2020; Apro et al., 2020; Susilawati et al., 2023).

Based on data at the Sungai Pandan Community Health Center, Hulu Sungai Utara Regency in November 2023, there was an elementary school that had the highest percentage of stunting, namely SDN Teluk Mesjid which is located in Teluk Mesjid Village. The results obtained from data on the distribution of students suffering from stunting at SDN Teluk Mesjid showed that 18.7% of the 81 students experienced stunting.

Dental caries remains a major public health concern, particularly among children, with various factors influencing its development, including nutritional status. This research will produce valuable information about analysis *pH saliva* as one of the causes of dental caries in stunted children. The results of this research can be used to develop more effective intervention strategies in preventing dental caries and improving children's dental health, especially children who experience stunting (Oktavianty et al., 2023). The findings of this study highlight the need for integrated nutritional and dental health programs to mitigate the risks associated with stunting and enhance overall child well-being.

Method

This cross-sectional analytical survey examined 121 students (total sampling) at Teluk Mesjid Elementary School. Data collected via direct examination included height (using a microtoise staturemeter) and saliva pH, all obtained before break time. Height was recorded by age and gender, determined from birth dates. Stunting was assessed using the height-for-age (TB/U) index. Collected data was recorded on prepared examination sheets for later analysis.

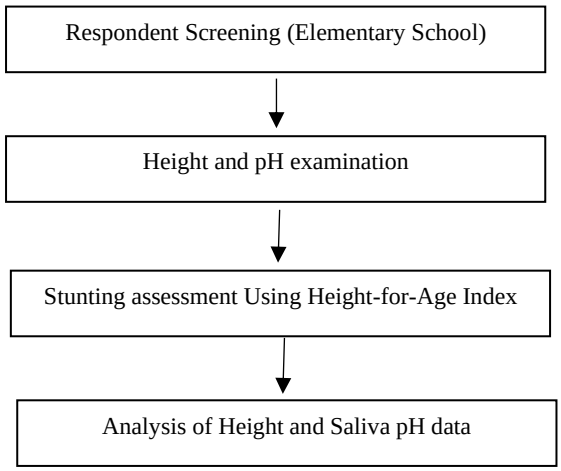

Figure1. Research Process Flow Diagram

This research offers a novel contribution by investigating the relationship between stunting, saliva pH, and dental caries risk within a specific high-risk population: students of SDN Teluk Mesjid, where 18.7% of the 81 students experience stunting. While previous research has explored the links between nutritional status and dental caries, this study focuses specifically on the interplay of stunting and saliva pH as potential contributing factors to caries in this vulnerable group. By examining saliva pH as a direct measure, this research

aims to provide more granular data on the mechanisms by which stunting may influence oral health. This targeted approach, combining stunting prevalence data with saliva pH analysis within a single, defined community, offers a unique perspective and has the potential to inform more effective, localized interventions for both nutritional deficiencies and oral health promotion. Furthermore, the study's focus on a school with a high stunting rate allows for a concentrated investigation of this complex relationship within a population where the need for intervention is demonstrably high. Finally, this research uses a standardized and precise method for saliva pH measurement using a digital pH meter, including calibration with a buffer solution, which adds rigor to the data collection process.

Result and Discussion

The population of this study was 121 students at Teluk Mesjid Elementary School. The sampling technique uses techniques *total sampling*. Data obtained from direct examination in this study were height and *pH saliva* in Teluk Mesjid Elementary School children. This research was carried out in the morning before break time. The research procedure was carried out by collecting data on children's height based on age and gender, by measuring the child's height using *microtoise staturemeter.* The results of measuring the child's height and age based on date of birth were recorded in an examination sheet prepared by the researcher. To get to know children *stunting* or not, the index used is the height-for-age index (TB/U) (Kurniawan et al., 2023).

Collection of salivary secretions did this by instructing the subject not to eat or drink for at least one hour before collection saliva done. Subjects were instructed to spit out saliva into container/cup to measure. Measurement pH saliva done using tools pH built-in digital meter saliva. How to use it starts with activating it pH meter by sliding the button at the top pH meter, then proceed by immersing the electrode in liquid buffer while moving it slowly until the monitor shows the number 7 (calibration), then enter pH meters into the sample saliva, then view it on the monitor and record the results. After finishing using the tool, rinse it with alcohol to minimize contamination. After all the data is collected, the data is analyzed using tests Mann-Whitney U.

Based on the results of research conducted on students at Teluk Mesjid Village, Teluk Mesjid Elementary School, Sungai Pandan District, Hulu Sungai Utara Regency, taking a sample of 121 respondents who were divided into two groups of respondents, namely children in the category stunting with no category stunting.

Table 1. Measurement results pH Saliva Child Stunting and No Stunting

pH Saliva	Amount	Mean
Stunting	36	5.794
No *stunting*	85	6.927

Source: Primary Data, 2024

The variables examined in this research are differences pH saliva child stunting with children no stunting. Data from the results of this research were analyzed using tests Mann-Whitney, to analyze pH saliva in children stunting with children no stunting at Teluk Mesjid Elementary School, North Hulu Sungai Regency. Based on table 1. shows the results pH saliva in children stunting lower than children do not stunting. Table 2, the results of the statistical analysis of the test using the test Mann-Whitney U to analyze the differences pH saliva child stunting with children no stunting value is obtained Mann-Whitney amounting to 27,000 and value Wilcoxon W amounting to 693,000.

Table 2. Results Uji Mann-Whitney U pH saliva towards Children Stunting with Children No Stunting

	Mark
Mann-Whitney U	27.000
Wilcoxon W	693.000
WITH	-8.567
Asymp. Sig. (2-tailed)	0.000

The calculated Z on table 2 showed value -8.567 with a significance value of 0.000. In the table, the numbers are in columns themselves. has a value of 0.000 with a significance of 0.05, which means the value of p = 0.000 with a significance value of $\alpha = 0.05$ so it can be concluded that $p < \alpha$, with the decision that H0 is rejected. This shows there is a difference pH saliva child stunting with children no Stunting.

The variables examined in this research are differences *pH saliva* child *stunting* with children no *stunting*. Data from the results of this research were analyzed using tests *Mann-Whitney,* to analyze *pH saliva* in children *stunting* with children no *stunting* at Teluk Mesjid Elementary School, North Hulu Sungai Regency.

Based on the research results, the percentage of children was obtained *stunting* 36 children (29.8%) and no children *stunting* amounting to 85 children (70.2%). Percentage of children stunting This is not much different from the 2018 Nutritional Status Monitoring (PSG) data which states that the prevalence *stunting* in children aged 5-12 years nationally it is 36.4%. *Stunting* is a problem of malnutrition caused by a lack of nutritional intake over a long period of time due to the provision of food that is not in accordance with nutritional needs. *Stunting* This is a problem of malnutrition over a long period of time resulting in

impaired height growth in children who are lower or shorter (stunt) than their age standard (Schmidt, 2019).

Child *stunting* has an average *pH saliva* amounted to 5,794 and children did not *stunting* has an average *pH saliva* amounting to 6,927. This shows that *pH saliva* in children *stunting* is lower than children who do not *stunting*. *pH saliva* child *stunting* tends to be low when compared with children who do not *stunting* due to a decrease in gland function *saliva* thus resulting in a decline *pH saliva* in children *stunting.* This research is in line with research conducted by Dewi et al., 2024. The results obtained were that *pH saliva* in children *stunting* lower compared to *pH saliva* in children no *stunting* (Dewi et al., 2024). According to (Prabawati & Andriani, 2021) in children *stunting* glandular development *saliva* experience atrophy causing flow *saliva* decreases, resulting in a decline *pH saliva* which ultimately can increase the risk of dental caries (Prabawati & Andriani, 2021).

Saliva, it plays a very important role in oral health, especially when there is a secretion disorder *saliva,* which will cause difficulty speaking, chewing and swallowing. The oral cavity is influenced by nutrition for the development, maintenance, repair and growth of teeth and healthy oral tissue. Lack of nutritional intake such as carbohydrates, protein, minerals and vitamins *stunting* can affect development, causing disruption in the development of the supporting structures of the oral cavity, one of which causes the growth and development of glands *saliva* be imperfect or *surroundings* and causes glands *saliva* to be *hypofunction.* This can affect the characteristics *saliva*, such as a decrease in flow rate *saliva*, low buffer capacity, and decreased acidity *(pH)* oral cavity which can interfere with functions *saliva*, and has an impact on reducing health and comfort in the oral cavity (Sutanti et al., 2021). These changes can impair saliva's protective functions and negatively impact oral health and comfort.

Saliva is one of the components that contributes to acidity levels *(pH)* mouth *Saliva* as a buffer system to maintain *pH* optimal mouth, ie *pH* which tends to be alkaline. If without *saliva*, then every food will create an acidic environment which will support the growth of bacteria that damage teeth [3]. The degree of acidity (pH) in the salivary glands has a very important role in the life, growth and multiplication of bacteria in the mouth. The number of acidophilic bacteria can increase when the pH in saliva is very low and this poses a risk of health problems in the oral cavity (Damawati, 2023).

Saliva is a key factor in maintaining the mouth's pH balance. As a buffer system, it helps to keep the oral pH within an optimal range, typically tending towards alkaline. Without sufficient saliva, food consumption can create an acidic environment that favors the growth of cariogenic bacteria (Tenovuo, 2010). Salivary pH is crucial for bacterial life, growth, and multiplication in the mouth. A decrease in salivary pH (increased acidity) can lead to an increase in acidophilic bacteria, raising the risk of oral health problems, including dental caries (Damawati, 2023). Studies have shown a correlation between lower salivary pH and increased caries prevalence in children (Al-Maweri et al., 2014). Furthermore, altered salivary composition due to nutritional deficiencies can affect the balance of minerals in the tooth enamel, potentially increasing susceptibility to demineralization and caries formation (Lynch, 2011). Research also indicates that stunting can be associated with changes in salivary electrolytes and proteins, which may further contribute to altered pH and buffering capacity (Grobler et al., 2000). Therefore, maintaining adequate nutrition is essential for proper salivary gland function and the maintenance of a healthy oral environment. Interventions aimed at addressing stunting may also positively impact salivary function and reduce the risk of dental caries. Further research is needed to fully elucidate the complex relationship between stunting, salivary characteristics, and oral health outcomes. Longitudinal studies tracking salivary changes in stunted children could provide valuable insights for developing targeted preventive strategies.

The results of this research are in accordance with research from Lutfi et al (2021), there is a relationship *significant* between *stunting* with the severity of dental caries in children aged 6-12 years in Tuah Negeri District, Musi Rawas Regency [4]. Apart from that, the results of this study are in line with Abdat et al (2019) who stated that there is a strong correlation between *stunting* and dental and oral health (Abdat, 2019).

Conclusion

Based on the research results, it was found that there were differences in pH saliva child stunting with children who are not stunted, pH saliva child stunting in Hulu Sungai Utara Regency is lower than pH saliva child not stunting.

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Author Contributions

Conceptualization; MA. NKU. BN.; methodology.; RU. I.; validation; MA.; formal analysis; SSH.; investigation.; S. MA writing: H.; review and editing: H.; visualization: H. All authors have read and approved the published version of the manuscript.

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Conflicts of Interest
The authors declare no conflict of interest

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