ORIGINAL ARTICLE

Comparison Salivary Zinc from Stunted-Children in Nangapanda

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ABSTRACT

Introduction: Stunting is a condition of failure in child growth and development caused by a lack of nutrition in the child's first thousand days. Various causes can influence the incidence of stunting and one of them is poor nutritional status. Zinc, which is a micronutrient, is believed to have a connection with stunting. Low zinc levels are often associated with the failure of children's linear growth. This study aims to evaluate the relationship between salivary zinc levels in stunted and non-stunted children aged 6 – 8 years old. **Methods:** This study was a laboratory study using 86 saliva samples of children aged between 6 – 8 years who were stunted and non-stunted in NTT. The subject's salivary samples were tested with the QuantichromTM Zinc Assay Kit (425 nm). Furthermore, the data is processed using Microsoft Excel and SPSS. **Results:** The levels of zinc in the saliva of stunted and non-stunted children between the ages of 6 – 8 years in NTT showed a significant difference ($p < 0.05$), with zinc levels in the saliva of stunted children lower than non-stunted children. Furthermore, zinc levels in the saliva of children between the ages of 6 – 8 years in NTT showed a strong positive correlation ($p < 0.05$) on stunting status. **Conclusion:** There is a correlation between zinc levels and stunting and non-stunting status in the saliva of children aged between 6 – 8 years.
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INTRODUCTION

Indonesia is one of the countries contributing to the stunting rate prevalence of 24.4% in 2021. According to Indonesian Nutrition Status Survey (Status Survey Gizi Indonesia) in 2021, the highest prevalence of stunting was found in East Nusa Tenggara (NTT) Province at 37.8%.(1) Stunting refers to children who have a lower height compared to other children of their age.(2) Stunting is indicated if the height-for-age Z-score (HAZ) is less than 2 standard deviations (SD).(3)

Many factors can affect the incidence of stunting, including poor sanitation, lack of access to care practices, insufficient understanding of stunting in the family, infections, and deficient in essential macro- and micronutrient intake.(4,5) The consequences of child who posed the risk of can have an impact both in the short term and long term. The possible disturbances may occur such as morbidity and mortality, poor child development, increased risk of infection and non-communicable diseases, inadequate development of cognition, memory and skills locomotor, increased risk of obesity, and others.(6,7)

Children require a balanced intake of macronutrients and micronutrients to fulfill nutritional needs. Zinc, which is a micronutrient, is important to have by the human body.(8) Zinc has a role in contributing to the immune system, helping wound healing rates, cell division, carbohydrate breakdown, cell growth, and enhancing the action of insulin.(9) Zinc can be found throughout the body and it can also detected in the oral cavities, more specifically found in saliva, plaque, and hydroxyapatite.(10,11) If zinc deficiency occurs, complications such as; growth failure, infection recurrent, diarrhea, dermatitis, delayed wound healing, low bone mineral density, and/or hypogonadism may appear.(8,9) Therefore, the objective of this study was to evaluate the relationship of salivary zinc with the stunted and non-stunted status in school-age children.

MATERIALS AND METHODS

Ethical Statement

This study was approved by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Indonesia, Cipto Mangunkusumo Hospital, Jakarta, Indonesia. The approval number was KET-1060/UN2. F1/ETIK/PPM.00.02/2019.

Study Description and Samples

It was cross-sectional descriptive laboratory in 2019. A consecutive sampling was used to obtain a minimum sample size. Eighty-six participants school-aged children 6–8 years old, from Nangapanda District, Ende, NTT, Indonesia who met the inclusion criteria were voluntarily recruited after receiving written informed consent from their parents/guardian. Children with mental retardation, cleft lip and palate abnormalities, and those on antibiotics and antihistamines in the last three months were excluded from this study. The 2mL unstimulated saliva sample was collected by spitting method without swallowing with the subject seated in an upright position between 8 to 9 am. Saliva was then mixed with the protease inhibitor phenylmethylsulfonyl fluoride (PSMF) at 1:100 (v/v). The samples were stored at −4 °C for no longer than 6 h and then moved to −80 °C storage.

Stunted Status

Standing height was measured to the nearest 0.1 cm using a microtoise. HAZ was used to determine stunting (height-for-age Z-score < −2.00). Stunting was defined as a height-for-age z-scorebased on the WHO Child Growth Standard.(12)

Identification of Zinc Level

Saliva samples were centrifuged at 10000xg (4 °C), 20 min to remove insoluble protein, and the supernatant was measured with the Quantichrome Zinc Assay kit according to manufacturer's instructions (BioAssay Systems, Hayward, CA) at 425nm wavelength.

Data Analysis

Comparative and correlation data analyses of the salivary zinc was obtained by using Mann–Whitney and Spearman statistics with the IBM® SPSS program (version 22.0) for IOS (IBM Corp., Armonk, NY, USA).

RESULT

Comparison of salivary zinc levels in stunted children

In this study, zinc levels in children's saliva were calculated in stunting and non-stunting groups with research results shown in figure 1.

Salivary zinc levels were found to be significantly different in the saliva of stunted and non-stunted children. Salivary zinc in the stunted group showed mean±SD (0.0853 ppm ± 0.013) while salivary zinc in the non-stunted group mean±SD (0.2021 ppm ± 0.073).

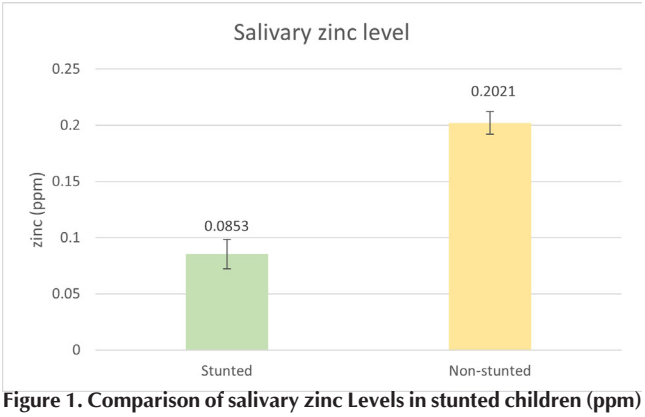

Figure 1. Comparison of salivary zinc Levels in stunted children (ppm)

Correlation of salivary zinc levels with stunted children

This study showed the correlation between salivary zinc levels in stunted and non-stunted children. According to the Spearman correlation test, it was used. In the correlation test results, Spearman obtained a strong positive linear correlation value with r=0.6912 and p=0.000. correlation between zinc levels in the saliva of stunted children 6 – 8 years old as shown in figure 2.

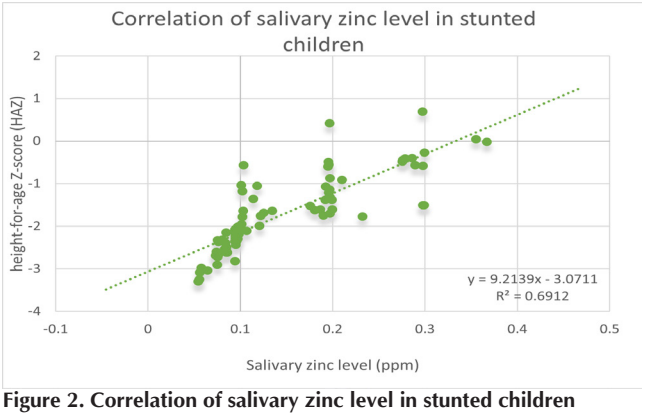

Figure 2. Correlation of salivary zinc level in stunted children

DISCUSSION

Millions of children throughout the world, including in Indonesia, every year experience stunting.(13) Stunting is a condition of failure to grow caused by lack of nutrition in the first 1000 days child's life.(2) Children can be diagnosed as stunted if the HAZ value <- 2 SD.4 Various factors that more or less influence each other can cause stunting. Poor sanitation in the environment can increase the risk of infection. Meanwhile. insufficient knowledge from the parents and followed by poor socio-economic conditions can affect the nutrition intake of the children leading to stunting.(4,5,14)

Nutrition as a factor that influences stunting is divided into 2, provision of macronutrient/micronutrient. Zinc is one of the micronutrients and is involved in the synthesis of DNA, RNA, and various proteins. Furthermore, zinc also acts as a catalyst for hundreds of enzymes in the body, balancing the levels of some hormones,

the immune system, bone metabolism, and others. (9,15) Various studies also link zinc as a factor risk of stunting and as a cause of delayed growth in children. (16) Therefore this study aimed to examine zinc levels and their relationship with the saliva of stunted and non-stunted children.

A study of salivary zinc in stunted and non-stunting children conducted using 86 saliva samples from children aged 6 - 8 years in NTT, found significant differences between groups of stunted and non-stunted children. The results of this study were in line with research by Berawi et al. (2019) that used blood as a sample and stated that serum zinc in the blood pressure of stunted children is lower than that of non-stunting children.(17)

Furthermore, the relationship between salivary zinc levels with stunted children showed that there was a strong positive linear correlation between salivary zinc levels of stunted children aged 6 - 8 years old. These results were in line with the results by Astutik et al. (2017), who stated that toddlers are at 4 times more risk of high incidence of stunting if zinc intake is low.(18)

Zinc deficiency causes various negative impacts, including increased risk of infection and depression of appetite.(19) Malnutrition and infection can be caused by decreasing immunity and ultimately result in easier invasion by pathogens. As part of nutrition, zinc deficiency affects reduced neutrophils, natural killer cell function, T and B lymphocytes.(16) On the contrary when someone has an infection, they tend to lose of appetite occur less food enters the body which leads to zinc deficiency.(19) Children with stunting are especially vulnerable and suffer from diarrhea which results in loss of appetite, malabsorption, loss of zinc in the intestines, and diversion of nutrients to the immune system, all things considered that leads to loss of nutrients.(20) Conditions where zinc levels in a lacking body are very precarious. Considering that zinc is not produced by the human body, so zinc needs to be supplied from food or supplements.(16) Meat, fish, and marine animals are the main sources of zinc, while vegetables and fruit contain zinc in large amounts the least. Foods that contain phytates and tannins need to be avoided together with foods that are rich in zinc because both substances can inhibit the absorption of zinc.(9,21)

The stature or height of an individual is an inherent characteristic that has clinical implications in assessing nutritional status in children.Likewise for children aged 6 - 8 years which is the age at which children go through their active development before later returning experience rapid development when entering puberty. (22)

Some children aged 6 - 8 years may be less than the other friend, but to determine whether this was caused by the incidence of stunting or not requires a relatively simple diagnosis, namely by testing zinc levels using saliva. Children who have been tested and found the results of low zinc levels can be declared as experiencing stunting. Six to eight years old, the incidence of stunting is irreversible, unlike children aged less than 2 years old where the condition is still reversible. Therefore, if the child is 6 - 8 years old was given in the form of improved nutrition including zinc, then the impact of future risks can be minimized.(12)

CONCLUSION

Based on the results of this research, it can be concluded that there is a relationship between salivary zinc levels with stunted children aged 6 - 8 years old in NTT. This study shows that lower salivary zinc levels can be used to predict the stunted of the children.

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