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Comparison of Calcium and Iron Intake of Stunting and Non-Stunting Toddlers in Langkat Regency

Dinda Dwi Khairani Jayusman[1], Evawany Y. Aritonang[2], Zulhaida Lubis[3]

[1,2,3]Universitas Sumatera Utara, Indonesia

Corresponding Author: Dinda Dwi Khairani Jayusman

ABSTRACT

Stunting is still a special concern in Indonesia, especially in Langkat Regency with a prevalence of more than 20 percent, namely 23.3 percent. The direct cause of stunting is due to lack of nutritional intake for a long time, especially minerals that are important for children's growth, such as calcium and iron, which play a role in bone formation. This study aims to analyze the comparison of calcium and iron intake of stunting and non-stunting Toddlers in Langkat Regency. This type of research method is a survey research using a cross-sectional design with a subject of 60 children consisting of 30 stunted children and 30 non-stunting children. Data analysis used the mann-whitney test. Calcium and iron intake was significantly lower in stunted children than in non-stunting children ($p<0.05$). The conclusion of this study is that the intake of calcium and iron is significantly lower in stunted children under five compared to non-stunting children in Langkat Regency.

Keywords: Calcium, Iron, Stunting

INTRODUCTION

Today's Indonesia needs special attention to overcome the problem of stunting because of the large number of children who experience this incident. Stunting is the growth of a child's body that does not match height and age due to lack of nutrition for a long time. Stunting occurs starting from the womb until the first two years of age. Malnutrition continues until infancy can result in growth and development disruptions, resulting in the loss of a quality generation (Mita and Rina, 2019).

Based on data from Riskesdas (2018), the prevalence of stunting in Indonesia is 30.8 percent. At the provincial level, North Sumatra found the prevalence of children under five with stunting at 28.5 percent, and one of the districts with the highest stunting rate was Langkat Regency at 23.3 percent. According to WHO in the World Bank (2006), public health problems can be considered bad if the prevalence of stunting is more than 20 percent. This means that nationally, the problem of stunting in Indonesia is classified as chronic and difficult to prevent or eliminate, so the prevalence needs to be addressed and reduced.

Stunting in children under five can affect morbidity and mortality (Ernawati, Prihatini and Yuriestia, 2016). Stunting children are at risk of decreased thinking skills, skills and creativity, and the risk of degenerative diseases (Anugraheni and Kartasurya, 2012). Stunted children are prone to infectious diseases so they are often left behind in their lessons, which results in learning achievement (Yunitasari, 2012).

Various factors can influence the occurrence of stunting, one of which is nutritional intake. Children who lack nutritional intake can cause an increase in children with growth disorders (Kusharisupeni, 2011). During the toddler years, children experience a very fast growth and development rate and the need for nutrients increases according to their age

so that they must be balanced with healthy and nutritious foods.

Some of the nutritional intake that supports children's growth are calcium and iron. Calcium is a macro mineral that has an important role in children's linear growth (Stuijvenberg *et al.*, 2015). Low calcium intake will result in low matrix mineral deposits of new bone and osteoblast dysfunction which has an impact on growth (Solihin, Anwar and Sukandar, 2013). Sari, Mohammad, Neti and Mei (2016)'s research shows that the risk of stunting is higher in the group with low calcium intake, namely 3,625 times than those whose intake has been fulfilled.

Iron is a micro mineral which is considered capable of preventing stunting (Souganidis, 2012). Toddlers who are deficient in iron are at greater risk of developing infectious diseases due to a decreased immune system (Damayanti, Muniroh and Farapti, 2017). The presence of infectious diseases will inhibit growth because they reduce food intake, interfere with the absorption of nutrients, and cause loss of nutrients (Mikhail, 2013). Research Damayanti (2017) states that iron deficiency has a 3.2 times risk of causing stunted children.

Seeing the high number of cases and the seriousness of the impact of stunting, especially lack of calcium and iron intake on growth, a study is needed to analyze differences in calcium and iron intake among stunting and non-stunting children in Langkat Regency.

RESEARCH METHODS

Design, Place and Time of Research

This type of research is a survey with a cross sectional study design. The research was conducted in Langkat Regency and selected three villages and one sub-district in three border areas with other districts, namely the Langkat Hulu area selected Naman Jahe Village, Sal Api District; the Langkat Hilir area was chosen Pantai Gemi Village and Perdamaian Village, Stabat District; Haru Bay area was selected Halaban Village, Besitang District. This research took place from November-December 2020.

Number and Method of Withdrawal of Subjects

The population in this study were all children aged 2-5 years in the three selected sub-districts, namely Stabat District, Sal Api District, Besitang District, namely children, with 73 stunted children and 4,525 non-stunting children. The sampling technique used in this study was the Regional Sample or Area Probability Sample, which is a sampling technique carried out by taking representatives from each region in the population (Arikunto, 2010). Sampling was carried out using a formula with two populations and with a cross sectional design obtained samples (Lemeshow, 1997), namely:

$$\boldsymbol{n = \frac{Z^2_{1-\alpha/2}[P1(1-P1) + P2\,(1-P2)]}{d^2}}$$

From the calculation results with the sample size formula above, the sample for this study was 60 children, consisting of 30 stunted children and 30 non-stunting children. Toddlers selected as subjects are children who are included in the inclusion criteria. The subject inclusion criteria used were children aged 2-5 years, living with a biological mother in the study area, if in one family there was more than one toddler, the toddler with the smallest age was taken, and the mother was willing to be interviewed.

Types and Methods of Collecting Data

The instrument used was a questionnaire to determine the characteristics of families and children, anthropometric measurements with the TB/U indicator using microtoise, and a 24-hour food recall.

Processing and Analysis of Data

Data processing was performed using the Kolmogorov-Smirnov test to see

the normality of the data. The data were not normally distributed, so using the Mann-Whitney test with a significance degree of α = 5% (p <0.05) to see the differences in calcium and iron intake in stunting and non-stunting children.

RESULT AND DISCUSSION

Result

Univariate Analysis

Child's Height

The child's height reflects the size of the child's body and bone length. The distribution of the child's height is presented in Table 1, as follows:

Table 1. Comparative Distribution Stunting Child Height and Not Stunting

Child's Height	Stunting	Not Stunting
Mean ± SD (cm)	85.33 ± 6.43	98.97 ± 8.10
Mean Z-Score (SD)	-2.86	-0.52
Minimum (cm)	76	81
Maximum (cm)	99.7	111

Table 1 shows that the average Z-Score of stunted children is -2.86 SD with a minimum height of 76 cm and a maximum of 99.7 cm, while the non-stunted children have an average Z-Score of -0.52 SD with a minimum height of 81 cm and a maximum of 111 cm.

Bivariate Analysis

Calcium and Iron Intake for Stunting and Non-Stunting Children

Nutritional intake is the number of components contained in food ingredients that the body needs every day in a certain amount for growth and maintaining health. Nutritional intake in this study was assessed by measuring calcium and iron that enter the body. The results of the comparative analysis of calcium and iron intake are shown in Table 2, as follows:

Table 2. Calcium and Iron Intake for Stunting and Non-Stunting Children

Variable	Stunting	Non-Stunting	p
	Rata-rata±SD	Rata-rata± SD	
Calcium Intake (mg)	127.68± 53.80	233.52± 162.68	0.000
Percentage AKG (%)	17.92 ± 8.18	28.16 ± 18.99	
Iron Intake (mg)	2.63 ± 0.98	4.06 ± 2.36	0.001
Percentage AKG (%)	34.35 ± 12.42	48.35 ± 29.32	

Table 2 above shows that the results of the Mann-Whitney test on calcium and iron intake have a p value<0.05, which means that there is a significant difference between calcium and iron intake in stunting and non-stunting children. The average intake of calcium and iron was significantly lower in the editing children compared to the non-stunting children, but based on the daily nutritional adequacy rate (RDA) in these two groups it had not been fulfilled.

DISCUSSION

Calcium Intake in Stunting and Non-Stunting Children

Calcium is a mineral that is needed by the body, especially in childhood for the formation of bones and teeth which can prevent stunting. Calcium is found in many dairy and dairy products such as milk, cheese and yogurt and is also found in soybeans and some green leafy vegetables. Based on the results of research conducted using food recall, it can be seen that stunted children have an average calcium consumption of 127.68 mg/day (fulfilling 18% of the RDA calcium requirement), while non-stunting children have an average calcium consumption of 233.52. mg/day (meets 28% of the RDA for calcium). The results of statistical tests with the Mann Whitney test obtained p=0.000 or p<α (0.05), meaning that there is a difference in calcium consumption in stunting and non-stunting children.

Based on these results it can be seen that the average calcium intake collected through the food recall method is significantly lower in stunted children than in non-stunting children. The main problem that is likely to cause a child to lack calcium intake is that at the age of 2-5 years the child begins to drink less milk, so that calcium is met from other food sources. Based on the calcium consumption habits obtained using the food frequency form, it can be seen that the food sources of calcium most often consumed by children are tofu,

tempeh and eggs with a frequency of 4-6 times a week.

Research by Nachvak, Moradi, Sadeghi, Esmailzadeh and Mostafai (2020), states that there is a significant relationship between milk consumption and stunting. In line with these findings in a prospective cohort study, Bao *et al.* (2018), reported that consumption of dairy products is inversely related to stunting. Children who consume milk in higher amounts have better height growth (Wiley, 2009).

According to Omidvar *et al.* (2015), the protein and calcium content of milk may be the reason for the beneficial effect of this food group on height growth in children. A large number of studies have shown that calcium is involved in bone mineralization and longitudinal bone growth (Fang *et al.*, 2017). In addition, dairy products are a rich source of high-quality protein necessary for bone growth (Samadi, Moradi, Azadbakht, Rezaei and Hojati, 2020). This protein can also stimulate the secretion of growth factors such as insulin like growth factor 1 (IGF-1), which is known as a factor that contributes to linear bone growth and mineralization. In addition, children need more calcium and high-quality protein than adults because of their rapid linear growth (Whitsett and La Grange, 2016).

During the growth period, calcium is the main mineral needed in the process of bone formation and it is important to pay attention to its adequacy because it can affect their growth and health conditions in adulthood and in later life. About 99 percent of calcium is in hard tissues, namely bones and teeth, especially in the form of hydroxyapatite, while the remaining 1 percent is in the blood, extracellular fluids and in cells throughout the body. Calcium in the bones and blood is in a balanced state which is regulated mainly through the hormonal system. This process involves parathyroid hormone (PTH), vitamin D, glucocorticoids, thyroid hormones, estrogen and progesterone hormones which can affect calcium balance (Mahan, Sylvia and Raymond, 2012).

Adequate calcium intake is needed to maintain several physiological functions of the body, especially in the aspect of bone growth and development. Very low calcium intake can lead to hypocalcemia, despite maximal secretion from the parathyroid glands, which can result in low mineralization of new bone deposit matrix and osteoblast dysfunction (Peacock, 2010). Calcium deficiency will affect linear growth if the calcium content in the bones is less than 50 percent of the normal content (Sloane, 2003 in Kurniasari, Juffrie, Sitaresmi and Jamil, 2016). Lack of calcium in the bones in infants can cause rickets, whereas in children it can cause stunted growth (Nolla, Sop, Mananga, Ekoe and Gouado, 2014).

The results of this study are in line with Hapzah and Supriandi (2018), that none of the children in their study had an adequate calcium intake of 100.0 percent. Another study by Chairunnisa, Kusumastuti, and Panunggal (2018), which shows that there is a significant difference between calcium in stunted and non-stunting children p=0.001 with an average calcium level in stunting children of 303.3±2.8 mg/day whereas non-stunting children were 606 ± 3 mg/day. The same study can also be seen from Bahar and Dachlan (2019), that there is no significant relationship between calcium intake and stunting with p=0.213.

Iron Intake in Stunting and Non-Stunting Children

One of the essential minerals for growing children is iron which is believed to have a close relationship with children's growth. Iron is one type of nutrient that is important for the body which is a constituent of hemoglobin in red blood cells and myoglobin which rapidly distributes oxygen and stores oxygen in muscles and tissues. In addition, iron is needed in the formation of collagen which is necessary for the formation of bones, teeth, joints, muscles and skin so that iron deficiency can cause short stature in children (Muchtadi, 2009).

The results showed that the average consumption of iron in stunted children was 2.63 mg/day (fulfilling 34% of the RDA for iron), and 83.3 percent in non-stunting children with an average consumption of 4.06 mg/day. days (fulfills 48% of the requirement for the RDA for Iron). The results of statistical tests with the Mann Whitney test obtained p=0.001 or p<α (0.05), meaning that there is a difference in iron consumption in stunted and non-stunting children.

Based on the explanation above, it can be seen that stunted and non-stunted children still do not meet their daily iron sufficiency. Most of the nutrients such as iron cannot be synthesized by the body so that it can be increased by eating a variety of foods. Many sources of iron are found from animal foods, but it is also easier for the body to absorb (Almatsier, 2009). Based on the iron consumption habits obtained using the food frequency form, it can be seen that children rarely consume animal side dishes with a frequency of 1-2 times per month and some even never consume these animal side dishes such as beef and liver.

Inadequate iron intake can cause iron stores in the bone marrow for the formation of hemoglobin to be inadequate. The result is that the number of free protoporfin erythrocytes increases, so that the production of microcytic erythrocytes and the value of hemoglobin decreases. Iron also plays an important role in the immune system. The immune response of cells by T-lymphocytes is impaired due to reduced formation of these cells, which is likely due to reduced DNA synthesis. The reduction in DNA synthesis is caused by disruption of the ribonucleotide reductase enzyme, which requires iron to function. In addition, white blood cells that destroy bacteria cannot work effectively when the body is deficient in iron. Another enzyme that plays a role in the immune system is myeloperoxidase which is also impaired in iron deficiency. In addition, the two iron-binding proteins transferrin and lactoferrin prevent infection by separating iron from the microorganisms that need it for reproduction. Lack of iron intake during childhood causes stunted growth and if it lasts for a long time it can cause stunting (Hidayati, Hadi and Kumara, 2010).

Research by Fatimah and Wirjatmadi (2018) shows that 68.2 percent of children under five with stunting have a deficit (≤70% RDA) and there is a significant difference in the level of iron adequacy between stunting and non-stunting children. The results of this study are also in line with Yuniarti, Margawati and Nuryanto (2019), that iron intake is a risk factor for stunting. Children in the stunting group had less iron intake than the non-stunting group. Children with less iron intake were 3.08 times more likely to become stunted. The results of research by Bahar and Dachlan (2019), which analyzed the relationship between iron intake and stunting in toddlers, found that 67 percent of stunting children had less iron intake, with statistical test results obtained p = 0.000, which means that there is a significant relationship between iron intake with stunting. The close association of iron with a history of infectious diseases in toddlers is also one of the supporters of stunted growth in children. The results of the research by Asiah, Yogisutanti and Purnawan (2020) at the Limbangan Community Health Center showed a relationship between iron and a history of infectious diseases in children under five with a value of p=0.000.

CONCLUSION

The intake of calcium and iron was significantly lower in stunted children under five compared to non-stunting children. The average consumption of calcium and iron in both groups was still below the RDA. The results of the study using the Mann-Whitney test showed that there was a significant difference between the consumption of calcium and iron in stunted and non-stunting children in Langkat Regency.

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