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The Relationship between Iron Deficiency and Nutritional Status of Elementary School Children in the Tuah Negeri District

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Abstract

During a child's growth period, iron is very necessary. High iron requirements during growth must be supplemented by adequate iron intake. Stunting in children is related to the lack of iron in their food. The objective of this study is to examine the relationship between iron deficiency and nutritional status among elementary school students in the Tuah Negeri District. This study was an analytic observational study with a cross-sectional design. A sample of 79 people was taken randomly from elementary school students in Tuah Negeri District. The determination of iron deficiency in children is done by examination of serum iron using the ELISA method while the nutritional status was determined based on high-for-age measurement. SPSS version 16 was used to analyze the data, which included Univariate, Bivariate, and Multivariate analysis. The results of the measurement of serum iron levels showed that 65.6% of children with iron deficiency were stunted, while in children who were not iron deficient, only 29.8% were stunted. There was a significant relationship between iron deficiency and nutritional status in children (p=0.004; OR=4,500). Multivariate test results showed that iron deficiency was the most dominant factor associated with nutritional status in children. There was a relationship between iron deficiency and the nutritional status of elementary school children in Tuah Negeri District., and recommended to increase health promotion efforts related to the importance of iron intake for the growth of children.

Keywords
iron deficiency; nutritional status; elementary school children

I. Introduction

Nutrition is one of the important factors that determine the level of health and harmony between physical and mental developments. In the period of child development, nutritional adequacy is an absolute thing that must be fulfilled and sufficient (Almatsier, 2009). Anemia occurs due to a decrease in the quantity of red blood cells in the circulation or the number of hemoglobin is below the normal amount. Symptoms that are often experienced include sluggish, weak, dizzy, charming eyes, and pale face (Corwin, 2009).

The World Health Organization in the Worldwide Prevalence of Anemia reported that the total population of the world suffering from anemia was 1.62 billion people with prevalence in elementary school children of 25.4% and 305 million school children around the world suffering from anemia anemia (McLean et al., 2009). In Indonesia, data shows that around 3.5 million Indonesian children suffer from anemia. Based on the Household Health Survey in 2005, the prevalence of anemia in school- age children reached 26.5%, while the Kusuma Bangsa Foundation survey in 10 elementary schools in Jakarta found that 34,1% of elementary school children suffered from anemia (Arifin & Mayulu, 2013).

Iron deficiency anemia is the most common anemia in children, because iron is needed during the growth period (Michael and Gibney, 2005). Based on the basic health research report (Riskesdas, 2013), iron nutritional anemia is still a public health problem in Indonesia, with a prevalence in children aged 5-12 years was 29%.

Iron deficiency Anemia can be influenced by several factors, namely, insufficient consumption of animal-sourced foods as a source of easily absorbed iron (heme iron), while plant foods (non-heme iron) are a source of high iron but difficult to absorb, so a large portion is needed to meet the daily need for iron (American Society of Hematology, 2013).

Iron is needed in the formation of blood, namely to synthesize hemoglobin. Excess iron is stored as ferritin and hemosiderin proteins in the liver, spinal cord, and the rest is stored in the spleen and muscle. Iron deficiency will cause a decrease in ferritin levels followed by a decrease in transferrin saturation or an increase in protoporphyrin. The situation continues to cause iron deficiency anemia, where the hemoglobin level drops below the normal value (Almatsier, 2009).

Lack of iron intake can result in low levels of hemoglobin in the blood, so that the oxygen needed by the body and the brain is reduced, which will result in metabolic changes in the brain. Metabolism changes in the brain can affect changes in the number and function of cells in the brain, so that the brain will experience changes in normal function (Widyastuti and Hardiyanti, 2008).

Research from Arifin and Mayulu (2013) on the relationship between nutritional intake and the incidence of anemia in elementary school children in North Bolaang Mongondow Regency, showed that iron intake had a significant relationship with the incidence of anemia in elementary school students.

Likewise, the study by Wandini et al. (2017) stated that iron intake was related to the incidence of anemia in children at Asto Mulyo Elementary School, Punggur District, Central Lampung, with a p-value of 0.000 < 0.005, there was a significant relationship between iron intake and the incidence of stunting in children.

Stunting is a condition where toddlers have a length or height that is less than their age. This condition is the most common form of malnutrition in children. Stunting is caused by malnutrition, impaired growth and development experienced by children due to poor nutrition, repeated infections, and inadequate psychosocial stimulation (WHO 2012).

This study aims to analyze the relationship between the incidence of iron deficiency and the nutritional status of the elementary school children in Tuah Negeri District.

II. Research Methods

This research is analytic observational research with a cross-sectional design. This research was conducted at the Elementary School, Tuah Negeri District. The study was conducted in March 2021. The sample of this study was elementary school students in Tuah Negeri District totaling 79 people. Elementary school students were selected randomly using a simple random sampling method. Respondents suffering from diarrhea/dysentery were not included in the study. The determination of iron deficiency in children was done by examining serum iron using the ELISA method while the nutritional status was determined based on high-for-age measurement.

The data was then analyzed using SPSS version 16. Data analysis was univariate, bivariate, and multivariate.

III. Results and Discussion

3.1 Results

a. Univariate Analysis

Table 1. Frequency Distribution of Child Characteristics

Variable	n	%
Gender		
a. Man	31	39,2
b. Women	48	60,8
Age		
a. 9 -10 Year	34	43,0
b. 11-12 Year	45	57,0
Nutritional Status		
a. Stunting	32	40,5
b. Not Stunting	47	59,5
Father's Education		
a. Low	35	44,3
b. High	44	55,7
Mother's Education		
a. Low	31	39,2
b. High	48	60,8
Father's occupation		
a. Farmer	37	46,8
b. Not a Farmer	42	53,2
Mother's Job		
a. Does not work	27	34,2
b. Work	52	65,8
Parent's Income		
a. Low	43	54,4
b. High	36	45,6
Total	79	100,0

Based on table 1, the results showed that the number of respondents aged 11-12 years old was 45 (57.0%), female gender was 48 (60.8%), nutritional status as not stunted was 47 (59.5%), high father education was 44 (55.7%), and high mother education was 48 (60.8%). The number of fathers who were not working as farmers was 42 (53.2%) and working mothers was 52 (65.8%). The number of low income parent was 43 (54.4%).

b. Bivariate Analysis

Table 2. Relationship of Iron Deficiency with Nutritional Status in Elementary School Children

Iron Deficiency	Nutritional Status				P	OR (95%CI)
	Stunting		Not Stunting			
	n	%	n	%		
Deficiency	21	65,6	11	34,4	0,004	4.500
No Deficiency	14	29,8	33	70,2		1.722-

Total	35	100 %	44	100%	11.761

Based on Table 2. The results showed that the number of children who have stunting and iron deficiency was 21 (65.6%), and as many as 14 (29.8%) children are stunted and iron sufficient. The results of the analysis showed a significant correlation of iron deficiency with nutritional status (p = 0.004, OR 4,500), meaning that there was a relationship between iron deficiency and the nutritional status of children, hence the risk of stunting in children with iron deficiency was 4.5 times higher than in elementary school children.

c. Multivariate Analysis

Table 3. Multivariate Analysis of Logistic Regression Methods

Variabel independen	**B**	***p***	**OR**	**95%CI**	
Gander	0,498	0,365	1,645	0,561	4.828
Child Age	0,299	0,592	1,348	0,452	4.024
Father's education	-0,189	0,791	0,828	0,204	3.353
Mother's educatio	0,306	0,692	1,357	0,299	6.152
Father's occupation	-0,199	0,735	0,820	0,259	2.591
Mother's Job	0,383	0,516	1,467	0,461	4.663
Parents' Income	-0,240	0,663	0,787	,267	2.318
Iron Deficiency	1,301	0,016	3,672	1.276	10.564
Constant	-3.034				

In Table 3. The binary logistic regression showed that the most influential variable on nutritional status is iron deficiency with 3.672 times of the children with iron deficiency are at risk of stunting.

3.2 Discussion

Based on Table 1. The results show that the number of respondents with an age of 11- 12 years was 45 (57.0%), female gender was 48 (60.8%), and nutritional status was not stunted by 47 (59.5%), high father education was 44 (55.7%), and high mother education was 48 (60.8%). The number of fathers who were not working as farmers was 42 (53.2%) and working mothers was 52 (65.8%). The number of low income parents was 43 (54.4%).

Iron deficiency, also known as nutritional deficiency, is the most common major nutritional problem. Iron deficiency anemia is anemia that occurs due to a lack of iron in the body (Herman, 2014). The research of Pahlevi, (2012) stated that income has a strong influence on nutritional status. Every increase in income generally has a direct impact on nutritional status. Income is the most important factor in determining the quality and quantity of food. So, an adequate family income will support the growth and development of children because parents can provide all the primary and secondary needs of children. (Pahlevi, 2012).

Based on table 2. The results showed that the number of children who have stunting and iron deficiency was 21 (65.6%), and as many as 14 (29.8%) children are stunted and iron sufficient. The results of the analysis showed a significant result of iron deficiency with nutritional status (p = 0.004, OR 4,500), meaning that there was a relationship

between iron deficiency and the nutritional status of the children, with the risk of stunting in children with iron deficiency being 4.5 times higher in elementary school children.

In Table 3. The binary logistic regression showed that the most influential variable on nutritional status is iron deficiency, with 1.2 times of the children with iron deficiency being at risk of stunting.

Stunting is a condition where toddlers have a length or height that is less than their age. This condition is the most common condition of malnutrition in children. Stunting is caused by malnutrition, impaired growth and development experienced by children due to poor nutrition, repeated infections, and inadequate psychosocial stimulation (WHO, 2012).

The study by Damayanti and Muniroh, (2016) stated that there is a significant relationship between the level of iron adequacy and stunting in children. Adinda et al (2019) stated that most students bring food to school, but the provisions do not meet the balanced nutrition of students, there are still many students who do not add vegetables and fruit in them lunch. Iron intake is stored in the muscles and spinal cord. If the adequacy of iron is inadequate, then the iron stores in the spinal cord which are used to produce hemoglobin (Hb) decrease. The study by Dewi and Nindya, (2017) regarding the level of iron adequacy with the incidence of stunting, it was known that the rate of children who have an inadequate level of iron adequacy and experience stunting was 33%. The results of the Fisher's Exact test with a value of = 0.05 showed a p value = 0.011 <0.05 which means that there is a significant relationship between the level of iron adequacy and the incidence of stunting in children.

IV. Conclusion

There is a significant relationship between iron deficiency and nutritional status in elementary school children aged 9-12 years in Tuah Negeri District, Musi Rawas Regency. It is necessary to improve health promotion efforts related to iron deficiency through health education activities involving the role of parents in choosing a balanced diet and nutrition.

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