

## Correlation of Malnutrition, Worm Infection, Parents, Income and Knowledge on Anemia Prevalence among 6–9 Year Old Students of Liliba Inpres Elementary School

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Received: February 26, 2019

Revised: February 20, 2019

Accepted: April 4, 2019



### Abstract

Anemia in school-age children will not only cause harm to health but also will have impact on students learning achievement. Thus, anemic children will indirectly affect the national development. The aim of this study is to observe the correlation between malnutrition, worm infection, parents income and knowledge on anemia prevalence among 6–9 years old children. The method of this research was a cross sectional study with a simple random sampling technique, consisted of 222 participants from Liliba Inpres Elementary School. This study was done by measuring children Body Mass Indeks (BMI)–for–age to measure the z score and compare to WHO Children growth standard, by using microscope examination with direct method for identifying helminthiasis, by using questionnaires to measure the parent knowledge and parent income and also by measuring haemoglobin values using POCT Device. The results showed that there are correlations between malnutrition and worm infection on anemia prevalence (p value 0.000). However, there are no correlations between parent's knowledge (p value 0.469) and parent's income on anemia prevalence among 6–9 years old children on Liliba Inpres Elementary School (p value 0.606). In conclusion, these findings confirm that malnutrition and worm infection was correlated with anemia prevalence on Liliba Inpres Elementary School Students so that they are advised to manage their nutritional intake and to practice personal hygiene.

### Keywords

Anemia, malnutrition, worm infection, knowledge, income

## INTRODUCTION

Children are one of the vulnerable groups affected by anemia beside pregnant and breastfeeding group and the elderly (1). The prevalence of anemia on school-aged children in developing countries and developed countries was estimated about 42% and 17%, respectively. Anemia prevalence in Indonesian children at age 5–14 years is 42.8 % for boys and 49.2% for girls (2).

Anemia is a condition where the haemoglobin (Hb) levels fall below the normal value (11 g/dL) (3). Anemia can happen as a consequence of extrinsic and intrinsic factors. The intrinsic factors are blood disorders, low iron intake, and worm infection. Meanwhile, the extrinsic factors are poor knowledge about nutrition, level of parent education, economy status, and lifestyle (4).

Anemia in children can disrupt the growing process, decrease learning concentration, and are vulnerable to have other diseases. Research proved that there was a correlation between hemoglobin level (anemia status) on children learning ability. Iron deficiency anemia could decrease the child concentration which will further affect their study achievement (5).

Liliba Inpres Elementary School is a school that has the most student compared to all elementary school in Kupang city, as many as 1.047 students (6). This school is not only has the most students, but also has very

diverse population variation. The students come from different background races, economic status, parent's education background and parent's occupation. Six until nine years old female students were selected as the inclusion criteria because the majority of female students in this range of age has not experience menstruation. Moreover, the female students are less likely manage their personal hygiene, are vulnerable to have infection, and are in a transisional age from childhood to adolescent. Therefore, the research aim to observe a correlation between malaria and malnutrition, worm infection, parent's knowledge and income on anemia in Liliba Inpres Elementary School students aged Six until nine years old.

## MATERIALS AND METHODS

This research was an analytical study with a cross sectional study design. The research setting was at Liliba Inpres Elementary School. The research held on October until November 2016. The population were students aged 6–9 years old who attended Liliba Inpres Elementary School in Oebobo, Kupang. The total amount of students was 338 children. The sample on this research were 222 students chosen by simple random sampling technique.

The tools used in this research were hemoglobinmeter (Easy touch<sup>®</sup>), hemoglobin test strips, body scales and height gauge.

Nutritional status determined by the z score based on children BMI-for-ages compared to WHO Children Growth Standard. The analysis of worm infection were done directly by microscope observation for worms' infection. The data of parent's knowledge and income was conducted by interview using a questionnaire. Haemoglobin (Hb) examination was done by taking blood capillary then was measured with haemoglobinmeter and was compared with anemia at child age school based-WHO standards. The research using Chi-square test for knowing the correlation between variables.

## RESULTS AND DISCUSSION

The research subject were 222 Student of Liliba Inpres Elementary School aged 6–9 years who met the inclusion criteria and received written approval from their parents. The subject consisted of 106 boys (47.7%) and 116 girls (52.3%). The majority of the

subjects research were 6–7 years old (66.2%). The body weight of the subject was mostly in the range of 17–21.9 kg as many as 130 people (58.6%). The highest body height of the subjects were in the range of 1.11–1.20 meters as many as 111 people (50%). The occupation of most fathers was private employee as many as 86 people (38.7%) and mother's occupation as many as 91.9% were housewives.

Table 1 shows the number of subjects who had anemia (Hb <11 g / dL), as many as 118 people (53.2%). The percentage of students who classified as malnutrition (BMI-for-age z score <-2 SD) were 47.3%. The amount of students who had positive worm infection were 60 people (27%). Meanwhile, 70.7% of parent knowledge was good (the questionnaire score  $\geq$  24) and 67.1% parent's income level (income > 386,139 rupiah /person/ month) fall in the low category.

**Table 1.** Research subject categories

No	Variable	Category	N	%	Min	Max	Mean
1.	Anemia condition	Anemia	118	53.2	6.9 g/dL	14.4 g/dL	10.7 g/dL
		Normal	104	46.8			
2.	Malnutrition	Yes	105	47.3	BMI 8.5	BMI 30.2	BMI 13.2
		Not	117	52.7			
3.	Worms Infections	Positive	60	27	-	-	-
		Negative	162	73			
4.	Parents Knowledge	Low	65	29.3	Score of 13	Score of 38	Score of 26
		Well	157	70.7			
5.	Parents Income level	Low	149	67.1	83,333 IDR/ Capita/Month	1,500,000 IDR/Capita/Month	379,500 IDR/Capita/Month

### Correlation between Malnutrition and Anemia

Table 2 implicated that there was a significant relationship between malnutrition and anemia prevalence. The description of malnutrition in children is obtained by the Z score (BMI-for-ages). Table 4. shows that there were 105 children (47.3%) who fall in the category of malnutrition. This is consistent with the study observed by Rosanti (7) which stated that there was a strong relationship between nutritional status (malnutrition) and the incidence of anemia in children in the Benan Ngisor area.

The National Heart, Lung and Blood Institute states that one of the main risk factors of anemia is consumption of low iron foods, vitamins and minerals. Nutrients in foods such as protein, folic acid, vitamin B 12 and iron are the main raw materials for the formation of erythrocytes (8). Malnutrition is a condition where a person does not

get enough nutrients that will decrease the erythrocyte synthesis so that it will cause anemia in children.

The six until nine years of age is a crucial moment where a child's body needs nutrients in sufficient quantities in order to grow according to the standards of growth. However, lack of consumption of nutritious food can also be caused by the parent's income. They cannot provide nutritious food for their children if the income is lower than the average.

Based on the observations, some children with malnutrition showed the signs of anemia such as weakness, lethargy, pallor, dry lip angle and pale eye conjunctiva. If the condition of anemia that occurs in children is still at a mild level (Hb 9.4–10.9 g / dl), it can be managed by increasing the intake of nutrients, especially protein and minerals. The iron (Fe) tablets can also increase the Hb levels in malnourished children (9).

**Table 2.** Correlation of malnutrition with the incidence of anemia

Malnutrition	Anemia condition				Total		Sig. (p)
	Anemia		Normal		n	%	
	n	%	N	%			
Yes	76	34.2	29	13.1	105	47.3	0,000
Not	42	18.9	75	33.8	117	52.7	
Total	118	53.1	104	46.9	222	100	

### Correlation between Infection and Anemia

Indriati (10) wrote about the incidence of anemia in school children due to lack of iron and worms infection. In line with that, the

research conducted by Supriadi (11) concluded that there was a significant relationship between helminthiasis and anemia in students of Dembol in Karanganyar Sub district.

Chi-square test analysis results (Table 3) concluded that there was a significant relationship between the incidences of anemia with helminthiasis from a total of 222 stool samples examined microscopically. There were 60 samples that were positive with the type of infecting worm.

Worms are often found in school-age children, especially in children who live in the environment with poor sanitation, unavailability of latrines, lack of clean water supplies, and lack of personal hygiene. Those are the underlying cause of the occurrence of helminthiasis in children (12). This study involved Six until nine years old children. At this range of age, most children spend their

time by playing with sand because the location of the elementary school is mostly a land field. Therefore, the chance of worm infection is higher when children did not wear a footwear when playing on the ground.

Worms that enter the human body will live and develop in the large intestine. The worm will suck blood ("seize" nutrients) needed by the body. In the case of severe parasitemia, worms can cause severe anemia in children (<7 g / dL). In addition to sucking blood on the surface of the intestine where the mouth of the worm attaches, blood leakage can also occur. This causes the body to lose blood and leads to a decrease in hemoglobin levels resulting in an anemia condition (8).

**Table 3.** Worm relationship with the incidence of anemia

Worms	Anemia degree				Total		Sig. (p)
	Anemia		Normal		n	%	
	n	%	N	%			
Positive	46	20.7	14	6.3	60	27	0,000
Negative	72	32.4	90	40.6	162	73	
Total	118	53.1	104	46.9	222	100	

### Correlation between Parent's Knowledge and Anemia

Table 4 shows that 70.7% parents have good knowledge about anemia based on questionnaire filling scores. Based on the statistical analysis of anemia variables with parental knowledge, it was concluded that there was no correlation between the incidence of anemia and knowledge of parents. This is contrary to the research conducted by Syafri, et al. (13) which concluded that there was a correlation

between family income and the incidence of anemia in children in Cilallang Inpres Elementary School, Makassar.

The results obtained in this study are in line with the research by Ikhmawati (14) which concluded there was no relationship between knowledge and Hb levels. In addition, Wetipulinge (15) stated there was no association between anemia knowledge and the incidence of anemia. Based on the results of interviews to the mothers of the students, some children who have low Hb

levels often have problems with eating patterns. Even though their parents have knowledge about anemia and its effects, they

tend to let their children to eat snack instead of eating main meal so it decrease the children's appetite.

**Table 4.** Worm relationship with the incidence of anemia

Parent's Knowledge	Anemia degree				total		Sig. (p)
	Anemia		Normal		n	%	
	N	%	N	%			
Less	37	16.7	28	12.6	65	29.3	0.469
Well	81	36.5	76	34.2	157	70.7	

### Correlation between Parent's Knowledge and Anemia

The parent's income of Liliba Inpres Elementary School as much as 67.1% is in the low category, with the average income was 379,500 IDR/capita/month (Table 1). It still below the standard of GKM according to BPS, which is 386,139 IDR/capita/month. Most income comes only from the fathers' income because 91.9% of mothers are housewives.

Statistical analysis (Table 5) showed that there was no relationship between the incidence of anemia and the income of parents. This result is in line with the research by Hendro (16) which states that there was no relationship between family income and anemia status. Different opinions expressed by Liow et al. (17) which stated that there was a significant relationship between income and the incidence of anemia. Syafri et al. (13) stated that there was a relationship

between family income and the incidence of anemia.

During the observation, children with sufficient parent's income have low Hb levels (<11 g/dL), whereas students with low parent's income have normal Hb levels. This condition could happen because even their parents has low income, they could provide nutritious food such vegetable which rich in Fe minerals that could prevented them from being anemic.

Family income will influence the ability to buy nutritious food. However, parent's income did not always guarantee that children cannot be anemia, especially if parents obey unhealthy eating patterns of their children. In other words, less income does not mean that children will suffer from anemia due to malnutrition. Nevertheless, having high income tends to provide pocket money for their children so that the children consume snacks more often and consume less food provided at home.



**Table 5.** Correlation between parental income and anemia

Income	Anemia degree				Total		Sig. (p)
	Anemia		Normal		n	%	
	N	%	n	%			
Weak	81	36.5	68	30.6	149	67.1	0.606
Intermediate	37	16.7	36	16.2	73	32.9	
Total	118	53.2	104	46.8	222	100	

## CONCLUSIONS

Anemia prevalence in Liliba Inpres Elementary School students was 52.3%. This research also find out that there were students suffer from malnutrition and worm infection. Besides, most of student parents have low income although they have good knowledge. Anemia prevalence in students of Inpres Liliba Elementary School was mostly caused

by the intrinsic factor (malnutrition and worms infection) compared to the extrinsic ones (parent's knowledge and income). Parental control on children eating pattern and personal hygiene was recommended to decrease the anemia prevalence in children.

## CONFLICT OF INTEREST

There are no conflicts of interest.

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