The Prevalence and Risk Factors of Anemia among Primary School Children in North Sumatera, Indonesia

Sri Lestari[1,*], Isti Ilmiati Fujiati[1], Putri Chairany Eyanoer[1], Dina Keumala Sari[2], Milahayati Daulay[3], and Nur Hidayah Nasution[4]

[1]*Departement of Public Health, Faculty of Medicine, Universitas Sumatera Utara, Jl. dr. Mansur No. 5 Kampus USU, Medan 20155, Indonesia*

[2]*Departement of Nutrition, Faculty of Medicine, Universitas Sumatera Utara, Jl. dr. Mansur No. 5 Kampus USU, Medan 20155, Indonesia*

[3]*Departement of Physiology, Faculty of Medicine, Universitas Sumatera Utara, Jl. Dr. Mansur No 5 Kampus USU, Medan 20155, Indonesia*

[4]*Master Student in Departement of Administration and health policy, Faculty of Public Health, Universitas Sumatera Utara, Jl. Universitas No. 21 Kampus USU, Medan 20155, Indonesia*

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Abstract: Primary school children are the groups at risk for nutritional problems. The most commonly nutrition problems suffered among primary school children in Indonesia is anemia and stunting. This research aimed to determine the prevalence of anemia and the risk factors associated with anemia among primary school children, North Sumatera Province. This research is a analytic study with cross-sectional approach. Total sample 400 primary school children between 8-13 years old were include in the study from the Medan City and Langkat district, In July - September 2017. Data collected by using questionnaire, anthropometric assessment and hemoglobinometer tool. Chi-square analysis and logistic regression were used to asses the association between risk factors and anemia. The prevalence of anemia among primary school children were 45,57%. The factors associated with anemia primary school children were mother's education (OR=3,06), income(OR= 2,93), breakfast (OR=2,10) dietary intake of heme sources(OR=3,38). The dominant factors that influence anemia in primary school children was dietary intake of heme sources. The conclusion of this study is prevalence of anemia in primary school children in North Sumatera higher than the national prevalence. interventions nutritional in school children are recommended.

1 INTRODUCTION

Primary school-age children are the nation's youth that will be the next generation in the future. School age is the transition from child to adult where mental, physical, and emotional growth is fast enough which requires sufficient and appropriate nutritional needs. The future quality of human resources in the future is reflected in the nutritional status of children today, amongst others in primary school children. Primary school children are one of the most vulnerable groups. The nutritional and health problems often experienced by elementary school children are anemia and stunting.

Anemia is one of the global public health problems in both developed and developing countries. World Helath Organization data in 2008 in Worldwide Prevalence of anaemia shows that the total world population with anemia is 1.62 billion people with a school-child prevalence of 25.4% and an estimated 305 million school children worldwide suffering from anemia. The prevalence of anemia among children in Asia reached 58.4% (Arisman, 2010). The Basic Health Research Report of 2013 shows that iron nutritional anemia in children aged 5-12 years is 26%. (Ministry of Health Republic of Indonesia, 2013)

The impact of anemia on primary school children is that it can cause physical growth disorders, low resistance to disease, less intelligence, and low learning / work achievement (Bobonis, 2004). In addition, anemia in primary school children will have an impact on the decreased ability and concentration of learning, disrupting the growth of both body cells and brain cells resulting in symtoms

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like pale, tired, lethargic so that it can decrease fitness and learning achievement (Nirmala, 2012)

There are various risk factors for anemia in primary school children. Research conducted by (Gutema, 2014) shows that risk factors for anemia in primary school children in Ethiopia are family socioeconomic statuses where low incomes increase the risk of anemia to 9-fold, very poor and poor childhood nutritional status and presence parasitic infections (especially worms) in school-aged children. While similar studies (Ngesa and Mwambi, 2014) in Kenya found the risk factors for anemia varied, from the age of the child, the sex of the child (men more than women), low maternal education, parasitic infections (especially malaria), and socioeconomic status. some of the causes of anemia, the most common cause of anemia in developing countries, is the lack of iron intake, which is the growing period of iron school children's need increases but iron intake is low (World Health Organization, 2001)

Base on these previous research anemia on SD Juara Medan. We check anemia for primary school children and found an anemia prevalence of 60%. The aim of the study to find the prevalence of anemia and risk factors associated with anemia in primary school children in North Sumatera.

2 MATERIAL AND METHOD

This type of research is an analytic survey with cross-sectional study design. Total samples of 400 elementary school children aged 8-13 years coming from 4 primary schools: SDN 064026, SDN 067246 from Medan City, and SDIT Al Anshar, SDIT Azdkia from Langkat Regency of North Sumatra Province. Data is taken in July-October 2017.

Types of data collected in this study were primary data, using questionnaires and anthropometry measurements and hemoglobin examinations. Interviews with structured questionnaires to find socio-demographic data, diet and risk factors for anemia. While anthropometric measurements include height, weight and weight gain z score and Body Mass Index (BMI). The level of hemoglobin (Hb) was measured using the HemoCue blood photometer (Kisworini and Triasih , 2005 and Akhtar, 2005). The classification of anemia was divided into four for the two age categories. For children 5 to 11 years; 11.5 g / dl normal, 11.0-11.4 g / dl mild anemia, 8.0-10.9 g / dl moderate anemia, and <8.0 g / dl severe anemia. For children 12 to 14 years; 12 g / dl normal, 11.0-11.9 g / dl mild anemia, 8.0-10.9 moderate anemia, and <8.0 g / dl severe anemia. (World Health Organization, 2001)

Data analysis includes univariate, bivariate and multivariate. Univariate analysis is used to describe the incidence of anemia in primary school children, gender and age range of school children. The bivariate analysis used was a chi-square test to see the association of anemia with diet and socio-demography. Multiple logistic regression analysis was used to determine the dominant factors that influenced the incidence of anemia in primary school children. Data were analyzed using SPSS Software

3 RESULT

Total respondents in this study are 400 primary school children from Medan City and Langkat Regency of North Sumatra Province. Most respondents is aged 10-11 years of 67.3%. Female was 49.0% of respondents, while 51.0% were male. Viewed from the father's education category, it is seen that most of the education level of SMA-DIII / PT level education is 81.3%, while maternal education is dominated by most SMA-PT level which is 60.5%. In terms of number of family members, 52.8% had less than 4 family members, while 47.3% had more than 4 family members (table 1).

Table 1: Distribution of socio-demographic characteristics of primary school children (n = 400)

Characteristics	Category	n	%
Gender	Male	204	51,0
	Female	196	49,0
Age (year)	8-9	119	29,8
	10-11	269	67,3
	12-13	12	3,0
Education of Father	Low	75	18,8
	High	325	81,3
Education of Mother	Low	158	39,5
	High	242	60,5
Family members	<=4	211	52,8
	>4	189	47,3
Total		400	100,0

The results of the study in Figure 1 show that from 400 primary school children found 25.5% primary school children suffer from mild anemia, 19.3% moderate anemia and 0.8% severe anemia.

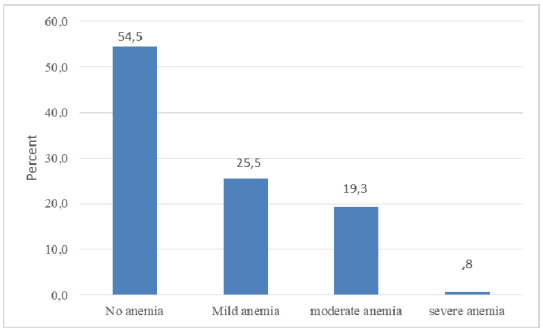

Figure: 1 Prevalence of anemia in primary school children

As many as 54.5% of primary school children do not suffer from anemia. The prevalence of anemia is more experienced by girls that is 50,5%, anemia most often experienced by children with age range 10-11 year that is 62,6% and anemia more suffered by primary school children in rural that is 55,5% (table 2).

Table 2 : Cross-distribution between sex, age and location with anemia (n=400)

Variable		Anemia	
		Yes(%)	No(%)
Gender			
	Male	49,5	52,3
	Female	50,5	47,7
Age (year)			
	9-Aug	33,0	27,1
	11-Oct	62,6	71,1
	13-Dec	4,4	1,8
Research area			
	Urban	44,5	54,6
	Rural	55,5	45,4
Total		100	100

The result of statistical analysis with chi-square test showed anemia in primary school children had a close relationship with morning habits P <0,001) and result of phi test showed that breakfast variable contributed 40,2% to the incidence of anemia. Dad's education and father's work are not related to the incidence of anemia (P> 0.05). While family income and mother education have close relation with anemia incidence (p <0,001), with contribution of each variable is 40,4% and 50,4%. The consumption pattern of food source of heme and non heme significantly influence the occurrence of anemia (p <0,001) with contribution of each variable 49,1% and 23,3%. Similarly, the consumption of iron-inhibiting foods significantly affected the incidence of anemia (P <0.001) with the test value of phi = 15.5%, which means the contribution value was weak (table 3).

Table : 3 Bivariate analysis of factors related of anemia in primary school children

Variable	Category	Anemia	Normal	P	Phi
		%	%	value	value
Breakfast	Sometimes	71,9	28,1	0,001	0,402
	Every day	30,3	69,7		
Father's Education	Low	48,0	52,0	0,63	0,024
	High	44,9	55,1		
Income	Low	68,2	31,8	0,0001	0,404
	High	27,7	72,3		
Mother's education	Low	76,6	23,4	0,001	0,504
	High	25,2	74,8		
Dietary sources of heme	Sometimes	72,4	27,6	0,0001	0,491
	Every day	23,3	76,7		
Dietary sources of nonheme	Sometimes	28,2	71,8	0,0001	0,233
	Every day	53,3	46,7		
Green vegetables	Sometimes	55,4	44,6	0,0001	0,176
	Every day	37,8	62,2		
Drink tea	Sometimes	36,6	63,4		0,155
	Every day				

The result of multivariate analysis by using multiple logistic regression test showed that there were 5 variables that significantly influence (p <0,005) to school anemia incidence of anemia, breakfast habit, parent income, heme food consumption, and inhibiting food consumption Fe. Among the 5 variables in table 4, it was found that consumption of heme source variable was the dominant factor that had an effect on the incidence of anemia in elementary school children (OR = 3,388).

Table 4: Multivariate analysis of multiple logistic regression variables that affect of anemia in primary school children

Variable Independent	B	*P*	OR (Adjusted)	CI 95%	
Mother's education (x1)	1,12	0,002	3,065	1,495	6,283
Breakfast (x2)	0,746	0,044	2,107	1,021	4,351
Income (x3)	1,075	0,003	2,931	1,442	5,958
Dietary sources of heme (x4)	1,22	0,001	3,388	1,686	6,809
Consume iron barrier (x5)	-0,729	0,052	0,483	0,231	1,007

4 DISCUSSION

The results of this study found anemia prevalence is 45.5%. Primary school children who suffer from anemia in rural areas are more than those living in urban areas. The prevalence of anemia is higher when compared with the national rate of Riskesdas 2013 which is 26%. This suggests that anemia is a public health problem in North Sumatera, where nearly half of school children are anemic. (Sudhagandhi, 2011) study at 900 school children aged 8-16 at Kattangulathur, Tamil Nadu, India shows a higher prevalence of anemia that is 52.88%. Another study conducted by (Iannotti, 2015) which found anemia prevalence in primary school children in Haiti was 70.6% . Studi (Gad, 2013) in 1117 primary school children aged 5-12 years in Riyad Saudi found an anemia prevalence of 22 , 3% (22.4 in boys and 22.2% girls). This reinforces the fact that anemia in primary school children is still a public health problem in many developing and developing countries.

The results of this study showed breakfast habits have a significant relationship with the incidence of anemia in primary school children. The results of this study are in line with a study conducted by (Sirajuddin and Masni, 2015) in primary school children in Makassar who found a relationship between breakfast habits with anemia status. Rare elementary school children (2-3 times / week) have anemia 2.95 times more than children who frequent breakfast. (Murphy, 2007) studies revealed that children who skip breakfast tend to have symptoms of anemia such as pale, lethargic and lackluster. The discovery of (Tandirerung, 2013) also found a significant association between morning breakfast habits with anemia status in primary school children in Manado. The results of the (Latifah and Oboudi , 2010) study in 120 elementary school students in Saudi Arabia showed that breakfast had an effect on hemoglobin levels, found that schoolboys who had breakfast routine did not suffer from anemia while school boys who rarely ate breakfast had lower hemoglobin and anemia. Skipping breakfast results in a decrease in learning concentration characterized by a sense of laziness, weakness, lethargy, dizziness, and drowsiness to a decline in child learning achievement as well as an impact on low blood pressure and anemia (Sartika, 2012)

The results of this study indicate that the educational level of the father is not significantly associated with anemia in primary school children. There is an anemic tendency more experienced by school children with low-educated fathers (SD-SLTP). This finding is in line with (Hioui, 2008) study which revealed no significant association between father education and the incidence of anemia in schoolchildren in Marocco. Another study showed different results performed by (Alelign, 2015) in Ethiopia found no significant association between father work and anemia in primary school children.

Father's work has no significant relationship with the incidence of anemia in school children. The results of this study are in line with a study conducted by (Al Zabedi, 2014) who found no association between father's work with anemia. However, another study conducted by (Gutema, 2014) showed a significant association between father work and the incidence of anemia in primary school children. While the income of parents have a significant relationship with the incidence of anemia in primary school children. The results of this study are supported by the findings of (Gutema, 2014) and (Al Zabedi, 2014) which revealed a significant association between parental income and the incidence of anemia in primary school children. Children of low-income parents were more likely to suffer from anemia than children of high-income parents. Family income is an important variable in determining the amount and type of food consumed by the family. Families with high incomes are more free to choose and prepare nutritious food for their children so that no shortage of iron intake.

The results of this study indicate a relationship between maternal education with the incidence of anemia in primary school children. This study is in

line with a study conducted by (Ngesa and Mwambi, 2014) which reveals that the mother's educational platform provides protection against the incidence of anemia in children. Mothers with secondary and higher education tend to have children with normal hemoglobin levels. Other studies supporting the results of this study were conducted by (Kahigwa, 2002) and (Leite, 2013) found that maternal education had a significant effect on the incidence of anemia in children. Mothers with low education are likely to have anemic children 4.9 times compared with higher educated mothers. The higher the mother's education the easier it is to absorb various information including nutrition information so as to influence the selection and preparation of food variation for the child.

The results study of (Briawan, 2012). showed that the consumption of food sources of heme and non-heme is closely related to the incidence of anemia in primary school children. Iron absorption is influenced by two factors, namely the absorption of heme iron and nonheme which indicate the existence of two different types of iron in the food. The sources of heme in human food are meat, fish, and poultry, whereas nonheme sources are cereals, nuts, vegetables and fruits. (Sirajuddin and Masni, 2015) study in Makassar also found an influence of food consumption of heme sources with the incidence of anemia. Another study conducted by (Mesfin, 2015) also shows elementary school children who rarely consume food sources of heme have anemia risk of 5 times compared with children who frequently consume food sources of heme. (Zuffo, 2016) study in Brazil found a strong influence between the consumption of dietary sources of heme (meat) and anemia in schoolchildren ($p < 0.005$). The results of this study indicate that the most frequent food sources of heme (5-7 times / week) are fish and chicken. While the food sources of nonheme are often consumed is tofu and tempeh.

The results of this study also found an association between dietary intake of iron absorption inhibitors and the occurrence of anemia, but showed a weak contribution (value of ph = 15%) (Briawan, 2012). The type of food constraint that is often consumed by school children is a good drink made at home and in the cup sold at school with a relatively affordable price of children. Studies supporting the results of this study were conducted by (Ferreira, 2016) in primary school children in Brazil, finding an prevalence of anemia is more prevalent in school children who consume iron-inhibiting foods, ie drinking more than 1 serving per day.

5 CONCLUSION

The results of this study indicate that the prevalence of anemia in primary school children in North Sumatera is still high (45.5%). Risk factors for anemia incidence in schoolchildren ($p < 0.05$) were maternal education (OR = 3.06), parent income (OR = 2,93), breakfast habits (OR = 2,10), consumption of heme sources OR = 3.38). The dominant factor affecting the incidence of anemia in primary school children is the consumption of food sources of heme (OR = 3.38). So it is necessary to immediately do nutritional intervention in primary school children to reduce the incidence of anemia and improve the quality of life of children in the future.

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