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Nutrient Intake Associated with Anemia Status of Primary School Children

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ABSTRACT

This study aims to analyzse nutrient intake associated with the anemia status of primary school children in Bogor, Indonesia. A cross-sectional study was conducted on 500 children aged 8–14 years from 16 primary schools in Bogor, Indonesia. Anemia status was determined using hemoglobin level and analyzed using the cyanmethemoglobin method. Meanwhile, the dietary intake was assessed using 3x24 hours food recall. Anemia prevalance is 58.8%. Most of the subjects had indequate energy and nutrient intake. In this study, vitamin C adequacy level is the only nutrient associated with anemia status (p=0.03; OR=2.3; 95% CI:1.1–5.1).

Keywords: anemia status, nutrient intake, primary school children

INTRODUCTION

Sufficient nutritional intake for children is needed to support learning abilities and achievement in school. During the growth period and development periods, primary school children frequently encounter nutritional problems, one of which is anemia. Iron deficiency anemia is the most common type of anemia found in the community (Noer *et al.* 2022). Generally, iron deficiency anemia has two causes: low intake of iron sources or low bioavailability of iron consumed and increased iron requirements. The prevalence of anemia in Indonesian children aged 5–15 years in 2013 was 26.40%, and the national prevalence of anemia increased to 26.80% in 2018 (MoH RI 2018). Untreated anemia can cause significant problems, and many of the detriments can be long-lasting. This study aims to analyze nutrient intake associated with the anemia status of primary school children in Bogor, Indonesia.

METHODS

This cross-sectional study involved 500 children from 16 primary schools in Cijeruk, Bogor, Indonesia. This research was conducted from October to December 2019 and received ethical approval from the Institute for Research and Community Service (LPPM) IPB University with number 242/IT3.KEPSM-IPB/SK/2019. The research subjects were selected based on the following inclusion criteria: fourth and fifth graders aged 8–14 years, students who willingly participated as research subjects, and students who obtained parental consent. Students who had a history of serious illness and had undergone the menstrual stage were excluded from the study. Three-day 24-hour recalls were used to assess food consumption. Meanwhile, the anemia status was determined using the hemoglobin levels and analyzed using the cyanmethemoglobin method.

RESULTS AND DISCUSSION

Table 1 shows that the research subjects were 241 males (48.2%) and 359 females (51.8%). Moreover, 345 subjects were 10–12 years old (69%), 136 subjects were 8–10 years old (27.3%), and 19 subjects were 12–14 years old (3.8%). The results show that the prevalence of anemia was more frequently found in female students aged 10–12 years (67%). Spearman's correlation test between nutrient adequacy levels with anemia status (Table 2) has revealed that the energy adequacy level (p=0.23; r=0.10), consumption level of animal protein (p=0.00; r=0.23), iron adequacy level (p=0.04; r=0.08), and vitamin C adequacy level (p=0.03, r=0.09) are positively correlated with anemia status. Vitamin C functions to absorb iron by reducing ferric to ferrous in the small intestine. Consuming 25–75

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mg of vitamin C can increase the absorption of non-heme iron four times (Briawan *et al.* 2013).

Table 3 shows the results of the logistic regression test of several variables suspected to be risk factors for iron deficiency anemia. Nutrient adequacy and animal protein consumption level were not the factors related to anemia. This result is supported by Putri *et al.* (2021), who have discovered that the protein and iron adequacy levels are not factors related to anemia. Vitamin C adequacy level was the only variable that was positively correlated to anemia and anemia status. Moroever, the analysis has found that primary school children with low vitamin C adequacy levels were 2.3 times at risk of anemia. This result is similar to that of Sholicha and Muniroh (2019), who mention that anemia occurs due to insufficient nutrient intake, especially iron (Fe) and vitamin C.

Table 1. Subject distribution based on anemia status

Subject characteristics	Groups			
	Anemia (n=294)		Normal (n=206)	
	n	%	n	%
Age				
8–10 years	85	28.9	51	24.8
10–12 years	197	67.0	148	71.8
Gender				
Male	141	48.0	100	48.5
Female	153	52.0	106	51.5

Table 2. Nutrition adequacy and the correlation test between nutrient adequacy levels and anemia status

Variables	Nutrition adequacy		Anemia	
			n=500	
	Average intake	% RDA	*p*	r
Energy (kcal)	1369±386	75.5±21.9	0.023*	0.102
Total protein (g)	36.4±10.0	77.9±24.0	0.086	0.077
Iron (mg)	8.07±2.9	94.9±37.2	0.048*	0.088
Zinc (mg)	4.1±1.3	56.6±20.8	0.097	0.074
Vitamin A (RE)	298.2±163.8	51.1±27.8	0.176	0.061
Vitamin B12 (mcg)	2.6±4.6	80.9±132.4	0.726	-0.016
Vitamin C (mg)	16.5±16.0	31.6±34.8	0.035*	0.094

*Spearman's correlation test; p<0.05
RDA: Recommended Dietary Allowances

Table 3. Risk factors for anemia

Variables	*p*	OR	95% CI
Energy adequacy level	0.26	1.27	(0.8–1.9)
Animal protein consumption level	0.19	1.26	(0.8–1.8)
Iron adequacy level	0.41	1.17	(0.8–1.7)
Vitamin C adequacy level	*0.03	2.31	(1.1–5.1)

*Logistic regression Test; p<0.05

CONCLUSION

Energy adequacy levels, consumption levels of animal protein, iron adequacy levels, and vitamin C adequacy are positively correlated with anemia status. In summary, vitamin C is the only nutrient associated with anemia status in primary school children.

DECLARATION OF CONFLICT OF INTERESTS

The authors have no conflict of interest.

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