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Profile of iron deficiency anemia among junior high school students

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ABSTRACT Iron deficiency anemia (IDA) is a serious significant public health problem, since it's negative impact on physical and psycological development, behavior and work capacity. There are many risk factors influencing the development of IDA. A cross-sectional study has been conducted in 301 Junior High School students at East Jakarta in January-February 2000. A structural questionnaire, physical, cell blood count (CBC) and Serum Iron (SI) examinations were performed. We found some of the many variables were connected with IDA by using bivariat analysis. Anemia was found in 41 out of 301 students (13,6%) and only 25 children (8.3%) suffered from IDA. Among 179 female students, only 33 children (18.5%) were anemic and 20 out of 33 (12.0%) have IDA. Bivariat analysis revealed a significant association between IDA with sex, parent's education, food frequency questionnaire (FFQ) scores, and menstruation. It is concluded that the prevalence of IDA in this study was lower than found in some previous studies in Indonesia. Gender, menstruation, low educated parents, and low FFQ scores were risk factors for IDA. **[Paediatr Indones 2001; 41:111-114]**

Keywords: *Adolescent, iron deficiency anemia (IDA), menstruation, hemoglobin, serum iron (SI).*

IT IS GENERALLY AGREED THAT IRON DEFICIENCY ANEMIA is the most common nutritional deficiency in Indonesia as well as in many developing countries, and contributes significantly in reducing work productivity and economic output. We can find iron deficiency anemia in teenagers, both in males or females. It happened because teenagers really need iron substances for their growth spurt. Till now, epidemiologic data of iron deficiency anemia in teenagers are rare, reflecting less attention from our community and the professionals in this matter.[1]

Based on the workshop on iron deficiency anemia (IDA) in Indonesia 1997, the prevalence of anemia among female adolescents (aged 15 - 18) is 20 - 30% and among boys it is expected to be approximately half of that figure,[1] The Health Household Survey in 1995 found that 24-35% school children suffered from IDA.[2] Because of the increasing prevalence of iron deficiency anemia in Indonesia, the government has targeted at the end of the second long term development plan in the year l993 - 2018 to decrease the prevalence of IDA about 9 % in pregnant women, and to 10% in both under fives and female workers.[1]

Prolonged IDA in schoolchildren will decrease their concentration and learning capacity. Besides, if it happens to the young female, not only will it decrease the working productivity but it also can cause IDA while they are pregnant that may cause abortion, preterm births and low birth weight babies.[3,4] The Ministry of Health has recommended a weekly iron supplementation (60 mg/week for 16 weeks in a year) for school children, adolescent female, and child bearing women.[2] Although the re-

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sponse in terms of hemoglobin concentrations is virtually normal after two months, iron therapy should be continued for two to three months to build up iron stores about 250 - 300 mg or a serum feritin level to 30 mg/l.[5] We all know that IDA can affect growth and decrease the concentration and learning ability, so we should know the risk factors that can cause IDA.

Methods

A cross-sectional study was done in 62 junior high school students at East Jakarta in January and February 2000. Three hundred one students were recruited in this study and fulfilling the inclusion criteria: between 11-15 years of age and been given an informed consent. Children with chronic infection and hematologic abnormalities were excluded.

Medical history, physical (body weight and height) and laboratory examination (BW, hemoglobin, serum iron) were performed. Subjects' characteristics were recorded, including sex, nutritional status, economic status, parent's education, menstruation, and FFQ scores by questionnaire (independent variable) and its relation to IDA (dependent variable). Data were analyzed by Epi info 6.0 program. Bivariat analysis was performed with the level of significance of $p < 0.05$.

Results

The number of subjects of more than 12 years old was 95.7% and females were found more than males. Children with low nutritional status were found more than those with good nutritional status, many of females have had their period cycles (Table 1).

From 301 children examined, about 41 children (13.6%) had anemia, and 25 children (8.,3%) suffered from IDA. Out of 179 females, 33 (18.5%) had anemia and 20 (12.0%) had IDA.

In this study we found that IDA in children with less nutrient, low economic status, low parent's education, low FFQ scores and in female whom having menstruation. The result of bivariat analysis showed that there is a significant relationship between IDA with Sex, parent's education, FFQ scores and menstruation status (Table 2).

TABLE 1. GENERAL CHARACTERISTICS OF SUBJECTS

	N 301	% 100
Age (Year)		
< 12	13	4,3
≥12	288	95,7
Sex		
Male	122	40,5
Female	179	59,5
Nutritional status (BMI)		
Good	116	38,6
Less + bad	185	61,4
Economic status		
High	56	18,06
Low	245	81,94
Parents education		
High	184	62,6
Low	117	37,4
Menstruation (Female)		
Not yet	55	30,7
Already	124	69.3

Discussion

Forty-one out of 301 children were anemic (13.6 %). Girls were affected more than boys, and this was seemingly because the proportion of girls in this study was higher than boys. IDA was found in 25 children (8.3%). Anemia was found in 33/179 (18.5%) girls and 20 (12.0%) girls had IDA, while 8/122 (6.5%) boys had anemia and 5 (4.2 %) of them had IDA. The Health Household Survey in 1995 revealed that 24-35 % school children had IDA. Untario reported that the prevalence of IDA in children above 6 years old was 37.7%, all from low socioeconomic class,[6] while Herdata found that the prevalence of anemia in 423 junior high school female students was 52.1%.[7] Nelson in London found that 20 % of 114 girls aged 11-14 years had IDA.[8]

Compared to the above studies, the prevalence of IDA in this study was much lower, and this might be due to many things including the sampling method. For a better result, more schools and the random sampling method may be needed to represent school children group better.

In this study, age group above 12 years was most affected by IDA or NIDA. The proportion of girls that

TABLE 2. RELATION BETWEEN IRON DEFICIENCY ANEMIA AND SOME RISK FACTORS (BIVARIATE ANALYSIS)

	IDA	NIDA	TOTAL	HYPOTHESIS TEST
Sex				
Female	20	159	179	PR = 2.73 (CI 95% 1.05; 7.07)
Male`	5	117	122	p=0.028
Nutritional status				
Less (less + bad)	18	167	185	PR =1.61 (CI 95% 0.69; 3.74)
Good	7	109	116	p=0.26
Economic Status				
Low	21	224	245	PR =1.20 (CI 95% 0.43; 3.36)
High	4	52	56	p=0.73 IK=95%
Parent's Education				
Low	16	107	117	PR = 2.80 (CI 95% 1.28; 6.12)
High	9	175	184	p=0.007
FFQ Score				
Low (0 - 30)	17	113	130	PR =2.80 (CI 95% 1.24; 6.28)
High (31 - 63)	8	163	171	p=0.009
Menstruation				
Already	17	7	24	PR =2.13 (CI 95% 0.81; 5.54)
Not yet	3	6	9	p=0.049 IK=95%

had anemia was 3 times higher than that of boys. According to the Triningsih study, the highest number of menarche occurred in age group 12-13 years, followed by age group 13-14 years.[9] Menstruation in girls results in more iron depletion every month, so that supplemental iron is required. Additionally this age group undergo accelerated growth resulting in increase of nutritional need including iron, hence these teenagers are classified as high-risk group for developing anemia. This study shows significant relationship between anemia and gender, and females have higher risk for developing IDA. The increased need of iron in the menstrual period and for accelerated growth during puberty may be the possible explanation for this .[3,4] Another report stated that during puberty girls had lower iron reserve than boys, due to hormonal differences between girls and boys.[10]

Good nutritional state was found in 116/301 (38.6%) and undernourishment in 185/301 (61.4%) of children. The proportion of children with anemia (IDA or NIDA) who were undernourished was higher than that of children who were well nourished. Sutejo and Samsudin (1976) found that the prevalence of IDA in well nourished children of low socioeconomic families was 46.6% and in the counterpart-undernourished children was 57.5%.[11] Statistically there was no significant relationship between anemia and nutritional state.

Among seven well nourished children with IDA there were 4 girls and 3 boys. It is clear that IDA may develop in children with good nutritional state. This is because of the increased need of iron support for replacement during the menstrual period and the accelerated growth.[3,4]

In the under-12 years age group there was 9 girls and none of them had their menarche nor had they anemia, even though their FFQ scores were low. This is probably because most of them haven't reached pubertal age so that their need for iron is not so big. Most of the girls with IDA already had their menstrual cycle, but the proportion of NIDA was higher in those who hadn't had their menstrual cycle. Statistically there was a significant difference between IDA and menstruation. Girls who already have their menstruation have twice as much risk to develop IDA as those who do not.

Most children in this study (81.94%) belonged to had low economic states, and only 18.05 % have well economic states. The proportion of IDA and NIDA was almost equal in both economic states. Pudjiadis study in children aged 6 months to 14 years showed that nutritional anemia was found more frequently (77%) in children from low economic class.[12] On the contrary, Herdata found a higher number of anemia in higher socioeconomic classes. This might be associated with the other causes of anemia namely

infection, malabsorption and deficiencies of essential substances such as vitamin C, vitamin A, vitamin B6, folic acid, etc. Four children with IDA from higher socioeconomic class were undernourished which can be explained by the above statement. Statistically there was no significant difference between IDA and economic state.[3,4]

IDA and NIDA were found more in children of low educated parents. Mean while Herdata[7] found that anemia was found equally in children of both low and well educated parents. If we compare with economic states in this study, both groups who had anemia (IDA or NIDA) were found more in families with low economic states.

There are 9/25 children with IDA whose parents were well educated, but half of these children had low economic states. This is probably because of poor economic condition in this country in which many parents loose their jobs including those who were well educated. All these circumstances have major influence in the child's nutritional intake. Statistically there was a significant relationship between IDA and parental education. Children whose parents were low educated had 2.8 times higher risk to develop IDA than their counterpart group.

The choice of food may have influence in the serum iron. IDA and NIDA were found in low FFQ score and statistically there was a significant relationship between FFQ score and IDA. Children with low FFQ score have2.8 times higher risk to develop IDA than those with high FFQ scores. A study in Sweden that compared iron intake from food between boys and girls, showed that the boy's iron intake was 1.6 the sufficiency recommended in RDA, while the girls only took 0.9 the recommended sufficiency. This also supported the result in our study that IDA was found more in girls than in boys.[10]

In summary we have shown that the prevalence of anemia and IDA among Junior High School children is lower than the DEPKES data or other studies results. Girls more frequently develop anemia or IDA than boys. IDA were more frequently found among children with low nutritional status, parental education, FFQ scores and girls who had menstruation. Sex, parent's of education, menstruation and low FFQ scores are risk factors for IDA.

Considering the many limitation of this study, there is a need to do further analytical studies with different method to give a better result. The level of feritin, SI/IBC to provent the continuation of iron deficiency into an IDA is also need to be studied.

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