A study on the intervention scheme to reduce anemia in female adolescences, in Curug, Tangerang

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Abstrak

Penelitian ini bertujuan untuk menilai suatu cara intervensi dalam menurunkan prevalensi anemia pada kelompok remaja putri. Penelitian dilakukan pada 71 siswi kelas I dan II sekolah lanjutan tingkat pertama. Pengambilan sampel dilakukan dengan cara cluster, dengan kelas sebagai "cluster". Intervensi yang diberikan berupa tablet yang mengandung 200 mg sulfas ferosus dan 0,25 mg asam folat selama 10 hari berturut-turut per bulan dalam jangka 3 bulan berurutan. Ukuran keluaran utama status gizi berupa kadar Hb, feritin serum dan indeks massa tubuh. Berdasarkan kadar feritin serum dan Hb didapatkan bahwa defisiensi besi terdapat pada 20% dan aemia defisiensi besi terdapat pada 5.7% dari subyek penelitian. Setelah pemberian suplementasi, didapatkan kenaikan bermakna baik pada kadar feritin serum maupun Hb. Diperkirakan intervensi ini dapat merupakan strategi alternatif dalam penanggulangan anemia pada remaja putri.

Abstract

This study was undertaken to evaluate the result of an intervention scheme in reducing anemia in female adolescences. The study was carried out in 71 female adolescences (students of the first and second year class, junior high schooll), which were taken using cluster sampling technique, with classes as clusters. The intervention was supplementation of daily pills containing 200 mg sulphate ferrosus and 0.25 mg folic acid for a period of 10 consecutive days monthly for three consecutive months. The supplementation were administered by the teacher at school during school days. Main outcome measure was nutritional status i.e. the level of Hb, serum ferritin as well as Body Mass Index/BMI. Based on serum ferritin and hemoglobin level, around 20% of the subjects were classified as early state of iron deficiency/ID, while 5.7% of the subjects suffered from iron deficiency anaemia/IDA. After supplementation, the serum level of ferritin, Hb, as well as the BMI showed a significant increase. This intervention seems to be effective as an alternative strategy in reducing anemia in female adolescences.

***Keywords**: Nutritional status, iron pills, ID, IDA*

Indonesia still has national nutritional problems. One of the problems is nutritional anemia i.e. iron deficiency anemia (IDA).[1] Anemia is a condition, characterized by hemoglobin (Hb) level below normal range.[2] The prevalence of anemia in several age groups in the community is still high i.e. between 40 – 60%.[3]

Adolescences, consisting of active individuals with a high growth rate, will determine the quality of man in the future. Therefore it is necessary to assure an optimal growth rate in this group, and special attention should be paid to the health of female adolescences, who are going to become mothers in the future.

There is little information available, however, concerning the iron status in adolescence and the prevalence of IDA.

The main cause of iron deficiency is possibly insufficient intake of iron and low absorption rate. Meanwhile, parasitic diseases caused by worms or malaria parasites, may worsen the situation.[4] There are also several determinant factors which influence the prevalence of anemia among female adolescences i.e. the economic level and level of education of the parents.

This study aimed to evaluate the anemia intervention model for female adolescence.

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efforts to control worms were already done in elementary schools in the cooperation with the Department of Parasitology, Faculty of Medicine, University of Indonesia.

One group pre and post test design was used for this study. The study was done from January to September 1998. The population was female students of the government junior high school (the 1st and 2nd year class), age 12-15 years. Subjects were taken using cluster sampling technique, with classes as clusters. Sample size was calculated using the formula of sample size for related-test.[5] The exclution criteria for the subjects of this study were Hb level below 8 g/dL.

Each subject was subjected to an intervention scheme. The intervention was supplementation of daily pills containing 200 mg sulphate ferrosus and 0.25 mg folic acid for a period of 10 consecutive days monthly for three consecutive by the teacher at school during school days. The supplementation was done after the elimination of intestinal helminths.

Home visits were done to obtain the data about socio economic status and data on the dietary intake. Furthermore, body weight, height, haemoglobin/Hb, and serum ferritin before and after the intervention were also measured. The Hb and serum ferritin level were determined using the cyanmeth[6] and IRMA[7] by the Department of Clinical Pathology, Medical Faculty, University of Indonesia.

Data analysis was done using the related t-test, using SPSS statistical package for PC. Ethical clearance applied in the study was approved by the Ethical Committee Medical Faculty, University of Indonesia.

RESULTS

Out of 75 subjects who were selected, 2 were excluded from this study because they did not want to participate, while 2 subjects moved to another class.

Characteristics of the subjects

The socio-economic characteristic of 71 subjects were as follow: the majority of the educational level of the fathers was intermediate (63.4%), while that of the mothers was low (56.4%). The religion of 90.1% of the subjects were moslem; 64.8% of the fathers worked at non government sector, while 70.4% of the mothers were housewives (Table 1).

The number of the family members was between 6-7 persons. Since there were difficulties to get information about the income, we analyzed the economic level using their monthly expenditure. Using the Biro *Pusat Statistik* criteria for expenditure, all of the subjects had low economic level.[9]

Table 2 is an overview of the general characteristics of subjects. Stunting was found in 28% of cases. Based on BMI[10] 13% of the subjects were classified underweight; 86% had normal nutritional status, while obese was found in 1% of subjects.

Table 3 is an overview of dietary consumption and iron status of the subjects. Further analysis using 2 x 24 hour recall method revealed that nutrient intake was below 80% of the recommended dietary allowances/RDA.[11] Compared to the RDA, the intake was 63% for carbohydrate, 84% for protein and 91% for iron respectively. Moreover, the food pattern of most of the subjects showed very little variation; consumption of vegetables and fruits were very rare, as well as the consumption of protein and iron sources. Using food frequency amount method, it was revealed also that the iron intake was very low i.e. 4.7 mg daily (28% of the RDA).

Considering the consumption of food it can be concluded that both in quality and quantity the nutrient intake was not adequate. Furthermore, the proportion of carbohydrate, protein and fat to the total calorie intake were 56.8 $\pm$ 9.0, 9.6 $\pm$ 2.3, and 30.25 (median), respectively. This findings indicated that the subjects did not consume a well balance diet.[12]

Hematologic data

Based on Hb and serum ferritin parameters, the subjects were then categoryzed in different iron status.[13] The distribution is shown in table 3, where 69.6% of the subjects were classified as having normal iron status, while iron deficiency was found in $\pm$ 20% of the subjects.

Reassessment of other variables

Before the reassessment of blood and anthropometry parameters, stool examination was done. The result of stool examination will be published in another paper. The results of blood examination and anthropometry measurements were presented in table 4.

Table 1. Distribution of study subjects according to socio-economic characteristics (n=71)

Characteristic	Number	%
Age (year) :		
Father (43.6 ± 8.1)		
Mother (38.2 ± 5.9)		
Level of education :*		
Father:		
Illiterate	7	9.9
Graduated from elementary school	15	21.1
Graduated from junior high school	15	21.1
Graduated from senior high school	30	42.3
Higher than senior high school	3	4.2
Mother:†		
Illiterate	10	14.1
Graduated from elementary school	30	42.3
Graduated from junior high school	16	22.5
Graduated from senior high school	12	16.9
Higher than senior high school	1	1.4
Religion:		
Father:		
Moslem	64	90.1
Christian	3	4.2
Hindu	2	2.8
Budha	2	2.8
Mother:		
Moslem	65	91.5
Christian	2	2.8
Hindu	2	2.8
Budha	2	2.8
Occupation :*		
Father:		
Non-Government	24	33.8
Enterpreneur	22	31.0
Farmer	1	1.4
Government official	11	15.5
Worker	7	9.9
Retired	3	4.2
Jobless	2	2.8
Mother†		
Non-Government	3	4.2
Enterpreneur	8	11.3
Government official	6	8.5
Worker	2	2.8
House-wife	50	70.4

* missing 1 data
† missing 2 data

Table 2. General characteristics of study subjects

Variables	
Age (years)*	13.60 ± 1.00
Weight (kg) †	40.58 ± 6.45
Height (cm) †	150.24 ± 5.33
B.M.I. (kg/m^2) †	26.94 ± 3.74
% < 5 th percentile	9 (13%)
% ≥ 85 th percentile	1 (1%)
Stunting (%)	
< 3rd percentile	20 (28%)
Haemoglobin (g/dL)	13.20 ± 0.96
Ferritin (mg/L)	35.16 ǂ (6.13-130.90)

* $\bar{x} \pm SD$
† *One subject was not analysed (obese)*
ǂ *Median value*

Table 3. The median of the consumption of nutrient and the iron status

Nutrient	Median†	
Energy	65.07 (31.5 -149.1)	
Protein	54.36 (21.77-171.8)	
Fe (% RDA)*	39.74 (18.39-144.5)	
Iron status	**N ǂ**	**%**
Normal	48	69.6
Prelatent iron deficiency	8	11.6
Latent iron deficiency	6	8.7
Iron deficiency anemia	4	5.7
Non iron deficiency anemia	3	4.5

* *Using 2 x 24 hours recall method*
† *Median value was used (C.O.V. > 20%)*
ǂ *Missing 2 data*

Table 4. Pre and post intervention result

Anthropometry parameters	Before supplementation Mean ± SD (mg)	After supplementation	Probability level*
Weight (kg)	40.60 ± 6.46	42.10 ± 6.46	0.001 (s)
Height (cm)	150.00 ± 5.30	150.80 ± 5.22	0.001 (s)
Body Mass Index (kg/m^2)	18.00 ± 2.31	18.51 ± 2.36	0.001 (s)
Blood examination			
Hb (g/dL)	13.21 ± 0.96	13.39 ± 0.83	0.02 (s) ǂ
Ferritin (µg/L) †	35.16 (6.13-130.90)	63.82 (13.16-198.00)	0.01 (s)

* *Paired t-test*
† *Median value*
ǂ *Wilcoxon match pair tests*

DISCUSSION

Characteristics of the subjects

In term of economic level, all of the subjects were classified as having low economic level (Table 1). This condition affects the nutrient intake of the subjects, since they still depend on their family. This situation was worsened by the fact that 56% of the mothers had low education level. Uneducated mothers lead to inability to absorb informations regarding health, particularly on IDA. On the other hand, mothers have important role on the preparation of meals in the family. Considering this data, we may conclude that most of the subjects could be classified as having low socioeconomic level.

This conclusion is supported by the overview of the general characteristic of the subjects which could be seen in table 2. The high rate of stunting (28.2%) is a manifestation of previous chronic poor health and nutrition condition, which has been regarded as an interplay between nutrient intake and infection in early life.[14] Nutritional factors are a more likely cause of stunting process than the ethnic or genetic back ground.[15]

Hematologic data

Iron deficiency refers to a state in which the body iron stores have been depleted, while IDA refers to a hematologic status resulting from iron deficiency. The occurance of IDA implies that body iron stores are severely depleted.[16]

Table 3 shows that from the total sample, 69.6% of the subjects were normal, non anemic iron deficiency were 20.3%, while the prevalence of IDA was 5.7%. These findings indicate that in this study iron deficiency was still a nutritional problem (26%). It is obvious that not all anemia is caused by the lack of iron. There were 3 subjects (4.5%) who did not meet the criteria of IDA. These subjects showed that the caues of the low Hb level was due to something else. For example vitamin B_6 deficiency, vitamin B_{12} deficiency or due to a chronic disease. However, further analysis should be done to determine this kind of anemia.

With regard to iron deficient status, dietary supply has to be taken into consideration. It is known that the dietary supply of iron is determined by 3 main factors: total iron intake, content of heme iron taken and the bioavailability of the non-heme iron.[17] Before intervention, the percentage of low plasma ferritin is quite high (26%). This condition could be caused by the increased physiologic demands for growth, expanding red cell mass, basal loss and menstruation.[18] At the end of the supplementation, several points could be noted:

1. There were an evident significant increase of both serum ferritin and Hb level.
2. The increase in weight as well as BMI indicate increased dietary energy intake due to increased appetite attributed to the intake of supplement.
3. The increase in height can be attributed to the normal increase in height of adolescence. Increase in height due to iron supplementation was also observed in preschool children[19] and school children.[20]

In public health programs, impact evaluation is very important. In this study, after the iron supplementation there was a decrease in the prevalence of iron deficiency. Regarding the food consumption of the subjects it can be concluded that the quality and the quantity were not adequate. On the other hand, prolonged poor Fe intake combined with increased iron losses due to menstruation may pose as risk factors of anemia. Therefore, iron supplementation as an immediate solution, remains the mainstay in the strategy of controlling iron deficiency/ID and IDA. Supplementation as preventive strategy should also be implemented in this high risk adolescence group (the low socio-economic level). The result of our study showed that the intervention is effective as an alternative strategy of controlling ID and IDA.

CONCLUSION

The method of the intervention was effective in reducing anemia as well as the cause of improvement of the nutritional status.

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