

Review of surveys and supplementation studies of anaemia in Indonesia

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Abstract

Iron-deficiency anaemia is one of the main nutritional problems in Indonesia, with a prevalence of 63.5% in pregnant women and 55.5% in pre-school children. Its frequency is related to low iron and folic acid contents of the diet. Intervention programmes to alleviate iron-deficiency anaemia are iron tablets for adults, iron syrup for infants and schoolchildren, and iron fortification of foods. Our studies have demonstrated that iron supplementation can reduce the prevalence of anaemia in pregnant women by 20% to 25%, and iron fortification can reduce it by 20% for those consuming the fortified foods. If iron-supplementation, iron-fortification, and diet-modification programmes were fully implemented in a community, the expected reduction in the prevalence of anaemia would be greater.

Introduction

Iron-deficiency anaemia is one of the main nutritional problems in Indonesia because of its devastating consequences and its magnitude. It is widespread not only in pregnant women but also among children under five years of age, schoolchildren, and low-income workers. Many studies have been conducted in Indonesia to assess the prevalence and the cause of anaemia and to evaluate various methods of solving the problem. As a result, considerable knowledge has been accumulated; however, despite many successful interventions in study settings, the prevalence of anaemia, especially in pregnant women, remains high. This raises many questions about the effectiveness of interventions in the community setting, including the question of compliance in consuming the recommended doses.

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The prevalence of anaemia in Indonesia

Table 1 presents the prevalence of anaemia among pregnant women in various parts of Indonesia and its prevalence at the national level. These data show that the prevalence in various parts of the country ranges between 38.0% and 71.5%, and the average prevalence for all of Indonesia is about 63.5%. Surprisingly, Java, the most developed part of Indonesia, is among the areas with the highest prevalence—57.8% to 71.5%. Irian Jaya, one of the less developed areas, has the lowest prevalence (38%).

The prevalence of anaemia in pre-school children in various parts of Indonesia is between 35.8% and 60.6%, and the average prevalence at the national level is 55.5% (table 2). Similar to the situation in pregnant women, the lowest prevalence in pre-school children is in Irian Jaya (35.8%). In central Java the prevalence in schoolchildren (44.9%) is among the lowest, whereas that in pregnant women (62.5%) is among the highest.

Causes of anaemia in Indonesia

In the early 1970s, analysis of blood from pregnant women found that the transferrin saturation was less than 16%, indicating that anaemia was caused by iron deficiency [4]. Although the vitamin B₁₂ status of these women was normal, their folic acid status was marginal. Therefore, in addition to iron deficiency, it seemed that folate deficiency might be contributing to the problem of anaemia. Eighteen years later, more evidence was provided that anaemia was caused by iron deficiency with the finding that ferritin values of anaemic pregnant women were low and free erythrocyte protoporphyrin (FEP) (also known as zinc protoporphyrin) values were high [5].

The source and bioavailability of iron are influenced by the composition of the diet. In the early 1970s, a series of studies [4, 6] on the prevalence of

TABLE 1. Prevalence of anaemia in pregnant women

Province	No. of subjects	Prevalence (%)	Ref.
West Java	221	71.5	1
Central Java	224	62.5	1
East Java	176	57.8	1
North Sulawesi	115	48.7	1
Southeast Sulawesi	867	67.4	2
East Nusa Tenggara	441	51.0	3
East Timor	382	64.7	3
Maluku	457	48.4	3
Irian Jaya	426	38.0	3
National		63.5	1

TABLE 2. Prevalence of anaemia in pre-school children

Province	No. of subjects	Prevalence (%)	Ref.
Central Java	224	44.9	1
West Nusa Tenggara	167	51.9	1
East Nusa Tenggara	493	48.9	3
East Timor	444	60.6	3
Maluku	443	48.8	3
Irian Jaya	399	35.8	3
National		55.5	1

TABLE 3. Prevalence of anaemia in pregnant women in areas with different staple foods

Area	Staple foods	Prevalence (%)
Indramayu + Purwakarta (west Java)	Rice	77
Bali	Rice + sweet potato	56
Gunung Kidul (Yogyakarta)	Cassava + rice	46
Bogor (west Java)	Rice	57

Source: Ref. 4.

anaemia among pregnant women was conducted in areas where the staple foods were rice, sweet potatoes, and cassava. There was a tendency toward a higher prevalence of anaemia among pregnant women in areas where the proportion of rice in the diet was higher (table 3). Among women in an area where rice was the only staple food, 77% suffered from anaemia, compared with only 46% in an area where cassava was the dominant staple food. Unfortunately, no information is available on the causes of the differences in the prevalence among areas with different staple foods. However, three questions arise:

1. Does rice contain more substances that inhibit the absorption of iron than other staple foods?
2. Do people in rice-eating areas have more hookworm infestation because of a greater number of worms in the environment and/or more exposure

to worms from direct contact with mud, especially during land preparation and planting?

3. Do people in areas in which rice is not the only staple food consume more pulses or other foods rich in iron?

Hookworm infestations are another major cause of iron deficiency [4], and therefore any intervention to combat anaemia in Indonesia should include deworming.

Intervention studies

An increase in hemoglobin and a decrease in the prevalence of anaemia have been consistently reported from daily iron supplementation studies. Table 4 shows the results summarized in a 1985

TABLE 4. Effect of iron supplements distributed by health workers or schoolteachers on haemoglobin (Hb) levels and prevalence of anaemia

Subjects	Treatment per day	Hb (g/dl)		Prevalence (%)		% reduction in prevalence
		Before	After	Before	After	
Pre-school children	Ferrous sulphate syrup 3 mg Fe/kg	11.7	12.3	39.1	29.6	24
Schoolchildren	Ferrous sulphate tablet 60 mg Fe, 2.5 mo	12.3	12.8	43.7	33.0	25
Pregnant women	Ferrous sulphate tablet 120 mg Fe, 2.5 mo	11.8	12.5	37.3	24.7	34
Adult women		12.2	12.8	38.9	34.5	11
Adult men		13.3	13.4	45.7	34.4	25

Source: Ref. 7.

TABLE 5. Effect of supervised iron supplementation on haemoglobin (Hb) levels and prevalence of anaemia

Subjects	Treatment per day	Hb (g/dl)		Prevalence (%)		Ref.
		Before	After	Before	After	
Workers	Ferrous sulphate tablet 120 mg Fe Placebo	11.95	13.38			8
		11.82	12.96			
Schoolchildren	Ferrous sulphate tablet 60 mg Fe	10.40	13.47			9
Pregnant women	Ferrous sulphate tablet 120 mg Fe (through health centre)	70% Hb increased 25% Hb decreased 5% Hb the same				10
Schoolchildren	Ferrous sulphate tablet 60 mg Fe Placebo			47.5	28.2 ^a	11
				46.2	52.8 ^b	
Infants	Ferrous sulphate syrup 3 mg Fe/kg Placebo	9.57	12.94			12
		12.61	13.46			
Pregnant women	Ferrous sulphate tablet 60 mg Fe (through traditional birth attendants)	10.3	11.3			13

a. 41% decrease in prevalence.

b. 14% increase in prevalence.

report for supplements provided by health workers or by teachers in the case of schoolchildren. Table 5 shows the results for other studies in which the distribution of iron supplements was supervised. It should be noted that compliance was particularly variable in the case of pregnant women, many of whom did not take the supplement because of side effects such as dizziness and nausea. Another reason for poor compliance was concern for the darkening of their faeces.

Coverage of iron tablet distribution

Evaluations of the coverage of iron distribution among pregnant women were conducted in various

areas in Indonesia [2, 14]. Coverage ranged from 30.8% to 78.6% (table 6). Unfortunately, these studies did not provide information on compliance. However, judging from the high prevalence of anaemia among pregnant women, one can conclude that despite moderate coverage, compliance was very low.

How to reduce the prevalence of anaemia among pregnant women

Three approaches have been considered for reducing the prevalence of anaemia: supplementation, fortification, and diet modification. Supervised supplementation with iron tablets was able to reduce the prevalence of anaemia by an average of 24%. Converting

TABLE 6. Coverage of iron tablet distribution

District	% coverage
Tangerang	70.9
Serang	61.8
Pinrang	70.8
Soppeng	78.6
Kendari	54.6
Kolaka	46.7
Buton	46.5
Muna	30.8

Source: Refs. 2 and 14.

this reduction into the community-based programme setting, the reduction due to iron supplementation will depend on the degree of compliance achieved

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with a weekly dose that is essentially free of side effects. In our studies this reduction was 20% to 25%.

The reduction of the prevalence of anaemia by adding 10 mg of elemental iron was approximately 20% [15] when the fortified foods were consumed. Since not all pregnant women will be consuming the fortified foods, the actual reduction will be somewhat less.

There are no solid data on the impact of diet modification. The best estimate for reducing anaemia by this method, about 10%, is obtained by comparing the prevalence of anaemia in an area with deficient staple food to that in areas with other staple foods. Diet modification requires a long time to be implemented.

The most desirable outcome would be the concurrent implementation of all three approaches.