Some Studies on Trace Elements in Nutritional Improvement Effects in Indonesia

D. Karyadi and Muhilal

Nutrition Research and Dvelopment Centre, Ministry of Health, Bogor, Indonesia

SUMMARY

Iodine deficiency disorder (IDD) and iron deficiency anaemia are the main nutritional problems related to the deficiency of trace elements in Indonesia. It is estimated that around 20 out of 165 million Indonesian suffer from IDD, and about 30–40% of the population suffer from iron deficiency anaemia. Salt fortification with potassium iodate in the entire country and the use of codinated oil injection in the severely endemic areas has been lauched by the Government since the 1970th to combat IDD. A sampling survey in the areas with fortification programs demonstrated a decrease in the prevalence of IDD. Iron supplementation to workers and their family members also resulted in the prevalence of anaemia and an increase their iron status. Improved iron status was associated with an increase in worker productivity by approximately 10%.

A limited study on serum zinc levels of children from vitamin A deficiency, mild protein energy malnutrition and their age and sex matched controls revealed no significant difference between the groups with all groups at an acceptable level. This study covered a small area at Western Java, and it is still unknown whether Zn deficiency is a significant problem in other parts of Indonesia.

INTRODUCTION

Iron deficiency anaemia and iodine deficiency disorder (IDD) are two of the main nutrition problems in Indonesia, affecting people of all ages and causing significant disturbances. It is estimated that the prevalence of iron deficiency anaemia is 40–70% among prequent women, 20–40% among workers and around 30% among school children or 30–40% of the population suffer from iron deficiency anaemia[1]. The total population suffering from IDD is around 20 million people especially those living in mountainous areas.

The government of Indonesia has been launching various programmes to combat iron deficiency anaemia and IDD. This paper will discuss these intervention programme and its impact on the reduction of the prevalence of iron deficiency anaemia and IDD. Other study concerning other trace element such as Zn status will be also reported.

I. Iron defeiciency anaemia

The two main intervention programmes to combat iron deficiecy anaemia are nutrition education and distribution of iron pill through health center at subdistrict level as well as through integrated health service delivery at village levels. For school children the delivery of iron pills is conducted through special school health programmes.

Nutrition education is a long term solution, therefore it is difficult to asses its effectiveness by measuring its impact on Hb level in shorter period.

One of the study to show the effectiveness of iron supplementation to pregnant women revealed that only about 13.2% of them visited regularly the Health Centres. Giving tablets of ferrous sulphate, when they visited Heath Centre, which should be taken daily proved to reduce the prevalence of anaemia[2]. It was revealed that 70.1% of them increased their Hb values,4.5% unchanged and about 25.2% decreased their Hb values. Since the percentage of frequent women visiting the health centre is low, the distribution of iron pills is mainly conducted through Intergrated Health Service Delivery at village level.

Other pilot project on iron supplementation covering around 2600 recipients in 25 villages consisting of workers, women including pregnant women, school children and preshcool children was evaluated its impact on the improvement of their Hb[3]. About 50% of recipients were taken their blood for Hb determination. The prevalence of anaemia decreased significantly after supplementation (Table 2).

Based on the report made by the cadres, the percentage of pills which was not taken was 16.2%. Data in Table 2 revealed that iron distribution alone could not reduce the prevalence of anaemia to a level which was not a public health problems anymore. It is likely that iron fortification should be getting serious consideration as an additional measures to combat iron deficiency. In Indonesia the prevalence of anaemia which was considered as a public health probelm was 15% or more[4].

For preschool children it was observed that vitamin A interventions may also increased the Hb status of the children[5,6,7]. The mecahnism responsible remains uncertain though it appears to involve iron mobilization and absorption. The role of vitamin A in haemopoeisis has been studied by Hodges *et al.*[8].

The impact of iron supplementation on work productivity can be seen from a study by measuring latex output before and after iron treatment as shown in Table 3[9].

Data in Table 3 showed that the latex output of anemic group treated with iron was not significantly different from that of non-anaemic group. On the other hand the anaemic group receiving placebo had significantly lower latex output than iron treated anaemic group.

II. Iodine deficiency disorder

Iodine deficiency disorder is a public health problem in Indonesia. It is estimated that the number of people suffering from IDD is around 20 million people, of which 500,000 people suffering from various degrees of cretinism.

The two main intervention programmes to prevent IDD are iodization of salt and the use of iodinated oil in severely endemic area. All salt for human consumption in Indonesia must be iodized. The iodine use for iodization of salt is potassium iodate (KIO_3) at a level of 40 ppm or equal to around 25 ppm of iodine. Asuming that the average consumption of salt is around 10 g per day,

Table 1. The percentage of pregnant women showing changes of their hemoglobin after iron treatment[1)]

Estimated	No. of pregnant women	
	No. of pregnant women visiting health centre	87 (13.2%)
	Percentage of pregnant women increased their Hb values	70% (61 of 87)
	Percentage of pregnant women decreased their Hb values	25.2% (13 of 87)
	Percentage of pregnant women no change on their Hb values	4.5% (4 of 87)

1) Martoatmodjo S. *et al.* Penelitian Gizi dan Makanan 4 : 3–20, 1980.

Table 2. Prevalence of anaemia before and after iron supplementation[1)]

Group	N	Prevalence of anaemia	
		Before	After
School children	644	43.7%	33.0%
Pregnant women	87	37.3%	14.7%
Adult men	226	38.9%	25.5%
Adult women	443	45.7%	34.4%

1) Muhilal *et al.* Gizi Indonesia X : 30–34, 1985.

Table 3. Latex output after iron supplementation to the anaemic workers[1)]

Group	N	Treatment	Latex output (kg)	
			Before	After
Anemic	19	Iron (100 mg/day)	20.94 ± 7.86	29.78 ± 8.47
	23	Placebo	20.94 ± 7.86	25.46 ± 10.88
Non anemic	35	Iron	25.77 ± 9.55	31.40 ± 12.57

1) Darwin Karyadi, Gizi Indonesia X : 1–13, 1985.

the majority of the people consume a daily requirement of iodine originated from salt.

A survey in one of the endemic area before and after the marketing of iodized salt is shown in Table 4[10].

In severely endemic area beside the marketing of iodized salt, a programme of iodinated oil injection is routinely conducted. A result of a monitoring and evaluation in one of the severely endemic area after the marketing of iodized salt accompanied with injection of lipiodol is shown in Table 5[11].

The exerience in the field during the implementation of iodinated oil injection programmes showed that there were problems of coverage, personnels and cost of operation. To solve this constraints it

is now serioulsy considered an alternative which is intervention oral administration of iodinated oil. There is an urgent need to produce the iodinated oil for oral administration locally in Indonesia.

III. Zn status

Vitamin A deficiency among preshool children is also a public health problem. Since signs of Zn deficiency such as loss of appetite, decreased growth and epithelial keratinization were similar to vitamin A deficiency[12], we were interested to reveal Zn status of vitamin A deficient children compared to their matched control and those suffering from mild PEM as judged by their anthropometric measurement. Their serum Zn values which are reflected their Zn status are shown in Table 6.

Table 4. The prevalence of endemic goitre before and after the marketing of iodized salt[1)]

Names of the village	Initial prevalence	Prevalence after 3–6 years of marketing iodized salt
	%	%
Simacan	61.9	29.1
Sinekkel	50.5	15.2
Brebes	51.9	31.2
Siloanda Ginting	29.6	7.0

1) Report of Directorate General Industry, 1985.

Table 5. The changes of the rates of visible goiter and iodine excretion in urine during the course of intensive intervention[1)]

Rates visible goiter	Date		
	1977	1979	1980
Grade I	24.45%	10.59%	4.88%
Grade II	11.70%	4.71%	1.22%
Grade III	1.10%	3.52%	0.00%
Iodine excretion in urine (ug/g creatinine)	77.7	159.1	192.2

1) Tarwotjo: Monitoring and evaluation of IDD prevention programme, 1987.

Table 6. Serum Zn of xerophthalmia children, mild PEM and their matched control[1)]

Group	N	Serum Zn X ± SD
		μg/dl
Xerophthalmia children	13	90.38 ± 18.70
Very mild PEM	14	86.92 ± 22.10
Matched control	13	91.38 ± 22.57

1) Unpublished data of NRDC—Min. of Health Republic of Indonesia.

Data at Table 6 revealed that there was no significant difference between Zn status of vitamin A deficient children and their matched control as well as for very mild PEM children. Their serum Zn values are at an acceptable level[12,13]. This study covered a small area in Western Java, and it is still unknown whether Zn deficiency is a significant problem in other parts of Indonesia.

REFERENCES

1. Tarwotjo, Ig., Muhilal, Karyadi, D. and Soekirman. (1978): Nutrition probelm in Indonesia. Presented at National Workshop of Food and Nutrition.
2. Martoatmodjo, S., Muhilal, Sastroamidjojo, S., Soemarno, I. (1985): The prevention of nutritional anaemia in pregnancy with supplementation of ferrous sulphate tablets through health centre. Penelitian Gizi dan Makanan, 4, 3–20.
3. Muhilal, Suharno, D., Saidin, S., *et al.* (1985): Iron supplementation pilot programme. Gizi Indonesia X, 30–34.
4. Nutrition Directrate, Ministry of Health. (1983): National Workshop on Iron Deficiency Anaemia.
5. Husaini. (1982): The use of fortified salt to control vitamin A deficiency. Doctor Thesis, Bogor Agriculture University.
6. Muhilal, *et al.* (1976): A pioneering project for combatting vitamin A deficiency and xerophthalmia with MSG fortified with vitamin A. Department of Health, Directorate General of Community Health, Republic of Indonesia, and Helen Keller International.
7. Muhilal and Karyadi, D. (1984): Slighlight of current studies: Consideration for programme intervention. Human Nutrition, Better Nutrition Better Life, Alesornsmai Press, Bangkok, Thailand, pp.191–195.
8. Hodges, R. L., Sauberlech, H. E., Cauham, J. E. *et al.* (1978): Hematopetic studies in vitamin A deficiency. Am. J. Clin. Nutr., 31, 876.
9. Karyadi, D. (1985): The effect of health improvement of productivity. Gizi Indonesia, X, 1–13.
10. Directorate General of Chemical Industry, Department of Industry. "Pembinaan Yodisasi Garam di Sarana Produksi", 1985.
11. Tarwotjo, I. (1987): Monitoring and evaluation of IDD prevention programme. unpublished report.
12. Hambidge, K. M., Casey, C. E. and Krebs, N. F. (1986): Zinc. in Trace Elements in Human and Animal Nutrition, ed. by Mertz W., Academic Press, Orlando, Florida, pp. 1–109.
13. Subcomittee on Zinc. (1979): Division of Medical Sciences, National Research Council Zinc. University Park Press, Baltimore, pp. 123–129.