Asian Journal of Home Science (June, 2010) Vol. 5 No. 1 : 118-122

Research Paper :

Effect of dose related iron supplementation on the anthropometry and haemoglobin level of the coal mine workers of Assam

M. DAS AND M. CHALIHA KALITA

Accepted : *April, 2010*

See end of the article for authors' affiliations

Correspondence to:

M. DAS
Department of Food and Nutrition, Faculty of Home Science, Assam Agricultural University, JORHAT (ASSAM) INDIA

ABSTRACT

The present study was undertaken to find out the effect of dose releted iron supplementation on the anthropometry and haemoglobin level. Appropriate methodologies were applied. 300 samples were screened for the study and the samples were pair matched for weight and haemoglobin, dewormed and then three groups *viz*., Placebo, Group I and Group II were formed consisting of 100 samples in each group. Data on haemoglobin and weight was collected at baseline (0 days), mid (90 days), final (180 days) and post final (270 days). Results revealed that prevalence of anaemia was universal. In Group I and Group II receiving 60 mg and 120 mg of iron supplementation, haemoglobin level increased from a baseline value of 9.42 g/dl to 12.24 g/dl and 12.58 g/dl at final intervention, respectively. Weight also increased from a baseline value of 55 kg to 58.5 kg in Group I and to 58.9 kg in Group II. In the Placebo group the mean haemoglobin level and weight at final intervention was 99.99 g/dl and 55.6 kg. Thus, it can be concluded that both the dose level had a positive and beneficial impact on the haemoglobin status and weight of the coalmine workers but the compliance was poor with 120 mg iron supplementation.

Key words : Anaemia, Haemoglobin, Supplementation, Coalmine workers, Weight

Iron deficiency anaemia is a major health problem in developing countries. It reduces haemoglobin concentration in the blood which in turn reduces oxygen carrying capacity to the blood and tissues thus impairing work capacity (Seshadri, 1988). The only proven way it can be alleviated is to increase iron intake either by providing medicinal iron (supplementation) or by adding iron to the diet (Bothwell *et al*., 1979). Iron supplementation has the advantage of producing rapid changes in iron status and of directing iron to those segments of a population in greatest need (Cook and Reddy, 1993). Hence, the present study was undertaken with the following objective : to assess the iron nutrition status of the coalmine workers and to study the dose related effect of iron supplementation on haemoglobin and weight.

METHODOLOGY

Subject and study design:

Three hundred samples were screened for the study and haemoglobin levels were estimated on all the samples. Then the samples were pair matched for haemoglobin level and weight and were dewormed using single dose of Albendazole tablets prior to one week of supplementation to avoid errors in haemoglobin ststus by mainly preventing parasitic infection. Pairs were randomly assigned as Placebo group, Experimental Group I and Experimental Group II comprising of one hundred samples in each group. Supplementation of 60 mg and 120 mg of elemental iron (ferrous sulphate) was given to Group I and Group II at a stretch for 180 days. The Placebo group received sugar coated tablets. Data on haemoglobin and weight were collected at baseline (0 days), mid intervention (90 days), final intervention (180 days) and post final intervention at 270 days following the withdrawal of supplements.

Experimental procedure :

Haemoglobin was estimated by the cyanmethemoglobin method (Oser, 1971). Weights and heights were recorded using standard procedure (Jelliffe, 1996). Body Mass Index was recorded using Garrow's Classification (1987). All measurements were made in duplicates.

Statistical analysis :

Means and standard errors were calculated for all parameters. Percentage prevalence was calculated for qualitative parameters. Paired 't' test was applied to compare the impact of specific treatment on the sample individual. Analysis of variance in terms of ratio between group variability to within group variability (F test) was used in order to test the equality of different treatments of the respondents.

FINDINGS AND DISCUSSION

The mean weight, height and haemoglobin level of the workers are presented in Table 1. The mean weight and height of the workers was 54.99±0.782 kg and 162.39±0.364 cm, respectively. The workers showed relatively better anthropometric status which could be attributed to their higher monthly per capita income than other working population. The mean haemoglobin level was 9.42±1.02 g/dl much below the accepted value of 13 g/dl (WHO, 1968) and 12 g/dl according to Indian cut-off point of 12 g/dl (NIN, 1986).

Table 1 : Mean weight, Height and haemoglobin level of male coalmine workers

No. of samples	Mean weight (kg) ± SE	Mean height (cm) ± SE	Mean Hb (g/dl) ± SE
300	54.99±0.782	162.39±0.364	9.42±1.02

The body mass index of the coal mine workers are classified according to Garrow's BMI classification (1987) which has been presented in Table 2. The table reveals that 51.66% of the workers were in normal nutritional status. 19.33% were classified as low weight normal. 14.33% were mild chronic energy deficient (Grade I), 4.66% were moderate chronic energy deficient (Grade II) and only 2.60% were chronic energy deficient (Grade III). The table also depicts that 7.33% were suffering from Grade I obesity. It is a matter of concern that over 41% of the workers were either low weight or suffering from mild to severe form of chronic energy deficiency which is identified as risk bearer of affecting the workers productivity and working efficiency.

Table 2 : Body mass index of male coalmine workers according to garrow's classification (1987)

BMI class	Number of persons	Characteristics
Below 16	8 (2.60%)	CED Grade III (Severe)
16.0-17.0	14 (4.66%)	CED Grade II (Moderate)
17.0-18.5	43 (14.33%)	CED Grade I (Mild)
18.5-20.0	58 (19.33%)	Low weight normal
20.0-25.0	155 (51.66%)	Normal
25.0-30.0	22 (7.33%)	Obese (Grade I)
Above 30	-	Obese (Grade II)

Prevalence of anaemia was universal (100%) using both the WHO and Indian cut-off point depicting a disturbing picture among the working population of a vast labour oriented industry. Table 3 indicats drop in the prevalence rate in Group I and Group II according to Indian cut off point. In Group I supplemented with 60 mg of elemental iron, the prevalence rate was 43% and 22% at mid and final intervention, respectively indicating a high drop in the prevalence of anaemia. Similarly in Group II, receiving 120 mg of the elemental iron the prevalence rate was 39% at mid intervention and at the end of final intervention only 16% were found to be anaemic. But according to WHO cut off point impact was not observed. However, at final intervention in Group II, the prevalence rate was 88%.

From Table 4 it is observed that there was significant increment in haemoglobin levels in all the supplemented groups. Highest increment was observed between Placebo and Group II, than between Placebo and Group I followed by Group I and Group II. Within different stages of intervention, the highest significant increment ($P<0.01$) was found between baseline and final intervention of both the Groups I. Within the Placebo group, there was no significant increment in haemoglobin level.

Fig. 1 reveals that when compared with WHO reference value, the impact was prominent at the final intervention (180 days) among the groups treated with iron. Increment in haemoglobin level was also observed in both the supplemented groups. From Table 5 it is observed that the increment in haemoglobin value in Group I was 2.33 g/dl and 2.82 g/dl at mid and final intervention, respectively. Highest increment was observed in Group II which was 2.48 g/dl and 3.16 g/dl at mid and final intervention.

Frequency distribution of haemoglobin level of Group I (Fig. 2) revealed that 37% had haemoglobin level between 10 to 10.99 at baseline, 57% had between 12 to 12.99 g/dl at mid intervention and 78% had haemoglobin values between 12 to 12.99 g/dl at final intervention. Similarly, in Group II (Fig. 3) 36% had haemoglobin values between 10 to 10.99 g/dl at baseline and 61% and 84%

Table 3 : Impact of intervention on the per cent prevalence of anaemia among male coalmine workers

Groups	Cut-off point taken as 12 g/dl % prevalence				Cut-off point taken as 13 g/dl % prevalence			
	Baseline	Mid	Final	Post final	Baseline	Mid	Final	Post final
Placebo (100)	100 (100)	99 (99)	99 (99)	99 (99)	100 (100)	100 (100)	100 (100)	100 (100)
Group I (100)	100 (100)	43 (43)	22 (22)	99 (99)	100 (100)	99 (99)	98 (98)	100 (100)
Group II (100)	100 (100)	39 (39)	16 (16)	94 (94)	100 (100)	100 (100)	88 (88)	100 (100)

Figures in parenthesis indicate the number of workers

Table 4 : Impact of Iron supplementation on the haemoglobin level of the male coalmine workers

Stages of evaluation	Treatment mean ± SE			F value	C.D. (P=0.05)	S.E. ±
	Placebo	Group I	Group II			
Baseline	9.42±0.103	9.42±0.103	9.42±0.103	For factor treatment		
Mid	9.96±0.88	11.75±0.071	11.9±0.065	419**	0.11	0.055
Final	9.99±0.068	12.24±0.05	12.58±0.043	For factor time		
Post final	9.97±0.085	11.02±0.045	11.31±0.044	450**	0.12	0.063

Table 5 : Impact of iron supplementation on the mean increment of haemoglobin level at various stages of evaluation

Groups	Stages of supplementation	Increment of haemoglobin from baseline (Hg g/dl)				
		<0.5	0.5-1.0	1.0-2.0	2.0-3.0	>3.0
Placebo	Mid	-	0.54	-	-	-
	Final	-	0.57	-	-	-
	Post final	-	0.55	-	-	-
Group I	Mid	-	-	-	2.33	-
	Final	-	-	-	2.82	-
	Post final	-	-	1.6	-	-
Group II	Mid	-	-	-	2.48	-
	Final	-	-	-	-	3.16
	Post final		-	1.89	-	-

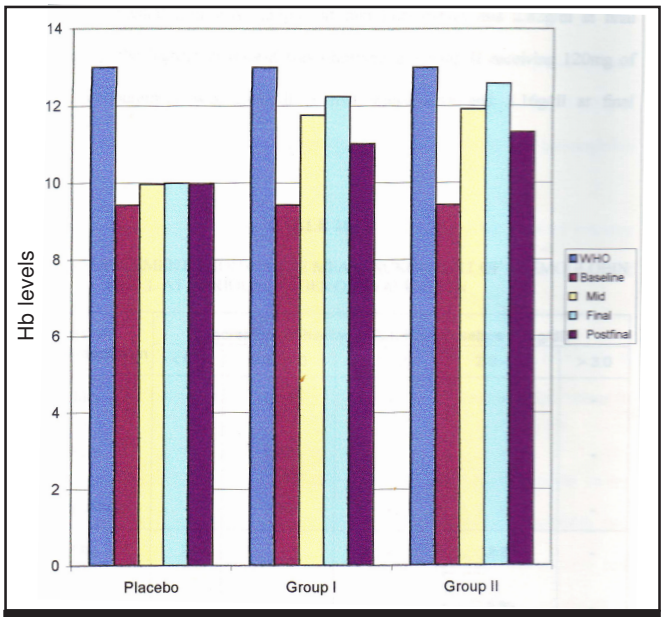

Fig. 1 : Comparison of Hb (g/dl) of coalmine workers before and after supplementation with WHO value

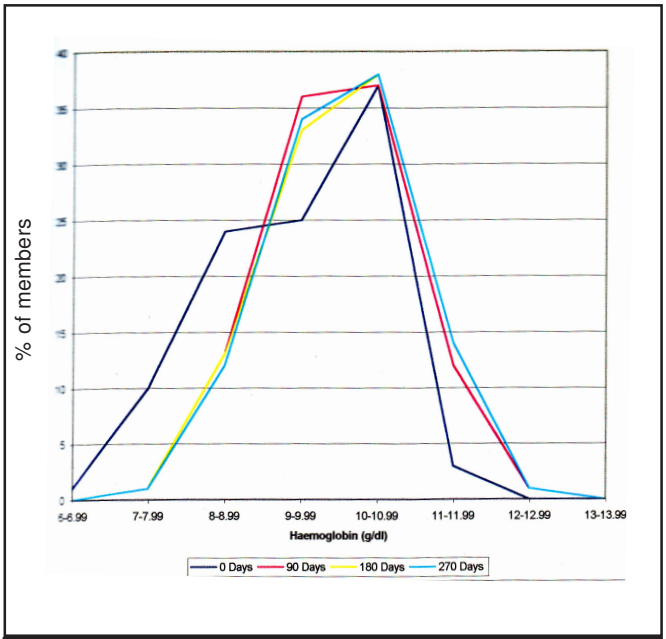

Fig. 2 : Frequency distribution of Hb during study period

had haemoglobin values between 12 to 12.99 g/dl at mid and final intervention, respectively. In both the groups, 70% and 77% of the workers had haemoglobin values between 11 to 11.99 g/dl at post final intervention.

Anthropometry is one of the major indicators of nutritional status assessment. In case of adult population, body weight is considered as the important indicator of nutritional status rather than height. Body weight is also influenced by the individuals iron status. Hence, improvement in iron status is directly associated to the weight gain of the individuals. Impact of supplementation between various treatments (Table 6) revealed that weight gain was highly significant (P<0.01) between Placebo and Group II followed by Placebo and Group I. No significant weight gain was observed between Group I and Group II (Fig. 3 and 4). However, between different stages of

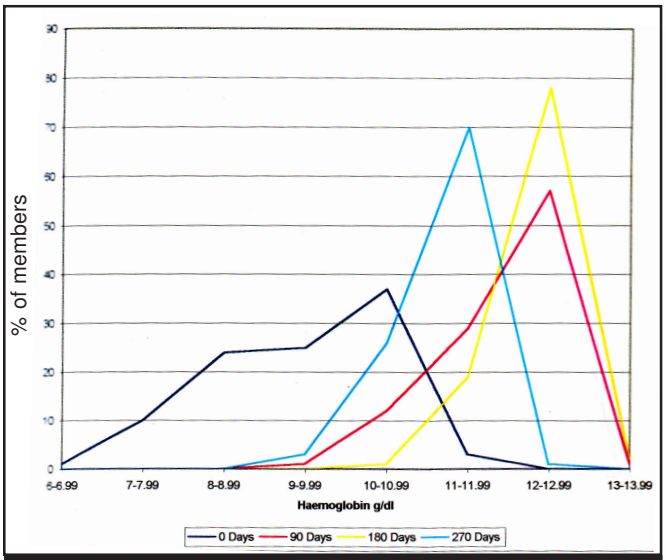

Fig. 3 : Frequency distribution of Hb in group I

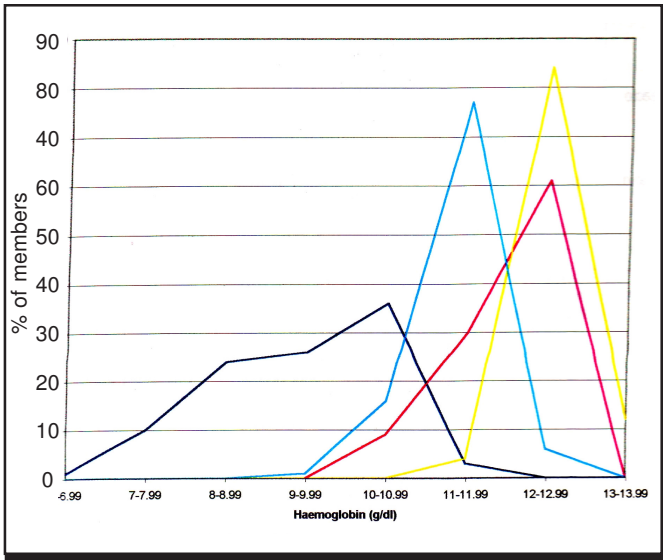

Fig. 4 : Frequency distribution of Hb in group II

Table 6 : Impact of iron supplementation on the body weight of the male coalmine workers

Stages of evaluation	Treatment mean ± SE			F value	C.D. (P=0.05)	S.E. +
	Placebo	Group I	Group II			
Baseline	54.99±0.782	54.99±0.782	54.99±0.782	For factor		
Mid	55.44±0.735	56.93±0.644	57.3±0.663	treatment		
Final	55.69±0.729	58.51±0.589	58.99±0.595	10.14**	0.96	0.498
Post final	55.17±0.731	58.03±0.584	58.82±0.604	For factor time	1.11	0.569
				11.35**		

intervention within the groups, highest significant (P<0.01) increase in weight gain was observed between baseline and final intervention in Group I and Group II.

The present study provides substantial evidence and confirms the beneficial effect of iron supplementation at a stretch for 180 days. Similar findings has also been observed by Edgerton *et al*. (1979); Reddaiah *et al.*(1989); Vijayalakshmi and Jayanti (1986) who reported that for good haematinic response of iron supplementation, higher dose of elemental iron are required to improve haemoglobin levels and to build up iron stores. Satayanarayan *et al.* (1972) also reported that nutrition supplementation not only improved haemoglobin levels but also improved the body weight of the coalmine workers and infused a feeling of improvement of general health condition.

It can be concluded that both the dose levels had a positive and beneficial impact on the haemoglobin status and weight but the compliance was poor with 120 mg supplementation because of the reported gastrointestinal side effects. From the study, it was clear that a 60 mg dose is most beneficial and effective for the working population like coalmine workers.

Authors' affiliations:
M. CHALIHA KALITA, Department of Food and Nutrition, Faculty of Home Science, Assam Agricultural University, JORHAT (ASSAM) INDIA

REFERENCES

Bothwell, T.M., Charlton, R.W., Cook, J.D. and Finch, C.A. (1979). *Iron metabolism in man*. Oxford : Blackwell Scientific, 1-576.

Cook., T.D. and Reddy, M.B. (1993). Serum transferring receipts. *Annu. Rev. Red*., **44** : 63-74.

Edgerton, V.R., Gardner, G.W., Ohira, Y., Gunawardena, K.A. and Senewiratne, B. (1979). Iron deficiency anaemia and its effect on workers productivity and activity patterns. *British. Med. J.*, **2**:1546-1549.

Garrow, J.S. (1987). Energy balance in man – An overview. *American J. Clin. Nutr.,* **45** (5) : 1114-1119.

Jelliffe, D.B. (1966). The assessment of nutritional status of the community monograph. Series No. 53. World Health Organization, Geneva.

National Institute of Nutrition (1986). Anaemia and endurance capacity. Annual Report. I.C.M.R., **7**(5):164-165.

Oser, B.L. (1971). *Hawk's Physiological Chemistry*. 14th Ed., Tata Mc. Graw Hill Pub. Pvt. Ltd., New Delhi.

Reddaiah, J.P., Prassanna, P. and Ramachandran, K. (1989). Supplementary iron dose in pregnancy anaemia prophylaxis. *Indian J. Pediatr*, **56** : 109-114.

Satyanarayan, K., Rao, D.H., Rao, D.V. and Swaminathan, M. C. (1972). Nutrition and work efficiency in coalmine. *Indian J. Med. Res.,* **60**(12):1800-1806.

Seshabari, S. (1988). Effect of anaemia on physical performance of children and the impact of iron supplements. *Proc. Nutr. Soc. India,* **34** : 44-52.

Vijayalakshmi, P. and Jayanthi, N. (1986). Anaemia and work output. *Indian J. Nutr.,* **23**: 279-285.

World Health Organization (1968). Nutritional anaemia. Tech. Re. Ser. WHO Geneva.

****
******