Efficacy of current antenatal oral iron supplementation programme

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Abstract

Objective To study the efficacy of current routine antenatal oral iron supplementation programme in improving iron status in pregnancy.

Design A prospective cohort study.

Setting University antenatal clinic, Galle.

Patients & Methods Serum ferritin (SF) and haemoglobin (Hb) were assessed before and after varying periods of routine oral iron supplementation in 88 pregnant women. The Obstetricians managing them were blind to the results. At the end of the study, the women were questioned regarding their compliance and the way they had taken the supplements.

Mean outcome measure The change in mean Hb and mean SF in subjects with different levels of Hb and SF.

Results Women who had an initial Hb less than 10 g/dl and SF less than 10 ng/ml had a significant increase of Hb and SF respectively ($p < 0.001$). Women who had supplementation for more than 12 weeks had a significant increase of SF ($p < 0.05$). The compliance and manner in which the supplements were taken were unsatisfactory.

Conclusion Poor compliance and unsatisfactory methods of intake of the supplements needs correction. This may improve the efficacy of routine antenatal oral iron supplementation.

Key words Anaemia, Haemoglobin, Serum Ferritin.

Introduction

In developing countries, the prevalence of anaemia in pregnant women has been estimated to be about 59%[1]. In the university antenatal clinic Galle, anaemia and iron deficiency was detected in 57% and 69% of pregnant women respectively[2]. Hence the practice of routine iron supplementation in this clinic seems justified. However the rate of anaemia and iron deficiency in parturient women remains high (Goonewardene & Liyanage 1995)*. This study was carried out to assess the efficacy of the current programme of antenatal care in the prevention of this problem.

Subjects and Methods

Pregnant women (n=88) with periods of gestation between 14 and 24 weeks, who registered at the antenatal clinic of the University obstetric unit, Galle, during the six week period commencing 15 May 1992 were included in the study. The objective and the potential benefits of the study were explained and written consent was obtained. Ethical approval for the study was obtained from the Faculty of Medicine Galle.

At the first clinic visit, when venepuncture was performed for other routine antenatal investigations, 2 ml of mixed venous blood was obtained.

Routine antenatal care in the clinic included daily supplements of ferrous sulphate (containing 60 mg iron) and 25 ug folic acid, and 300 mg calcium lactate. In addition 'Thriposha', a nutritional supplement (corn soya blend containing 10 mg iron in a 50 g portion) was also given.

During the six week period commencing 7 August 1992, a structured interview was used to obtain relevant information from the subjects and, 2 ml of mixed venous blood was obtained.

The haemoglobin (Hb) was estimated by cyanmethaemoglobin method and the serum ferritin (SF) by immuno radiometric assay technique using IRMA Ferritin Kits (Diagnostic Products Corporation, Los Angeles) which detects SF levels of 0.1 ng/ml or more. The clinicians managing the subjects were blind to the results.

In the study, anaemia was defined as Hb less than 11 g/dl and iron deficiency as SF less than 12 ng/ml.

The change in Hb and SF after routine antenatal care was assessed in subjects with different levels of Hb and SF using the paired T Test.

* unpublished data

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Results

All the subjects were Sinhalese and 46 (52%) were primigravidae.

They were young, educated but poor. (Tables 1,2,& 3).

Table 1. Age (n=88)

Years	*n(%)*
< 20	13(15)
20-24	27(31)
25-29	18(20)
30-34	19(22)
35-39	07(08)
> 40	04(05)
	88(100)

Table 2. Level of Education (n=88)

	n(%)
Not attended School	03(03)
Grade 1-5	18(20)
Grade 5-9	23(26)
Ordinary Level	33(38)
Advanced Level	10(11)
University Education	01(01)
	88(100)

Table 3. Monthly Family Income (n=88)

Rupees	*n(%)*
500-999	12(14)
1000-1999	40(45)
2000-2999	16(18)
>3000	19(22)
Not known	01(01)
	88(100)

Of the 88 subjects 24 (27%) had taken iron supplements before being included in the study but only 2 had taken them for more than 8 weeks.

At the beginning of the study, 43 (49%) were anaemic and 35 (40%) were iron deficient (Table 4).

Table 4. Distribution of subjects according to Hb & SF before supplementation (n=88)

	Hb g/dl				
SF ng/ml	*<8*	*8-10.9*	*11-12.9*	*>13*	*All*
<10	2	18	3	1	24
10-11.9	-	5	6	-	11
12-59.9	-	17	21	6	44
>60	-	1	6	2	9
All	2	41	36	9	88

In the total sample the mean Hb of 10.9 g/dl SD 1.7 and the mean SF of 23.9 ng/ml SD 20.5 did not change significantly after routine antenatal care for periods ranging from 5 to 18 weeks (Table 5).

Table 5. Anaemia and iron deficiency in the study population (n=88)

Measure	*Range*	*mean*	*sd*	*Change in mean*	*p*
Hb g/dl	6.8-15.4	11.0	1.7	0.1	>0.05(NS)*
SF ng/ml	2.3-88.7	23.9	20.5	5.4	>0.05(NS)*

* Not Significant

There was a highly significant increase in mean Hb ($p < 0.001$) only in the subjects who had initial Hb levels below 10 g/dl. (N=27) (Table 6). Similarly only the subjects who had an initial SF level below 10 ng/ml (N=25) showed a significant increase in mean SF ($p < 0.001$) (Table 7).

Table 6. Effects of supplementation on the Hb level (n=88)

	mean increase		*sed*	*p*
Hb g/dl	*n*	*g/dl*		
<8	2	3.0	0.5	< 0.001
8-9.9	25	0.8	0.2	< 0.001
10-11.9	37	0.01	0.2	> 0.05(N.S)*
>12	24	-1.0	0.3	< 0.001
All	88	0.1	0.24	>0.05(N.S)*

Table 7. Effects of supplementation on the SF level

		mean Increase		
SF ng/ml	*n*	*ng/ml*	*sed*	*p*
<10	25	11.7	4.3	<0.001
10-11.9	10	-0.3	0.5	>0.05(N.S)*
12-59.9	44	3.9	3.9	>0.05(N.S)*
>60	09	7.2	8.1	>0.05(N.S)*
All	88	2.0	3.49	>0.05(N.S)*

* Not Significant

Subjects who received supplements for more than 12 weeks had a significant increase of mean SF by 12.8 ng/ml (SED 6.37, $p < 0.05$) but no change in mean Hb (Tables 8 & 9). All the subjects had taken the iron and calcium supplements together, and all except one had taken the supplements after meals. Of the subjects 46% had taken the supplements after dinner while 16% had taken them with tea. Only 58% had taken the supplements regularly. The main reasons for this poor compliance was forgetfulness (18%) and side effects (16%). Of the subjects 53% experienced side effects of which nausea and vomiting were predominant.

Table 8. Effect on Hb concentration according to duration of supplementation

Duration in weeks	*mean increase of Hb g/dl*	*sed*	*p*
5-8(n=22)	0.0	-	-
9-12(n=33)	-0.1	0.36	>0.05(N.S)*
13-18(n=33)	0.3	0.41	>0.05(N.S)*
All(n=88)	0.1	0.24	>0.05(N.S)*

* Not Significant

Table 9. Effect on SF according to duration of supplementation

Duration in weeks	*mean increase of SF ng/ml*	*sed*	*p*
5-8(n=22)	3.3	7.0	> 0.05(N.S)*
9-12(n=33)	-0.7	4.49	> 0.05(N.S)*
13-18(n=33)	12.8	6.37	< 0.05
All(n=88)	5.4	3.49	> 0.05(N.S)*

* Not Significant

Discussion

The absence of a significant change in the mean Hb level could be due to two factors; haemodilution and unsatisfactory intake of the iron supplements.

Haemodilution occurs in pregnancy and progressively increases with increasing gestational age[3,4] and its absence in this study may be interpreted as a beneficial effect of iron supplementations. However the compliance of the women towards their iron supplements, and the manner in which they were taken was unsatisfactory. As found in this study, lack of motivation and side effects are common reasons for poor compliance[5,6,7,8] and gastro intestinal side effects are common with oral iron supplements[5,7,8].

The typical Sri Lankan meal of unpolished rice with plenty of vegetables contains phytates and polyphenolic compounds which inhibit non heam iron absorption from the diet[9,10,11]. Tea and calcium also inhibit absorption of non haem iron from the diet[12,13]. Hence, as seen in this study, the common practice of taking iron and calcium supplements together, after a meal of rice and vegetables, sometimes with tea, will not result in satisfactory iron absorption.

A study on plantation workers showed that oral iron supplementation for more than 17 weeks resulted in improved Hb levels although the iron stores remained unchanged[14]. In the present study however, although no improvement was seen in the Hb levels, a possible improvement of iron stores was seen in the subjects who had supplementation for more than 12 weeks.

Conclusion

The current antenatal oral iron supplementation programme appears to be beneficial in improving the iron status of pregnant women. However the compliance of these women and the manner in which these supplements are taken, should be improved in order to achieve better results.

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