Preventive Strategy to Control Iron Deficiency Anemia in Children and Adults

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Abstract

Objective: To compare improvement in hemoglobin, mean corpuscular volume, mean corpuscular hemoglobin and ferritin levels in children aged 5-10 years and women of reproductive age (15-45) supplemented with daily oral and once weekly with single and double dose of ferrous sulphate.
Method: Twenty children received 200 mg ferrous sulfate daily and 20 received the same dose once weekly for two months. Ten women received 300 mg ferrous sulfate daily, 10 received the same dose once weekly while 10 received 600 mg of ferrous sulfate once weekly for one month.
Results: All parameters improved significantly in children who received 200 mg ferrous sulfate daily and weekly. Similarly, the parameters improved significantly in women who received 300 mg of ferrous sulfate daily and 600 mg of ferrous sulfate weekly.
Conclusion: Weekly supplementation of iron is far better in controlling iron deficiency anemia due to cost effectiveness and better compliance (JPMA 53:131;2003).

Introduction

Iron deficiency anemia is the commonest micronutrient deficiency in the world, affecting more than 2000 million people. It is more common in children and women due to their higher requirements. low bioavailahility of dietary iron and intestinal or menstrual blood losses.[1]
In developed countries, 7-12% of children and women are affected by iron deficiency anemia but in less developed countries the situation is worse as this form of anemia affects about 50% of children and women.[2] The consequences of iron deficiency anemia are serious like poor pregnancy outcome, reduced school performance, decreased growth rate and impaired motor development.[3-7]
The general measures to control iron deficiency anemia include improvement of dietary practices[8], food fortification[9], environmental sanitation, control of infections,[10,11] and oral supplementation of medicinal iron daily.[12] Among these, though oral supplementation of iron is considered as most effective measure to control iron deficiency anemia but studies showed the poor compliance due to side effects.[13,14]
Supplementation program in recent years has been focused on the administration of iron less frequently than once daily. This concept is based on studies in small laboratory animals[13-15] and humans[16-17] that indicate that the daily administration of oral iron impairs the absorption of a subsequent iron dose. The aim of this study was to find out whether once weekly supplementation of oral iron would improve hemoglobin (Hb) level, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and serum ferritin

level as effectively as daily supplementation in children and pregnant women with iron deficiency anemia.

Patients and Methods

Subjects were school children (5-10 years of age) and women of reproductive age (15-45 years). Complete history was taken and physical examination was done. Those having acute diseases like diarrhea >4 loose motions per day), fever, cough, running nose or history of chronic disease, joint pain or bleeding disorders were excluded. Children and women showing clinical anemia with hemoglobin <1 Ig/dI and ferritin levels below 12 mg/I respectively were included in the study.

Forty children were selected and were divided into two groups i.e., daily and weekly supplementation groups. Daily supplementation group received 200 ing ferrous sulfate daily for 8 weeks and weekly supplementation group received same dose of ferrous sulfate once a week i.e., 8 doses. Similarly 30 women were selected and were divided into three groups. Daily supplementation group received 300 mg ferrous sulfate daily for 30 days. weekly supplementation group received same dose of ferrous sulfate weekly for 4 weeks while, double dose weekly supplementation group received 600 mg of ferrous sulfate weekly i.e., six doses for 4 weeks. Hemoglobin concentration, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and serum ferritin levels were determined before and after supplementation. Each group was dewormed by giving 100 mg mebendazole before the start of supplementation. Data analysis was carried out by using software, MiniTab. Values were given as mean ±SEM. Comparison between the values of two groups were done by paired student's t-test and P-value of <0.05 was considered as significant.

Results

All the 40 children and 30 women completed the study. There was no significant difference in Hb, MCV, MCH and serum ferritin levels between two groups of children and three groups of women before iron supplementation.

Subjects of all pre-supplementation groups were anemic with microcytosis and hypochromasia. All the parameters of Hb. MCV and MCH significantly improved ($P<0.05$) in both groups of children and women of double dose weekly group after iron supplementation (Tables 1 and 2).

Table 1. Hemoglobin, MCV and MCH of women of reproductive age (pre and post supplementation data).

Groups	Hb%	MCVfl	MCH Pg/cell
Daily (10)			
Pre-Supplementation	10.10± 0.15	77.30± 0.61	25.30± 0.35
Post - Supplementation	11.80*± 0.13	84.40*± 2.01	26.20± 0.41
Weekly Single Dose (10)			
Pre - Supplementation	10.40± 0.10	74.90± 2.68	26.30± 0.76
Post - Supplementation	10.60± 0.10	75.10± 2.10	26.20± 0.32
Weekly Double Dose (10)			
Pre-Supplementation	10.20± 0.16	76.40± 1.31	24.10±0.41
Post-Supplementation	11.50*± 0.19	85.60*± 1.40	27.40*± 0.35

*P<0.05 Significant as compared with pre-supplementation values.

Table 2. Hemoglobin, MCV and MCH of children (pre and post supplementation data).

Groups -	Hb %	MCV Fl	MCH Pg / Cell
Daily (20)			
Pre-Supplementation	10.55± 0.3	72.87± 0.9	23.97± 0.4
Post-Supplementation	12.51*± 0.1	81.88 *± 1.8	28.45 *± 0.3
Weekly Dose (20)			
Pre-Supplementation	10.48± 0.1	70.82± 1.8	28.16± 1.9
Post-Supplementation	12.24*± 0.1	81.52 *± 1.2	27.09 *± 0.3

*P<0.05 Significant as compared with pre-supplementation values.

Discussion

Iron deficiency anemia is a major nutritional problem in developing countries. Attempt has been made to control other micronutrient deficiencies like vitamin A and Iodine

deficiency but there is limited or no progress in solving the problem of iron deficiency.[18] Several studies have been done to verify the results of intermittent iron supplementation program around the world with different dosage and duration of intervention.[19-21]

In the present study the difference between presupplementation hemoglobin levels in all three groups of women and two groups of children were non-significant (Tables I and 2). After supplementation with iron, hemoglobin levels increased in all groups of women and children except women on single dose weekly group (Table I and 2). Similar results were also obtained by other workers in Indonesia20'21, Bolivia22 and China.[23]

The values of Hemoglobin, MCV and MCH are shown before and after administration of 300 mg of ferrous sulfate to women once daily. once weekly or double dose of 600 mg of ferrous sulfate weekly. The values are expressed as mean ± SEM. Number of subjects is shown in parentheses.

The values of hemoglobin, MCV and MCH are shown before and after administration of 200 mg of ferrous sulfate daily and once weekly to Children. The values are expressed as mean ± SEM. Number of subjects is shown in parentheses.

MCV below 78 fI indicates that the erythrocytes are on an average smaller than normal volume (microcytosis) which suggests that there may be decreased synthesis of hemoglobin, while MCH below 25pg signify hypochromacity i.e. red cells arc lacking in hemoglobin. These red cell indices arc important parameters for diagnosing iron deficiency anemia but effects of intermittent supplementation programs on these were not reported before. We found that red cell indices improved in all supplementation groups except weekly single dose group of women. In children the indices increased on supplementation. This study also shows that ferritin levels in children who received 200 mg of ferrous sulfate daily or weekly were comparable. Similarly, serum ferritin levels in reproductive age group of women who received daily or double dose weekly were comparable.

Recent literature shows that serum ferritin levels provide more sensitive, specific and reliable measurement for determining iron stores.[24] Results of our study show that once weekly double dose in women and once weekly single dose iron supplementation in children, not only repletes functional iron but also storage iron, i.e., serum ferritin. A significant rise in the serum ferritin levels has also been shown by others.[25-27]

It is therefore, concluded that once weekly double dose and once weekly single dose supplementation with iron is effective in controlling (preventing or correcting) iron deficiency anemia. Moreover, weekly supplementation is superior to daily supplementation as better compliance is achieved by motivation to take iron supplements. There was no or less side-effects and the method is cost effective.

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