

**ORIGINAL ARTICLE**

# EFFECT OF DAILY VERSUS WEEKLY IRON FOLIC ACID SUPPLEMENTATION ON THE HAEMOGLOBIN LEVELS OF CHILDREN 6 TO 36 MONTHS OF URBAN SLUMS OF VADODARA

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**ABSTRACT**

**Objective:** To assess the effect of daily versus weekly iron folic acid (IFA) supplementation on the haemoglobin levels of children 6 to 36 months of urban slums of Vadodara

**Design:** Non Randomized control supervised trial

**Setting:** Five out of 40 anganwadi centres were randomly selected. The centres were randomly divided into 3 groups i.e., daily, weekly and control.

**Participants:** All children age 6 to 36 months were selected

**Intervention:** Subjects of daily group (n=31) received one IFA tablet (19.8 mg of elemental iron/tablet) daily for 60 days; weekly group (n=30) received one IFA tablet per week for 19 weeks; control group (n=31) did not receive any supplementation.

**Main Outcome Measure(s) included** impact on haemoglobin levels, anemia prevalence.

**Results:** A significant rise in the hemoglobin levels of 2.03g/dl and 1.75g/dl was observed in daily and weekly group respectively, with anaemic subjects showing a higher rise. Overall prevalence of anemia reduced significantly by 35% and 43% respectively in daily and weekly group. Weekly supplementation showed fewer side effects and more reduction in anemia compared to daily.

**Conclusions:** IFA supplementation significantly increased haemoglobin levels of underprivileged children below 3y of age, irrespective of dose and regimen (daily or weekly). Weekly supplementation with medicinal iron can be used as a strategy for improving haemoglobin levels and anemia reduction among children 6 to 36 months with fewer side effects.

**Key words:** Under 3, IFA supplementation, anaemia, weekly vs. daily supplementation, low socio economic group

**INTRODUCTION**

Iron deficiency anemia (IDA) is a public health problem of staggering proportions affecting 20-50% of world's population <sup>1</sup>. It is the most common nutritional disorder in the world affecting particularly pregnant and lactating women and preschool children <sup>2</sup>.

Infants and young children are highly vulnerable to IDA because of depletion of iron

stores due to rapid growth, low iron content of most infant diets and early initiation of top milk. According to WHO (1991), 48% of children <3years of age have IDA <sup>3</sup>. In India nearly 60-70% of all children below 6 years suffer from varying degree of anemia <sup>4</sup>.

The results of the National Family Health Survey III (NFHS-3) show almost 40% of all children below three are underweight and

almost 80% of children in the age group of 6-35 months are anaemic<sup>5</sup>.

In India, 57 of every 1000 children die before they reach the age of one year.<sup>6</sup> Iron deficiency anaemia is associated with impaired motor development, physiological and behavioural effects, reduced physical activity and poor scholastic performance in children<sup>3 7</sup>.

Iron supplementation has successfully proved to be a short term strategy to combat anaemia. But daily iron-folic acid (IFA) supplementation has shown to have certain limitations like rapid decline in iron absorption due to high dose and gastrointestinal side effects. On the other hand weekly iron supplementation has advantage over daily iron supplementation like - lower side effects, cost effectiveness and improved compliance.

The National anemia control program recommends supplementation of 100 IFA tablets every year for all children 6 to 36 months. However, this has failed to make any dent in anemia control among under 3 with latest NFHS III data showing increase in anemia from 74.3% to 78.9%, the reasons for this are many predominantly poor compliance. Fewer than one in ten children were given IFA supplementation in last seven days (4.7 %) as per NFHS III. The operational success of this strategy needs to be examined and redefined.<sup>5</sup>

While the effectiveness of weekly regimen of iron supplementation in improving haemoglobin levels has been established in older children and adolescents<sup>8 9</sup>, very few studies have addressed this issue in infant and young children (< 3 years)

Therefore, the present study was undertaken with the major objective of assessing the effectiveness of weekly versus daily iron supplementation in improving the haemoglobin levels of young children (6 months - 3 years) and reducing the prevalence of anemia.

## METHODOLOGY

The prospective study was undertaken in the areas of anganwadi centres managed by a children's hospital of Baroda, in 2004. Five out of 40 anganwadi centres were randomly selected and a total of 158 subjects (6- 36 months of age) were enrolled for the study. The anganwadi centres were randomly divided into three groups, with a minimum of 50 subjects in each.

The three groups were - daily group (n=55) and weekly group (n=51), each of which served as experimental groups and a control group (n=52). Daily group received one iron folic acid (IFA) tablet/day for 60 days, whereas weekly group received one IFA tablet/week for 19 weeks. Control group did not receive any supplementation. It was a supervised trial. Chemical analysis of the IFA tablets was done using Wong's method.

Baseline data were collected on socio-economic status, dietary intake, hemoglobin levels, red cell morphology and morbidity profile. Hemoglobin levels and red cell morphology were again measured at the end of the intervention period.

*Socio-economic status:* Information on socio-economic profile of the subjects was collected using a pre-tested structured questionnaire.

*Dietary intake:* Data on dietary intakes was collected using 24 hour dietary recall method and food frequency questionnaire.

*Haemoglobin estimations:* Haemoglobin levels were measured using standard cyanmethemoglobin method.

*Red cell morphology:* The red cell morphology of all the subjects was studied using peripheral blood smear.

*Morbidity Profile:* Data on morbidity profile was collected using a reference period of two weeks, both at baseline and after intervention.

*Ethics:* Before starting the study, consent was taken from the social welfare officer of the hospital, supervisors of the anganwadi centres and the parents of all the subjects.

*Statistical analysis:* Data was analysed using the SPSS package. Frequency distribution and percentages were calculated for all parameters while means and standard errors were calculated for all numerically expressed parameters. Independent 't' test were used to compare the difference between the means in different groups. Paired 't' test were used to assess the differences between the means of same group before and after the study period. Chi-square test was used to test difference between the frequency distribution.

## RESULTS

Out of the 158 enrolled children, 92 children - 31 each in daily and control groups and 30 in weekly group, completed the study, for analysis the subjects were classified into two categories. The subjects in the two categories were not mutually exclusive.

All subjects - Total 92 (daily =31, weekly=30 and control =31) subjects who participated and completed the study, including both anaemic and non-anaemic subjects.

Anemic subjects - Total 80 subject with initial Hemoglobin levels below 11g/dl including 28 from daily, 25 from weekly and 27 in control group.

**Table 1:** Mean Dietary Iron Intake of the Subject in Three Groups

Age group	Daily (A) Mean ± SE	Weekly (B) Mean ± SE	Control (C) Mean ± SE	A v/s B 't' value	B v/s C 't' value	A v/s C 't' value
6 to 12 m	7.42 ± 1.33	5.85 ± 1.47	6.61 ± 0.99	0.78	0.43	0.47
12 to 24 m	5.9 ± 0.8 9	5.11 ± 0.38	5.38 ± 0.44	0.82	0.464	0.529

The results of chemical analysis showed that the IFA tablets contained 19.8 mg of elemental iron/tablet. The daily group was supplemented 1 tablet/day for 2 months (60 days) thus consuming a total of 1188 mg of iron through supplements, while the weekly group was supplemented 1 tablet/week for 19 weeks thus consuming a total of 376.2 mg iron.

The data on the dietary intakes obtained both through the 24 hour dietary recall method and the food frequency method showed that the dietary iron intake was very low in all three groups and was statistically non significant (Table 1).

**Table 2:** Impact of IFA Supplementation on Haemoglobin levels of Children (6 to 36 months)

Groups	Haemoglobin Levels (g/dl) Mean ± SE			A v/s B 't' Value	B v/s C 't' Value	A v/s C 't' Value
	Daily (A)	Weekly (B)	Control (C)			
All Subjects	(31)	(30)	(31)			
Initial	9.06±0.23	9.59±0.251	8.73±0.284	1.56	2.23	0.875
Final	11.09±0.79	11.27±0.22	8.68±0.256	0.68	7.65***	8.252***
Difference	2.03±0.25	1.75±0.24	-0.06±0.23			
Paired 't' Value	7.9***	7.7***	0.316			
Anaemic Subjects	(28)	(25)	(27)			
Initial	8.81±0.205	9.19±0.22	8.27±0.19	1.24	3.08	1.91
Final	10.97±0.12	10.98±0.21	18.36±1.19	0.57	8.33***	10.09***
Difference	2.16±0.26	1.87±0.25	0.1±0.22			
Paired 't' Value	8.13***	7.42***	0.48			

\*\*\* Significant at p<0.001, Figures in parenthesis indicates no of subjects

The effect of iron supplementation on the mean haemoglobin levels of the subjects is shown in Table 2. The initial hemoglobin level of the three groups was not different significantly. However,

the mean final hemoglobin level of "All subjects" of the daily and weekly groups was significantly higher than the control group.

**Table 3:** Effect of IFA Supplementation on Change in the Percent Prevalence of Red cell Morphology among Children (6 to 36 months)

	Normocytic Normochromia		Microcytic Hypochromia		Macrocytic Hypochromia	
	Initial (%)	Final (%)	Initial (%)	Final (%)	Initial (%)	Final (%)
Daily	9 (29)	28 (90)	17 (54.8)	1 (3.3)	5 (16.1)	2 (6.4)
Weekly	10 (32.2)	22 (70.9)	16 (53.3)	5 (16.6)	4 (12.1)	3 (9.6)
Control	7 (22.5)	7 (22.5)	15 (50)	16 (53.3)	9 (29.0)	8 (25.8)

When the different levels of change in hemoglobin levels was seen for all subjects, 39% of subjects from daily group and 33% of subjects

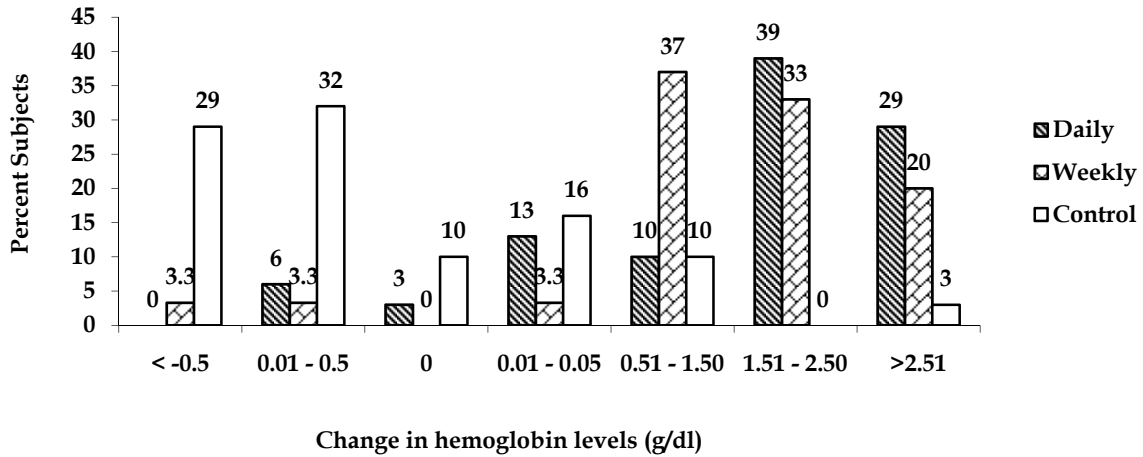
from weekly group showed an increase in hemoglobin levels between 1.51g/dl to 2.5g/dl. A total of 29% and 20% subjects from daily and

weekly group respectively showed an increase greater than 2.51g/dl (Figure 1). Sixty one percent subjects in the control group showed a drop in hemoglobin levels. The data when analysed for anemic subjects showed a similar trend.

The impact of supplementation on the final haemoglobin levels of all subjects in relation to initial hemoglobin levels is shown in Figure 2. A higher increase in hemoglobin levels was

observed in the subjects with hemoglobin level below 10g/dl in both daily (2.43g/dl) and weekly (2.03g/dl) groups.

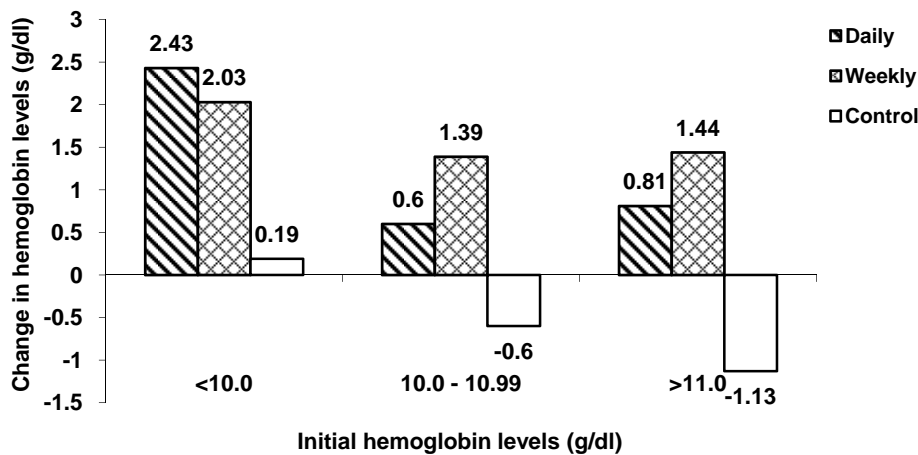
With respect to the impact of supplements on the percent prevalence of anemia, the results showed that the overall percent prevalence of anemic subjects reduced from an initial 89% to 55% in the daily and 83% to 40% in the weekly group, whereas it increased from initial 87% to 93% in the control group.



**Figure 1:** Percent of All Subjects Showing Different Level of Change in Hemoglobin Levels - After Supplementation

Analysis of hemoglobin levels of the subjects according to the initial red cell morphology showed that irrespective of the type of red cells, significant increase in hemoglobin levels from initial to final was seen in all the three categories i.e. Microcytic, Hypochomic, Normlcytic,

Normochromic and Macrocytic Hypochromic in the daily and weekly groups. Normocytic Normochromic subjects showed rise in hemoglobin levels but lower in comparison to the other two deficient cell morphologies.



**Figure 2:** Effect of Supplementation on Change in Hemoglobin Levels of Subjects in Relation to Initial Hemoglobin Levels

Moreover the impact of supplementation brought about a drastic shift in the red cell morphology of the experimental group subjects with majority of subjects having normal red cell morphology in these groups after the intervention as shown in Table 3. An assessment of the physiological effects experienced on consumption of the supplements as reported by the subjects showed that majority of the subjects (90.3%) in daily group reported to have side effects as against only 9.6% in the weekly group.

## DISCUSSION

Supplementation with medicinal iron in the present study led to a significant rise in the haemoglobin levels of the subjects in both the daily (2.03 g/dl) and weekly (1.75 g/dl) groups. The anemic subjects showed a higher increase in hemoglobin levels as compared to the normal subjects, in both supplementation groups.

A rise of 2.43 g/dl and 0.6 g/dl respectively was observed in daily group among subjects with hemoglobin levels <10g/dl and 10-10.9g/dl, and 2.03 g/dl and 1.39 g/dl in the weekly group. On the other hand no change in the mean hemoglobin levels was observed in the control group.

Studies in literature have shown a significant increase in haemoglobin levels on weekly supplementation to different age group thus showing it to have a comparable effect on hemoglobin levels. While studies have been carried out to assess the effect of daily supplementation of iron on hemoglobin levels of children, the effect of daily versus weekly iron supplementation on hemoglobin levels have been studied in few.

In a study by Sungthong et al (2002) in Thailand, 397 primary (6-13yr) school children were supplemented 60 mg of elemental iron, either on daily or weekly basis for 16 weeks. An increase in hemoglobin levels of 0.65 g/dl in daily group and 0.57 g/dl in weekly group was observed <sup>9</sup>.

A study in North-East Delhi on 2210 girls aged 10-17 years assessed the effect of supplementing 100mg elemental iron and 500 mg folic acid for 100 days to the daily group and for 230 days to the weekly group. The haemoglobin levels significantly increased from pre to post, 11.7 to 12.2 g/dl in daily group and 11.7 to 12.1 g/dl in weekly group <sup>10</sup>.

In the present study, overall 91% and 93% subjects from daily and weekly group showed improvement in haemoglobin levels. Further 39% and 33% of subjects respectively from daily and weekly group showed an increase in hemoglobin levels between 1.51 g/dl to 2.5 g/dl, while 29% subjects from daily and 20% subjects from weekly group showed an increase greater than 2.51 g/dl. As against this, 61% of control group subjects showed a drop in hemoglobin levels with 29% showing drop of over 0.5 g/dl.

A study conducted in Andhra Pradesh <sup>8</sup>, to assess the effect of daily versus weekly iron supplementation on 244 girls (13-15 yrs) with different degrees of anemia, showed that rise in hemoglobin levels observed increased with the severity of anemia in both the groups. The results in the present study also showed a similar trend. The highest rise in hemoglobin levels of 2.43 g/dl and 2.03 g/dl was observed in severely anemic subjects from daily and weekly group respectively. Over all there was 35% and 43 % reduction in anemia among the daily and weekly group respectively.

To conclude, the results of the present study have shown that supplementation with IFA (19.8 mg elemental iron) brought about a significant rise in the haemoglobin levels and the rise was comparable between both the groups i.e. daily and weekly. Also weekly supplementation was reported to have fewer side effects and better anemia reduction than daily supplementation.

Thus, weekly supplementation with iron-folic acid tablets can be recommended as a strategy for improving haemoglobin levels of young children (6 to 36 months). Further research needs to be carried out to test the long-term effect of IFA supplementation on hemoglobin levels, anemia prevention, compliance and growth of young children.

### What is already Known

IFA supplementation can cause a significant rise in the haemoglobin levels in different age groups.

### What this Study Adds

Irrespective of dose and regimen (daily or weekly) IFA supplementation significantly

increases haemoglobin levels in young children (6 to 36 months).

Weekly supplementation shows fewer side effects.

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