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Original Research Article

Identification of A Better Strategy to Control Anemia in Adolescent Girls in Singheshwar, Madhepura, Bihar

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Abstract

Background: Intense physical, psychological, and cognitive development occurs during adolescence. The fact that teenagers gain up to 50% of their adult weight, more than 20% of their adult height, and 50% of their adult skeletal mass at this time explains the increased dietary needs at this point. Due to increasing demands for blood volume expansion brought on by teenage growth spurts and the start of menstruation, adolescent girls have higher than average iron needs. The prevalence of iron deficiency anaemia among women, particularly teenage girls, is highest in India. Anemia affects 60–70% of adolescent girls in India.

Objectives: To gather baseline information on haemoglobin (Hb) levels of adolescent girls attending anganwadi centres (11–18 years old) in Singheshwar, Madhepura, Bihar from August 2020 to December 2021; to compare the effectiveness of once-weekly and once-daily iron-folate tablet administration with regard to impact on the Hb levels; and to determine the impact of additional ascorbic acid supplementation on the effectiveness of iron-folate administration.

Methods: The baseline assessment for this prospective randomised research includes assessments of Hb levels, weight, and height. After three months and six months of supplementation, the Hb levels of the enrolled subjects were assessed once more.

Results: 61.9% of the participants had anaemia. Hb levels responded better to daily iron/folic acid intake than they did to once-weekly supplementation. The increase in individuals' haemoglobin levels brought on by the addition of vitamin C to iron and folate treatment was greater than that brought on by iron and folate administration alone.

Conclusions: A public health approach that entails once-weekly distribution of iron/folate supplements through welfare centres and schools is preferable and can be suggested as an effective

technique for battling anaemia in adolescent girls from underprivileged populations in developing nations like India.

Keywords: Anganwadi Centres, Iron-folate, Hemoglobin (Hb) Levels.

Introduction

Nearly 1.5 billion people worldwide still suffer from iron deficiency anaemia as of today (IDA). IDA has been estimated to affect 38–72% of the population in India alone, with women and children making up the majority, depending on age and sex [1]. Girls' IDA prevalence rates rise after the age of 6 years [2]. Menstruation, gender inequality in intra-household food distribution, and early marriage resulting in early pregnancy are a few possible causes of this. Adolescent girls make up around 10% of the population overall, and estimates indicate that by the time they reach menarche, 25–50% of females have anaemia [3,4].

According to a study on Chinese adolescents, 61.8% of the girls were anaemic [5]. The prevalence of iron insufficiency was higher in females than in boys, according to a different study [6] with teenage girls having the greatest percentage. Thus, pregnancy merely contributes to exacerbate the anaemia that already exists in these young girls who will become the moms who will bring forth the next generation.

In light of the situation, the Nutrition Foundation of India had advocated for the necessity to treat anaemia in adolescent girls [7]. Support a plan that makes sure women have a good Hb status (12 g/dl as recommended by WHO) even from the start of conception in order to prevent foetal brain damage caused by maternal anaemia in early pregnancy [8].

Numerous studies had suggested that daily treatment could cause the intestinal mucosa to get "weary," which would lead to a decrease in iron absorption [9,10]. A study found that after a few days of continued daily administration, the absorption of a single dose of iron drops from 30–40% on the first day to as low as 3-6% [10]. Studies on preschoolers show that supplementing with iron once or twice a week greatly improved their haemoglobin level [11,12].

Due to their high phytate content, cereal-based diets have a limited bioavailability of iron. It has been hypothesised that supplementing with ascorbic acid could greatly increase the bioavailability of iron [13].

When taken with a meal, ascorbic acid as low as 50 mg can increase the absorption of iron [14]. It would appear that more research is necessary to determine the relative effectiveness of iron/folate supplementation with and without the inclusion of vitamin C to the supplement.

In order to determine the comparative effectiveness of once-weekly and once-daily administration of iron-folate tablets with respect to impact on the Hb levels, as well as the impact of additional ascorbic acid supplementation, the current study was conducted on adolescent girls from low socioeconomic groups.

Material and Methods

The three treatment groups included of the following participants were: Group A: One iron-folate pill, once every week, containing 100 mg of elemental iron and 500 mg of folate; One iron-folate pill (100 mg elemental iron + 500 mg folate + 25 mg vitamin C) for Group B; one iron-folate tablet (100 mg elemental iron + 500 mg folate) for Group C; once per week.

The study's execution used a prospective, completely randomised experimental design [15]. Three experimental/control groups were formed from a random distribution of the subjects. The anganwadi worker gave the individuals the tablets once a week after lunch so they wouldn't have to take them right after eating.

The information was studied. We compared and tested the mean and standard deviation of height (%) and weight (%) by Hb value grades. All of the subjects who took part in the intervention study had their Hb levels measured at the third and sixth months of the study. The Mean±SD of haemoglobin improvements for the scales of Hb were discovered and differences between all the study groups were examined. Procedures for multiple comparisons 't' test and analysis of variance were used [14] Between research groups, the prevalence of anaemia with Hb values under 12 g/dl was determined. Chi square test was used to determine the significance of proportional differences [15]. The most effective set of factors related to haemoglobin levels were found using stepwise multiple regression analysis with multiple corelation co-efficients [15].

Results

The National Center for Health Statistics [NCHS] [16] and National Nutrition Monitoring Bureau [NNMB] were used to compare the mean heights and weights of females of various ages [17].

As can be seen from *Table I*, the percentage of anemic girls with Hb<12 g/dl in the sample was 61.9%

Table 1: Number and Percentage of Girls According to Hemoglobin Levels

Haemoglobin level (g/dl)	Number	Percentage
< 10.00	50	9.6
10.00-10.99	139	26.7
11.00-11.99	133	25.6
>12.00	198	38.1
Total	520	100.0

Table 2: Initial Hb and Change in Hb in Study Group

S. No.	Study Groups	Initial Haemoglobin (g/dl)	Change in Haemoglobin (g/dl)	
			0-3 months	0-6 months
(a)	Fe/folate (weekly)	10.8^{a}±0.70(55)	0.62^{a}±0.65 (55)	0.79^{a}±0.80(54)
(b)	Fe/folate/Vitamin C (weekly)	10.5^{b}±0.95(57)	1.05^{b}±0.91 (57)	1.17^{b}±1.06(55)
(c)	Fe/folate (daily)	10.8^{a}±0.78 (55)	-0.06^{c}±0.88 (55)	0.63^{a}±0.85(55)
	F ratio (df)	3.56 (2,164)	25.53 (2,164)	4.98 (2,161)
	Level of significance	0.0306	0.0001	0.0080

[a]Difference in superscripts between groups indicates that the contrast is statistically significant (p<0.05); [b]Values represent mean±SD (sample size).

Table 3: Prevalence of anemia (Hb < 12 g/dl) by period of standard

Period of study	Fe/folate Weekly	Fe/folate/Vitamin C Weekly	Fe/folate Daily
Initial	100.0^{a}	100.0^{a}	100.0^{a}
3rd month	67.5^{b}	63.2^{b}	45.9^{b}
6th month	50.6^{c}	51.6^{c}	56.8^{b}
N	55	57	55

[a]Difference in superscripts between time points for a given study group indicates that the contrast is statistically significant ($p<0.05$).; [b]The differences in prevalence of anemia between study groups are significant in 3rd and 6th months of the study ($p<0.05$).; [C]Chi-square test has been used for the significance.

Girls with higher grades in terms of weight (%) or height (%) were shown to have higher haemoglobin values than those with lower grades ($p <0.05$). In other words, people who were taller or heavier for their age had a lower prevalence of anaemia than those who were shorter or lighter. The values of the haemoglobin were favourably linked with BMI as well. Height, BMI, and age were the best combination of factors that were related to haemoglobin in that order. With these factors, the multiple correlation coefficient was 0.260 ($p = 0.002$). The similarity in anthropometric status and haemoglobin profiles between the two populations would imply that poor haemoglobin status was a symptom of general malnutrition caused by a variety of dietary deficits.

38.1% of the 520 participants with baseline data who had Hb levels greater than 12 g/dl were disqualified from the intervention study. Only 169 (55, 57, and 55 in groups a, b, and c) of the 322 anaemic individuals left expressed interest in taking part in the study. For the statistical analysis, the information from the 164 subjects who were accessible for all follow-up periods was used.

After three months and six months from the start of supplementation, the effect of iron/folate supplementation with/without Vitamin C on haemoglobin levels was examined (Table II). Weekly administration of the Fe/folate supplement significantly improved the subjects' mean haemoglobin levels, with improvements of 0.62 g/dl at three months and 0.79 g/dl at six months compared to -0.06 g/dl and 0.63 g/dl in the control group, respectively. The effect at three months was statistically significant ($p<0.05$). A substantially higher improvement was shown after adding vitamin C, with 1.05 g/dl at three months and 1.17 g/dl at six months.

Although Table II demonstrates a rise in the participants' haemoglobin levels, this does not necessarily reflect the degree to which the iron deficiency anaemia had been eliminated. Table III shows that: I the response was better with daily Fe/Folate supplementation than with weekly Fe/Folate supplementation; and (ii) the results were just as favourable with weekly vitamin C supplementation as they were with daily Fe/Folate administration.

Discussion

Anemia was more common in the patients who were short and low in weight, but it was present in nearly all age groups of children studied. One may make the case that children who are malnourished severely shown higher vitamin absorption with supplementation, including iron.

It's important to remember that even with once-weekly treatment, a significant response was obtained, even though the increase in Hb levels attained by daily iron/folate supplementation was larger than that attained through once-weekly supplementation. Once-weekly administration seems appropriate as a public health measure for the control of anaemia, especially for developing countries, from the perspectives of feasibility, affordability, and compliance.

Trials with intermittent doses have been conducted among various groups, including teenage girls, in China, Guatemala, Indonesia, Malaysia, Mali, and the USA [18]. According to a Chinese study, weekly supplementation with 120 mg of iron was more effective than daily doses of 60 mg, which in turn were just as beneficial as

weekly doses of 120 mg [18]. Another study found that a daily 60 mg intake of iron was more beneficial than a weekly 180 mg dose [18]. To determine the degree of effectiveness of the intermittent dosage, a proposed meta-analysis of the previously mentioned approach is necessary.

From August 2020 to December 2021, this study was carried out in Anganwadi centres in Singheshwar, Madhepura, Bihar. Green leafy vegetables were scarce and expensive during the first three months of the study's initial phase (September, October, and November 2020), when it was conducted, and the poor did not consume them as part of their diet. The second phase of the trial, which was conducted after six months, was carried out in the winter (December, January, and February), when green leafy vegetables were also inexpensive and accessible to the poor practically daily. Wintertime also saw a spike in the availability of foods high in vitamin C, such as guava, oranges, tomatoes, and cabbage.

Vitamin C intake considerably improves iron absorption when combined with sources of iron [14]. According to the study's findings, vitamin C insufficiency may be just as, if not even more, responsible for anaemia among low-income, cereal-eating populations. The difference in reaction between the participants receiving Vitamin C treatment together with Fe/folate and those receiving simply Fe/folate appears to emphasise the aforementioned argument. As a result, it can be advised to include Vitamin C with Fe/folate as part of a public health operation. It may not be practical for everyday management because it is an expensive endeavour. On the other side, this might still be achievable if administration occurs once a week. However, we want to underline that, in order to battle anaemia over time, it is even more crucial to modify diet through greater intake of GLVs and fruits.

Conclusion

Thus, it is interesting to see how once-weekly Fe/Folate supplementation with or without Vitamin C affects the prevalence of anaemia. A supplementation programme like this might be implemented through educational institutions and child welfare organisations like Integrated Child Development Services (ICDS) in India. The benefits of this significant programme could include decreased weariness, increased productivity and job capacity, improved immune function, decreased risk of infertility and maternal mortality, and improved immunological function.

Reference

1. National Family Health Survey–3, 2005-06, Ministry of Health & Family Welfare, Govt. of India
2. Govt. of India, Annual Report 2009-10, Ministry of Women and Child Development New Delhi. 2010.
3. Govt. of India, Sample Registration system Statistical Report. 2010. 2012.
4. Agarwal DK, Upadhyay SK, Tripathy AM, Agarwal KN. Nutritional Status, Physical Work Capacity and Mental Function in School Children. Nutrition Foundation of India, New Delhi, Scientific Report No. 6, 1987; 16-23.
5. Cai MQ, Yan WY. Study on iron nutritional status in adolescene. Biomed Environ Sci. 1990; 3: 113-119.
6. Shaw NS. Iron deficiency and anemia in school children and adolescents. J Formos Med Assoc. 1996; 95: 692-698.
7. Gopalan C. Child Care in India - Emerging Challenges. NFI Bull. 1993; 14: 1-4.
8. Agarwal KN, Agarwal DK. Brain and Nutrition. Ann NatlAcad Med Sci. 1992; 28: 15-20.
9. Gopalan C. Iron/Folate deficiency anemia. In: Nutrition Research in South-East Asia - The Emerging Agenda of the

Future. World Health Organization Southeast Asia Regional Publication No. 23, New Delhi, 1994; 41-47.
10. Viteri FE, Liu X-N, Morris M. Iron (Fe) retention and utilization in daily versus every 3 days Fe supplemented rats. FASEB J 1992; 6: A1091.
11. Palupi L, Schultink W, Achadi E, Gross R. Effective community intervention to improve hemoglobin status in prescoolers receiving once-weekly iron supplementation. Am J Clin Nutr, 1997; 65: 1057-1061.
12. Schultink W, Gross R, Gliwitzki M, Karyadi D, Matulessi P. Effect of daily vs twice weekly iron supplementation in Indonesian preschool children with low iron status. Am J ClinbNutr. 1995; 61: 111-115.
13. Report of the WHO/UNICEF/UNU Consultation on Indicators and Strategies for Iron Deficiency and Anemia Program. Geneva, World Health Organization, 1994.
14. De Maeyer EM. Preventing and Controlling Iron Deficiency Anaemia Through Primary Health Care. Geneva. World Health Organization, 1989; 24-25.
15. Visweswara Rao K. Biostatistics - A Manual of Statistical Methods for Use in Health, Nutrition and Anthropometry. New Delhi, Jaypee Brothers Medical Publishers (P) Ltd, 1996; 137-179.
16. Measuring Change in Nutritional Status - Guidelines for Assessing the Nutritional Impact of Supplementary Feeding program for Vulnerable Groups. Geneva, World Health Organization, 1983; 84-86.
17. Report of NNMB Surveys. Nutritional Status of Rural Population. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, 1996.
18. Gillespie S. Major Issues in the Control of Iron Deficiency. The Micronutrient Initiative Publication, 1998; 22-30.