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Research Article

AN INTERVENTION ON IRON DEFICIENCY ANEMIA AND CHANGE IN DIETARY BEHAVIOR AMONG ADOLESCENT GIRLS

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ABSTRACT

Iron deficiency anemia (IDA) is one of the most prevalent nutritional deficiencies in the world, and more than half of the population in India is anemic. The prevalence of anemia is very high among adolescent girls (upto 60-70%) as the hemoglobin level is reported <120 g/L. Iron deficiency anemia leads to poor pregnancy outcome, impaired school performance, decreased work productivity and other adverse outcomes. Adolescence, a period of rapid growth and development, is considered the most nutritionally vulnerable group. To combat these problems, initiation of iron supplementation have been recommended, yet not implemented.

An intervention study was conducted among 104 unmarried adolescent girls with an objective to study the effect of change in dietary behaviors and iron supplementation for reduction of iron-deficiency anemia. The relevant information was collected with anthropometric measurements and hemoglobin estimation. Socioeconomic status was collected using pre-tested questionnaires. The girls were administered iron-folate and calcium tablets on alternate days for 3 months. Results showed there was an increment of 19.55 g/L hemoglobin in the group of girls receiving IFA supplements whereas hemoglobin decreased slightly in girls in the control group. A significant weight gain of 2.66 kg was seen in the intervention group, whereas girls in the control group showed little weight gain.

In conclusion, considering the biological feasibility and effectiveness of the intervention, supplementation of iron should be started and dietary behaviors should be improved in adolescent girls for the control and prevention of anemia and IDA in this population.

Keywords: Anemia, Adolescents, Iron-deficiency, Iron supplementation.

INTRODUCTION

Iron deficiency anemia is a serious and widespread public health concern in both developing and developed countries. It affects 20-50% of the world's population and is common in young children [1]. The prevalence of Iron deficiency anemia (IDA) is high in developing countries than in the developed countries due to poverty, inadequate diet, high incidence of communicable diseases, pregnancy/lactation and low immunity. In India, adolescent girls constitute a vulnerable group of iron deficiency anemia, resulting in a reduced physical work capacity and cognitive function, behavioral disturbances, comorbidity and delay in the onset of menarche which leads to cephalopelvic disproportion. Measuring hemoglobin (Hb) concentration is relatively easy and inexpensive, and this measurement is frequently used as a proxy indicator of iron deficiency anemia [2].

A review of Indian studies on anemia in adolescent girls revealed that > 70% of adolescent girls in low income communities had Hb levels <110 g/L. When WHO cut off of 120 g/L was applied, the prevalence was even higher (80-90%) [3]. Anemia is an indicator of both poor health and poor nutrition [2]. Interventions for anemic adolescent girls should raise their iron stores and sustain their hemoglobin at normal levels. This will not only improve their physical and mental capacity, but also subsequently help in reducing the incidence of low birth weight of infants and maternal mortality rates. Other micronutrients of concern in adolescent growth and development are calcium, iodine, vitamin A, zinc and folic acid. Data suggests that calcium supplementation of post menarcheal girls with low calcium intakes for one year may improve peak body mass, and reduce the risk of osteoporosis. Possible ways to improve iron status may include food fortification, diet, antihelminthic treatment and supplementation. According to Gillespie [4], iron and folate supplementation is one of the most important nutritional interventions for adolescent girls. Studies with multiple micronutrient deficiencies have shown improvement in linear growth, psychomotor functions, and correction of biochemical abnormality when more than one nutrient was supplemented [5,6,7,8].

Therefore, the aim of the study was to improve the dietary behavior and reduce iron deficiency anemia among adolescent girls. This was done by evaluating the effect of giving iron-folic acid and calcium supplements on alternate days for 3 months on Hb levels, height, weight and BMI in unmarried, urban adolescent girls.

MATERIALS AND METHODS

The study was undertaken, between August 2007 and November 2007, in Mumbai, Maharashtra, India. National School, a secondary school was selected for this study. The study was designed to include all eligible aged 10-16 years adolescent girls. Ethics approval was received from the school officials, girls and the parents. There were 387 girls who participated in this study. Measurement of hemoglobin itself is a direct means of determining the presence of anemia, which is most frequently associated with iron deficiency [9]. Anemia in the study was defined as Hb level below 13.0 g/L in men and 12.0 g/L in women according to World Health Organization standards [10]. Out of 387, 104 girls were identified to be anemic. The girls were administered iron-folate (60 mg of elemental iron + 0.5 mg folic acid) and calcium tablets on alternate days for 3 months. Girls were given 15 tablets in a sachet and asked to consume one tablet on alternate days after the evening meal. Every 20 days, the leftover tablets, if any, were counted and the balance replenished for the next 20 days. If a girl was irregular in consumption, she was counseled on the importance of the tablets and (if needed) on how to cope with side effects. Lectures on nutrition and good eating habits were organized for these girls. The girls were also advised to increase the number of daily meals from two meals to 3-4 meals. They were encouraged to consume vitamin C rich foods in combination with iron rich foods daily.

DATA COLLECTION

Structured questionnaire

Demographic and socioeconomic data on the subjects were collected using a standard questionnaire. General characteristics of 104 school girls participating in the study:

Anthropometric and hemoglobin assessments

Weight and height were measured before and after the intervention with the use of standard techniques [11], and body mass index (BMI) was calculated. Blood hemoglobin was estimated by the cyanmethemoglobin method [12] before and after the intervention.

Data were analyzed with SPSS, version 17.0, a data analysis program. Data analysis included descriptive statistics and paired t test.

RESULTS

General characteristics of subjects

The general socioeconomic and health characteristics of subjects are shown in Table 1. Out of 104, majority girls belonged to low income group. 55.8% of the mothers were literate. Worm infestation was present in 7.69% girls.

Adolescent girls participating in the experimental and control groups were similar in weight, height, body mass index (BMI) and Hb levels. They were also similar in indicators of socioeconomic status, housing conditions, water supply and sanitation and health facilities.

A high level of compliance with the supplements was observed, that is 95 % of the girls consumed the tablets regularly. Table 2 summarizes the effect of the intervention on Hb levels, BMI, weight and height gains in the experimental group compared to the control group. At post intervention, there was an increment of 19.55 g/L Hb in the group that received IFA supplementation, whereas the controls showed a slight decrease in Hb levels. The food intake of the girls was increased during the study period in the experimental group. A significant weight gain of 2.66 Kg was seen in the experimental group, whereas the controls showed little weight gain. The experimental group also had a significantly better BMI response to supplementation than the control group.

Table 1: Table shows general characteristics of subjects

Characteristics	No. (%)
Age	
Early adolescence	74 (71.15)
Late adolescence	30 (28.85)
Socioeconomic status	
Mother's education level	57 (55.8)
Low household income	80 (76.92)
Large family size (>8)	50 (40.07)
Piped water supply	65 (65.38)
Nutritional status	
Significant underweight	35 (33.65)
Consumption of leafy vegetables	47 (45.19)
Habit of post meal consumption of tea/coffee	28 (26.92)
Intestinal parasitic infections	
Present	8 (7.69)
Absent	96 (92.31)

Table 2: Table shows changes in hemoglobin levels, height, weight and body mass index BMI after the iron-folic acid intervention

Indicator	Experimental Group				Control Group				Students t test (A vs. B)
	n	Initial	Final	Change (A)	n	Initial	Final	Change (B)	
Hemoglobin g/DL	104	9.348 ± 0.068	11.306 ± 0.147	1.955 ± 0.138	104	9.352 ± 0.068	9.350 ± 0.068	-0.002 ± 0.07	11.890
Height (cm)	104	149.73 ± 0.456	150.31 ± 1.387	1.93 ± 0.193	104	149.81 ± 0.455	150.04 ± 0.463	0.21 ± 0.051	8.352
Weight (kg)	104	42.53 ± 0.664	39.80 ± 0.747	2.66 ± 0.252	104	40.27 ± 0.624	40.13 ± 0.612	-0.06 ± 0.103	10.540
Body Mass Index	104	18.637 ± 0.255	17.852 ± 0.291	1.062 ± 0.181	104	17.820 ± 0.247	17.692 ± 0.245	-0.154 ± 0.534	6.468

Values are mean ± SEM; significant at P< 0.001

DISCUSSION

Anemia, defined as Hb concentration below the established cut-off levels, is a major public health problem with major consequences for human health as well as social and economic development [13]. However, little progress has been reported in the control of anemia. Focus on adolescent girls is required to reduce prevalence of anemia and could be integrated with Participatory nutrition education.

This study demonstrated that IFA supplements for 3 months improved growth and hemoglobin content significantly among adolescent girls as compared with controls. This was expected because the younger ages correspond with the adolescent spurt and the highest iron needs [14]. IFA supplementation is recommended in schools throughout India because of its growth promoting benefits. Iron supplementation also lead to improved cognition which in turn resulted in better academic performance.

The national nutritional anemia-control program in India, failed to make an impact, which focused on iron supplementation to pregnant women after the first trimester of pregnancy. This shows a strong association between anemia and reproductive health resulting due to added demands of iron during pregnancy resulting in low birth weight babies and increased prenatal mortality. Thus as suggested by [15] the adolescent girls should be provided with IFA supplements regularly before marriage and child bearing stage so that they can enter pregnancy with adequate iron status.

The present study has shown the effectiveness of the weekly supplementation of iron folic acid tablets better. It could be concluded that administration of iron supplementation whether weekly or daily, is recommended. The situations where daily supplementation is not possible, alternate supplementation may be the feasible alternative. Also, a better compliance was seen in adolescent girls regarded they were informed about the benefits of IFA supplements.

Further programmatic research should be organized to gain an understanding of the iron growth relationships in adolescence and the mechanism by which iron improves growth [8].

To conclude, considering the effectiveness of iron supplementation in adolescent girls anemia prophylaxis measures should be initiated in India, to correct the iron stores of women prior to pregnancy.

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