

ISSN: 2454-3659 (P), 2454-3861 (E)

Volume I, Issue 4 September 2015

International Journal of Multidisciplinary Research Centre

Research Article / Survey Paper / Case Study

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EFFECT OF SUPPLEMENTATION OF IRON RICH HEALTH MIX TO SELECTED ANAEMIC ADOLESCENT GIRLS (13-18 YEARS)**Authors Details****Name: Prof. REVATHI, P****Affiliation: ARUL ANANDAR COLLEGE,
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UNIVERSITY OF WOMEN COIMBATORE****COUNTRY: INDIA****E mail Id: thirumaniarasu@gmail.com****ABSTRACT**

Iron deficiency anaemia is the most common micronutrient deficiency in developed and developing countries. The prevalence of anaemia in developing countries is 3 - 4 time higher than that in developed countries. Adolescent girls often suffer from anaemia. RVL NagulanAmmappillai Government Higher Secondary School, Sitharevu at Dindigul District was selected as the area for the present study based on convenient sampling. The investigator selected a total of 200 adolescent girls, of age 13-18 years were selected based on random sampling. Using Interview Schedule, the anaemic subjects were selected for the further supplementation study. Finally sixty moderately anaemic adolescent girls with haemoglobin level of 7-9.9g/dl, were identified and were willing to participate in the present study. They were divided into two groups Experimental group (N=20) and control group (N=20) based on the supplement given during the study period of 90 days. The nutritional status of the subjects was assessed by using anthropometric measurements, dietary survey, biochemical assessment and clinical assessment. Thus, the salient findings of the present study proved that supplementation of iron rich healthmix for anaemic adolescent girls had resulted in significant improvement of iron nutriture in the Experimental Group. It is evidenced that iron rich health mix are very effective to enhance the iron nutriture.

Keywords: Anaemia, Adolescent, Haemoglobin

INTRODUCTION

Iron deficiency anaemia is the most common micronutrient deficiency in developed and developing countries. The prevalence of anaemia in developing countries is 3 to 4 times higher than that in developed countries. It is usually attributed to a poor diet.

Iron is an essential element required for the formation of haemoglobin. It combined with oxygen and acts as a transport mechanism for oxygen within the blood and it is involved in various substrate oxidation reactions. It is an essential element required for the formation of haemoglobin and myoglobin and for proper functioning of immune system and central nervous system.³

Iron deficiency anaemia occurs, due to diminished iron stores, insufficient intake of dietary iron and poor bioavailability of iron from cereal based diets.²

Dietary manipulation is important to tackling iron deficiency anaemia. The adolescent girls require suitable dietary intervention to build up their iron stores for future physiological demands as their health profile has greater impact in their later reproductive performance.⁵

REVIEW OF LITERATURE

Adolescence is a particularly unique dynamic period in life because it is the 'second and last growth spurt' in the life of human beings. The adolescence is considered nutritionally vulnerable for several reasons. First, there is an increased demand for nutrients related to the dramatic increase in physical growth and development. Second, the change of life style and food habits of adolescents affects both meals and nutrient intake. Third, there are special nutrient needs associated with participation in sports, development of an eating disorder, and other situations common to adolescents.¹⁰

Because of their rapid growth and development, adolescents need more energy, protein, vitamins and minerals.⁷

Anaemia is one of the major micronutrient problems and is characterized by low level of haemoglobin causing oxygen starvation in tissues.⁹ The cause of iron deficiency is usually malnutrition that is inadequate iron intake, either from sheer lack of food or from high consumption of the wrong foods.¹¹

The overall prevalence of anaemia is estimated to be about 40 per cent of the world's population. Prevalence of anaemia in developing countries is about four times that of

developed countries.⁹The incidence of anaemia among adolescent girls in India was found to be 45 per cent.⁸

It is essential to measure haemoglobin in blood for the diagnosis of nutritional anaemia. It is one of the most common and least expensive measurements done in a nutritional laboratory¹ and also red blood cell count, PCV, MCV and MCH, tests are used to correct the iron deficiency anaemia⁶.

Iron in food exists in heme and nonheme forms. Heme iron which is found in meat, poultry and fish are well absorbed⁴. Heme iron is absorbed more than twice as efficiently as nonheme iron. Non heme iron is found in whole grain cereals, enriched grain products, vegetables, fruits, eggs and is more difficult to absorb but made up a greater proportion of dietary intake¹³.

Sood and Sharada (2002) studied the nutritional significance of "Iron food supplement" in their supplementation study. A supplement food (laddoo) was developed using locally available foods like jaggery, rice flakes, garden cress seeds and amaranth seeds (45:40:10:5) and supplemented for a period of 60 days, after supplementation significant increase in haemoglobin level was observed.

METHODOLOGY

(i) Selection of subjects

Two hundred adolescent girls, of age 13-18 years from RVL NagulanAmmappillai Government Higher Secondary School, Sitharevu at Dindigul District were selected at random and their blood haemoglobin levels were estimated. Based on the results, 60 moderately anaemic adolescent girls were identified and categorized into two groups – Experimental group and control group of 20 each.

(ii) Assessing the Health status of the Anaemic Adolescent Girls

The Health status of the subjects was determined by analyzing an individual's medical, dietary and social history, anthropometric, biochemical and clinical data⁵. Effect of the supplementation was evaluated through assessment of iron status using clinical examination and biochemical estimation as the criteria at the beginning and the end of the supplementation period of 90 days.

Clinical examination was carried out with the help of a physician to find out any obvious signs and symptoms of nutritional deficiencies. The differences in iron

nutriturebetween the initial and final values and between the groups were tested using suitable statistical methods.

Biochemical tests are the most objective and sensitive measures of nutritional status. Five milliliters of blood was collected from each sample, out of which two milliliters was anti coagulated with ethylene diamine tetra acetic acid (EDTA) and used for estimation of red blood cell count and packed cell volume.MCV and MCH also estimated.

(iii) Supplementation of Iron Rich Health mix

Food supplementation is one of the most effective ways of preventing or combating malnutrition especially deficiency disease to reach some or all population. Formulation of supplementary foods based on low cost, locally available ingredients familiar to homemakers has been one of the strategies suggested to improve nutritional status and to combat malnutrition among vulnerable population.

For supplementation, 80g of sweet balls was prepared using Rice flakes, Wheat, Roasted Bengal gram, Gingelly seeds, Jaggery in three different variations. Three variations were prepared separately and followed the same methods for sensory evaluation. Among the three variations, the variation II was found to contain the highest amount of iron 8.9mg/80g followed by the variation I, 7.4 mg/80g and the variation III contributes 7.8mg/80g of iron.

Acceptability of sweet balls for supplementation was tested by sensory evaluation and the nutrient content. A pilot study was conducted. Three variations used for sweet ball preparation, were organoleptically tested by a trained taste panel members, based on the characteristics like colour, taste, texture and flavour. Among the three variations, variation II was selected for supplementation due to its iron content and its highest acceptability scores. Variation II was prepared using 30g of rice flakes, 10g of wheat, 15g of roasted Bengal gram, 5g of gingelly seeds and 20g of jaggery. Variations II was prepared in the form of sweet balls.

Wheat, rice flakes, roasted Bengal gram dhal, gingelly seeds and jaggery were used in the formulation of the iron rich snack. Rice flakes are a famous processed product from rice and have the highest iron content, compared to other cereals. Wheat is valuable for its gluten content. The other ingredients used were roasted bengal gram dhal, gingelly seeds and jaggery which are also rich in iron and are locally available and comparatively low cost food items. The proportion of the ingredients were chosen such that their combined iron

content would help to meet the deficit in iron intake the selected moderately anaemic adolescent girls.

Eighty gram of health mix was given in the form of sweet balls. The subjects were instructed to take one ball in the mid morning and other with the evening tiffin. Experimental group was monitored and consumption of the health mix throughout the study period for the supplemented group was ensured for a period of 90 days.

RESULTS AND DISCUSSION

(i) Age wise Distribution of the Selected Adolescent Girls in the Study Groups

Majority of (75 per cent) the subjects selected for the study, were in the age group of 13-15 years while 25 per cent were in the age group of 16-18 years and did not have public examination and freely involved in feeding study.

(ii) Clinical Profile of the Selected Adolescent Girls

Table I shows the prevalence of clinical signs and symptoms among the selected adolescent girls who participated in the nutritional intervention studies.

Table I: Percentage Prevalence of Clinical symptoms among the Selected Adolescent Girls

Signs and Symptoms	Experimental Group				Control Group			
	Before		After		Before		After	
	N	%	N	%	N	%	N	%
Fatigue	3	15	1	15	5	25	5	25
General weakness	8	40	4	20	9	45	8	40
Lack of interest	8	40	3	15	8	40	8	40
Head ache	7	35	4	20	5	25	5	25
Paleness of the eye	5	25	3	15	6	30	5	35
Koilonychia	-	-	-	-	-	-	-	-
Pale conjunctiva	4	20	3	15	1	5	1	5
Dry and rough skin	4	20	2	10	2	10	2	10
Angular stomatitis	2	10	-	-	3	15	2	10
Cheilosis	1	5	-	-	-	-	-	-
Swollen bleeding gum	4	20	4	20	1	5	-	-
Dental caries	3	15	3	15	3	15	3	15
Fluorosis	11	55	11	55	12	60	12	60

In the study groups, the signs and symptoms of iron deficiency anaemia were observed in mild to moderate level. Percentage prevalence of lack of interest, fatigue, general

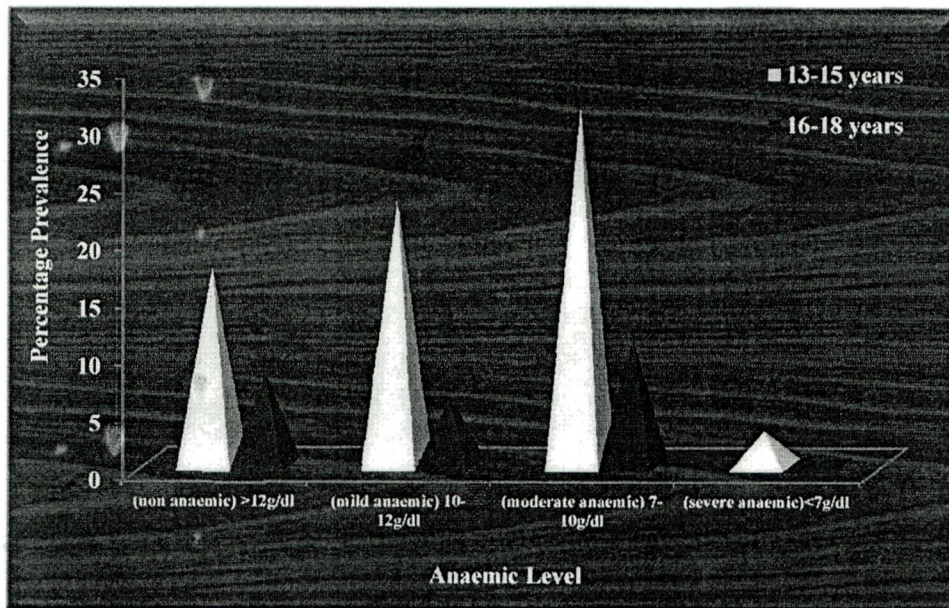
weakness, paleness of the eye and so on was high in the study groups. Fortunately, none of subjects of the study groups were affected by koilonychias. Signs and symptoms were considerably reduced in the Experimental Group after supplementation of health mix for the period of 90 days.

(iii) Prevalence of Anaemia among the Selected Adolescent Girls

The common screening test for the diagnosis of iron deficiency anaemia is estimating haemoglobin concentration. Prevalence of anaemia among the selected adolescent girls is given in figure I.

Figure I

Prevalence of Anaemia among the Selected Subjects



(iv) Biochemical Profile of the Selected Adolescent Girls

Table II depicts the data regarding level of haematological parameters of the selected adolescent girls in the study groups, before and after supplementation for the period of 90 days.

Table II
Haematological Parameters of the Selected Adolescent Girls in the Study Groups

Haematological Parameters	Mean \pm Standard deviation		Mean Difference	't' value
	Initial	Final		
Haemoglobin (g/dl)				
Experimental Group	8.77 \pm 0.356	9.75 \pm 0.452	0.98	9.414**
Control Group	9.04 \pm 0.270	9.08 \pm 0.192	0.04	0.589 ^{NS}
Red Blood Cell Count (m/m³)				
Experimental Group	2.88 \pm 0.139	3.11 \pm 0.218	0.23	4.893**
Control Group	3.02 \pm 0.327	3.06 \pm 0.207	0.04	0.534 ^{NS}
Packed Cell volume (%)				
Experimental Group	24.8 \pm 1.032	27.3 \pm 1.337	2.5	6.229**
Control Group	27 \pm 1.0	26.6 \pm 1.516	0.4	0.666 ^{NS}
Mean Corpuscular Volume (fl)				
Experimental Group	86.21 \pm 4.042	87.979 \pm 4.426	1.762	2.546*
Control Group	90.072 \pm 8.072	87.122 \pm 5.764	2.95	2.109 ^{NS}
Mean Cell Haemoglobin (pg)				
Experimental Group	30.43 \pm 0.691	31.44 \pm 1.938	1.01	1.679 ^{NS}
Control Group	30.218 \pm 3.465	29.778 \pm 2.100	0.44	0.560 ^{NS}

*- Significant at 1 % level; **- Significant at 5 % level; NS-Not Significant

Haemoglobin level of the selected subjects increased from 8.77 to 9.75 per cent for the Experimental Group, whereas in Control Group, it was 9.04 to 9.08 per cent. The increment was noticed in Haemoglobin level in Experimental Group and it was significant at One Per cent and five Per cent level respectively, whereas in Control Group, was not significant. This increment might be due to the regular intake supplements of iron rich health mix for the period of 90 days.

There was a significant improvement in RBC count of the subjects in Experimental Group whereas in Control Group there was no significant difference in RBC count, before and after supplementation.

In Experimental Group PCV increased from 24.8 to 27.3 per cent whereas in Control Group it is reduced from 27 to 26.6 per cent. The same trend was noticed in MCV.

MCH of Experimental Group was increased after supplementation whereas in control group there is no significance difference.

It is evident that the subjects of the Experimental group have shifted the iron nutriture during the study period of 90 days. This implies that even a short term supplementation with iron rich health mix can reduce the prevalence of anaemia among the adolescent girls and improves their iron status.

The need of the hour is to create awareness among the younger generation of adolescent girls regarding the intake of iron with the combination iron absorbing enhancer, to improve their iron nutriture and in turn their total health and vitality.

SUMMARY AND CONCLUSION

Thus, the present study proved that supplementation of iron rich health mix for anaemic adolescent girls had resulted in significant improvement of iron nutriture. It is evidenced that iron rich health mix are very effective to enhance the iron nutriture ; Hence the regular intake of iron rich foods and iron fortified foods should be encouraged among the adolescent girls with alliance between the public and sectors to reduce the prevalence of iron deficiency anaemia.

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