Supplementation Of Iron Fortified Millets To Selected Anaemic Adolescents

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Abstract- *Anaemia is characterized as a condition resulting from the inability of erythropoietic tissues to sustain a normal concentration of haemoglobin due to an inadequate supply of one or more essential nutrients. According to WHO statistics, the global prevalence of anaemia stands at approximately 30 percent, with higher rates observed in developing countries. Adolescent girls represent a critically important demographic in any society. The prevalence of anaemia in this group is particularly concerning, as they transition into reproductive life shortly after beginning menstruation. To confront this issue, a study was conducted to evaluate the prevalence of anaemia among adolescent girls from low-income families and to assess the effects of medicinal iron and millet supplementation on selected individuals with anaemia. The research took place in Moolapalayam, a rural area in the Erode district. A total of 30 adolescent girls were randomly selected; among them, 15 girls with haemoglobin levels below 12 g/dl were assigned to the experimental group, while the others formed the control group. The experimental group received a daily supplementation of 100 g of iron-fortified millets for 60 days, whereas the control group did not receive any supplements. Sixty percent of the selected participants were aged 15-16 years, 30 percent were aged 16-17 years, and only 10 percent were in the 17-18 year age bracket. Initially, the serum iron level in the iron-supplemented experimental group was recorded at 35.93 µg/dl. After 60 days of supplementation, this level raises to 39.66 µg/dl. Statistical analysis revealed a significant increase at the 1% level. The mean initial haemoglobin level of 7.69 g/dl in the experimental group increased to 10.12 g/dl post-supplementation, demonstrating a significant improvement at the 1% level.From the study, it was evident that, iron-fortified milletsare an excellent source of iron with low-cost potential for reducing iron deficiency anemia*

Keywords- Anaemia, Millets, Haemoglobin, Iron , Micronutrients and Fortification

I. METHODOLOGY

The investigator selected Moolapalayam, a rural area in Erode, to conduct the study. A total of thirty (30) anemic individuals within the adolescent age group were chosen and assigned into two groups; 15 in the control group and 15 in the experimental group. Data on family composition, income, dietary intake, nutritional knowledge, and nutritional status were gathered from all participants. Since dietary intake can fluctuate from day to day, employing the repeated 24-hour recall method for the same individual often yields more precise estimates of typical intake (Michaud, 2014). In this study, dietary patterns of the subjects were recorded over three days using the 24-hour recall method.

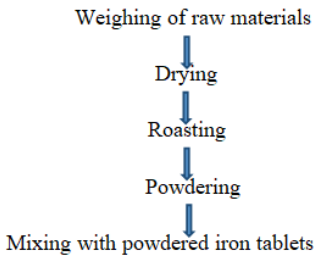
To gauge the subjects' awareness of nutrition, simple questions were posed. Information regarding their consumption of cereals, pulses, vegetables, green leafy vegetables, fruits, dairy products, and meat were collected to evaluate their nutritional status. This data enabled the investigator to assess, how nutritional knowledge influenced the dietary and activity patterns of the subjects. Anthropometric measurements were also taken from the participants. The weight of the samples was recorded using a precise weighing balance. Subjects were instructed to stand upright in the center of the scale, barefoot and without support, with measurements taken to the nearest 0.1 kg. A wooden scale was positioned gently on the subject's head, perpendicular to the wall, and height was measured with a tape to the nearest 0.1 cm. Body Mass Index (BMI) is utilized to express desirable body weight in adults by calculating the ratio of weight to height.

Clinical assessments are vital physical indicators that signify a severely compromised nutritional status and represent a crucial component of all nutritional surveys. Anemic individuals were selected based on biochemical analysis of their blood and serum, with their progress monitored through monthly analyses during supplementation. Blood samples were obtained using the finger prick method and intravenously from each subject, and these samples were analyzed for specific parameters. The serum iron levels of the selected participants were evaluated using Wong’s method.

Supplementation to Experimental group

Fresh and good quality Bajra, Ragi and Bengal gram dhal were procured from the local market. Among the iron containing supplementation compounds, ferrous sulphate has high absorption rate and are more effective, when compared with ferric and reduced iron. Hence ferrous sulphate tablets obtained from the medical store were powdered and used for mixing with millet powder.

Processing techniques:



100g of the final product was weighed and packed in polythene covers.

Each 100g packet of the mixture contains,

Bajra	- 40g
Sprouted ragi flour	- 10g
Bengal gram dhal flour	- 20g
Jaggery powder	- 30g
Ferrous sulphate powder	-15mg

Number of feeds: Per day 100g of the formulated food product was supplemented in the form of balls as 50g in the mid-morning and another 50g in the evening.

Duration: The supplementation schedule was continued for a period of 60days providing 100g of formulated food product per day for each subject.

Assessment of Effect of Supplementation

To assess the improvement in the blood haemoglobin and serum iron, blood samples were analyzed before supplementation initially, after 30days and after 60 days of supplementation for all subjects.

II. RESULTS AND DISCUSSION

The results of the study were consolidated ,analysed systematically and the results are presented and discussed in the following:

TABLE – I

Age of the Subjects

Age	Number	Percent
15-16	18	60
16-17	9	30
17-18	3	10

Table – I indicates that, among the selected subjects about 60 percent of them were in the age group of 15-16 years and 30 percent of them were in the age group of 16-17 years and 10 percent in 17 -18 years.

Among 30 adolescent subjects 30 percent attained their Menarche in the age group 12-13 years and 30 percent in the age of 14-15 years and the remaining 40 percent of them attained Menarche in the age of 13-14 years. The type of family of the selected adolescent subjects were found to be nuclear family in the case of 40percent and joint family in the case of 60 percent families. It was evident that the joint families were more than the nuclear families because they belong to rural areas. The joint family system, one of the traditional cultures of India, are existing in rural areas only.

TABLE – II

Educational Status of the Selected Subjects

Level of Education	Total Number	Percent
Primary Education	10	33.5
Graduate	5	16.5
Illiterate	15	50
Total	30	100

Frequency of consumption of Iron Containing foods:

Bajra, rice flakes and wheat (whole) are rich sources of iron but none of the adolescent girls (100 Percent) consumed bajra. Rice flakes was consumed bi-monthly by 40 percent of the adolescent girls and 10 percent never consumed it. Wheat was consumed occasionally by 14 percent of the adolescent subjects.

Pulses are good sources of protein. The food consumption are evident by surveys of Roa and Joshi (2019) and it showed considerable difference in dietary pattern in different regions of the country and also among different socio-economic groups of some regions. The high protein foods are consumed more in Punjab, Haryana, Madhaya Pradesh compared to South India.

Soyabean was never consumed by 80 percent of the adolescent girls which is a good source of protein. Roasted Bengal gram was consumed weekly once by 30 percent of the adolescent subjects. It was consumed daily by 40 percent of the adolescent subjects. Dry peas was consumed occasionally by 50 percent of the adolescent subjects.On the whole, pulses were consumed only occasionally by majority of the adolescent girls.

Lorismolin (2007) reported that, dark green leafy vegetables are rich in iron and vitamin –C, which are important for the prevention of aneamia in adolescent girls. In this study, most of the selected subjects were consuming amaranth weekly (14 percent) and 9 percent of the subjects were consuming occasionally. Cauliflower greens rich in iron were not consumed by the subjects. Manathakkali leaves were consumed occasionally by 40 percent of the adolescent subjects. Kuppameni was consumed weekly by only 14 percent of the subjects.

Methods of Cooking

Cereals were mainly cooked by pressure cooking method (90 percent).Pulses were cooked by boiling method (47 percent) and pressure cooking method(53 percent). Green leafy vegetables were cooked by boiling method(60 percent).Majority of them cook vegetables by boiling method. Nearly half of the members were cooking eggs by more than two methods. Fleshy foods were cooked by shallow fat fry and roasting method.

Table –III
Food Intake of the Selected Subjects

Food items	ICMR (g)	Subject's Intake	Deficit percent
Cereals	320	221.0	30.7
Pulses	50	29.12	41.7
Green leafy vegetables	150	32.01	78.66
Other vegetables	150	106.70	28.90
Fruits	100	59.8	40.2
Milk	400	260.20	35
Fats and Oils	30	30	-
Meat, Fish and egg	80	16.40	79.5
Sugar and Jaggery	30	27.50	8.4
Peanut	30	19.20	63

When the food intake of the selected subjects was compared with the ICMR value, the intake of cereals, pulses and green leafy vegetables were low except fats and oils. The intake of milk and sugar and jaggery were also low showing a deficit percent of 35 and 8.40 percent respectively.

Table –IV
Nutrient Intake of the Selected Subjects

Category	Energy (Kcal)	Protein (g)	Fat (g)	Iron (mg)	Vitamin –C (mg)
RDA*	2400.0	64.0	22.0	22.0	40.0
Adolescent girls	1069.0	28.0	22.1	6.47	17.7
Deficit percent	44.1	43	_	30	42

*ICMR Recommended Dietary Allowances for Indian Adolescent girls

Anthropometric Measurements

The comparison of mean height, weight and BMI of the Control group and Experimental group were predicted in the following table;

Table –V
Comparison of Anthropometric measurements between Control and Experimental group

Groups						t-value		
Experimental n = 15			Control n = 15			Height	Weight	BMI
Height(cm)	Weight (Kg)	BMI	Height(cm)	Weight(Kg)	BMI			
150 ± 7.75	42.2 ± 4.17	19.2 ± 1.76	149.9 ± 5.66	41.7 ± 4.74	19.6 ± 3.1	0.1026^{NS}	0.2653^{NS}	0.5324^{NS}

NS – Not Significant

Statistical analysis of the data revealed that there was no significant difference in the anthropometric parameters of the experimental group and control group.

Comparitive analysis of the blood parameters before and after Supplementation

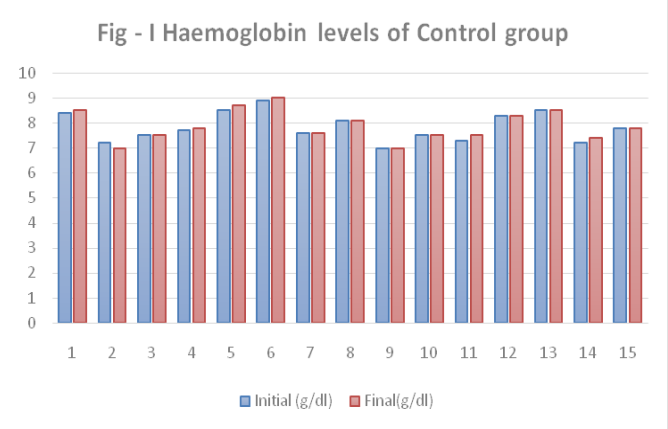
The biochemical analysis were compared with control and the supplemented subjects and predicted in the following table;

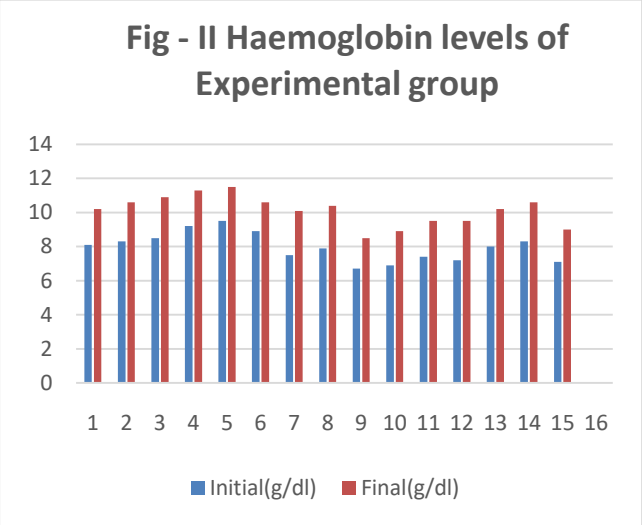
Table –VI
Mean Haemoglobin levels between Control and Experimental group

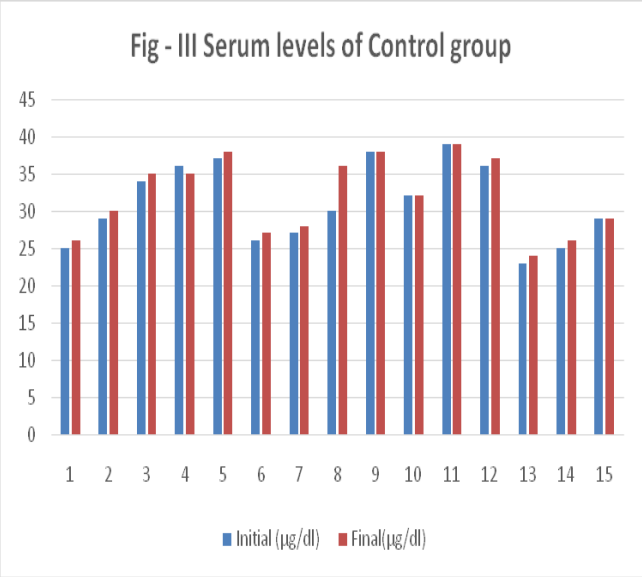
Groups	Initial Mean ±S.D (g/dl)	Final Mean ±S.D (g/dl)	Difference ±S.D (g/dl)	't – value'
Control n=15	7.83 ± 0.580	7.88 ± 0.610	0.05	1.011^{NS}
Experimental n=15	7.69 ± 0.840	10.12 ± 0.879	2.43	6.855**

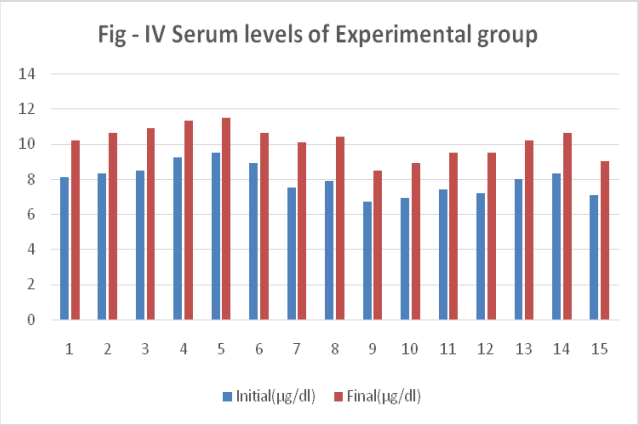
**** - Significant at 1% level**
NS – Not Significant

When the initial haemoglobin level of the control was compared with the final value , no significant difference was found. The initial haemoglobin level of the Experimental group was found to be 7.69 g/dl of blood. After supplementation for a period of 60days , the haemoglobin level increased to 10.12 g/dl of blood. Thus there is an improvement of about 2.43 g/dl of blood which was found to be statistically significant at 1% level.









III. SUMMARY AND CONCLUSION

The present study was conducted with the objective of studying the effect of supplementation of iron fortified millets to the selected anaemic adolescent girls. The study

revealed that, the initial serum level of the iron supplemented experimental group was found to be 35.93µg/dl. After supplementation for a period of 60days, the serum iron level was increased to 39.66µg/dl. The statistical analysis of the data showed significant increase at 1% level.The mean haemoglobin level of 7.69 g/dl in the experimental group was increased to 10.12 g/dl after the supplementation of iron fortified millets. The statistical analysis of the data showed significant increase at 1% level. From the results obtained, supplementation of iron fortified millets was found to be effective in the treatment of anaemia.

REFERENCES

[1] Adamson, S. (2000), "Oral iron supplementation to control anaemia in adolescent girls", American journal of Clinical nutrition, Vol.33, Pp.86-118

[2] Agarwal, A.(1999), "Impact of vitamin C supplementation on utilization of calories, proteins and iron anaemia of PEM", The Indian journal of Nutrition and Diabetes, Vpl.35(1), Pp.14-16

[3] Ballot, F and Livera, N. (2003), "Fortification of the diet as a strategy for preventing iron deficiency", Journal of Clinical Nutrition, Vol.361, Pp.114-224

[4] Beard, J.L.(2000), "Iron requirements in adolescent females", Journal of Nutrition, Vol.130, Pp.40-44

[5] Cobioc, L and Baghurst, K. J(2001), "Iron status and dietary intake of Australians", CSIRO Division of Human Nutrition, Vol.45(4), Pp.81-86

[6] Dollman, P.P and Looker. A.C. (1999), "Effect of Nicotonic acid on zinc and iron metabolism", American journal of Clinical Nutrition, Pp.126-129

[7] Devi, A.(2004), "Energy and blood forming nutrients in the Diets of urban and rural adolescent girls", The Indian journal of Nutrition and Dietetics, Vol.35(5), Pp.96-97

[8] Francis, V.F.(2003), "Use of common salt fortified with iron in prevention of anaemia", American journal of Clinical Nutrition ,Vol.35(5), Pp.1442-1451

[9] Garcia, T., Respicio, N and Keller, H.(2000), "Efficacy and acceptability of two iron supplementation schedules in adolescent school girls in Lima, journal of Nutrition, Vol.130(5), Pp.462-464

[10] Halder, K., Sinda, B.W and Nandhini, B.K.(1993), "Effect of Deworming and iron fortified common salt on haemoglobin , Vol.8,Pp.12-45

[11] Moe, N.(2000), "Iron deficiency and anaemia", Food and Nutrition Bulletin, Vol.17(7), Pp.3-6

[12] Nurdiati, D.S.(1999), "Chronic energy deficiency and Obesity in Indonesian women", Food and Nutrition Bulletin, Vol.15(5), Pp.6

[13] Okoye, V.(2002), "Adolescent and aneamia", Journal of Nutrition Vol.87(2), Pp.161 – 171

[14] Pushpama, P., Geerani, P and Usharani (2004), "Food intake and nutritional adequacy of rural population", Human Nutrition, Vol.5(2), Pp.126

[15] Rajesh, O.(2004), "Interdependence of Vitamin A and iron", Food and Nutrition Bulletin, Vol.35(5), Pp.96-97

[16] Shendurnikar, N.(1997), "Iron deficiency anaemia", journal of practical pediatrics, Vol.5(4), Pp.317- 319

[17] Sarwate, N and Sharma, K.(1994), "Impact of supplementing Indigenous sweet Ladoo on Haemoglobin level of Anaemia children", the Indian journal of Nutrition and Dietetics, Vol.31(9), Pp.262 – 264

[18] Swami, H.M.(1999), "Role of Millets in prevention of anaemia", Indian journal of Maternal and Child Health, Vol.19, Pp.62-64

[19] Tait, F.(2004), "Millet requirements and prevalence of Iron deficiency in Adolescents", Swedish society of Medicine, Vol.23, Pp.120-125

[20] Tomkins (1999), "Iron fortified cereal grain product:, Food Digest, Vol.16, Pp – 335-337

[21] UNICEF/ WHO (2000), "Preventing Iron deficiency in women and children", Technical consensus on issues, International foundation, Boston, Pp.160

[22] Yip (1999), "Improvement in anaemic persons by supplementation of Milllets", Food Digest, Vol.16, Pp.335 – 337

[23] Zamora (2004), "Dietary habits of adolescent girls", The journal of Human Nutrition and Dietetics, Vol.1, Pp.463