

Improvement of haemoglobin level through supplementation of raagi *Laddu*, drumstick leaf powder and iron tablets among adolescent girls

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ABSTRACT : The study was conducted on adolescent girls who had anemic clinical signs and supplemented raagi *Laddu*, drumstick leaf powder and iron tablets for four months for improvement of hemoglobin under on farm testing for three years and one year front line demonstration at Krishi Vigyan Kendra, Rudrur, Nizamabad district Telangana state. The results revealed that there was no improvement in hemoglobin level for treatment normal diet only, for second treatment the hemoglobin level of the adolescent girls was below normal hemoglobin level but on an average 0.36 mg/dl increased hemoglobin levels was observed after four months intervention. Other symptoms are proscribed and slight upgrading in weights of adolescent girls 3 (17%) were in normal weight and 15 (83%) in under weight. Adolescent girls had improved their mean hemoglobin level from 8.9 mg/dl to 9.5 mg/dl but their hemoglobin level was lower than the normal hemoglobin level. Though their BMI showed they were in underweight but the average BMI increased from 16 to 16.7 after four months.

KEY WORDS : Adolescent girls, Haemoglobin, Raagi *Laddu*, Drumstick leaf powder, Iron tablets, BMI

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INTRODUCTION

Anemia is a burning problem in India at present. Adolescents, pregnant, lactating mothers, young children and elderly are the most vulnerable population who are suffering from iron deficiency medically known as IDA (NFHS 2005-06). The recommended dietary allowances (RDA) of Indian people show that the iron requirement for children is 10 mg/day, adolescent is 15-18 mg/day, adult male is 20 mg/day and adult female is 28 mg/day,

but it increases to 38 mg/day in pregnancy and 30 mg/day in lactation (Gopalan *et al.*, 2007). Adolescence has been defined by the World Health Organization as the period of life spanning the ages between 10 to 19 yrs. Adolescents especially girls are particularly vulnerable to iron deficiency. Adolescence is a time of intense physical, psychosocial and cognitive development. Increased nutritional needs at this juncture relate to the fact that adolescents gain upto 50 per cent of their adult

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weight, more than 20 per cent of their adult height and 50 per cent of their adult skeletal mass during this period. The iron needs are high in adolescent girls because of the increased requirements for expansion of blood volume associated with the adolescent growth spurt and the onset of menstruation. Raagi is an excellent source of natural iron patients of anemia and low hemoglobin levels can begin to include raagi in their diets as a domestic remedy. Vitamin C is known to aid the absorption of iron. Once raagi is allowed to sprout, the vitamin C levels increase and lead to further absorption of iron into the blood stream. Drumstick leaf help in regulating blood flow to the abdomen and reduces pain during menstruation and relieves you from menstrual cramps. In this context, present study has been taken and iron enriched Raagi *Laddu*, drumstick leaf powder developed and supplemented along with Iron tablets with the objective to improve hemoglobin level among adolescent girls.

METHODOLOGY

The study was conducted on adolescent girls residing in Rudrur. On farm testing was conducted during the year 2013 to 2015, a total of 61 adolescent girls were selected for the test. Among 61 girls who are having clinical signs of anemia with underweight were selected for treatments are given below.

Development of treatments :

During the year 2013-14 at the time of state level technical programme meeting with the consultation of experts of College of Home Science formulated three treatments for on farm testing namely T_1 - Normal diet only, T_2 - Normal diet + Iron tablets and T_3 - Normal diet + supplementation of raagi *Laddu*, drumstick leaf powder and iron tablets.

Identification of anemic adolescent girls for testing:

Adolescent girls were selected based on their clinical



Fig. A : Observed clinical signs among adolescent girls

signs of anemia viz., pale conjunctiva, pale tongue, pale nails and flatterng of nails and body mass index (BMI). Height and weight were taken and calculated BMI. For first treatment 19 adolescent girls, 18 for second treatment and 24 adolescent girls for third treatment were selected based on their clinical sign of iron deficiency, Hb level and BMI.

Calculation of BMI:

Calculate body mass index (BMI) as under:

$$BMI = \frac{\text{Weight in kg}}{\text{Square of height (in mt)}}$$

BMI 18.5 to 24 is normal,

>24 are overweight,

<18.5 are underweight

The adolescent girls de-wormed 10 days before supplementation to avoid warm infestation.

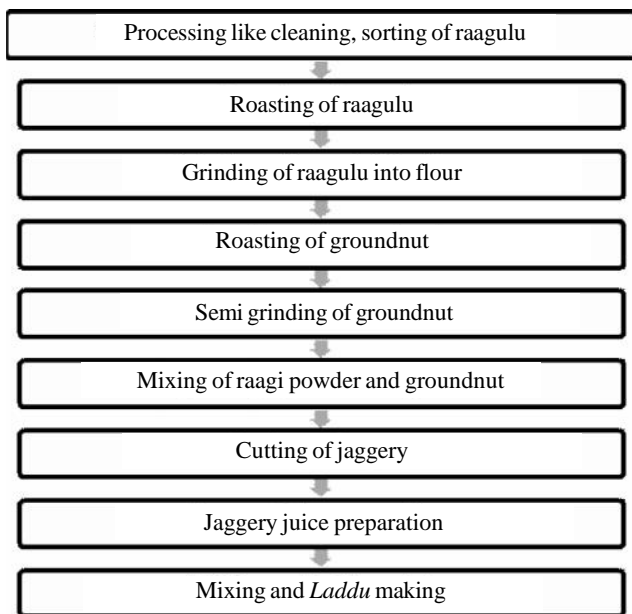


Fig. B : Preparation of raagi Laddu

Procurement of material:

For preparation of raagi *Laddu* raw material like raagulu, jaggary and ground nut were purchased from the supermarket of the Bodhan to avoid adulteration of the material. Drumstick leaves are procured from the premises of Krishi Vigyan Kendra, Rudrur and iron tablets procured from the health center, Bodhan. Required quantity of material for raagi *Laddu*, drumstick leaf powder and their nutritive values are given in the below Table A.



Fig. C : Raw material for raagi Laddu



Fig. D : Raagi Laddu

Table A: Quantity of products and their nutritive values			
Ingredients required to prepare 1 kg raagi <i>Laddu</i>	The calories present in 33 g <i>Laddu</i>	The calories present in 2 g of dried drumstick leaf powder	In each iron tablet
Roasted raagi - 500 g	Calcium – 57.4mg	Calcium – 400.06mg	Iron – 100 mg + folic acid
Roasted groundnuts- 125 g	Calories – 23.46	Calorie – 4.1	– 500 mg
Jaggery-375 =30 <i>Laddus</i> of each	Protein - 1.05g	Protein – 0.542g	
33 g	Iron – 1.425 mg	Iron – 0.564 mg	
	Betacarotene - 7.01µg	Betacarotene – 0.378 µg	
	Total folic acid – 3.05mg	Vitamin C – 0.346 mg	
	Fat – 1.67 g	Fat – 0.046g	

Preparation of drumstick leaves powder:

Cleaned the drumstick leaf and dried on clean cloth in the shadow place till it sounds like gala gala. Powdered the leaf after drying and kept in a clean glass bottle.

After preparation of products supplemented daily one raagi *Laddu*, 2 g of drumstick leaf powder and one iron tablet once in a week four months. After four months collected weights and heights of adolescent girls,



Fig. E : Cleaned and dried drumstick leaves



Fig. F : Drumstick leaves powder

observed clinical signs and recorded changes.

OBSERVATION AND ASSESSMENT

In order to work out efficacy to these treatments, clinical signs, BMI and Hb level were recorded before and after treatment. Difference in terms of improvement in anthropometric measurement and hemoglobin was indicative of anemic condition of the respondents under observation.

Data of clinical assessment of adolescent girls before and after intervention given in Table 1 showed that out of 19 adolescent girls, 5 (26%) adolescent girls did not show any clinical sign of iron deficiency of anemia, 6 (32%) displayed clinical sign like pale conjunctiva 1 (5%) and pale tongue 5 (26%). Conducted hemoglobin level testing to the remaining adolescent girls 8 (42%) had mean hemoglobin level lower than the normal hemoglobin level. The mean hemoglobin level of the adolescent girls was 11.4 mg/dl.

With regard to body mass index of adolescent girls, majority of adolescent girls 9 (47%) were under weight and meager percentage 2 (11%) of adolescent girls were in normal weight. The other problems *viz.*, easy tiredness, dizziness, menses irregularity, stomach pain, back pain and leg pains were noted from almost all the adolescent girls.

The girls in the control group were not provided any dietary supplementation and more so were left to their own choice for dietary consumption during the entire span of experiment.

After four months of intervention there were no significant changes observed among adolescent girls

Sr. No.	Observations	Before treatments	After treatments
1.	No clinical sign	5 (26%)	6 (32%)
2.	Clinical sign	6 (32%)	5 (26%)
	Pale conjunctiva	1 (5%)	1 (5%)
	Pale tongue	5 (26%)	5 (26%)
	Flattening of nails	-	-
3.	Hemoglobin level		
	Normal (12 g/dl)	-	1 (5%)
	>12 mg/dl	8 (42%)	7 (37%)
4.	Body mass index		
	Under weight (>18.5)	17 (89%)	17 (89%)
	Normal weight (18.5 to 24)	2 (11%)	2 (11%)
5.	Other problems	10 (53%)	10 (53%)

through normal diet only as they were consumed less than the recommended dietary allowances for improvement of hemoglobin level to control iron deficiency.

It is evident from the results that no improvement in hemoglobin level with normal diet only. The possible reason might be overall food and nutrients intake was found inadequate in all the respondents.

The results are similar with the findings of Yadav and Dunkwal (2013).

It was observed that out of 18 adolescent girls, 2 (11%) adolescent girls had no clinical sign of iron deficiency anemia, 16 (89%) adolescent girls showed clinical sign *viz.*, pale conjunctiva 8 (44%), pale tongue 7 (39%) and flattening of nails 1(5%). Conducted hemoglobin test for 6 (33%) adolescent girls for

identification of iron deficiency, the mean of hemoglobin level of adolescent girls was 10.7 mg/dl before intervention and it was lower than normal hemoglobin level.

Majority of the adolescent girls 15 (83%) explained other symptoms like dizziness, menses irregularity, stomach pain, back pain and leg pains during menstruation and hormonal problems. Most of the adolescent girls 16 (89%) were under weight and a meager in normal weight (Table 2).

Supplied weekly one iron tablet contains 100 mg iron and 500 mg folic acid for four months to the adolescent girls, the result observed after four months revealed that majority of the adolescent girls 12 (67%) were not exhibited any clinical sign of iron deficiency anemia as the pale conjunctiva changed to red conjunctiva,

Table 2: Distribution of adolescent girls according to their clinical sign and body mass index for treatment normal diet + iron tablets (n=18)

Sr. No.	Observations	Before treatments	After treatments
1.	No clinical sign	2 (11%)	12 (67%)
2.	Clinical sign	16 (89%)	-
	Pale conjunctiva	8 (44%)	-
	Pale tongue	7 (39%)	-
	Flattening of nails	1 (5%)	-
3.	Hemoglobin level		
	Normal (12 g/dl)	-	-
	>12 mg/dl	6 (33%)	6 (33%)
4.	Body mass index		
	Under weight (>18.5)	16 (89%)	15 (83%)
	Normal weight (18.5 to 24)	2 (11%)	3 (17%)
5.	Other problems	15 (83%)	-

Table 3 : Distribution of adolescent girls according to their clinical sign and body mass index for treatment normal diet + supplementation of raagi *Laddu*, drumstick leaf powder and iron tablets (n=24)

Sr. No.	Observations	Before treatments	After treatments
1.	No clinical sign	-	16 (67%)
2.	Clinical sign	24 (100%)	-
	Pale conjunctiva	12 (50%)	-
	Pale tongue	11 (46%)	-
	Flattening of nails	1 (4%)	-
3.	Hemoglobin level		
	Normal (12 g/dl)	-	-
	>12 mg/dl	8 (33%)	8 (33%)
4.	Body mass index		
	Under weight (>18.5)	24 (100%)	24 (100%)
	Normal weight (18.5 to 24)	-	-
5.	Other problems	15 (63%)	-

pale tongue to pink colour tongue and distorted flattening of nails. Though the hemoglobin level of the adolescent girls was below normal hemoglobin level but on an average 0.36 mg/dl increased hemoglobin levels was observed after four months intervention. Other symptoms are proscribed and slight upgrading in weights of adolescent girls 3 (17%) were in normal weight and 15 (83%) in under weight.

It can be concluded from the above findings that, the adolescent girls improved their hemoglobin level with iron tablets along with normal diet.

It is obvious from Table 3 that cent per cent of the adolescent girls 24 (100%) presented clinical sign of iron deficiency anemia like pale conjunctiva 12 (50%), pale tongue 11 (46%) and flattening of nails 1 (4%). Out of 24 subjects, 15 (63%) were elucidated dizziness, menses irregularity, legs and back pain during menstruation and hormonal problems as other problems due to lack of hemoglobin.

Hundred percentage 24 (100%) of the adolescent girls were under weight, 8 (33%) subjects were having low hemoglobin level and mean hemoglobin level was 8.9 mg/dl which is lower than normal hemoglobin level.

Supplemented daily one raagi *Laddu* with weight of 33 g and which contains 57.4mg calcium, 23.46 calories, 1.05g protein, 1.425 mg iron 7.01µg betacarotene, 3.05mg total folic acid and 1.67 g fat and daily 2g drumstick leaf powder contains calcium – 400.06mg, calorie – 4.1, protein – 0.542g, iron – 0.564 mg, betacarotene – 0.378µg, vitamin C – 0.346mg, fat – 0.046g and weekly one iron tablet contains 100 mg iron and 500 mg folic acid for four months regularly to the selected adolescent girls for improvement hemoglobin.

The results clearly revealed that out of 24, 16 adolescent girls flaunted that pale conjunctiva to red conjunctiva and pale tongue to pink colour tongue. Other problems like dizziness, menses irregularity, legs and back pain during menstruation were diminished after consumption of raagi *Laddu* and drumstick leaf powder. This was due to through drumstick leaf powder, raagi *Laddu* and iron tablets they got daily calcium – 457.46mg, calorie – 27.56, protein – 1.592g, iron – 16.289 mg, betacarotene – 7.388µg, folic acid- 503.05mg, fat – 1.716 g for improvement of hemoglobin level.

The remaining 8 adolescent girls had improved their mean hemoglobin level from 8.9 mg/dl to 9.5 mg/dl but their hemoglobin level was lower than the normal hemoglobin level. It is observed that 5 per cent hemoglobin level was increased among adolescent girls. Though their BMI showed they were in underweight but the average BMI increased from 16 to 16.7 after four months.

The present investigation revealed that the hemoglobin level of subjects improved significantly with supplementation of raagi *Laddu*, drumstick leaf powder and iron tablets with in four months through observation of clinical sign of iron deficiency anemia and hemoglobin level. Hence, food based approach needs to be applied for eradicating nutritional deficiencies as it has a better rapport with the general masses (Lande, 2013).

Conclusion :

The present study concluded that for the improvement of hemoglobin level among adolescent girls was observed by framing three treatments. It could be concluded that there was no improvement in hemoglobin level with only normal diet, an average 0.36 mg/dl increased hemoglobin level was recorded with normal diet and iron tablets after four months. There was significant change in clinical signs of anemia, BMI, hemoglobin level and other problems like dizziness, menses irregularity, legs and back pain during menstruation were diminished observed after supplementation of raagi *Laddu*, drumstick leaf powder and iron tablet. Hence, for eradication of anemic problem among vulnerable groups food based approach was important.

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