

Impact of iron rich toffees supplementation on anemic adolescent girls

T. N. Khan, A. A. Kamble and J. P. Nerlekar

A total number of 250 adolescent girls, in the age group of 13-18 years from school were selected and screened haemoglobin content. Based on result of haemoglobin content, 40 adolescent girls suffering from moderate type of anaemia were selected for the supplementation of iron rich toffees. These adolescents girls were divided into two groups experimental group (20) receiving the supplementation and control group (20) not receiving the supplementation. The Iron rich toffees (20g/day) were supplemented for 60 days to the selected anaemic adolescent girls. The anthropometric measurement, blood haemoglobin levels were measured in both the groups initial and after (30 and 60 days) of study period. Supplementation of 20 g/day iron rich toffees for 60 days exerted positive effect on haemoglobin level of experimental group.

Key Words : Supplementation of iron rich toffees, Anthropometric measurement, Haemoglobin content

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INTRODUCTION

Iron deficiency anaemia is a serious and widespread public health concern in both developing and developed countries. Globally, iron deficiency anaemia affects 4 to 5 billion people. (WHO, 2004). In India it is a major public health problem, especially women and adolescent girls are at high risk of micronutrient malnutrition ie iron deficiency anemia and vitamin A deficiency (Nambiar *et al.*, 2010). Adolescent girls, constituting nearly one tenth of Indian population, form a crucial segment of the society.

This period is characterized by an exceptionally rapid rate of growth.

Due to enhanced growth during adolescence, the requirement of some mineral is of paramount important. The overall prevalence of anaemia among 12-14 adolescent girls is 69 per cent and for older adolescent girls (15-17 yrs) it is around 70 per cent (NNMB, 2003).

To overcome iron deficiency anaemia a concentrated source of iron has to be supplemented in large amounts dietary diversification and the modification of diets to increase the iron content or improve iron bioavailability is the feasible and sustainable strategy at household level. India is blessed with an array of plant foods rich in micronutrients. Greens can be utilized in multiple ways by incorporating into existing products and formulation of health foods using techniques of dehydration. Rajkeera leaves (Botanical name) is one of the locally available plant foods and is natural source

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of antioxidants can help scavenge free radicals and oxidants and protect the body against diseases (Ferri, 1994). In the present study dried rajkeera leaves are utilized to prepare iron rich toffee which if consumed regularly have important contribution in meeting iron requirements

METHODOLOGY

Two hundred and fifty adolescent girls belonging to the age group of 13-18 years were randomly selected. The anthropometric measurement and haemoglobin content were studied of all the selected adolescent girls. The anthropometric measurements of the selected subjects recorded were weight (kg), height (cm) and skinfold thickness (mm) by following the standard procedures described by Jelliff (1966) and body mass index was calculated by using the standard formula and blood haemoglobin levels were assessed using cyanmethyloglobin method.

Based on result of haemoglobin content only 132 girls had normal haemoglobin level and remaining 118 girls were anaemic. Among them 43 were moderately anaemic (7-10 g/dl) and 75 were mildly anaemic (10-12 g/dl). None of the girl was severely anaemic (<7.0 g/dl). The forty moderately anemic (7-10g/dl). Subjects were selected and they were divided into two groups of 20 each constituting the experimental (Group A) and control (Group B) groups. All the 40 moderately anemic adolescents were given a single dose of deworming tablets before starting the experiment. The experimental group (Group A) were supplemented with 20 g /day of rajkeera leaves toffee for a period of 60 days which provided the 6.36 mg of iron per day. The anthropometric

measurement and haemoglobin level measured in both the groups at initial, 30 and 60 days of experimental period. The collected data was evaluated by appropriate statistical methods (Panse and Sukhatme, 1985).

OBSERVATIONS AND ASSESSMENT

The mean values of anthropometric measurements of 250 adolescent girls are presented in Table 1. The mean value of body weight of the adolescent girls was 40.30 kg and it was ranged from 25-60 kg. The height of the adolescent girls ranged from 138-162 cm with an average value of 150.2 cm. it was clear from the result that the BMI ranged from 11.41- 28.06 with the mean value 18.43. It was found that out 38 per cent were having normal BMI, whereas 61.2 per cent having BMI less than 18.5, only 0.8 per cent (2) subjects were found to be in the category of obese. Verma *et al.* (2004) revealed that those having BMI of 18.5 or lower (82.4%) were having high percentage of anaemia.

Prashant and Shaw (2009) study results are in conformity. It was found that large proportion (54% to 58%) of adolescents were malnourished.

The data regarding the haemoglobin content of 250 adolescent girls is presented in Table 2. It was found that majority of the girls 52.8 per cent are having normal haemoglobin content. Among the screened adolescent girls 30 and 17.2 per cent were suffering from mild and moderate type of anaemia, respectively. However, none of the adolescent girl was found to be severely anaemic.

Joseph *et al.* (1997) showed the prevalence of severe (0.6 %), moderate (20.8 %) and mild (38.4%) anaemia

The mean anthropometric measurement of selected adolescent girls (n=40) was given in Table 3. It was clear

	Weight (kg)	Height (cm)	BMI	Haemoglobin (g/dl)
Range	25-60	138-162	11.41-28.06	7.73-15.09
Mean	40.30	150.2	18.43	11.81
S.D.	5.60	6.06	9.21	1.37

Sr. No.	Classification	Number	Percentage
1.	Normal (12 and above)	132	52.8
2.	Mild (10-12)	75	30
3.	Moderate (7-10)	43	17.2
4.	Severe (<7)	-	-

from the result that the mean value of weight of selected adolescent girls in experimental group was 41.4 and it was ranged from 35-53 kg while in control group the mean value of weight is 40.4 ranged from 27-51 kg. The height of the experimental group was ranged from 142-162 with mean value 153.9 and in control group it was ranged from 138-160 with mean value 149.1. The BMI of both groups was ranged from 15.8-20.6 and 14.21-26.02 in experimental and control group, respectively with the mean value 17.41 and 18.17.

The data regarding the mean haemoglobin content of selected adolescent girls is presented in Table 4. Among the 250 adolescent girls 43 girls were suffering from moderate type of anaemia. Out of them 40 girls were selected and divided into two groups control group (20) and experimental group (20). It was clear from the result that, the haemoglobin level of adolescent girls in the experimental group was ranged from 7.73-9.94 with the mean value 8.96. On the other hand in control group the haemoglobin level ranged from 8.83 to 9.94 with the mean value 9.08.

The changes in the mean values of anthropometric measurements of experimental and control group before and after supplementation of iron rich toffee are presented in Table 5. The mean increase in body weight due to supplementation of iron rich toffee in case of experimental group was 0.9 kg. However, the mean increase in body weight was statistically non-significant. The average height and tricep skinfold thickness of experimental group and control group were 153.9 and 149.1 cm, 2.33 and 2.05 mm, respectively. The difference in height and tricep skinfold thickness was not seen throughout the study period. The mean increase in the body mass index of

experimental group and control group was found to be 0.48 and 0.01, respectively which are non significant statistically. On the whole result indicated that supplementation of iron rich toffee for 60 days showed non significant impact on anthropometric measurements.

The mean values for haemoglobin content of the adolescent girls of experimental and control group selected for study are given in Table 6. The initial values for haemoglobin content ranged from 7.73 - 10.30 and 9.2 to 10.67 g/dl with mean values of 9.64 ± 0.72 and 10.47 ± 0.35 for experimental and control group, respectively. It was noticed that as the period of feeding increased the values of mean haemoglobin content were significantly increased in experimental group. Hence, it can be said that the developed toffees showed positive effect in improving haemoglobin level.

A study conducted by Yang (1979) reported that consumption of indigenous green leafy vegetables has its effect on increasing dietary intakes of iron and provitamins as well as other minerals and vitamins.

Green leafy vegetables are the most suitable food stuffs for enriching dietary iron of the Indians (Karva *et al.*, 2010).

Gopalan (1996) have shown the incorporation of fresh and dried amaranthus leaves in various recipes which can improve the nutritional quality of those products if consumed regularly can have an important contribution in meeting iron and vitamin A requirements.

According to Shende (2006) rajgira leaves can be considered as a good and cheapest source of iron and calcium. Therefore, it can be recommended for consumption in the diet of community to reduce the prevalence of anaemia.

Table 3 : Mean anthropometric measurements of the adolescent girls selected for study

	Experimental group (20)			Control group (20)		
	Weight (kg)	Height (cm)	BMI	Weight (kg)	Height (cm)	BMI
Range	35-53	142-162	15.8 - 20.6	27 -51	138 -160	14.21 – 26.02
Mean	41.4	153.9	17.41	40.4	149.1	18.17
SD	4.33	5.77	1.8	6.28	7.03	2.8

Table 4 : Mean haemoglobin content of selected adolescent girls

	Experimental group (20)	Control group (20)
Range	7.73-9.94	8.83-9.94
Mean	8.96	9.08
SD	0.72	0.68

Table 5: Anthropometric measurements of experimental and control group before and after supplementation (n=40)

Parameters	Experimental group					
	Initial		30 days		60 days	
	Range	Mean \pm SD	Range	Mean \pm SD	Range	Mean \pm SD
Weight	35-53	41.35 \pm 4.33	35-53	41.85 \pm 4.46	36 - 53.5	42.25 \pm 4.23
Height	142-162	153.91 \pm 5.77	142-162	153.91 \pm 5.77	142-162	153.91 \pm 5.77
Tricep skinfold	2.0-2.5	2.23 \pm 0.21	2.0-2.5	2.2 \pm 0.2	2.0-2.5	2.23 \pm 0.21
B.M.I.	14.28-20.62	17.41 \pm 1.8	14.28-20.62	17.71 \pm 0.82	14.48-20.72	17.89 \pm 1.77
F values of anthropometric measurements		NS= Non-significant				
Parameters		F value		C.D.		
Height (cm)		0.00 NS		0.00		
Weight (kg)		0.21 NS		2.68		
BMI		0.36 NS		1.11		
Tricep skin fold (mm)		0.00NS		0.00		

Parameters	Control group					
	Initial		30 days		60 days	
	Range	Mean \pm SD	Range	Mean \pm SD	Range	Mean \pm SD
Weight	27-51	40.4 \pm 6.28	27-50	40.00 \pm 6.12	28-50	40.8 \pm 5.85
Height	138-160	149.10 \pm 7.03	138-160	149.10 \pm 7.03	138-160	149.10 \pm 7.03
Tricep skinfold	1.6-2.8	2.05 \pm 0.35	1.6- 2.8	2.05 \pm 0.35	1.6- 2.8	2.05 \pm 0.35
B.M.I.	14.21-26.02	18.17 \pm 2.8	14.21-25.51	18.11 \pm 2.69	14.73-25.51	18.18 \pm 2.58
F values of anthropometric measurements		NS= Non-significant				
Parameters		F value		C.D.		
Height (cm)		0.00 NS		0.00		
Weight (kg)		0.02 NS		3.7		
BMI		0.36NS		1.61		
Tricep skin fold (mm)		0.00NS		0.00		

Table 6: Mean haemoglobin content (g/dl) of the selected adolescent girls for study

	Experimental group (20)			Control group (20)		
	Initial	30 days	60 days	Initial	30 days	60 days
Range	7.73 – 9.94	8.46 – 11.41	8.83 – 11.78	9.2 – 10.67	8.83 – 11.08	9.2 – 11.04
Mean	8.96	9.56	9.97	10.47	10.29	10.62
SD	0.72	0.68	0.6	0.35	0.67	0.50
'F' Value	12.46**	S.E. \pm	0.094	C.D.	0.26	

Conclusion:

It is concluded from this study that rajgira leaves which is normally wasted can be used as a valuable source of micronutrients. The results of the study shows that by supplementation of iron rich toffee anaemia can be prevented and blood haemoglobin levels can be successfully elevated in adolescent girls. Thus, it can be supplemented daily, as the presence of multiple nutrients in toffee and haemopoietic factors like iron and vitamin C of toffee will be useful to improve the blood haemoglobin level and ultimately promote the better health.

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