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Efficacy of iron rich *Bajra* chiwada on haemoglobin content of adolescent girls

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Food based approaches have higher potential for achieving far reaching and long lasting benefits for the control of iron and other micronutrient deficiencies. Keeping in view the present study was planned with the main objective to explore effectiveness of iron rich product popped *Bajra* chiwada (Pearl Millet) supplementation prepared by utilizing pearl pop, rajgira leaves, roasted bengal gram dhal, turmeric, mango powder, curry leaves and cumin on haemoglobin content of adolescent girls. 60 moderately anaemic adolescent girls were selected. They were divided into two group *i.e.* experimental group (30) and control group (30). The highly accepted iron rich popped *Bajra* chiwada was supplemented 50 g/day to the experimental group for 60 days. The parameters such as anthropometric measurements and haemoglobin content were studied at 0, 30 and 60 days. The investigation of study revealed that supplementation of 50 g. popped *Bajra* chiwada daily for the adolescent girls helped in improving the haemoglobin of the subjects.

Key Words : Haemoglobin content, Adolescent girls

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INTRODUCTION

Iron deficiency is the most prevalent nutritional problems in the world, approximately 1.3 billion individuals in the world suffer from anaemia, making it one of the most important public health issues on the nutritional agenda (Berger *et al.,* 1997). In India it is a major health problem, especially women and adolescent girls are at high risk of micronutrient malnutrition *i.e.* iron deficiency anemia and vitamin A deficiency (Nambiar *et al.,* 2010).

Prevalence of anaemia among adolescent girls is high from 10 years 18 years of age. The prevalence was reported to range from 65 to 75 per cent in under privileged adolescent girls of India. The figures for rural girls being 60 to 70 per cent (Hanji, 2013).

Thus there is a need to identify nutrient rich foods that can be produced in expensively to meet the nutrient requirements for vulnerable groups. Benefits of such food-based strategies include not only improved intakes of specific nutrients but also improved overall diets and health status. Hence a research was undertaken to assess the efficacy of iron rich chiwada on the heamoglobin content of selected anaemic adolescent girls.

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METHODOLOGY

Iron rich product popped *Bajra* chiwada was prepared by utilizing popped *Bajra*, rajgira leaves , roasted bengal gram dhal, turmeric, mango powder, curry leaves and cumin seed. A total number of 200 adolescent girls were selected randomly from high school. They were screened for anthropometric measurements and haemoglobin content. The anthropometric measurements of the selected subjects recorded were weight (kg), height (cm) and skinfold thickness (mm) by following the standard procedures described by Jelliffe (1966) and body mass index was calculated by using the standard formula and blood haemoglobin content was assessed using cyan methyl globin method. Based on the results of haemoglobin content 60 adolescent girls suffering from moderate anaemia (7-10 g/dl) were selected for the study. They were divided into two group *i.e.* experimental group (30) and control group (30). The iron rich product popped *Bajra* chiwada was supplemented in an amount of 50 g/ day to the experimental group for 60 days. The parameters such as anthropometric measurements and haemoglobin content were studied at 0, 30 and 60 days. The collected data was evaluated by appropriate statistical methods (Panse and Sukhatme, 1985).

OBSERVATIONS AND ASSESSMENT

The mean values of anthropometric measurements of 200 adolescent girls are presented in Table 1. The mean value of body weight of adolescent girl was 40.81 kg and it was ranged from 25-68 kg. The height of the adolescent girls ranged from 129-167 cm with an average value of 149.54 cm. It was cleared from the result that BMI ranged from 13-29.5 with the mean value 18.54. Verma *et al.* (2004) revealed that those having BMI 18.5 or lower were having high percentage of anaemia.

The Table 2 shows the data on classification of anaemia based on the haemoglobin content of adolescent girls. The surveyed girls were categorized as normal, mild, moderate and severe anaemic on the basis of haemoglobin content. Majority (40 %) of the adolescent girls were found mild anaemic whereas 35.5 per cent girls were moderate anaemic 22 per cent girls were in the normal range on the other hand the 2.5 per cent severely anaemic girls.

The values for mean anthropometric measurement of selected adolescent girls is given in Table 3. The result showed that the mean values of weight of the selected adolescent girls for the study ranged from 31-57 for experimental group and 33-64 for control group. The mean values of weight were 43.33 for the experimental and control group. The mean values of height were 150.77 for experimental group and 151.27 for control group and it was ranged from 135-167 and 133-161 for experimental and control group, respectively. The BMI of experimental and control group was 19.10 and 18.65 with the range of

Table 1 : The mean anthropometric measurement and haemoglobin content of adolescent girls (n=200)

	Weight (kg)	Height (cm)	BMI	Haemoglobin (g/dl)
Range	25-68	129-167	13- 29.5	7.09 -14.9
Mean	40.81	149.54	18.54	10.62
S.D.	6.65	6.67	2.62	1.76

Table 2 : Classification of anaemia based on the haemoglobin content of adolescent girls (n=200)

Sr. No.	Classification	Number	Percentage
1.	Normal (12 and above)	44	22
2.	Mild (10-12)	80	40
3.	Moderate (7-10)	71	35.5
4.	Severe (<7)	5	2.5

Table 3 : Mean anthropometric measurement of selected adolescent girls

Parameter	Experimental group (30)			Control group (30)		
	Range	Mean	S.D.	Range	Mean	S.D.
Weight (kg)	31-57	42.33	6.09	33-64	42.33	6.79
Height (cm)	135-167	150.77	6.90	133-161	151.27	6.36
BMI	14- 25.9	19.10	2.77	15-25.6	18.65	2.60

14-25.9 and 15-25.6 for both the groups, respectively.

The mean values of haemoglobin content of selected adolescent girls for the study are given in Table 4. The haemoglobin content of experimental group selected for the study was 8.58 mg/dl and that of control group was 10.31 mg /dl. The values are ranged between 7.3-9.8 and 8.8 -11.3 for experimental and control group, respectively.

The changes in the mean values of anthropometric measurements of experimental and control group before and after supplementation of popped *Bajra* chiwada are presented in Table 5. The mean increase in body weight due to supplementation of popped *Bajra* chiwada in case of experimental group was 0.14 kg. However the mean increase in body weight was statistically significant. The average height and tricep skinfold thickness of experimental group and control group were 150.77 and 151.27cm, 14.34 and 19.80, 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 0.29 and 0.01, respectively which are significant statistically. On the whole result indicated that supplementation of popped *Bajra* chiwada for 60 days showed non-significant impact on anthropometric measurements.

The changes in mean values of haemoglobin content of the experimental and control group before and after supplementation is presented in Table 6. The subjects were found to have the initial value of haemogobin content of experimental and control group in the range of 7.3-9.8 and 8.8-11.3 g/dl, respectively. Initially mean recorded value for haemoglobin for the experimental group was 8.59 g/dl while in control group the mean value for haemoglobin was 10.31g/dl. After 30 days of supplementation of popped *Bajra* chiwada the value of haemoglobin was found to increase by 1.11g/dl in experimental group, while in control group after 30 days

Table 4 : Mean haemoglobin content of selected adolescent girls

	Experimental group (30)	Control group (30)
Range	7.3- 9.8	8.8 -11.3
Mean	8.58	10.31
S.D.	0.67	0.57

Table 5 : Anthropometric measurements of experimental and control group before and after supplementation (n=60)

Parameters	Experimental group (30)								
	Initial			30 days			60 days		
	Range	Mean	SD	Range	Mean	SD	Range	Mean	SD
Weight (kg)	31-57	42.33	6.09	31-58	42.40	5.91	31-59	42.47	5.98
Height (cm)	135-167	150.77	6.90	135-167	150.77	6.90	135-167	150.77	6.90
Tricep skinfold	14-32	21.18	4.34	14-32	21.18	4.34	14-32	4.34	21.18
BMI	31-59	18.85	5.98	14-25.9	19.10	2.72	14-26.3	19.10	2.72

F values of anthropometric measurements

Parameters	F Value	C.D. (P=0.05)
Height (cm)	0.00NS	0.00
Weight (kg)	33.24	0.907
BMI	62.57	0.943
Tricep skin fold (mm)	0.00NS	0.00

Parameters	Control group (30)								
	Initial			30 days			60 days		
	Range	Mean	SD	Range	Mean	SD	Range	Mean	SD
Weight (kg)	33-64	42.2	6.82	31-64	41.8	6.81	33-64	42.3	6.79
Height (cm)	133-162	151.27	6.36	133-162	151.27	6.36	133-162	151.27	6.36
Tricep skinfold	14-30	19.77	3.20	14-30	19.80	3.22	14-30	19.80	3.22
BMI	14.7-25.6	18.64	2.60	14.7-25.6	18.49	2.60	14.7-25.6	18.65	2.60

F values of anthropometric measurements

Parameters	F Value	C.D. (P=0.05)
Height (cm)	0.00NS	0.00
Weight (kg)	169.67	1.439
BMI	161.63	0.563
Tricep skin fold (mm)	0.00NS	0.00

NS=Non-significant

Table 6 : Haemoglobin content of experimental and control group before and after supplementation

	Experimental group			Control group		
	Initial	30 days	60 days	Initial	30 days	60 days
Range	7.3-9.8	8.3-11.9	8.3-11.9	8.8-11.3	8.33-11.3	9.6-11.3
Mean	8.59	9.70	9.77	10.31	10.32	10.40
SD	0.69	0.87	0.78	0.57	0.72	0.47

F value 1.29
S.E. 0.521
C.D. 1.442

there was slight decrease in the haemoglobin content of adolescent girls by 0.29 g/dl.

When the supplementation was continued upto 60 days in experimental group a further slight increase in the value of haemoglobin was noticed. The mean value of haemoglobin 9.77 g/dl was recorded at the end of 60 days period of supplementation of popped *Bajra* chiwada. It is clear from the result that the supplementation of popped *Bajra* chiwada for 60 days has exerted a positive effect on the haemoglobin level of moderate anaemic adolescent girls and the level of haemoglobin was found to be increased by 1.18 g/dl. In case of the control group there was increase was by 0.09 g/dl.

It is evident from the results that as period of feeding increased the mean haemoglobin content was increased. But it was not statistically significant. The iron content in popped *Bajra* chiwada may be responsible for improving the haemoglobin level of adolescent girls. Thus, the present study stridently supported the food based therapy implying pearl millet based iron rich pearl pop chiwada. Although, this millet is immensely nutritious with a high content of iron. Pearl Millet contain the highest amount of iron among all the cereals. It is also a rich source of calcium and dietary fibre, phytochemicals and micronutrients (Siegal and Kwatra, 2006).

Observations are in conformity with the study of Vasanthmani and Durga Devi (2009). It was found that supplementation of iron rich health drink was very effective in bringing up the Hb levels in anaemic adolescent girls and was found to be successful measure to elevate anaemia among adolescent girls. Similar trend was observed by Singh and Kochhar (2012). The mean Hb of the subject after the supplementation was increased.

In conclusion this study confirms that the newly formulated popped *Bajra* chiwada was pleasingly relished by the selected adolescent girls. Moreover it was found nutritious and economical. Supplementation of 50 g of popped *Bajra* chiwada per day showed a positive effect in improving the haemoglobin levels. Presence of multiple nutrients in the popped *Bajra* chiwada and haemopoietic factors like iron, proved to improve blood haemoglobin level. Green leafy vegetables are the most suitable food stuffs for enriching dietary iron of the Indians (Karwa *et al.,* 2010). Rajgira leaves normally wasted, the incorporation of rajkeera leaves in the preparations of products can be valuable source of micronutrients, enhancing the consumption of rajgira leaves and helpful in increasing the haemoglobin level.

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