

# Clinical Trial of Nutri-Kassar on Rural Anaemic Adolescent Girls

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**Abstract:** - Nutritional anaemia is one of India's major public health problems that affect about 60 percent adolescent girls. An imperative effort should be made to combat anaemia as it adversely impairs adolescent girls' physical work capacity and educational performance and reproductive physiology. In ayurved garden cress seeds (*Lepidium sativum*) is claimed to possess a variety of medicinal properties. Therefore, a clinical trial was done on anaemic adolescent girls to evaluate the impact of developed nutri-kassar on anaemic adolescent girls. Ethical approval for the study was obtained from Ethical committee of Kurukshetra University, Kurukshetra. Screening for anaemia was conducted by assessing the haemoglobin level of the 300 adolescent girls (13-18 years). From that, 100 anaemic adolescent girls (N=60 as Experimental Group and N=40 as Control Group) were chosen. Biochemical assessment (Hb, serum iron, TIBC and percentage saturation) of the selected subjects was done both prior, between and after the supplementation. Haemoglobin status was assessed through cyanomethemoglobin method. Deworming was done prior to supplementation. Data was analysed using SPSS16. The present study revealed seventy eight per cent prevalence of anaemia among adolescent girls. Experimental Group was supplemented 140gm nutri- kassar for a period of four months. After four months of supplementation a significant increase in haemoglobin (g/dl), serum iron and % saturation was observed in experimental group but declined was noticed in the Control Group.

**Keywords---** anaemia, adolescent, garden cress seeds, supplementation, haemoglobin

## I. INTRODUCTION

Anaemia is a condition characterized by a decreased number of red blood cells and has detrimental effect on work capacity, learning ability and resistance to disease. Once anaemia results, it also impairs cognitive performance, behavior and productivity of adults and children. Further, among girls, it leads to pregnancy complications, maternal and foetal mortality and morbidity [1]. In 2010, anaemia globally affects thirty two million women and at least half of all the pregnant women in middle and low-income countries. Toteja, *et. al.*, 2006 has estimated that prevalence of anaemia among ninety adolescent girls in India. Previous research has identified several potential causes of anaemia in the Indian context, such as low iron intake [3], limited vitamin C intake [4, 5], and lower gastric acidity relative to populations of European descent [6]. Among girls, poor access to nutritional supplements, subsequent menarche exacerbates anaemia [9]. Furthermore, parasitic infections, such as hookworm and malaria, are also important causes of anaemia [6, 9]. Despite recent economic growth and prevention efforts, anaemia remains particularly pervasive in India and is the largest cause of countrywide disability [19]. Food-based intervention programs, dietary

enhancement and diversification play a critical role in alleviating micronutrient malnutrition [8]. Benefits of such food-based strategies include not only improve intakes of specific nutrients but also improve overall diets and health status [8]. Therefore, it is essential that locally available food materials which are inexpensive and highly nutritious be use as a vehicle to improve the nutritional status of adolescent girls. *Garden cress seeds (Lepidium sativum)* are known to have health promoting properties as it contains 25-39 per cent of protein. Thirty three percent carbohydrate, 2.4per cent crude fat, 7.6% crude fiber and 6.4% minerals, iron (100%) [9]. Development and consumption of such local available food products could raise the hemoglobin level in adolescents.

With this in mind, a study in a village Shera of Haryana, North India, conducted to determine prevalence estimates of mild, moderate, and severe anaemia in adolescent girls. Also, a clinical trial was done on anemic adolescent girls to evaluate the impact intervention trial of developed *nutri-kassar* on anaemic adolescent girls.

## II. MATERIAL AND METHODS

### A. Selection of Subjects

A sample of 300 girls, who attended school, of age group 13-18 years were randomly selected for the study. Out of these, only hundred moderate (8-10.9gm/dl) and mild

degree (11- 11.9gm/dl) anaemic girls who were not suffering from fever, malaria or typhoid were voluntary, purposively selected for the intervention trials.

### **B. Background Information**

A pre-tested questionnaire was used to record the background information of the subjects pertaining to the age, socio economic profile. The anthropometric measurements- height and weight were also recorded.

### **C. Ethical Clearance**

Ethical approval for the study was obtained from Ethical Committee of Kurukshetra University, Kurukshetra. Written informed consent was availed from the subjects of the study.

### **D. Determination of Haemoglobin**

To estimate haemoglobin (Hb) level- 20 $\mu$ L of sample blood of subjects was transferred to a pre-numbered glass bottle containing 5 ml Darbkins reagents. Cyanmethaemoglobin method was used for hemoglobin estimation using a photoelectric colorimeter with green filter (500-570nm wavelength) on the same day of sample collection. Based on Hb level subjects were classified as normal, mild, moderate or severely anemic (WHO, 2001).

### **E. Development And Standardization Of Garden Cress Seeds Incorporated Nutri-Kasaar**

Garden cress seeds were purchased from local market of Panipat in bulk. *Nutri-kassar* was prepared by the following processes-garden cress seeds were roasted and grinded; all flours (atta and besan) were roasted separately. Then all three were mixed. Sugar and fat were added to the hot mixture. The mixture was cooled and stored until served. Seventy gram of *nutri-kassar* contained wheat flour (18g), Bengal gram flour (18g), roasted garden cress seeds (4g), sugar (20g), and Fat (10g).

### **F. Intervention Trail**

Hundred girls were divided into two groups i.e. control (40 anemic girls) and experimental group (60 anemic girls). Experimental group was given *nutri -kasaar* (wt. 140 gm.) for a period of four months and control group was given no supplements.

### **G. Impact Analysis**

The blood profile was measured in all the groups at the beginning, between and after trial. At the end of 120 days, thirteen girls drop out from experimental group.

### **H. Statistical Analysis Of Data**

The data collected was statically tested. Statistical analysis was done (frequency, %, mean, S.D. and t- test) in order to justify the impact of intervention using SPSS 16.

## **III. RESULT**

### **Background Information**

The age group of majority of the respondents (54%) was 13-15 years and 46 per cent of subject belonged to age group of 16-18 years. About half of the participants' fathers (43.7%) were university graduates, whereas only nine and three per cent of their mothers had a graduation and post-graduation degree, respectively. Most of the adolescent girls (76%) came from medium-sized family (5-6 members) whereas only 6 percent belonged to small sized family (family members less than 5). More than two third (68%) of the subjects had family income above Rs.96000 annually and only four percent of the participants' family had low annual income i.e. less than Rs.53, 000.

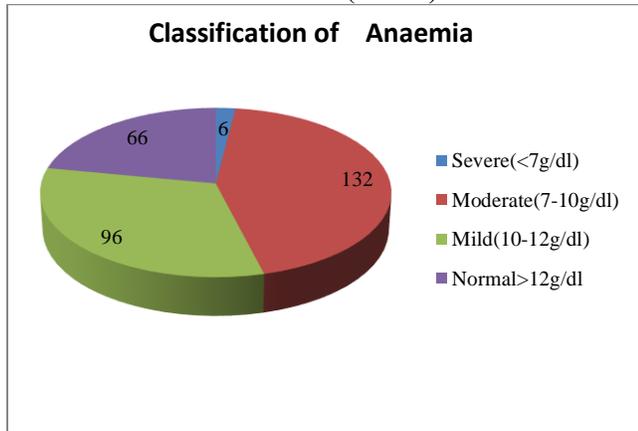
### **Prevalence Of Anaemia**

The haemoglobin determination of three hundred adolescent girls (Fig. 1) showed prevalence of anaemia seventy eight per cent among adolescent girls. Among them nearly half (44%) were moderate anemic and thirty two and two per cent of the subjects had mild and severe anaemia, respectively. Low serum ferritin (<10ng/ml) and serum iron (<40.0  $\mu$ g/dl) were estimated in nineteen and fourteen adolescent girls, respectively.

### **Nutrient Composition Of Nutri-Kasaar**

Garden cress seeds were incorporated at various levels to the basic recipe of kassar. Among these the most acceptable was garden cress seeds incorporated *nutri-kassar* (6% level of incorporation) was given a score of 8.2 (liked very much) by panel of judges using nine point hedonic scale ( Table 2). Nutrient analysis showed that that 100gm of this *nutri-kassar* contained 491.6 Kcal energy, 7.42g protein, 23.58g of fat, 24.49 mg calcium, 5.7 mg iron and 1.38 g ash.

**Fig. 1: Prevalence of anaemia among adolescents(N=300)**



**Table 1: Biochemical assessment of adolescent girls**

Variable	Mean ± sd	Range
HAEMOGLOBIN (g/dl)	10.1 ± 1.13	7.3-11.5
IRON (µg/dl)	92.7 ± 41.7	11.8-189.8
TIBC (µg/dl)	391.3±31	318.1-475.3
TS (%)	24.5 ± 12.5	3.03-57.9
SERUM FERRITIN	43.77± 39.5	3.3-196

**Table 2: Sensory evaluation of Nutri-Kasaar**

Food preparation	% level of incorporation	Color	Appearance	Texture	Taste	Aroma	Overall acceptability
Nutri-Kassar	4	6.2±1.2*	6.3±1.08	6.5±1.32	6.3±1.45*	7.2±1.27	6.8±1.38*
	6	7.5±1.03*	7.9±0.83	8.3±0.50	7.5±0.68*	8.5±0.52	8.2±0.52*
	8	5.8±1.48*	5.9±1.45	6.3±1.58	7±1.23*	6.9±1.47	7.1±1.36*

\*Significant at  $p \leq 0.01$

#### Impact of Intervention Trial

The impact intervention trial of supplementation of *nutri-kassar* revealed a significantly ( $p \leq 0.05$ ) increased in haemoglobin, serum iron and percentage saturation in Experimental Group where as a decline was observed in

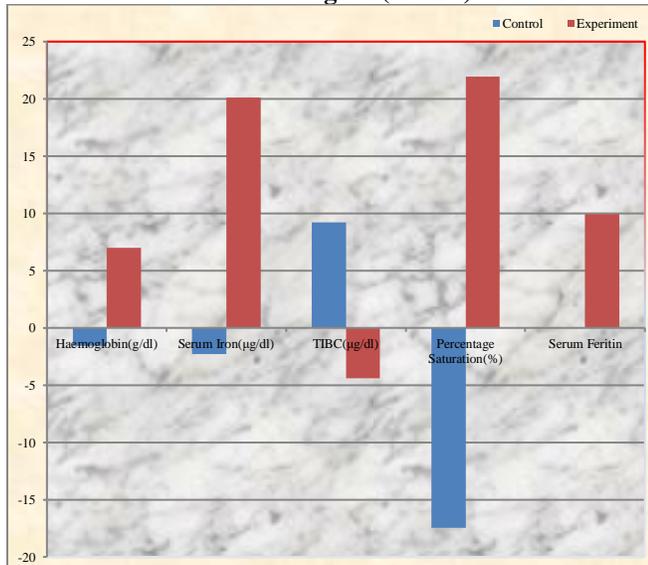
Control Group (Table 3). Thus, the daily supplementation of *nutri-kassar* was beneficial with respect to rise in haemoglobin levels and maintaining adequate iron status of essentially the anemic adolescent girls.

**Table 3: Haematological parameters of adolescent girls (N=100)**

Sr. No.	Haematological parameters	Intervention Group	Before Mean + S.D.	After Mean + S.D.	Percentage change (%)	t-value
1	Haemoglobin (g/dl)	Control	10.2 ± 0.87	10.04 ± 0.99	-1.56	-0.76 <sup>NS</sup>
		Experiment	10.17 ± 0.88	10.88 ± 0.91	6.98	3.54*
2	Serum Iron (µg/dl)	Control	87.45 ± 37.5	85.47 ± 36.3	-2.26	-0.23
		Experiment	88.10 ± 23.58	106.59 ± 36.3	20.9	4.34*
3	TIBC(µg/dl)	Control	363.66 ± 62.4	391.78 ± 13.2	7.73	3.27*
		Experiment	375.62 ± 57.86	359.14 ± 30.38	-4.38	-1.69*
4	Percentage saturation(%)	Control	24.04 ± 14.44	21.8 ± 9.2	-9.31	-0.82
		Experiment	23.45 ± 9.36	29.67 ± 5.32	26.5	3.65*

\* Significant at  $p \leq 0.05$

**Fig.2: Comparison of haematological parameters of adolescent girls (N=100)**



### Discussion

In the present study majority of the adolescent (76%) had family size of 5-6 members.

This is parallel to NFHS (2005) documentation about mean family size (4.54 members) in rural India. The per capita income of Haryana is Rs.1,09,227. Similarly, in our study only four percent of the participants' family had low annual income (less than Rs 53,000) and sixty eight per cent of the participants had family income above Rs.96,000 annually. Results of the present study documented high prevalence of anaemia, which is also projected in various studies conducted in India and abroad in the recent past (Shirode, *et. al.*, 2010; Benoist, *et. al.*, 2008; Balarajan, *et. al.*, 2012). This study showed that the daily consumption of Nutri-Kassar led to a significant increase in haemoglobin, serum iron and percentage saturation in anemic adolescent girls. Similarly, Miglioranza, *et. al.*, 2008 confirmed a pronounced reduction in the prevalence of Iron deficiency anaemia in children and adolescents following 6 months' ingestion of corn flour-derived products enriched with elemental Iron. Previous studies on intake of iron tablets or iron-fortified foods lead to increased hemoglobin concentrations and iron status in Indian women but the use of iron tablets has also reported adverse effects, such as constipation, diarrhea, nausea, and vomiting (15,16,). The present study also depicted non significant change in serum ferritin as with lower doses, the time required to increase serum ferritin was longer (15). Although iron-fortified foods are better tolerated, it may be difficult to implement effectively in India as the production of many staple foods, such as rice milling or flour processing,

is not centralized (17). Furthermore, treatment through fortified foods often takes longer time to bring rises in hemoglobin concentrations. The double fortification of salt has shown some promise of rise in hemoglobin concentrations by 1.1–2.0 g/dL for women (anemic and non-anemic combined) when consumed over 1 year (18). Supplementation through food based approach should be followed to improve iron status of adolescent. Garden cress seeds are low cost nutritious and easily available all over India and can assist communities and households to increase their haemoglobin level, maintain their iron stores and nourish themselves.

### IV. CONCLUSION

Adolescence is a period where rapid growth spurt occur. Lack of mineral-iron in adolescents diet leads to low iron status among adolescent which may limit their growth spurt. Government of India conducted various programmes to control anaemia in vulnerable groups. Iron and folic acid tablets are distributed through various interventions programmes. But one of the problems faced through this intervention is cause of unpleasant gastrointestinal side effects like nausea, vomiting, epigastric pain, diarrhoea etc. Supplementation through food based approach should be followed to improve the iron status of adolescent. Garden cress seeds are low cost, nutritious, and easily available all over the India. The present study concludes that nutri-kassar is good source of iron and could be used as iron supplement to prevent and combat iron deficiency anaemia in vulnerable population.

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