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## GARDEN CRESS SEEDS CAN COMBAT ANEMIA

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**ABSTRACT**

Garden cress, *Lepidium sativum* is herbaceous edible cultivated in India. In ayurved *L. sativum* is claimed to possess a variety of medicinal properties. The seeds are highly nutritious and are cheaply available in India. IDA is one of the major public health problems which affects especially adolescent girls. So, the present study was carried out to study the impact of garden cress seed incorporated *atta besan ladoo (GABL)* among anemic adolescent girls. A sample of 300 adolescent girls of age 13-18 years were selected. Haemoglobin was estimated through cyanomethymoglobin method. Data was analysed using SPSS 16. Hundred anemic girls (control (N=40) and experiment (N=60)) were selected for experimental trial. Two GABL (140gm) were supplemented in the Experimental Group for a period of two months. Deworming was done prior supplementation in Experiment group only not in the Control Group. After two months of supplementation, the haemoglobin (g/dl) gradually increased in experimental group from 10.17±0.88to 10.77±0.90. There was no specific change in the Control Group.

**KEYWORDS**

Anemia, adolescent, Garden cress seeds, Supplementation and Haemoglobin.

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## INTRODUCTION

Garden cress, *Lepidium sativum* is herbaceous edible plant botanically related to mustard and watercress. It is cultivated in India[1], in North America and parts of Europe[2] and harvested several times in a year. Few years back garden cress seeds or halim (known in India) was not a common food to be heard but now it is gaining its importance as a functional food. Nutritionally the seeds comprise 25 per cent of protein, 33-54% of carbohydrates, 14–24% of lipids, and 8% of crude fiber[3]. The major fatty acid present in garden cressis alpha-linolenic acid (34.0%) and also contains monounsaturated fatty acids (37.6%),

polyunsaturated fatty acids (46.8%) and antioxidants such as tocopherols and carotenoids[4,5]. Seeds are also excellent source of minerals like zinc, phosphorous and calcium. In ayurved *L. sativum* is claimed to possess a variety of medicinal properties like galactogue, aperient, diuretic, alterative, tonic, demulcent, aphrodisiac, carminative and emmenagogue[6]. Seeds were largely used for the treatment of hypertension and renal diseases[7]. In traditional times seeds were taken by lactating women to increase the milk secretion during post natal period.

Garden cress seeds are claimed to possess various pharmochemical properties like galactogue and antioxidants and has a tremendous potential to be developed as a functional food. Also its cheaper availability and high nutrient density makes it suitable to the weaker sections of society to include in their diets. The seeds in India is an ignored food item so an effort is made to develop a value added food product by incorporating garden cress seeds in popularly consumed atta besan ladoo. The present study also studies if these laddoo are effective to dislodge iron deficiency anemia among the rural adolescent girls.

## MATERIAL AND METHODS

### Selection of Subjects

Three schools namely Geeta Public Sr. Sec. School, Aryan Global School and Govt. Girls School of village Shera, Madlauda blocks of Panipat district, Haryana were selected for the study. From 531 adolescent girls studying in these schools, a sample of 300 girls of age group 13-18 years was randomly selected.

### Background Information

Information regarding demographic and socio economic profile were recorded using a pre-tested questionnaire. A Food Frequency questionnaire was also used to record food consumption frequency. The anthropometric measurements- height and weight were also recorded.

### 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.

### Determination of Hemoglobin

To estimate haemoglobin level- 20µL of sample blood of subjects was transferred to a pre-numbered glass bottle containing 5 ml Darbkins reagents. Cyanmethaemoglobin method was used for haemoglobin estimation using a photoelectric colorimeter with green filter (500-570nm wavelength) on the same day of sample collection. Anemia was classified as normal, mild, moderate or severely anaemic according to WHO, 2001. Only moderate (8-10.9gm/dl) and mild degree (11-11.9gm/dl) anemic girls were selected for further study.

## DEVELOPMENT AND STANDARDIZATION OF GARDEN CRESS SEEDS INCORPORATED ATTA BESAN LADOO

### Flow chart

Garden cress seeds were purchased from local market of Panipat in bulk. *Ladoo (GABL)* 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 mixture. The mixture was shaped into balls *(ladoo)*, cooled and stored until served. Each garden cress seeds incorporated atta besan *ladoo (GABL)*, contained roasted garden cress seeds (4g), wheat flour (18g), Bengal gram flour (18g), sugar (20g), and Fat (10g).

### Experimental trail

Hundred anemic girls who were not suffering from fever, malaria or typhoid were voluntary included for the study. These girls were divided into two groups i.e. control (40 anemic girls) and experimental group (60 anemic girls). Experimental subjects were given two garden cress seeds incorporated *atta besan ladoo* (wt. 140 gm.) for a period of 60 days and control subjects were given no supplements. At the end of 60 days, thirteen girls drop out from experimental group.

### Statistical analysis of data

The data collected was statically tested. Descriptive (frequency, %, mean, S.D.) and t- test were used for data analysis using SPSS 16.

## RESULTS

### Demographic profile

The age group of majority of the respondents (54%) were 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. A substantial proportion (93.3%) of the girls lived in their own house.

### Prevalence of anemia

The haemoglobin determination of 300 adolescent girls (Table No.2) showed prevalence of anemia was seventy eight per cent. Among them nearly half (44%) of adolescents were moderate anemic and 32 and 2 per cent of the subjects had mild and severe anemia respectively.

Low serum ferritin level (<10ng/ml) and serum iron (<40.0 µg/dl) were estimated 6.3 and 4.6 per cent of adolescent girls, respectively. Also nearly one–fifth adolescent girls (21%) had iron deficient erythropoiesis (percentage saturation less than 15%).

Table No.4 shows the correlation between various biochemical parameters. Haemoglobin (Hb) concentrations were found to be positively correlated (r= 0.65) with serum iron, serum ferritin (r=0.6) and percentage saturation (r = 0.65); While serum iron was negatively correlated with serum TIBC (r = -0.6).

### Nutrient composition of garden cress seeds incorporated Atta besan ladoo

Garden cress seeds were incorporated at three different level 4, 6 and 8 per cent. Among these *Atta besan laddoo* at 6 per cent level of incorporation was found most acceptable (Table No.5). A score of 8.2 (liked very much) was given by a panel of judges using the nine point hedonic scale. Garden cress seeds incorporated *atta besan laddoo* was analysed for its biochemical composition. Nutrient analysis showed that that 100gm of garden cress seeds incorporated *atta bessan laddoo* contained 7.42g protein, 23.58g of fat, 491.6 Kcal energy, 24.49 mg calcium 5.7 mg iron and 1.38 g ash.

### Impact of supplementation on haemoglobin level of adolescents

The impact of supplementation of the garden cress seeds incorporated *atta besan laddoo* revealed a significantly ($p \leq 0.05$) increased in haemoglobin in Experimental Group than in Control Group. The result also showed an increment 5.8 per cent of haemoglobin whereas in control group a mild decline (0.49%) in haemoglobin value from 10.2±0.87 to 10.15±1.13 was noticed. Also the result of the 't' test signifies significant difference between the haemoglobin value (t=9.37) of experimental group and the control group. Thus the garden cress seeds incorporate d*atta besanladdoo* improve the haemoglobin level of the selected anemic adolescent girls.

## DISCUSSION

The demographic profile of NFHS (2005) documented that mean family size in rural India is 4.54 members. In the present study majority of the adolescent (76%) had family size of 5-6 members. 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 68 per cent of the participants had family income above Rs.96,000 annually.

Results of the present study regarding prevalence of anemia in adolescent girls are comparable with the other studies from SAARC countries. In the present study seventy eight percent of adolescent girls are anemic which was slightly more to an estimation of 70 per cent prevalence of anemia in above studies.

In the present study inferred that in control group the mean haemoglobin values decreased while in the experimental group the haemoglobin level of the subjects increase significantly ($p<0.05$). The supplementation of garden cress seeds incorporate d*atta besanladdoo* met 26.6 per cent of the daily requirement of the iron.

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[14]. Government of India conduct 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, diarrhea etc. Supplementation through food based approach should be followed to improve the iron status of adolescent. Garden cress seeds are low cost, nutritious seeds, easily available all over the India. The present study concludes that garden cress seeds incorporated laddooare good source of iron and could be used as iron supplement to prevent and combat iron deficiency anaemia in vulnerable population.

**Table No.1: Social - personal and economic profile of adolescent girls (n = 300)**

| Variable | Frequency |
|---|---|
| **AGE (Years)** | |
| 13-15 | 162 (54) |
| 16-18 | 138 (46) |
| **EDUCATION OF FATHER** | |
| Illiterate | 30(10) |
| Matric | 42(14) |
| Below, Matric | 90(30) |
| Senior Secondary | - |
| Graduate | 131(43.7) |
| Post Graduate | 7(2.3) |
| **EDUCATION OF MOTHER** | |
| Illiterate | 33(11) |
| Matric | 129(43) |
| Below, Matric | 72(24) |
| Senior Secondary | 30(10) |
| Graduate | 27(9) |
| Post Graduate | 9(3) |
| **TYPE OF FAMILY** | |
| Nuclear | 102(34) |
| Extended Nuclear | 117(39) |
| Joint | 81(27) |
| **FAMILY SIZE** | |
| Small (<5) | 18(6) |
| Medium ( 5- 8) | 228(76) |
| Large (>8) | 54(18) |
| **FAMILY INCOME (ANNUALLY)** | |
| Less than 53,000 | 12(4) |
| 53,000-96,000 | 84(28) |
| Above 96,000 | 204(68) |
| **RESIDENTIAL STATUS** | |
| Owned | 298(99.3) |
| Rented | 2 (0.7) |

# values in parentheses indicate percentage of respondent.

**Table No.2: Prevalence of anemia among adolescents (N= 300)**

| S.No | Classification of anemia | Haemoglobin (g/dl) | No. of Subjects |
|---|---|---|---|
| 1 | Severe | <7 | 6 (2) |
| 2 | Moderate | 7 -10 | 132 (44) |
| 3 | Mild | 10 – 12 | 96 (32) |
| 4 | Normal | > 12 | 66 (12) |

**Table No.3: Biochemical assessment of adolescent girls**

| S.No | Variable | Mean ± sd | Range |
|---|---|---|---|
| 1 | HAEMOGLOBIN (g/dl) | 10.1 ± 1.13 | 7.3-11.5 |
| 2 | IRON (µg/dl) | 92.7 ± 41.7 | 11.8-189.8 |
| 3 | TIBC (µg/dl) | 391.3±31 | 318.1-475.3 |
| 4 | TS (%) | 24.5 ± 12.5 | 3.03-57.9 |
| 5 | SERUM FERRITIN | 43.77± 39.5 | 3.3-196 |

**Table No.4: Correlation between various biochemical parameters**

| S.No | | Heamoglobin | Serium Iron | TIBC | Serium Ferritin | Percentage Saturation |
|---|---|---|---|---|---|---|
| 1 | Heamoglobin | r = 1 | | | | |
| 2 | Serium Iron | r = 0.65 | r = 1 | r=-0.6 | | |
| 3 | TIBC | r = -0.45 | r = - 0.6 | r=1 | | |
| 4 | Serium Ferritin | r = 0.6 | r = 0.5 | r =- 0.4 | r=1 | |
| 5 | Percentage Saturation | r = -0.65 | r = 1 | r = 0.6 | r = 0.5 | r = 1 |

**Table No.5: Sensory evaluation of Garden Cress Seeds Incorporated *Atta Besan Laddoo***

| S.No | Food preparation | % level of incorporation | Color | Appearance | Texture | Taste | Aroma | Overall acceptability |
|---|---|---|---|---|---|---|---|---|
| 1 | *Atta besan laddoo* | 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* |

**Table No.6: Haemoglobin status of adolescent's girls**

| S.No | Hematological Parameters | Intervention Group | Before Mean ± S.D | After Mean ± S.D | Percentage change (%) | t - Value |
|---|---|---|---|---|---|---|
| 1 | Haemoglobin (g/dl) | Control | 10.2 ± 0.87 | 10.15 ± 1.13 | -0.49 | 9.37* |
| | | Experiment | 10.17 ± 0.88 | 10.77 ±0.90 | 5.8 | |

*****Significant at $p < 0.05$

## CONCLUSION

Youth are assets of a country. A nation will not developed if its youth are not healthy. It is therefore essential that adolescents grow in an environment which is suitable to meet their nutritional, social, emotional and educational needs of development. Hence it is essential to include foods rich in macro and micro nutrients constantly in our regular diet for healthy and desirable blood profile of the body.

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**CONFLICT OF INTEREST**

We declare that we have no conflict of interest.

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