

Received : March, 2011; Accepted : April, 2011

Anaemia : impact assessment of dietary intervention on iron status of college going girls

MAMTA KUMARI AND VIBHA BHATNAGAR

ABSTRACT

Anaemia is a recognized public health problem throughout the world. It is an indicator of both poor health and poor nutrition. The present study aimed to assess the nutritional status and prevalence of anaemia among college going girls (18-22 yrs) along with impact of dietary intervention. Background and nutritional information was collected through interview schedule, 24 hour dietary recall and haemoglobin assessment. For dietary intervention, niger seed ladoos were prepared and supplemented for four weeks. Results were significant ($p < 0.05$) in the haemoglobin levels. Mean haemoglobin level of subjects before supplementation was 8.42 ± 0.37 g/dl, which increased to 11.16 ± 0.37 g/dl after completion of supplementation. The study confirmed that supplementation can rapidly improve iron status, hence continued interventions are necessary to maintain the improved status.

Kumari, Mamta and Bhatnagar, Vibha (2011). Anaemia : impact assessment of dietary intervention on iron status of college going girls, *Food Sci. Res. J.*, 2 (1) : 76-79.

Key words : Anaemia, Intervention, Haemoglobin, Nutritional status

INTRODUCTION

Iron deficiency is the most common nutritional disorder in the developing world and the most common cause in young children and women of reproductive age (ACC/SCN, 1991). Nutritional anaemia is a recognized public health problem throughout the world. In the present scenario, the widespread prevalence of anaemia in young girls in India is gaining increasing recognition. With 40 per cent prevalence of anaemia in the world on an average for the general population, the prevalence in the developing countries tends to be three to four times higher than in the developed countries (Gillespie, 1998). Iron deficiency is ranked at the top of three global "hidden hungers" (Iron, Iodine and Vit A: sub clinical deficiency without visible signs of deficiency) with about one fifth of the world's population is suffering from iron deficiency anaemia (Chen *et al.*, 2005). Iron deficiency in its most severe form results in anaemia-IDA and since haemoglobin concentration is relatively easy to determine, the prevalence of anaemia has often been used as proxy of Iron Deficiency Anaemia (IDA) (WHO, 2004). Anemia is an indicator of both poor health and poor nutrition (De Betonist *et al.*, 2008).

Interventions for anemic adolescent girls should raise their iron stores and sustain their haemoglobin at normal levels. This will not only improve their physical and mental capacity, but also subsequently help in reducing the incidence of low birth weight of infants and maternal mortality rates. Other micronutrients of concern in adolescent growth and development are calcium, iodine, vitamin A, zinc and folic acid. The present study was undertaken to determine the prevalence of anaemia among young girls aged 18 to 22 yrs from a college hostel and an attempt has also been made to overcome the nutritional anaemia through dietary intervention strategy.

MATERIALS AND METHODS

The study was undertaken between April 2010 and May 2010, in Udaipur, Rajasthan and a college girls hostel was selected. The study was designed to include volunteer adolescent girls aged 18-22 years. A group of 60 girls were randomly selected for this study and out of that, 10 girls were further selected for subsequent intervention on the basis of haemoglobin level (moderately anaemic, 7-9.9 mg/dl), willingness and not consuming any iron supplements.

Measurement of haemoglobin itself is a direct means of determining the presence of anaemia, which is most frequently associated with iron deficiency (Hollowell *et al.*, 2005). The girls were supplemented niger seeds ladoo (50g ladoo/person/day) for 4 weeks. The recipe was standardized and 1/3rd of day's requirement (12.45mg) of iron of girls was given, calculated from nutritive value of Indian foods (Gopalan and Balasubramanian, 2009).

Structured questionnaire:

Demographic and socioeconomic data on the subjects were collected using a prestructured questionnaire. It included information about respondent's age, religion, caste, education, food habits, etc. of 60 adolescent girls.

Nutritional status and haemoglobin assessment:

Weight and height were measured using standard techniques (Gibson, 1989) and body mass index (BMI) was calculated. The general meal pattern was assessed through 24 hour dietary recall method. Blood haemoglobin was estimated by the cyanmethaemoglobin method (Oser, 1979) before and after the intervention. Data analysis was done on the basis of mean, standard deviation and standard error and the samples were compared with students' t-test.

Preparation of niger seed ladoo:

Niger and sesame seeds were cleaned, roasted separately, coarsely ground and mixed. Jaggery was melted with little water added, to one thread consistency. Then ground mixture were added to jaggery and shaped into ladoos. The recipe was standardized in the laboratory of Foods and Nutrition, College of Home Science, MPUAT, Udaipur and ingredients were procured from local market.

Evaluation of ladoos:

The organoleptic evaluation (colour, flavour, texture, taste and overall acceptability) of standardized ladoos were done by staff and students of Department of Foods and Nutrition using nine point Hedonic Scale. The nutritional analysis (protein, fat, moisture, ash, fiber and iron) of ladoos were done by AOAC standard procedures. Iron bioavailability was also assessed through *in vitro* method (Rao and Prabhavathi, 1978; Reddy *et al.*, 1986). All determinations were made in duplicates and the average values were adopted. All the analysis was done on dry weight basis.

RESULTS AND DISCUSSION

The background profile of the subjects revealed that

out of 60, majority of girls belonged to middle income group (MIG) and were vegetarian. BMI based on anthropometric measurements Fig. 1 showed that only 23.33% girls were normal whereas 13.33%, 23.33% and 3.33% girls belonged to Grade I, II and III of CED, respectively. Rest 36.66% were in low weight but normal category.

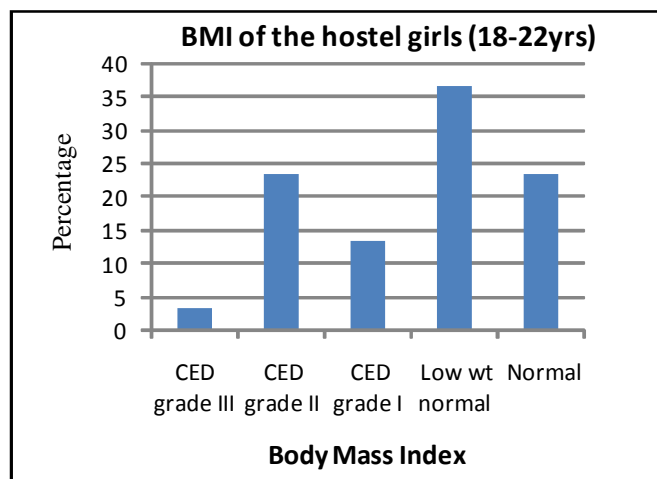


Fig. 1: Distribution of respondents by their type of malnutrition

IDA is a serious concern, therefore the food and nutrient intake of girls selected for intervention trial was assessed through 24-hour recall method and it was found that the mean intake of energy (64%), protein (83.9%), iron (51.96%) and calcium (76.66%) was less than the RDA by the girls (18-22yrs).

The prevalence of anaemia among respondents is shown in Fig. 2. Majority (80%) of the subjects were suffering from anaemia. Out of that 40% and 36.66% were moderately and mild anaemic respectively. Severe from of anaemia was observed in 3.3% subjects.

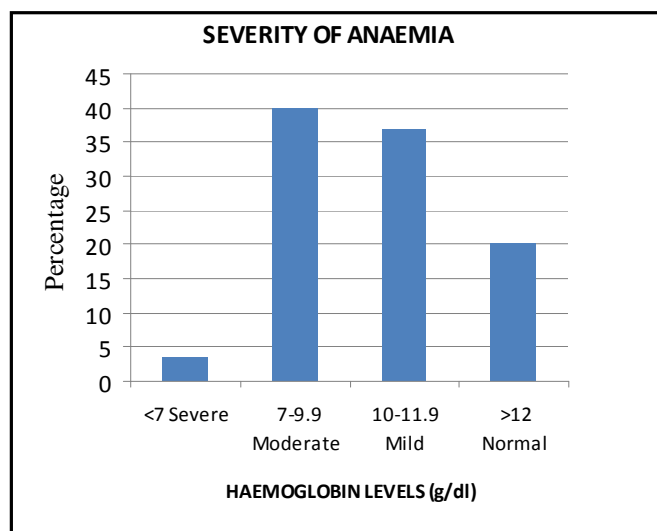


Fig. 2: Distribution of respondents by their severity of anaemia

Table 1 shows the organoleptic scores of developed niger seed ladoos. The scores of colour, flavor, texture, taste and overall acceptability of the ladoos were in the range of 7.8 to 8.0 indicating 'liked moderately' to 'liked very much' on a 9 point Hedonic scale. Thus, the ladoos were highly acceptable among the subjects. Table 2 shows the information regarding the mean nutrient composition of ladoos. Therefore, it was evident that the analyzed samples were at par with the values calculated from nutritive value of Indian foods.

Table 1: Sensory evaluation of niger seed ladoos

Attributes	Ladoos(Mean \pm S.E)*
Colour	7.8 \pm 0.18
Flavour	7.9 \pm 0.16
Texture	7.8 \pm 0.18
Taste	8.0 \pm 0.13
Overall acceptability	7.9 \pm 0.22

*The scores are expressed for ten determinations

Table 2 : Nutrient composition of niger seed ladoos per 100g

Nutrient (g)	Analyzed	Calculated
Moisture	6.2	4.14
Protein	9.86	11.58
Fat	15.6	19.96
Carbohydrate	67.02	56.84
Fibre	4.3	4.64
Iron (mg)	25.33	24.92
Bioavailable iron (mg)	18.66	----

To evaluate the effect of supplemented ladoos, the haemoglobin levels were measured before and after intervention. The findings revealed that there was significant difference ($p < 0.05$) in the haemoglobin levels. Mean haemoglobin level of subjects before supplementation was 8.42 \pm 0.37g/dl, which increased to 11.16 \pm 0.37g/dl. after completion of supplementation (Fig. 3).

Conclusion:

Anaemia, defined as Hb concentration below the established cut-off levels, is a major public health problem with major consequences for human health as well as social and economic development (Al-Mekhlafi *et al.*, 2008) Therefore, there is high demand to focus on adolescent girls to reduce the prevalence of anaemia. This study demonstrated that niger seed ladoo supplementation for 4 weeks improved haemoglobin content significantly among the girls. The study has also shown the effectiveness of the daily supplementation of ladoos. It could be concluded

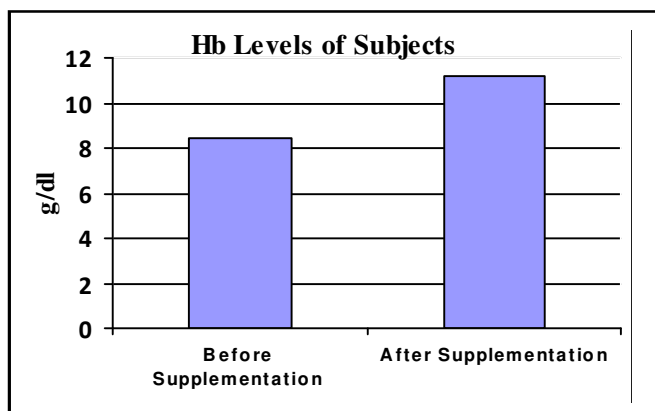


Fig. 3: Haemoglobin status of subjects before and after supplementation of ladoos

that dietary approach to prevent IDA is quite effective. The International Center for Research on Women's Guatemala metabolic study found that haemoglobin levels increased during iron supplementation but fell when a placebo was taken. This confirms the finding that while supplementation can rapidly improve iron status, continued interventions are necessary to maintain this improved status.

REFERENCES

- ACC/SCN (1991).** (United Nations Administrative Committee on Coordination/Sub-Committee on Nutrition) Statements on iron deficiency control: June 1990, Dublin. In: Gillespie SR, Mason JB, Kevany J, editors. *Controlling Iron Deficiency*. ACC/SCN, World Health Organization, Geneva, Switzerland, State-of-the-Art Series, Nutrition Policy Discussion paper 9; 1991.
- Al-Mekhlafi, M.H., Surin, J., Atiya, A.S., Ariffin, W.A., Mohammed Mahdy, A.K. and Che Abdullah, H. (2008).** Transactions of the Royal Society of Tropical Medicine and Hygiene, **102** : 1046-1052.
- Chen, J., Zhao, X., Zhang, X., Yin, S., Piao, J. and Huo, J. (2005).** Studies on the effectiveness of Na Fe EDTA-fortified soy sauce in controlling Iron deficiency: a population based intervention trial. *Food Nutr Bull.*, **26** : 177-186.
- De Betonist, B., McLean, E., Egli, I. and Cogswell, M. (2008).** Worldwide prevalence of anemia 1993-2005: WHO global database on anemia, Geneva: World Health Organization.
- Gibson, R.S. (1989).** In: *Principles of nutritional assessment*. Oxford University Press, New York, NY.
- Gillespie, S. (1998).** Major issues in the control of iron deficiency. Micronutrient Initiative/UNICEF, USA.
- Gopalan, C., Rama, B.V. and Balasubramanian, S.C. (2009).** Nutritive value of Indian foods. National Institute of Nutrition. ICMR. Hyderabad, A.P (India).

Hollowell, J.G., Van Assendelft, O.W., Gunter, E.W., Lewis, B.G., Najjar, M. and Pfeiffer, C. (2005). Hematological and iron-related analytes-Reference data for persons aged 1 year and over: United States, 1988-1994. *Vital & Health Statistics*, **11**:1-15.

Oser, B. (1979). In: *Hawk's Physiological Chemistry*. Tata Mc Graw Hill Publishing, New Delhi, India.

Rao, B.S.N. and Prabhavathi, T. (1978). An *in vitro* method for predicting the bioavailability of iron from foods. *Am. J. Clin. Nutr.*, **31**:169-175.

Reddy, M.B., Chidambaram, M.V., Fonseca, J. and Bates, G.W. (1986). Potential role of *in vitro* iron bioavailability studies in combating iron deficiency: A study of the effects of phosvitin on iron mobilization from pinto beans. *Clin. Physiol. Biochem.*, **4** (1): 78-86.

WHO, UNICEF (2004). Focusing on anaemia: towards an integrated approach for effective control: Joint assessment by the WHO & UNICEF. Geneva: WHO.

Address for correspondence :

MAMTA KUMARI

Department of Food and Nutrition, College of Home Science, Maharana Pratap University of Agriculture and Technology, UDAIPUR (RAJASTHAN) INDIA

Email : mamta.kumari27@gmail.com

Authors' affiliations :

VIBHA BHATNAGAR

Department of Food and Nutrition, College of Home Science, Maharana Pratap University of Agriculture and Technology, UDAIPUR (RAJASTHAN) INDIA

