

Impact of Niger seeds supplementation on hemoglobin level of women with anemia

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Received November 13, 2015. Accepted November 28, 2015

Abstract

Background: The prevalence of anemia for ever married women has increased from 52% in the National Family Health Survey 2 (NFHS)-2 to 56% in NFHS-3. Three decades of iron and folic acid supplementation has failed to improve the situation. Nutrition supplementation by Niger seeds that contain high amount of iron (56.7 mg/100 g of seeds) may be used to increase the hemoglobin level.

Objective: To study the impact of Niger seeds supplementation on hemoglobin level of women with anemia and to assess its adverse effects.

Materials and Methods: The interventional study was conducted among female students of a postgraduate institute of Kolkata, India, from January to May 2014. A total of 80 female students were screened and 35 were found to have anemia. Of 35 students with anemia, 15 were purposively selected. One serving of 25 g Niger seeds chutney supplementation for 30 days was given as intervention. Hemoglobin level was estimated before (0 day) and after supplementation (30 days) by using cyanmethemoglobin method.

Result: Mean age of women was 22.2 ± 0.77 years. After intervention, the mean hemoglobin level increased from 10.26 ± 0.89 to 11.23 ± 1.11 g/dL ($p < 0.000$). Of 15 women with anemia, 5 became non-anemic after taking Niger seeds chutney supplementation for 30 days.

Conclusion: Niger seeds supplementation among women with anemia significantly increased the hemoglobin level.

KEY WORDS: Niger seeds supplementation, anemia, hemoglobin level

Introduction

Nutritional anemia is a major public health problem in India and is primarily due to iron deficiency.^[1] Almost 58% pregnant women in India have anemia and it is estimated that anemia is the underlying cause for 20%–40% maternal deaths in India. India contributes to about 80% maternal deaths due to anemia in South Asia.^[2] According to the National Family Health Survey 3 (NFHS), 55.3% women in the reproductive age group in India have anemia. The prevalence of anemia for ever married women has increased from 52% in NFHS-2

to 56% in NFHS-3.^[3] Even though supplementation of diet with iron and folic acid (IFA) has been a part of Government of India programming for more than 30 years, the NFHS data show that the levels of IFA intake remain low. For example, less than 20% girls below 20 years took IFA supplements, and only 22% women reported consuming IFA for 90 days or more when they were pregnant.^[1] Many experts believe that one of the main reasons that national iron supplementation programs have failed is “noncompliance” of women.^[4–7] IFA tablets supplementation is associated with unpleasant gastrointestinal side effects such as pain in epigastria, nausea, vomiting, and diarrhea, due to which there is low adherence.^[8]

Niger seed (*Guizotia abyssinica*) is one of the underutilized oilseed crops. In India, it is planted as a rained crop in kharif and rabi season.^[9] Niger seed is also known as *ramtil*, *kalatil*, and *sorguja*. Niger seed is a concentrated source of energy, protein, and iron and also a rich source of linoleic acid, an essential fatty acid. The oil and seed are completely free from any toxic substances.^[10] Niger seeds are used in southern parts of India. In Karnataka, Andhra Pradesh, and

Access this article online

Website: <http://www.ijmsph.com>

DOI: 10.5455/ijmsph.2016.13112015245

Quick Response Code:



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Maharashtra, Niger seeds (called *valisalu/valasulu*, *uchellu/gurellu*, and *karale* in Telugu, Kannada, and Marathi, respectively) are used to make a dry chutney that is accompaniment with breads (chapati). They are also used as a spice in some curries.^[11] Niger seeds that contain high amount of iron (56.7 mg/100 g of seeds) can be alternatively used to reduce the side effects and also increase the hemoglobin level. So this study was carried out to see the impact of Niger seeds supplementation on hemoglobin level of women with anemia.

Materials and Methods

This interventional study was carried out at the Department of Biochemistry and Nutrition of All India Institute of Hygiene and Public Health, Kolkata, West Bengal, India, among the postgraduate female students in the age group of 20–30 years, pursuing MSc (Applied Nutrition), Diploma in Dietetics, and Diploma in Health Promotion and Education at the institute. The study was carried out from January to May 2014. Written informed consent was obtained from all the study participants prior to the study. Of a total of 80 students screened for anemia, 35 were found to have anemia (Hb < 12 g%). Of 35 women with anemia, 15 willing to participate were included in the study. Self-structured schedule was used to collect the information such as socioeconomic, demographic, and adverse effects. Acceptability of the chutney was assessed by 9-point hedonic scale.

Intervention

Each participant received one serving of 25 g Niger seeds chutney for 30 days. Hemoglobin levels were estimated before (0 day) and after (30 days) supplementation by using cyanmethemoglobin method. One week prior to intervention, all 15 women were administered a single dose of 400 mg albendazole tablet.

Ingredients of Niger seeds chutney were Niger seeds, curry leaves, salt, sugar, green chili, lemon juice, and garlic cloves (optional). The chutney was prepared by roasting the Niger seeds in a thick-bottomed utensil on medium heat. The seeds were heated and stirred continuously till the seeds crackled followed by cooling. Salt, sugar, and green chili were added to the seeds and grinded into powder. Lemon juice was added to the powder.

Statistical Analysis

Data were entered in Microsoft Excel spreadsheet and analyzed by using SPSS (version 20.0). Results were presented in the form of tables. Student's *t*-test was applied as a test of significance and a *p*-value of <0.05 was considered to be significant.

Results

Mean age of the participants was 22.2 ± 0.77 years. According to BG Prasad socioeconomic scale 2013, 12 (80%)

women belonged to class 1 socioeconomic status followed by 2 (13.3%) to class 2, and 1 (6.7%) to class 3. Eleven (73.3%) participants were from urban area.

After the intervention, the mean hemoglobin level was found to be significantly increased by 0.97 g/dL (*p* < 0.0001) and 33.3% women became non-anemic (Hb ≥ 12 g/dL) [Tables 1 and 2].

The color, flavor, and appearance were neither liked nor disliked but the taste of chutney was slightly disliked by the women assessed by 9-point hedonic scale [Table 3]. Of 15 participants, 5 reported different adverse effects after Niger seeds chutney consumption [Table 4].

Discussion

The prevalence of anemia was 43.7% among the women screened for anemia. The mean age of the study participants was 22.2 ± 0.77 years and most of them belonged to urban area.

A similar study conducted by Paul et al.[12] reported that 50 g Niger seeds laddoo supplementation for 30 days along with the daily meal brought about a significant improvement (*p* < 0.05) in hemoglobin levels from 8.88 ± 1.2 to 10.4 ± 0.72 g/dL and 10.6 ± 1.20 to 11.16 ± 0.41 g/dL in intervention and control groups, respectively.

Barnwal et al.[13] found that after supplementation of Niger seeds laddoo for 75 days among adolescent girls, a net change in mean hemoglobin values was observed (0.85 ± 0.10 and 1.57 ± 0.15 g/dL, *p* < 0.001) in the control and experimental subjects, respectively.

This study confirms the findings of earlier-mentioned studies that Niger seeds supplementation helps in increasing the hemoglobin level among women with anemia. The developed supplementary food, that is, Niger seeds chutney, was found to be acceptable and its efficacy as an iron supplement in combating mild-to-moderate iron deficiency anemia is reflected in the results.

There are various programs being conducted by the Government of India to control anemia. One of them is distribution of the IFA tablet to vulnerable population. One of the problems of IFA tablet supplementation is that it causes unpleasant gastrointestinal side effects such as epigastric pain, nausea, vomiting, and diarrhea.[1] Therefore, to improve the hemoglobin status, food-based approach should be followed. Niger seeds are easily available all over India and its productivity is high. The Niger seeds chutney can be used as food supplement to prevent and combat iron deficiency anemia in vulnerable population.

Table 1: Comparison of hemoglobin level at baseline and after 30 days among study participants

Day	Hb (g/dL), Mean ± SD	Paired <i>t</i> -test	df	<i>P</i> -value
Baseline (day 0)	10.26 (0.89)			
Final (after 30 days)	11.23 (1.11)	4.52	14	<0.0001

Table 2: Comparison of type of anemia pre- and post-intervention among study participants

Day	Type of anemia (n = 15)			
	Mild (Hb: 10–11.9 g/dL)	Moderate (Hb: 7–9.9 g/dL)	Severe (Hb: <7 g/dL)	Normal (Hb: ≥12 g/dL)
Baseline (day 0)	3	12	0	0
Final (after 30 days)	6	4	0	5

Table 3: Acceptability of Niger seeds chutney among participants by 9-point hedonic scale

Score	Color	Flavor	Taste	Appearance
Mean ± (SD)	5.20 (1.26)	5.07 (1.38)	4.53 (1.24)	5.53 (1.64)

Table 4: Distribution of adverse effects of Niger seeds supplementation among study participants

Adverse effects reported	Number of participants (n = 15)	Average number of episodes in 30 days
Loose stools	2	7
Black stools	1	21
Acidity after consumption of chutney	1	30
Nausea	1	7

The limitation of this study was small sample size and no use of control group. Community-based randomized control trial with large sample size and research on the bioavailability of iron from Niger seeds supplement is recommended.

Conclusion

This study concludes that Niger seeds chutney supplementation (25 g) for 30 days significantly increased the hemoglobin level, was acceptable, and had very few adverse effects.

Acknowledgments

We are grateful to all the study participants who took part in the study.

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How to cite this article: Hazra S, Taklikar CS. A descriptive cross-sectional study of breast-feeding practice in Bikaner, Rajasthan. *Int J Med Sci Public Health* 2016;5:1721-1723

Source of Support: Nil, **Conflict of Interest:** None declared.