



EFFECTIVENESS OF DRUMSTICK LEAVES SUPPLEMENTATION IN DURING IRON DEFICIENCY ANEMIA IN ADOLESCENT GIRLS AGE GROUP (13-18yrs)

Neelu Vishwakarma, Alka Singh, Alpana Sharma, D.K. Singh
and Rashmi Shukla

^{1*4&5} KVK, Jabalpur, MP

² KVK, Sidhi, MP

³ KVK, Shahdol, MP

E-mail: neelu_vishwakarma@rediffmail.com

ABSTRACT:

The present study investigated the effects of drumstick leaf powder supplementation on iron deficiency anemia in adolescent girls. Anemia is a prevalent cause of malnutrition and a significant public health concern, particularly affecting children, adolescents, and women of reproductive age globally. Iron deficiency anemia (IDA) is especially common among adolescent girls and women from lower socioeconomic backgrounds, with nearly 80% of anemic women suffering from IDA. This research aimed to explore the efficacy of using dry drumstick leaf powder, a vegetable-based source of non-heme iron, as a dietary supplement for treating anemia. The study targeted 20 anemic adolescent girls aged 13–18 years, selected through a convenient sampling technique from a lower socioeconomic group. Anemia was diagnosed based on clinical signs and symptoms and confirmed using the cyanmethemoglobin method. The intervention involved administering 10 grams of dry drumstick leaf powder daily for three months. Post-intervention analysis showed a significant increase in the participants' average hemoglobin (Hb) levels, from 9.8 g/dL to 11.2 g/dL. This cost-effective and accessible intervention demonstrates potential as a community-level strategy to combat iron deficiency anemia.

KEYWORDS: Drumstick leaves, Supplementation, iron deficiency anemia, malnutrition, adolescence girls.



INTRODUCTION:

Adolescence represents the critical transition between childhood and adulthood, characterized by rapid physical growth and development, commonly referred to as a growth spurt. During this phase, the normal hemoglobin level ranges from 11–14 g/dL. The World Health Organization (WHO) defines adolescence both as a developmental stage (spanning 10–19 years of age) and as a phase marked by unique physiological and psychological attributes. Adolescent girls are particularly vulnerable to micronutrient deficiencies, with iron deficiency anemia (IDA) being one of the most common conditions due to factors such as inadequate dietary intake, increased physiological demands during rapid growth, and iron losses associated with menstruation. Other causes of anemia include malaria, chronic infections, and deficiencies in essential vitamins such as A, B12, and folate. Notably, vitamin C plays a significant role in enhancing iron absorption. Good nutrition is a fundamental requirement for maintaining positive health (Singh and Sandhu, 2014). *Fuglie* notes and describes their important nutritional value (2005) reported that just one serving of dried drumstick leaf powder provides 14% of a child's daily protein needs, 40% of calcium, 23% of iron, and nearly all the required vitamin A. For women, a 100-gram portion of the leaves meets over one-third of daily calcium requirements and provides substantial amounts of iron, protein, copper, sulfur, and B-vitamins. Considering these attributes, the current study aims to evaluate the impact of drumstick leaf powder supplementation in managing iron deficiency anemia among adolescent girls in M.P., with the broader goal of addressing malnutrition in this vulnerable group.

MATERIALS AND METHODS:

This study focused on assessing the impact of drumstick leaf powder supplementation on iron deficiency anemia in adolescent girls. On farm trial was conducted in 2019 & 2021 in the adopted village of Tiwarikheda & Sihoda, block Panager & Sahrpura, M.P. A one-group pre- and post-test pre-experimental design was utilized, with 20 adolescent girls aged 13–18 selected using a convenient sampling method. The participants had hemoglobin levels ranging from 9–10 g/dL and were identified as anemic. Assessments were conducted from three month each year and included anthropometric, biochemical, clinical, and nutritional evaluations. Informed consent was obtained from all participants and their guardians before the intervention. Baseline hemoglobin levels were recorded prior to initiating supplementation. The intervention involved administering 10 grams of dry drumstick leaf powder daily for three months. To ensure accurate results and participant compliance, potential inhibitors of iron absorption such as tea and coffee were withheld during the supplementation period. Hemoglobin levels were measured again at the end of the intervention to assess the effectiveness of the supplementation.



Socio-Economic Survey: Socio-economic data were collected using an interview schedule. Information gathered included participants' age, educational class, family type, family composition, and monthly household income.

Anthropometric Measurements: Anthropometric assessments of the selected participants were conducted following standard procedures, focusing on height, weight, and body mass index (BMI):

Height: Height was measured with participants standing erect, feet together, and heels against a flat surface. Measurements were taken to the nearest centimeter.

Weight: Weight was measured using a digital weighing scale. Participants were instructed to remove extra clothing and shoes before stepping on the scale. The weight was recorded to the nearest half kilogram.

Body Mass Index (BMI): BMI was calculated using the formula: WHO (1997) classifications, published in 2000, were used to categorize BMI as follows:

Grading	BMI
Underweight	<18.5
Normal	18.5-25
Overweight	25-29.9
Obesity	>30

Biochemical assessment: Laboratory evaluation can identify specific nutrition related abnormalities like anemia, iron deficiency or protein deficiency. The packed cell volume of whole blood (hematocrit) is often used to diagnose iron deficiency. The direct determination of iron and the degree of saturation of transferrin are extremely useful detection iron deficiency status. Blood hemoglobin level of the subjects was estimated before and after intervention.

Diet survey: Diet survey was conducted with the help of pretested schedule approved by ICMR (2000) [3]. 24-hour recall method was used to gather information on food intake. The data collected through diet-survey was converted in terms of weight and tabulated accordingly. Calories, proteins, fats, carbohydrates, iron and vitamin A was calculated with the help of food composition tables of the ICMR. These were compared with Recommended Dietary Allowances (RDA) 2010.



Process of making drumstick leaves powder harvesting of leaves: Young and old leaves both are used for making dried leaf powder. Drumstick leaves can easily lose moisture after harvesting, therefore, harvest early in the morning and complete the initial phase of processing in the same day, if possible. Diseased and damaged leaves are discarded manually just after the collection of fresh leaves.

Washing: Collected leaves are washed in running tap water till the removal of dirt. After this leaves are soaked in 1% saline solution (NaCl) for 5 minutes to remove dust, pathogens as well as microbes present on the leave surface.

Drying: It is estimated that only 20-40% of vitamin A will be retained if leaves are dried under direct sunlight, but that 50- 70% will be retained if leaves are dried in the shade therefore we just go to the shadow drying.

Grinding: In small scale dried leafs can be grinded by mortar and pestles or pulverizer machine can be used for fine grinding, but we used mixer grinder for this purpose.

Storage of leaves powder: Dried powder stored in clean airtight containers, protected from light and humidity, and kept below 24 °C (75.2 °F) for 6 month.

Proximate composition of dry drumstick leaves

Nutrients	Fresh leaves	Shadow dry leaves
Energy (Kcal)	92	271.83 (66.15)
Proteins (gm)	6.7	23.66 (71.68)
Fats (gm)	1.7	7.03(75.81)
Carbohydrates(gm)	12.5	28.47 (56.10)
Iron (mg)	0.85	24 (96.45)
Calcium (mg)	440	3405 (82.88)



RESULTS AND DISCUSSION:

Socio-Economic Status

Table 1 indicates the socio-economic characteristics of the study participants:

- Age Distribution: 40% of the participants were 15 years old, 20% were 18 years old, 15% were 16 years old, 10% were 13 & 17 years old and only 5% were 14 years old.
- Family Type: The majority of participants belonged to nuclear families.
- Dietary Habits: 67% of the participants were vegetarians, while 33% were non-vegetarians.
- Education Level: Most of the participants were studying in High School.

These findings highlight the demographic and lifestyle factors relevant to the study population, which could influence their nutritional status and susceptibility to iron deficiency anemia.

Note: Figures in parentheses throughout the study represent the percentage increase in nutrient content after dehydration, as reported by Joshi and Mehta (2010) [4]. The nutrient values of fresh leaves are based on the “Nutritive Value of Indian Foods.”

Table 1: Socio Economic Status of sample

Variables	Subject	Percentage of Subject
Age	13 years	10
	14 years	5
	15 years	40
	16 years	15
	17 Years	10
	18 Years	20
Type of Family	Nuclear	87
	Joint	13
Educational Status	Middel School	25
	High School	38



	Higher School	37
Type of meal	Vegetarian	67
	Non-Vegetarian	33

Anthropometric assessment Table- 2 show that the Anthropometric measurement of the 20 anemic adolescence girl between age of 13-18. Pre and post observation after intervention of three month indicate that there was increase in average weight from 36 kg to 37.4 kg respectively. In case of height there are no significant observation was found as it is 144 cm before and after intervention. Body mass index (BMI) was calculated using formula weight (Kg) and height (in m²) before intervention it was 17.4 and after intervention it was recorded 18.1.

Anthropometric Assessment

Table 2 presents the anthropometric measurements of 20 anemic adolescent girls aged 13–18 years, recorded before and after a three-month intervention with drumstick leaf powder supplementation.

- **Weight:** The average weight increased from 35 kg pre-intervention to 36.4 kg post-intervention.
- **Height:** No significant change in height was observed, with the average remaining at 164 cm before and after the intervention.
- **Body Mass Index (BMI):** The BMI was calculated using the formula:

The average BMI improved from 17.2 (underweight) before the intervention to 18.8, indicating a slight improvement in nutritional status.

These results suggest a positive impact of the intervention on the participants' overall nutritional status, with a slight increase in body weight and BMI.

The data indicate that all measured nutrients were consumed in amounts below the RDA, reflecting overall inadequacies in dietary intake among the study participants. These nutritional gaps underscore the importance of targeted dietary interventions, such as supplementation with nutrient-dense foods like drumstick leaf powder.



Table 3: Biochemical assessment

Biochemical Analysis	Normal (gm/dl)	Before intervention	After intervention
Hemoglobin (gm/dl)	11-14	9.8	11.2

Biochemical Assessment

Following three months of daily supplementation with 10g of dry drumstick leaf powder, the mean hemoglobin level of the participants showed a notable improvement, increasing by an average of 1.2 g/dL. This result underscores the beneficial effect of drumstick leaf powder in addressing iron deficiency anemia. Similar findings were reported by *Chandra et al. (2015) [1]*, where significant improvements in hemoglobin levels were observed in women aged 15–45 years after consuming drumstick leaves *poriyal* (a traditional dish). These findings highlight the potential of drumstick leaf powder as an effective and affordable dietary supplement for combating anemia.

In conclusion, anemia continues to be a prevalent health issue among adolescent girls, with potential long-term consequences, including higher morbidity and mortality during the motherhood stage. The study highlighted that many girls lack adequate knowledge about anemia, its causes, prevention, and management. The use of dry drumstick leaves powder demonstrated a mild but positive impact on improving anemia, with significant increases in hemoglobin levels following supplementation. With 10 grams of drumstick leaves powder providing approximately 30.6 Kcal, 2.6g of protein, 4.5mg of iron, and 198 mg of calcium, this affordable and locally available food source proves effective in combating iron deficiency anemia. Furthermore, drumstick leaves powder offers a cost-effective nutritional supplement, especially beneficial for economically disadvantaged communities. Therefore, promoting its use as a dietary supplement could be an effective strategy to address the widespread issue of anemia in adolescent girls.

REFERENCES:

1. Chandra T, Karunagari K, Felix AJW. Effect of drumstick leaves supplementation in treating iron deficiency anemia in women of reproductive age group (15-45yrs). *International Journal of Modern Research Reviews*. 2015. 3(11):1065-69.
2. Fuglie LJ. The moringa tree: A local solution to malnutrition? Church world service, Senegal, 2005.



3. ICMR. Recommended dietary intakes for Indians. Expert Group, Indian Council of Medical Research, New Delhi, 2000.
4. Joshi P, Mehta D. Effect of dehydration on the nutritive value of drumstick leaves. Journal of metabolomics and system biology. 2010; 1(1):5-9.
5. Joshi SM, Swarna L, Agarwa SS, Mishra MK, Umashankar S. A study of nutritional status of adolescent girls in rural area of Bhopal district. National Journal of Community Medicine. 2015; 5:191-4.
6. Alka Singh , RK Yadav and Deepali Suryavanshi, The Effect of Drumstick Leaves (*Moringa oleifera*) and Aonla (*Emblica officinalis*) Powder on Blood Profile and Lipid Profile ,Indian Res. J. Ext. Edu. 18 (5), KVK special issue, December, 2018
6. Kaviyaasi R, Abirami J. Effect of cauliflowers greens *poriyal* supplementation on blood hemoglobin levels of anaemic adolescent girls. International Journal of Scientific and Engineering Research. 2017.8(6):2229-55.
7. Mishra SP, Singh P, Singh S. Processing of *Moringa oleifera* leaves for human consumption. Bulletin Environmental Pharmacology and Life Science. 2012; 2(1):28-31. 8. WHO. WHO Expert committee on medical assessment of nutritional status. Health Organization Technical Research Ser., 1963, 258.