

Original Article

The effect of mung bean juice (*Vigna radiata*) on hemoglobin levels among pregnant women with anemia

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Abstract:

Anemia in pregnancy reduces oxygen-carrying capacity and increases maternal-fetal risk. Locally available iron-containing foods may support standard iron supplementation. Objective: This study analyzed the effect of mung bean juice (*Vigna radiata*) on hemoglobin levels among pregnant women with anemia in the working area of Damuli Public Health Center. A quasi-experimental one-group pretest-posttest study was conducted from June to August 2023. Fifteen second- and third-trimester pregnant women with anemia consumed mung bean juice for 14 consecutive days while continuing iron tablet supplementation. Hemoglobin levels were measured before and after the intervention using a hemoglobin meter. Data normality was assessed using the Shapiro-Wilk test, and hemoglobin differences were analyzed using the Wilcoxon signed-rank test. Most respondents were in the third trimester (73.3%) and had secondary education (66.7%). The mean hemoglobin level increased from 10.5 ± 0.32 g/dL to 11.4 ± 0.27 g/dL, with a mean increase of 0.9 g/dL. The Wilcoxon test showed a significant improvement ($p < 0.001$). Mung bean juice was associated with increased hemoglobin levels among pregnant women with anemia and may be used as supportive dietary counseling alongside iron supplementation and routine antenatal care.

Keywords:

anemia in pregnancy, hemoglobin, mung bean juice, nutritional intervention, *Vigna radiata*

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INTRODUCTION

Anemia during pregnancy is a persistent global maternal health problem and is especially important in low- and middle-income countries where dietary diversity, infection control, antenatal care access, and supplement adherence remain uneven. It is generally defined by hemoglobin concentration below the recommended threshold for pregnancy and reflects a reduced capacity of maternal blood to transport oxygen to maternal tissues and the fetus. Iron deficiency is the most common cause, but anemia may also be influenced by folate and vitamin B12 deficiency, chronic inflammation, parasitic infections, hemoglobinopathies, short birth intervals, and inadequate dietary intake (Benson et al., 2022; Faghir-Ganji et al., 2023; Garzon et al., 2020). During pregnancy, iron

requirements increase because of maternal red-cell mass expansion, placental development, fetal growth, and preparation for blood loss during delivery. If these requirements are not met, hemoglobin concentration may decline, and clinical anemia may develop.

The consequences of anemia in pregnancy are clinically relevant. Large population-based studies have shown that anemia severity is associated with adverse maternal and fetal outcomes, including preterm birth, placental abruption, severe postpartum hemorrhage, fetal growth restriction, and stillbirth, particularly when anemia is moderate or severe (Lauer et al., 2024; Shi et al., 2022; Wang et al., 2025). In addition, maternal iron deficiency may contribute to fatigue, reduced physical capacity, impaired immunity, lower tolerance to bleeding, and poor quality of life during pregnancy. For the fetus, inadequate maternal iron status may compromise iron transfer and increase vulnerability to low birth weight or suboptimal development. These risks make anemia prevention and treatment an essential component of antenatal care.

Standard management of anemia in pregnancy includes screening, iron-folic acid supplementation, nutrition counseling, treatment of underlying causes, and follow-up hemoglobin assessment. Current evidence supports oral iron supplementation for improving maternal hematological status, although optimal dosing and adherence remain important challenges (Banerjee et al., 2024; Finkelstein et al., 2024; Stanworth et al., 2024). Gastrointestinal side effects, forgetfulness, low knowledge, misconceptions, and limited family support can reduce adherence to iron tablets (Bloor et al., 2021; O'Toole et al., 2024). Therefore, non-pharmacological dietary support may be useful when integrated with standard supplementation. Such approaches should not replace iron tablets when clinically indicated, but they may improve nutrient intake, acceptability, and maternal engagement with anemia management.

Mung bean (*Vigna radiata*) is a locally accessible legume widely consumed in Asian communities. It is valued for its protein, carbohydrate, fiber, folate, iron, zinc, magnesium, potassium, and bioactive compounds, including phenolic acids and flavonoids (Dahiya et al., 2015; Hou et al., 2019; Idris & Urga, 2025). Recent evidence from food science confirms that mung bean varieties contain substantial amounts of plant protein and minerals, while processing methods such as soaking, boiling, and preparing beverages may improve palatability and reduce certain antinutritional factors (Desta et al., 2024; Idris & Urga, 2025; Wang et al., 2021). Although non-heme iron from plant sources has lower bioavailability than heme iron, it can still contribute to iron intake, particularly when consumed with vitamin C-rich foods and when dietary inhibitors are minimized (Gharibzahedi & Jafari, 2017; Zhang et al., 2022).

Several studies have examined food-based approaches to increasing hemoglobin levels among pregnant women or other vulnerable groups. Research in Indonesia reported that moringa-based dietary intervention increased hemoglobin levels among pregnant women, while Fe tablets combined with tomato juice improved hemoglobin levels in third-trimester pregnant women with anemia (Carolín et al., 2023; Laiskodat et al., 2021). Another line of research has published studies showing that avocado and honey, beetroot juice, and other nutritional interventions can improve hemoglobin or other nutritional indicators among pregnant women (Carolín, Rukmaini, & Situmorang, 2023; Kundarti et al., 2024; Novelia et al., 2025). In addition, a randomized controlled trial reported that a mung bean drink containing inulin and iron tablets supported the erythropoietic response among adolescent girls with iron-deficiency anemia (Putri et al., 2024). These findings support the

feasibility of investigating mung bean juice as a complementary food-based intervention for pregnancy-related anemia.

The local preliminary assessment at the Damuli Public Health Center showed that anemia among pregnant women persisted and that many rarely consumed iron-rich foods such as mung beans. This situation suggests an opportunity to strengthen locally acceptable nutrition interventions within antenatal services. Based on this background, the present study aimed to analyze the effect of mung bean juice on hemoglobin levels among pregnant women with anemia in the working area of Damuli Public Health Center. The study provides practical evidence for midwives and primary care providers on the use of locally available foods as supportive nutritional counseling for anemia management.

METHOD

This study used a quantitative quasi-experimental design with a one-group pretest-posttest approach. The design was selected to evaluate changes in hemoglobin levels before and after the administration of mung bean juice among pregnant women with anemia. Although this design does not include a separate control group, it is useful for preliminary evaluation of a practical nutrition intervention in a primary health care setting. The study was conducted in the working area of the Damuli Public Health Center from June to August 2023.

The population consisted of pregnant women with anemia who visited or were registered at the Damuli Public Health Center during the study period. The final sample included 15 pregnant women selected according to eligibility criteria. Inclusion criteria were pregnant women in the second or third trimester with anemia based on hemoglobin assessment, willingness to participate, willingness to consume mung bean juice according to the study protocol, and continued standard iron tablet supplementation as recommended by health workers. Exclusion criteria were pregnancy complicated by preeclampsia, tuberculosis, diabetes mellitus, kidney disease, or other clinical conditions requiring special medical management that could influence hemoglobin levels or dietary intake.

The intervention consisted of mung bean juice consumed for 14 consecutive days. Each respondent received mung bean juice prepared from boiled, blended, and filtered mung beans, served as a beverage. Respondents consumed three servings per day, with each serving containing approximately 120 g of mung bean preparation, according to the source protocol. The intervention was delivered as supportive nutrition and did not replace iron tablets. Respondents were advised to continue consuming iron tablets and to follow antenatal recommendations from the public health center. Compliance was monitored using an observation sheet.

Hemoglobin level was the primary outcome. Hemoglobin was measured before the intervention and again after 14 days using a hemoglobin meter. The measurement results were recorded in g/dL. Respondent characteristics included gestational age and education level. Gestational age was categorized into the second and third trimesters, and education level into lower, middle, and upper. Data collection was conducted by the research team after informed consent had been obtained from all respondents.

Data analysis was performed using descriptive and inferential statistics. Descriptive analysis was used to summarize respondent characteristics and hemoglobin levels, reporting frequencies, percentages, means, standard deviations, and minimum-maximum values. The Shapiro-Wilk test was used to assess data normality because the sample size was fewer than 50. Since the hemoglobin data were not normally distributed, the Wilcoxon signed-rank test was used to compare pretest and posttest hemoglobin levels. A p-value of < 0.05 was considered statistically significant.

The study was conducted in accordance with ethical principles of voluntary participation, confidentiality, beneficence, and non-maleficence. Respondents received information about the purpose, procedures, possible benefits, and their right to withdraw from the study. No personal identifiers were reported in the manuscript.

RESULT

Fifteen pregnant women with anemia completed the study, which included the pretest assessment, a 14-day mung bean juice intervention, and a posttest hemoglobin measurement. No participant withdrew during the intervention period. The baseline characteristics of the participants are presented in Table 1. Most participants were in the third trimester (73.3%), while 66.7% had a middle level of education.

Table 1. Characteristics of Pregnant Women with Anemia at Damuli Public Health Center (n = 15)

Characteristic	Category	n	%
Gestational age	Second trimester	4	26.7
	Third trimester	11	73.3
Education level	Lower	3	20.0
	Middle	10	66.7
	Upper	2	13.3

Hemoglobin concentrations before and after the intervention are shown in Table 2. The mean hemoglobin concentration increased from 10.5 ± 0.32 g/dL at baseline to 11.4 ± 0.27 g/dL after the 14-day intervention, corresponding to a mean increase of 0.9 g/dL. The observed post-intervention values ranged from 10.9 to 11.8 g/dL, compared with 9.8 to 10.9 g/dL at baseline.

Table 2. Hemoglobin Concentrations Before and After the 14-Day Mung Bean Juice Intervention (n = 15)

Measurement	Mean $\pm$ SD (g/dL)	Range (g/dL)
Pretest	10.5 ± 0.32	9.8–10.9
Posttest	11.4 ± 0.27	10.9–11.8
Mean change (Δ)	0.9	—

Table 3. Wilcoxon Signed-Rank Analysis of Hemoglobin Concentrations (n = 15)

Analysis	Result	p-value	Interpretation
Wilcoxon signed-rank test	Posttest > pretest	< 0.001	Significant increase in hemoglobin

The distribution of hemoglobin values was assessed using the Shapiro–Wilk test. The data were not normally distributed ($p = 0.039$); therefore, a Wilcoxon signed-rank test was performed. The analysis demonstrated a statistically significant increase in hemoglobin concentration following the intervention ($p < 0.001$).

DISCUSSION

This study found that hemoglobin levels in pregnant women with anemia increased significantly after 14 days of consuming mung bean juice. The mean hemoglobin level increased from 10.5 g/dL to 11.4 g/dL, with a mean difference of 0.9 g/dL. This result suggests that mung bean juice may be a useful supportive dietary intervention when integrated with standard iron supplementation and routine antenatal care. The finding is clinically relevant because even modest improvement in hemoglobin may help shift pregnant women from a lower hemoglobin category toward a safer range, especially when the intervention is affordable and acceptable in the local context.

The biological plausibility of this finding is supported by the nutritional profile of mung beans. Mung beans contain plant-based protein, iron, folate, minerals, dietary fiber, and bioactive compounds that may support maternal nutrition (Dahiya et al., 2015; Hou et al., 2019; Idris & Urga, 2025). Protein is required for tissue formation and general maternal-fetal growth, while iron and folate are directly related to erythropoiesis and hemoglobin synthesis. Although mung beans contain non-heme iron, which is less readily absorbed than heme iron, consistent dietary intake may still contribute to overall iron availability. The preparation of mung bean juice may also improve acceptability among pregnant women who have difficulty consuming solid foods or have reduced appetite during pregnancy.

Iron absorption is influenced not only by the amount of iron consumed but also by enhancers and inhibitors in the diet. Vitamin C can improve non-heme iron absorption by reducing ferric iron to ferrous iron and forming soluble iron complexes, whereas phytate, tannins, tea, coffee, and some dietary inhibitors may reduce absorption (Gharibzahedi & Jafari, 2017; Zhang et al., 2022). Therefore, counseling on mung bean juice should be accompanied by education on optimizing absorption, such as taking iron tablets with water, consuming vitamin C-rich foods, and avoiding tea or coffee immediately after iron intake. This is consistent with evidence showing that Fe tablets combined with tomato juice improved hemoglobin levels in third-trimester pregnant women with anemia (Carolín et al., 2023).

The results are also consistent with other food-based interventions for anemia in pregnancy. Laiskodat et al. (2021) reported that moringa-based intervention improved hemoglobin levels among pregnant women. Other studies have also reported improvements in hemoglobin or nutritional indicators after nutrition-based interventions, including avocado and honey, beetroot juice, and spirulina supplementation (Carolín, Rukmaini, & Situmorang, 2023; Kundarti et al., 2024; Novelia et

al., 2025). These findings collectively suggest that locally available foods can be integrated into antenatal nutrition education as supportive interventions. However, such interventions should be positioned as complementary strategies rather than substitutes for evidence-based iron-folic acid supplementation.

The magnitude of hemoglobin improvement in this study should be interpreted carefully. The intervention lasted only 14 days, and the study used a one-group pretest-posttest design without a control group. The observed increase may have been influenced by mung bean juice, continued iron tablet consumption, improved dietary attention during the study period, or better adherence due to monitoring. Nonetheless, the significant change observed after a short intervention period is encouraging and may warrant further controlled trials with larger sample sizes. A randomized controlled design would better separate the effect of mung bean juice from iron tablet adherence and other dietary changes.

Most respondents were in the third trimester. This is important because maternal blood volume expansion and fetal iron transfer are pronounced during later pregnancy, making hemoglobin monitoring and dietary support essential. Evidence indicates that hemoglobin concentration and iron status during pregnancy are closely related to birth outcomes and maternal morbidity (Benson et al., 2022; Lauer et al., 2024; Shi et al., 2022). Midwives at public health centers should therefore strengthen routine hemoglobin screening, anemia classification, adherence counseling, and nutrition follow-up, particularly for women in the second and third trimesters.

Education level may also influence how pregnant women understand anemia, dietary counseling, and the importance of consuming iron tablets. In this study, most respondents had middle-level education. Nutrition education should be designed using simple language, visual media, and culturally familiar food examples. Studies from Indonesia Research show the importance of health education, food-based counseling, and maternal nutrition interventions for improving pregnancy-related health indicators (Hasanah & Ilmiah, 2026; Novelia et al., 2022). Integrating counseling on mung bean juice into antenatal classes may help women and families understand how local foods can support anemia prevention and management.

Infection-related factors should not be ignored. Iron deficiency may coexist with inflammatory conditions or parasitic infections, particularly in areas where sanitation and hygiene remain challenges. An article reported that personal hygiene is important for reducing the risk of soil-transmitted helminth infection, which is relevant because helminthiasis can contribute to nutritional problems and anemia (Kurniyawan et al., 2023). Therefore, anemia prevention in pregnancy should combine dietary support, iron supplementation, infection prevention, sanitation improvement, and antenatal monitoring.

The practical implication of this study is that mung bean juice can be used as a locally acceptable nutrition message in maternal health services. Public health centers can provide counseling on preparation, serving sizes, consistency of consumption, and pairing with other iron-rich foods. Families should also be involved because household food preparation and purchasing decisions often influence maternal diet. However, health workers should avoid presenting mung bean juice as a single curative therapy. Pregnant women with moderate or severe anemia, symptoms, poor response to oral iron, or suspected underlying disease should receive clinical evaluation and appropriate treatment according to maternal health guidelines.

This study has several limitations. The sample size was small, the intervention was short, and the one-group design limits causal inference. Dietary intake, iron tablet adherence, infection status, menstrual or bleeding history, and inflammatory markers were not fully controlled for. Hemoglobin was the only hematological outcome; ferritin, transferrin saturation, C-reactive protein, reticulocyte hemoglobin, and dietary recall would have strengthened the analysis. Future studies should use randomized controlled designs, larger sample sizes, longer follow-up periods, and a comparison group receiving iron tablets without mung bean juice. Additional outcomes, such as ferritin levels, maternal symptoms, adherence, acceptability, and birth outcomes, should also be examined.

CONCLUSION

Mung bean juice consumption for 14 days was associated with a significant increase in hemoglobin levels among pregnant women with anemia at Damuli Public Health Center. The mean hemoglobin level increased from 10.5 ± 0.32 g/dL to 11.4 ± 0.27 g/dL, with a mean increase of 0.9 g/dL and a statistically significant Wilcoxon test result ($p < 0.001$). Mung bean juice may be used as a supportive, locally available dietary intervention alongside iron tablet supplementation, antenatal monitoring, and nutrition education. Further research with a larger sample and controlled design is recommended to confirm its independent effect and clinical relevance.

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AI USE DECLARATION

Artificial intelligence tools were used only to assist with language refinement, grammar checking, and manuscript formatting. The authors remain fully responsible for the study content, data interpretation, conclusions, and final version of the manuscript.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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