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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 remains a maternal health problem because it can reduce maternal endurance and increase the risk of poor maternal and fetal outcomes. Mung bean juice is a local food-based intervention that may support hemoglobin improvement when combined with standard Fe tablet consumption. This study aimed to analyze the effect of mung bean juice on hemoglobin levels among pregnant women with anemia in the working area of Damuli Community Health Center. This quantitative study used a quasi-experimental one-group pretest-posttest design. The sample consisted of 15 pregnant women with anemia selected by total sampling. Respondents consumed mung bean juice three times daily for 14 days and continued Fe tablets. Hemoglobin levels were measured before and after the intervention using a hemoglobin measuring device. Data were analyzed using descriptive statistics, the Shapiro-Wilk normality test, and the Wilcoxon signed-rank test. Most respondents were in trimester III (73.3%) and had middle-level education (66.7%). The mean hemoglobin level increased from 10.5 +/- 0.32 g/dL before the intervention to 11.4 +/- 0.27 g/dL after the intervention. The mean difference was 0.9 g/dL. The Wilcoxon test showed a significant difference between pretest and posttest hemoglobin levels (p = 0.000). Mung bean juice can significantly improve hemoglobin levels among pregnant women with anemia. Health workers can use mung bean juice as a complementary nutrition counseling strategy while maintaining Fe tablet adherence and routine hemoglobin monitoring.

Keywords:
anemia, hemoglobin, mung bean juice, pregnant women, vigna radiata

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INTRODUCTION

Anemia in pregnancy remains a major maternal health problem because it reduces the capacity of blood to carry oxygen to maternal tissues and the fetus. This condition can occur when the concentration of hemoglobin, red blood cell mass, or iron stores falls below the physiological demand of pregnancy. During the second and third trimesters, plasma volume expands more rapidly than red cell mass. This hemodilution increases the risk of low hemoglobin levels, especially when iron intake, absorption, and supplementation do not meet maternal requirements. Recent global evidence shows that iron deficiency anemia continues to affect a substantial proportion of pregnant

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women and varies across gestational age, socioeconomic context, diet quality, infection burden, and access to antenatal care (Kebede et al., 2025; Burayu & Degefa, 2024). The clinical importance is high because anemia can reduce maternal endurance, increase fatigue, affect immunity, and contribute to poor maternal and neonatal outcomes (Shi et al., 2022; Lauer et al., 2024).

The effect of anemia does not stop at laboratory findings. Pregnant women with anemia may face a higher risk of infection, postpartum hemorrhage, tolerance problems, preterm birth, low birth weight, and delayed recovery after delivery. Severe anemia can also increase the risk of maternal morbidity and mortality, especially when emergency obstetric care is delayed. Studies in several settings show that anemia in pregnancy often coexists with low nutritional quality, low health literacy, irregular antenatal care, and low adherence to iron supplementation (El-Kholy et al., 2023; O'Toole et al., 2024). These factors make anemia a biological and behavioral problem. World Health Organization maternal health guidance also includes anemia control within broader efforts to reduce preventable maternal deaths and strengthen the quality of antenatal care (World Health Organization, 2023).

Iron supplementation remains the main intervention for preventing and treating anemia in pregnancy. Daily oral iron supplementation can improve hemoglobin levels, and recent evidence continues to support iron supplementation as a core antenatal strategy (Finkelstein et al., 2024; Banerjee et al., 2024). However, supplementation alone does not always solve the problem. Some pregnant women experience nausea, constipation, forgetfulness, low perceived need, or low family support, which can reduce adherence. The experience of taking oral iron during pregnancy can influence whether mothers continue the treatment as recommended (O'Toole et al., 2024). Therefore, health workers need practical, acceptable, and locally available food-based strategies to support iron intake and improve maternal nutrition behavior. Nutrition education, family involvement, and regular monitoring also shape maternal health awareness, as shown in studies on family support and nutrition-related health awareness (Kurniyawan et al., 2023a; Kurniyawan et al., 2023b).

Mung bean (Vigna radiata) is a local food source that has potential as a supportive nutritional intervention for anemia. Mung beans contain plant protein, iron, folate, magnesium, and other micronutrients that can support hemoglobin synthesis when consumed as part of a balanced diet. They are also affordable, familiar, and easy to process into juice or extract. Plant-based iron has lower bioavailability than heme iron, but it can still contribute to daily intake when combined with adequate vitamin C and continuous Fe tablet use. Recent work on underutilized iron-rich plant foods argues that locally available plant foods should be considered as part of strategies to address anemia, particularly in communities where access to diverse animal-source foods is limited (Kaur et al., 2025). Evidence on nutritional mitigation also supports the role of comprehensive strategies that combine supplementation, dietary improvement, education, and monitoring rather than relying on a single intervention (Kumar et al., 2022; Van Cor et al., 2022).

Several studies have examined food-based interventions to increase hemoglobin. Moringa leaf soup improved hemoglobin levels among third-trimester pregnant women (Kundaryanti & Novelia, 2021). Other studies also reported improvements in hemoglobin levels after avocado and honey, beetroot juice, and Dutch eggplant juice, and mild anemia management through education, supplementation, and monitoring (Carolin et al., 2023; Novelia et al., 2025; Ferasinta & Dinata, 2024; Husna et al., 2025). For mung bean interventions, previous studies reported improved hemoglobin levels after giving mung bean juice, mung bean extract, or mung bean juice combined with Fe tablets

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(Choirunissa & Manurung, 2020; Sari et al., 2020; Mayasari et al., 2021; Wulan & Vindralia, 2021; Ratnaningsih et al., 2024; Lamana et al., 2024). These findings suggest that mung bean juice can become a feasible complementary intervention in primary health care settings.

Despite this evidence, local data remain important because food acceptance, adherence, preparation method, and antenatal service context can differ between health center areas. The preliminary condition at the Damuli Community Health Center showed that several pregnant women rarely consumed iron-rich food sources, including mung beans. The local health team needed empirical evidence to support counseling and practical nutrition recommendations for pregnant women with anemia. This study aimed to analyze the effect of mung bean juice supplementation on hemoglobin levels among anemic pregnant women in the working area of the Damuli Community Health Center. The study focused on changes in hemoglobin levels before and after a 14-day intervention, while respondents continued standard Fe tablet use.

METHOD

This study used a quantitative quasi-experimental design with a one-group pretest-posttest approach. The design was selected because the study aimed to compare hemoglobin levels in the same respondents before and after the nutritional intervention. The study was conducted in the Damuli Community Health Center's working area from June to August 2023. The target population consisted of pregnant women diagnosed with anemia who visited the health center during the study period. The accessible population was 15 pregnant women in the second and third trimesters who met the study criteria and agreed to participate. The sampling technique used was total sampling because the number of eligible respondents was limited, and all respondents who fulfilled the criteria were included in the intervention group.

The inclusion criteria were pregnant women with anemia, pregnant women in trimester II or trimester III, women who were willing to consume mung bean juice during the intervention period, and women who continued consuming Fe tablets according to health worker recommendations. The exclusion criteria were pregnant women with preeclampsia, tuberculosis, diabetes mellitus, kidney disease, or other clinical conditions that could interfere with hemoglobin status or require special medical management. Respondents who could not complete the intervention schedule or refused the second hemoglobin examination were also excluded from the final analysis. Before data collection, the researchers explained the study objective, intervention procedure, possible discomfort, confidentiality, and voluntary participation. Each respondent signed informed consent.

The intervention consisted of mung bean juice given for 14 consecutive days. Respondents consumed three portions per day. Each portion contained 120 grams of mung bean juice preparation. The juice was prepared from mung beans that were boiled, blended, filtered, and served in a ready-to-consume form. Respondents were instructed to consume the juice regularly and to continue Fe tablets during the study period. This decision followed the principle that food-based intervention should support, not replace, standard anemia management in pregnancy. The intervention model was aligned with previous mung bean and Fe tablet studies that used pretest-posttest measurement to evaluate hemoglobin changes (Choirunissa & Manurung, 2020; Sari et al., 2020; Lamana et al., 2024).

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The main outcome variable was hemoglobin level measured in g/dL. Hemoglobin was measured before the intervention and again after 14 days of mung bean juice consumption. The instruments used were a hemoglobin measuring device and an observation sheet. The observation sheet recorded respondent identity code, gestational age, education level, pretest hemoglobin, posttest hemoglobin, and intervention adherence. Data quality was controlled by using the same measurement procedure before and after the intervention, by checking the device before use, and by recording results immediately after each measurement. Respondent characteristics were analyzed descriptively using frequency and percentage. Hemoglobin levels were summarized using mean, standard deviation, minimum, and maximum values.

Data analysis used univariate and bivariate procedures. The Shapiro-Wilk test was applied to assess the normality of hemoglobin data because the sample size was less than 50. The normality test indicated that the data were not normally distributed ($p < 0.05$). Therefore, the Wilcoxon signed-rank test was used to compare hemoglobin levels before and after the intervention. The level of significance was set at 0.05 with a 95% confidence level. A p-value below 0.05 was interpreted as a statistically significant difference between pretest and posttest hemoglobin levels. The analysis focused on whether mung bean juice consumption was associated with an increase in hemoglobin after the intervention period.

RESULT

The study included 15 pregnant women with anemia who completed the intervention and hemoglobin measurement schedule. Respondent characteristics are presented in Table 1. Most respondents were in trimester III, and most had a middle level of education. Hemoglobin results before and after the intervention are presented in Tables 2 and 3.

Table 1. Characteristics of pregnant women with anemia (n=15)

Characteristics	Frequency (n)	Percentage (%)
Gestational age		
Trimester II	4	26.7
Trimester III	11	73.3
Level of education		
Lower	3	20.0
Middle	10	66.7
Upper	2	13.3

Based on Table 1, most respondents were in trimester III (11, 73.3%). Most respondents had a middle-level education (10, 66.7%).

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Table 2. Mean hemoglobin levels before and after mung bean juice intervention

Hemoglobin level (g/dL)	Mean +/- SD	Min - Max
Pretest	10.5 +/- 0.32	9.8 - 10.9
Posttest	11.4 +/- 0.27	10.9 - 11.8

Table 2 shows that the mean hemoglobin level increased from 10.5 +/- 0.32 g/dL before the intervention to 11.4 +/- 0.27 g/dL after 14 days of mung bean juice consumption.

Table 3. Wilcoxon test results for hemoglobin levels before and after intervention

Hemoglobin level (g/dL)	Mean +/- SD	Mean difference	p-value
Pretest	10.5 +/- 0.32	0.9	0.000
Posttest	11.4 +/- 0.27		

The Wilcoxon signed-rank test showed p = 0.000, indicating a significant difference in hemoglobin levels before and after the mung bean juice intervention.

DISCUSSION

The results showed that hemoglobin levels increased after 14 days of consuming mung bean juice. The mean hemoglobin level before the intervention was 10.5 +/- 0.32 g/dL, and after the intervention, it was 11.4 +/- 0.27 g/dL. The mean increase was 0.9 g/dL. The Wilcoxon test yielded p = 0.000, indicating a statistically significant difference between pretest and posttest hemoglobin levels. This finding supports the use of mung bean juice as a complementary nutritional intervention for pregnant women with anemia in a primary health care setting. The finding also aligns with the concept that anemia management requires a combined approach involving Fe tablets, iron-rich foods, nutrition counseling, and regular monitoring (Finkelstein et al., 2024; Kumar et al., 2022; Van Cor et al., 2022).

The improvement in hemoglobin can be explained through the nutritional content of mung beans and the continued use of Fe tablets. Mung beans contain plant protein, iron, folate, and several micronutrients needed for erythropoiesis. Protein supports globin synthesis, while iron supports heme formation. Folate contributes to red blood cell maturation. Although the iron in mung beans is non-heme iron, regular consumption can contribute to total dietary iron intake. When pregnant women also take Fe tablets, mung bean juice may enhance the overall nutritional environment required for hemoglobin synthesis. Recent reviews on plant-based iron-rich foods stress that underutilized legumes can support anemia prevention when integrated with broader diet and supplementation strategies (Kaur et al., 2025; Kebede et al., 2025).

This result is consistent with several studies on mung bean interventions. Ratnaningsih et al. (2024) found that mung bean extracts increased hemoglobin levels among pregnant women in trimesters II and III, with a significant difference in the Wilcoxon test. Choirunissa and Manurung (2020) also reported that mung bean juice affected hemoglobin levels among pregnant women. Sari

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et al. (2020) found that adding mung bean juice to Fe tablets increased hemoglobin in pregnant women. Mayasari et al. (2021), Wulan and Vindralia (2021), Mas'amah and Utami (2022), and Retnorini et al. (2017) reported similar patterns of hemoglobin improvement after mung bean-based interventions. Lamana et al. (2024) compared legume juice combined with Fe tablets and showed that both green bean and red bean juice combinations improved hemoglobin. Together, these findings show that the present result is not isolated. It follows a repeated empirical pattern in which legume-based nutritional support improves hemoglobin indicators.

The magnitude of the increase in this study, 0.9 g/dL, is clinically meaningful for pregnant women with mild anemia because it moved the group mean from the anemic range toward the normal threshold. This change may reduce fatigue and support better maternal physiological reserve. However, the interpretation must remain cautious. The study did not use a control group. The increase could be influenced by the combined effect of mung bean juice, Fe tablets, dietary changes, improved attention from health workers, and natural variation in hemoglobin values. Even so, a pretest-posttest design remains useful for early evidence in a small health center setting. It helps identify whether an intervention is acceptable and whether the outcome moves in the expected direction before larger controlled studies are conducted.

The study also aligns with broader evidence on nutritional interventions for anemia. A study by Kundaryanti and Novelia (2021) showed that Moringa oleifera improved hemoglobin levels in pregnancy. Studies by Carolin et al. (2023) and Novelia et al. (2025) found improved hemoglobin levels following interventions with avocado and honey and beetroot juice. Ferasinta and Dinata (2024) reported the effect of Dutch eggplant juice on anemia prevention among adolescents, while Husna et al. (2025) emphasized the role of education, supplementation, and monitoring in managing mild anemia among pregnant women. These studies suggest that local food interventions have practical value when they are safe, acceptable, and used alongside standard care. The present study contributes to this body of evidence by adding data from the Damuli Community Health Center context.

Anemia prevention also depends on behavioral and family factors. Pregnant women may know that Fe tablets are important, but adherence can decline because of side effects, forgetfulness, low motivation, or limited support at home. Kurniyawan et al. (2023a) reported that family support can increase health awareness, improve nutrition, support treatment compliance, and encourage regular health checks. Kurniyawan et al. (2023b) also discussed the role of parents in fulfilling nutrition and health needs in agricultural settings. Afandi et al. (2023) showed that nutritional status remains linked to broader environmental and health conditions in agronursing contexts. Although these studies did not focus specifically on anemia in pregnant women, they support the argument that a food-based anemia intervention will work better when family and community support maternal nutrition behaviors.

The respondent profile should also be considered. Most respondents were in trimester III. This trimester has high iron demand because fetal growth accelerates and maternal blood volume remains expanded. Setiyarini and Dewi (2025) showed that age and parity are associated with anemia prevalence among third-trimester pregnant women. Other international evidence shows that anemia severity during pregnancy is associated with adverse maternal and fetal outcomes (Shi et al., 2022; Lauer et al., 2024). Therefore, interventions in late pregnancy need quick, feasible, and

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acceptable strategies. A 14-day mung bean juice program is relatively simple for health workers to explain and for mothers to implement, especially when the food is familiar and affordable.

The findings have practical implications for midwifery services. First, midwives can include mung bean juice as part of nutrition counseling for pregnant women with mild anemia while maintaining Fe tablet adherence. Second, health centers can develop simple counseling sheets that explain how to prepare mung bean juice, when to consume it, and why it should not replace Fe tablets. Third, hemoglobin monitoring should continue during antenatal visits so that women who do not improve can receive further assessment. Bó et al. (2022) emphasize that early indicators of iron deficiency can support timely detection, and El-Kholy et al. (2023) showed that counseling can improve awareness of anemia in pregnancy. Counseling should be direct, repeated, and linked to measurable follow-up.

This study has limitations. The sample size was small, and the study used one intervention group without a comparison group. The intervention lasted 14 days, so the study could not assess long-term sustainability or birth outcomes. Dietary intake outside of mung bean juice was not measured in detail, which could have influenced hemoglobin changes. The study also did not measure ferritin, transferrin saturation, or inflammatory markers, so it could not distinguish iron deficiency anemia from other anemia types. Future studies should use a randomized controlled design, a larger sample size, dietary intake assessment, adherence monitoring, and longer follow-up. They should also compare mung bean juice plus Fe tablets with Fe tablets alone to estimate the independent contribution of mung bean juice. Despite these limitations, the study provides useful local evidence that mung bean juice can support hemoglobin improvement among pregnant women with anemia.

CONCLUSION

The study found a significant increase in hemoglobin levels among anemic pregnant women after 14 days of consuming mung bean juice. The mean hemoglobin level increased from 10.5 +/- 0.32 g/dL before the intervention to 11.4 +/- 0.27 g/dL after the intervention, with a mean difference of 0.9 g/dL and p = 0.000. Mung bean juice can be used as a complementary nutrition intervention to support standard Fe tablet consumption in pregnant women with anemia. Midwives and community health centers can integrate this intervention into antenatal counseling, especially when mothers need affordable, familiar, and locally available iron-rich food options. Further research with a control group, larger sample, and longer follow-up is needed to confirm the independent effect of mung bean juice and its impact on maternal and neonatal outcomes.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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