



Nutritional Support Through Mung Bean Juice Supplementation and Its Effect on Hemoglobin Levels among Pregnant Women at Kelua Community Health Center, Tabalong Regency

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Abstract. Anemia during pregnancy remains a major public health concern because it increases the risk of maternal and neonatal complications. Although iron supplementation is routinely provided, its effectiveness may be limited by poor adherence and inadequate nutritional intake. This study aimed to determine the effect of nutrition counseling combined with mung bean juice supplementation on hemoglobin levels among pregnant women at Kelua Community Health Center, Tabalong Regency. A quantitative study with a quasi-experimental one-group pretest–posttest design was conducted among 60 pregnant women selected through purposive sampling. Hemoglobin levels were measured before and after the intervention using a standardized digital hemoglobin analyzer. Respondent characteristics and adherence to the intervention were also recorded. Data were analyzed descriptively, and differences in hemoglobin levels before and after the intervention were assessed using a paired-sample t-test with a significance level of 0.05. The results showed a significant improvement in hemoglobin levels following the intervention. These findings indicate that nutrition counseling combined with mung bean juice supplementation may contribute to improving hemoglobin levels among pregnant women. This integrated approach may serve as a complementary strategy for anemia prevention and management by promoting appropriate nutrition and utilizing locally available food resources in primary maternal healthcare services.

Keywords: Anemia; Hemoglobin; Mung Bean Juice; Nutrition Counseling; Pregnant Women..

1. Introduction

Pregnancy is a critical stage of life characterized by increased nutritional demands to support fetal growth, placental development, and the maintenance of maternal health. Among the nutritional problems commonly encountered during pregnancy, anemia—particularly iron deficiency anemia—remains a major public health concern. This condition is characterized by reduced hemoglobin (Hb) concentration, resulting in diminished oxygen-carrying capacity of the blood. Maternal anemia has been associated with a wide range of adverse outcomes, including fatigue, impaired immune function, reduced physical performance, preterm birth, low birth weight, postpartum hemorrhage, and increased maternal and neonatal mortality. Consequently, the prevention and management of anemia during pregnancy have become essential components of maternal healthcare, requiring integrated promotive, preventive, curative, and rehabilitative strategies (World Health Organization [WHO], 2024; Ministry of Health of the Republic of Indonesia, 2023).

Anemia among pregnant women continues to represent a significant global health challenge and is recognized as an important indicator in achieving the Sustainable Development Goals (SDGs). According to the World Health Organization, approximately one-third of women of reproductive age worldwide are affected by anemia, with pregnancy representing one of the highest-risk periods. The burden is particularly substantial in low- and middle-income countries, where inadequate iron intake, protein deficiency, chronic infections, poor adherence to iron supplementation, and limited access to nutritious foods contribute to its persistence. In Indonesia, maternal anemia remains a major public health issue despite ongoing national intervention programs, with relatively high prevalence reported across many regions, including areas with adequate access to healthcare services (WHO, 2024; Ministry of Health of the Republic of Indonesia, 2023).

Received: July 10, 2025

Revised: August 12, 2025

Accepted: September 21, 2025

Published: October 30, 2025

Curr. Ver.: October 30, 2025



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To address this problem, the Indonesian government has implemented several maternal nutrition programs, including the recommendation that pregnant women consume at least 90 iron and folic acid tablets throughout pregnancy. Nevertheless, improvements in maternal hemoglobin levels have not consistently met expected targets. Previous studies have shown that poor adherence to iron supplementation is frequently associated with gastrointestinal side effects, such as nausea, constipation, and an unpleasant metallic taste, as well as insufficient awareness of the importance of iron supplementation during pregnancy. These findings indicate that pharmacological interventions should be complemented by continuous nutritional education and the utilization of nutrient-rich local foods to enhance their effectiveness (Ministry of Health of the Republic of Indonesia, 2023; Sunuwar et al., 2022).

Nutrition counseling has been recognized as an effective strategy for improving maternal nutritional status and strengthening anemia prevention programs. Through continuous guidance, pregnant women gain knowledge regarding nutritional requirements during pregnancy, appropriate food selection, cooking methods that preserve nutrient content, and the importance of adhering to iron supplementation. Beyond increasing nutritional knowledge, counseling also promotes sustainable behavioral changes that encourage healthier dietary practices and improve maternal nutritional status over time. Compared with supplementation alone, this approach addresses the behavioral determinants of nutritional deficiencies, making it a more comprehensive intervention (Girard & Olude, 2012; WHO, 2024).

One locally available food with considerable potential to support hemoglobin synthesis is mung bean (*Vigna radiata*). Mung beans are rich in plant-based protein, iron, folate, B-complex vitamins, vitamin C, magnesium, phosphorus, and various bioactive compounds involved in erythropoiesis. In addition to their favorable nutritional composition, mung beans are inexpensive, widely available, culturally acceptable, and can be processed into several food products, including mung bean extract, which is more convenient for pregnant women to consume. The combination of protein, vitamins, and minerals contained in mung bean extract may also enhance iron absorption, thereby contributing to improved hemoglobin production through natural dietary mechanisms (USDA, 2023; Gropper & Smith, 2021).

Several previous studies have demonstrated that mung bean-based products can improve hemoglobin levels among vulnerable populations, including pregnant women and adolescent girls. These beneficial effects are believed to result from the synergistic contribution of iron, protein, and folate to red blood cell production. However, most existing studies have evaluated mung bean extract as a standalone nutritional intervention without incorporating structured nutrition counseling. Furthermore, variations in study design, intervention duration, and participant characteristics have produced inconsistent findings, highlighting the need for more comprehensive investigations that integrate both dietary education and nutritional supplementation (Fitriani et al., 2021; Rahmawati et al., 2022).

Kelua Community Health Center in Tabalong Regency is one of the primary healthcare facilities providing routine antenatal care services for pregnant women. Despite the implementation of iron supplementation programs, reports from community health centers indicate that maternal anemia remains a frequently encountered problem. This situation suggests that iron supplementation alone may not be sufficient to effectively address anemia without simultaneous improvements in dietary behavior and overall nutritional intake. Consequently, the incorporation of locally available food resources that are affordable and culturally acceptable offers a practical and sustainable alternative for strengthening maternal nutrition programs within primary healthcare settings (Ministry of Health of the Republic of Indonesia, 2023; South Kalimantan Provincial Health Office, 2023).

A review of the current literature reveals an important research gap. Most previous studies have focused exclusively on the effects of mung bean extract on hemoglobin concentration without integrating continuous nutrition counseling into the intervention. However, improvements in hemoglobin levels are influenced not only by dietary intake but also by maternal knowledge, adherence to nutritional recommendations, daily eating habits, and the ability to adopt balanced dietary behaviors throughout pregnancy. Therefore, combining nutrition counseling with mung bean extract supplementation may produce greater benefits than either intervention alone. Addressing this gap provides the primary rationale for conducting the present study among pregnant women attending Kelua Community Health Center, Tabalong Regency.

The novelty of this research lies in the integration of two complementary intervention strategies: behavior-oriented nutrition counseling and the administration of mung bean extract as a locally available functional food. Unlike previous studies that focused primarily on biological outcomes, this study also emphasizes educational processes aimed at improving maternal adherence to nutritious dietary practices and iron supplementation. This integrated approach is expected to generate a practical, low-cost, and easily replicable intervention model

suitable for implementation in primary healthcare facilities while promoting the utilization of local food resources in maternal anemia prevention programs.

Based on these considerations, this study entitled "The Effect of Nutrition Counseling Combined with Mung Bean Extract Supplementation on Hemoglobin Levels Among Pregnant Women at Kelua Community Health Center, Tabalong Regency" was undertaken. The primary objective was to evaluate the effect of integrating continuous nutrition counseling with mung bean extract supplementation on maternal hemoglobin levels during pregnancy. It is anticipated that the findings will provide scientific evidence to support the development of innovative antenatal nutrition programs, strengthen public health policies promoting the use of local food resources in anemia prevention, and serve as a reference for healthcare professionals in designing more effective and sustainable nutritional interventions within primary healthcare settings.

2. Literature Review

Anemia during pregnancy is defined as a condition in which maternal hemoglobin (Hb) concentrations fall below the recommended thresholds for gestational age, specifically less than 11 g/dL during the first and third trimesters and less than 10.5 g/dL during the second trimester. Pregnancy is characterized by a physiological expansion of plasma volume that exceeds the increase in red blood cell mass, resulting in hemodilution. However, when the increased requirements for iron, folate, protein, and other essential micronutrients are not adequately met, erythropoiesis becomes impaired, leading to the development of anemia. Maternal anemia is associated with an increased risk of adverse maternal and neonatal outcomes; therefore, comprehensive management strategies—including nutritional supplementation, dietary counseling, and improvements in maternal dietary practices—are essential for preventing and treating this condition (World Health Organization [WHO], 2024; Gropper & Smith, 2021).

Health behavior theories emphasize that improving knowledge through nutrition education and continuous counseling can facilitate positive behavioral changes and encourage healthier dietary practices. Nutrition counseling extends beyond the simple delivery of information by incorporating motivation, regular monitoring, and behavioral reinforcement, thereby improving pregnant women's adherence to nutritious diets and iron supplementation. Compared with one-time educational sessions, sustained counseling is considered more effective because it supports long-term behavioral modification and promotes healthier nutritional habits throughout pregnancy (Notoatmodjo, 2018; Contento, 2020).

Mung bean (*Vigna radiata*) is a locally available food source that contains high-quality plant protein, iron, folate, B-complex vitamins, vitamin C, and several essential minerals involved in erythropoiesis. These nutrients contribute synergistically to hemoglobin synthesis and red blood cell production, making mung beans a promising dietary option for improving anemia among pregnant women. In addition to their nutritional value, mung beans are affordable, widely accessible, culturally acceptable, and can be processed into mung bean extract, a form that is easy for pregnant women to consume. Consequently, mung bean extract has considerable potential as a locally sourced nutritional intervention within routine antenatal care services (USDA, 2023; Gropper & Smith, 2021).

Evidence from previous studies indicates that mung bean-based interventions can effectively improve hemoglobin concentrations. Fitriani et al. (2021) reported that regular consumption of mung bean extract significantly increased hemoglobin levels among pregnant women with mild anemia. Similarly, Rahmawati et al. (2022) found that pregnant women who consumed mung bean extract in combination with iron supplementation experienced greater improvements in hemoglobin concentration than those who received iron tablets alone. These findings suggest that locally available food resources may serve as valuable complementary interventions for the prevention and management of maternal anemia.

Research focusing on nutrition counseling has also demonstrated its positive contribution to maternal nutritional outcomes. Intensive nutrition education has been shown to improve nutritional knowledge, increase adherence to iron and folic acid supplementation, and enhance overall dietary quality during pregnancy. Girard and Olude (2012) concluded that nutrition education accompanied by continuous counseling produces more substantial and sustained improvements in dietary behavior than conventional health education delivered without ongoing support. Nevertheless, most previous investigations have evaluated nutrition counseling and food-based interventions independently, leaving limited evidence regarding the effectiveness of integrating these two complementary strategies.

Based on the existing theoretical frameworks and empirical evidence, improvements in maternal hemoglobin levels appear to depend not only on adequate nutrient intake but also on sustained positive dietary behaviors. Accordingly, the present study integrates continuous nutrition counseling with mung bean extract supplementation as complementary components of a single intervention. This integrated approach is expected to produce greater improvements in maternal hemoglobin concentrations than either strategy implemented independently, thereby providing the conceptual foundation for investigating the effectiveness of nutrition counseling combined with mung bean extract supplementation among pregnant women attending Kelua Community Health Center, Tabalong Regency.

3. Research Methods

This study employed a quantitative approach using a quasi-experimental one-group pretest–posttest design. This research design was selected to evaluate changes in hemoglobin (Hb) levels among pregnant women before and after receiving a combined intervention consisting of structured nutrition counseling and mung bean extract supplementation. Hemoglobin measurements were obtained at two time points: prior to the intervention (pretest) and after completion of the intervention period (posttest), allowing direct assessment of changes within the same group of participants.

The study was conducted at Kelua Community Health Center, Tabalong Regency, Indonesia. The study population comprised all pregnant women who attended antenatal care services at the health center during the study period. Participants were recruited using purposive sampling based on predefined eligibility criteria. Inclusion criteria included pregnant women in the second or third trimester who had mild anemia, agreed to participate voluntarily, and completed the entire intervention protocol. Women with severe obstetric complications, chronic medical conditions, or those who failed to complete the intervention were excluded from the study. A total of 60 pregnant women met the eligibility criteria and were included in the final analysis, providing an adequate sample size for the planned statistical procedures.

The independent variable was the integrated intervention consisting of nutrition counseling combined with mung bean extract supplementation, whereas the dependent variable was maternal hemoglobin concentration. Nutrition counseling was delivered through a structured educational program covering maternal nutritional requirements during pregnancy, the importance of adherence to iron and folic acid supplementation, the utilization of locally available nutritious foods, and continuous monitoring of participants' compliance throughout the intervention period. Mung bean extract was administered according to the dosage and duration specified in the study protocol.

Data were collected using a respondent characteristics questionnaire, an intervention adherence observation checklist, and a calibrated digital hemoglobin analyzer that complied with healthcare quality standards. Baseline participant characteristics included maternal age, gestational age, educational attainment, occupation, and parity. Hemoglobin measurements were performed by trained healthcare professionals following standardized operating procedures to ensure measurement accuracy and consistency.

Before implementation, the research instruments underwent content validity assessment by experts in midwifery and nutrition. Reliability testing demonstrated satisfactory internal consistency, with Cronbach's alpha coefficients exceeding 0.70, confirming that the instruments were both valid and reliable for data collection. In addition, the digital hemoglobin analyzer was routinely calibrated in accordance with laboratory quality assurance standards to maintain measurement precision.

Data analysis began with descriptive statistics to summarize participant characteristics using frequencies, percentages, means, and standard deviations. Subsequently, data normality was assessed to determine the appropriate inferential statistical test. For normally distributed data, differences in hemoglobin levels before and after the intervention were analyzed using the paired-samples t-test. When the assumption of normality was not satisfied, the Wilcoxon signed-rank test was applied as the non-parametric alternative. Statistical significance was established at $\alpha = 0.05$. The analytical procedures followed the statistical methodologies recommended by Ghazali (2021) and Dahlan (2020).

The conceptual framework of this study illustrates the relationship between the integrated nutrition counseling and mung bean extract intervention (X) and changes in maternal hemoglobin levels (Y). The independent variable represents the combined behavioral and nutritional intervention, while the dependent variable consists of hemoglobin concentrations measured before and after the intervention. The relationship between these

variables was analyzed to determine the effectiveness of the intervention in improving hemoglobin levels among pregnant women receiving antenatal care at Kelua Community Health Center.

4. Results and Discussion

Results

The study was conducted at Kelua Community Health Center, Tabalong Regency, Indonesia, between February and April 2026. Data collection commenced with coordination between the research team and the community health center, followed by the identification and recruitment of pregnant women who met the predetermined inclusion criteria. Eligible participants received a comprehensive explanation of the study objectives, procedures, potential benefits, and ethical considerations before providing written informed consent.

Baseline hemoglobin (Hb) concentrations were measured prior to the intervention to obtain pre-intervention (pretest) data. Participants subsequently received a structured nutrition counseling program combined with mung bean extract supplementation for 30 consecutive days in accordance with the study protocol. Following completion of the intervention period, hemoglobin levels were reassessed to obtain post-intervention (posttest) measurements.

A total of 60 pregnant women were enrolled in the study, and all participants completed the intervention and follow-up assessments. Consequently, no participant withdrew from the study, resulting in a 100% completion rate with no loss to follow-up.

Participant Characteristics

The baseline characteristics of the study participants are presented in Table 1. Most participants were within the healthy reproductive age range (20–35 years), had completed secondary education, and were predominantly homemakers. In terms of gestational age, the majority of respondents were in the third trimester of pregnancy.

Table 1. Baseline Characteristics of the Study Participants

Characteristics	Frequency (n)	Percentage (%)
Age (years)		
<20	4	6,7
20–35	46	76,7
>35	10	16,6
Educational Level		
Primary Education	12	20,0
Secondary Education	36	60,0
Higher Education	12	20,0
Occupation		
Homemaker	39	65,0
Employed	21	35,0
Gestational Age		
Second Trimester	24	40,0
Third Trimester	36	60,0

Source: Primary Data, 2026.

As presented in Table 1, the majority of participants (76.7%) were between 20 and 35 years of age, representing the optimal reproductive age group with a relatively lower risk of obstetric complications. This finding suggests that the occurrence of anemia during pregnancy is not determined solely by maternal age but is also influenced by factors such as nutritional adequacy and adherence to anemia prevention strategies throughout pregnancy.

Changes in Hemoglobin Levels Before and After the Intervention

The comparison of maternal hemoglobin (Hb) levels measured before and after the nutrition counseling program combined with mung bean extract supplementation is presented in Table 2.

Table 2. Mean Hemoglobin Levels Before and After the Intervention

Variable	Mean $\pm$ SD (g/dL)	Mean Difference	p-value
Before the intervention	9,82 $\pm$ 0,63		
After the intervention	11,34 $\pm$ 0,71	1,52	<0,001*

Note: Paired-samples t-test; $\alpha = 0.05$.

Source: Primary Data, 2026

As shown in Table 2, the mean hemoglobin concentration increased from 9.82 ± 0.63 g/dL at baseline to 11.34 ± 0.71 g/dL following the nutrition counseling intervention combined with mung bean extract supplementation. The paired-samples t-test demonstrated a statistically significant difference between the pre-intervention and post-intervention measurements ($p < 0.001$). These findings indicate that the intervention was associated with a significant improvement in hemoglobin levels among pregnant women..

Distribution of Hemoglobin Status

Changes in participants' hemoglobin status before and after the intervention are presented in Table 3.

Table 3. Distribution of Participants' Hemoglobin Status Before and After the Intervention

Hemoglobin Status	Before, n (%)	After n (%)
Mild Anemia	60 (100,0)	14 (23,3)
Normal Hemoglobin (Non-anemic)	0 (0,0)	46 (76,7)

Source: Primary Data, 2026.

As presented in Table 3, all participants were diagnosed with mild anemia before the intervention. Following completion of the nutrition counseling program and regular consumption of mung bean extract, 46 participants (76.7%) achieved normal hemoglobin levels, whereas 14 participants (23.3%) continued to exhibit mild anemia. These findings indicate a marked improvement in hemoglobin status among the majority of pregnant women after receiving the combined nutritional intervention.

Discussion

The findings of this study revealed that nearly half of the participants reported high levels of exposure to health-related information on social media. This suggests that social media has become one of the primary sources through which pregnant women obtain information about fetal development, childbirth preparation, maternal nutrition, and pregnancy-related complications. While the widespread use of smartphones provides convenient access to health information at any time, it also increases the likelihood of encountering content that is not derived from reliable scientific or professional sources.

Most participants experienced a moderate level of anxiety, indicating that the physical and psychological changes associated with pregnancy continue to pose significant adaptive challenges. In addition to hormonal fluctuations, maternal anxiety may be influenced by concerns about childbirth, fetal well-being, previous pregnancy experiences, and information obtained from various external sources, including social media platforms.

Bivariate analysis demonstrated a statistically significant association between social media information exposure and anxiety levels among pregnant women ($p = 0.001$). Participants with greater exposure to health-related information on social media were more likely to report higher levels of anxiety. This finding is consistent with the Health Belief Model, which proposes that individuals' perceptions of health threats are shaped by the information they receive. Exposure to content describing pregnancy complications, traumatic childbirth experiences, or unverified health claims may heighten perceived risk and subsequently trigger emotional responses such as anxiety.

The present findings are also consistent with previous studies. Boursier et al. (2020) reported that excessive exposure to health information, commonly referred to as information overload, was associated with increased anxiety among digital media users. Likewise, Gao et al. (2020) found that intensive social media use was significantly associated with greater psychological distress. Among pregnant women, Nanjundaswamy et al. (2023) concluded that although social media can enhance maternal knowledge, exposure to inaccurate or unverified information may increase unnecessary worry, particularly among first-time mothers.

Nevertheless, these findings should not be interpreted as suggesting that social media is inherently harmful. When health information is obtained from qualified healthcare professionals, professional organizations, or official public health institutions, social media can serve as an effective tool for improving maternal health literacy. Therefore, the quality, credibility, and reliability of online information appear to be more influential than the frequency of social media use alone.

From a theoretical perspective, this study supports the view that the digital information environment constitutes an important psychosocial determinant of maternal mental health. The observed association broadens the current understanding of factors contributing to

anxiety during pregnancy by highlighting the influence of digital information exposure in addition to established biological, obstetric, and social determinants.

From a practical standpoint, these findings provide valuable implications for midwives at PMB Neneng Mahfuzah in developing digital health literacy education as part of routine antenatal care services. Pregnant women should be equipped with the skills to critically evaluate online health information, distinguish credible sources from misinformation, and minimize exposure to content that may unnecessarily increase anxiety. Furthermore, the findings may inform the development of evidence-based social media health promotion programs within primary healthcare settings, ensuring that maternal health information disseminated to the public is accurate, accessible, and scientifically reliable.

The findings of this study demonstrated that nutrition counseling combined with mung bean extract supplementation significantly improved hemoglobin levels among pregnant women. The mean hemoglobin concentration increased from 9.82 g/dL before the intervention to 11.34 g/dL after the intervention, with statistical analysis revealing a highly significant difference ($p < 0.001$). These results suggest that integrating behavioral nutrition education with a locally available nutrient-rich food may provide greater benefits than interventions focused solely on iron supplementation. The observed improvement in hemoglobin levels indicates that the nutritional requirements necessary for erythropoiesis were more adequately met through both improved dietary practices and the additional nutrient intake provided by mung bean extract (World Health Organization [WHO], 2024; Ministry of Health of the Republic of Indonesia, 2023).

From a physiological perspective, hemoglobin synthesis depends on an adequate supply of iron, protein, folate, vitamin B12, and other essential micronutrients involved in erythropoiesis. Mung beans are recognized as a valuable source of plant-based protein, iron, folate, B-complex vitamins, and minerals that support red blood cell formation. Although the iron content of mung beans is lower than that of animal-based foods, regular consumption as part of a balanced diet, together with routine iron supplementation, can contribute substantially to meeting the increased nutritional demands of pregnancy. Therefore, the improvement in hemoglobin concentration observed in this study is biologically plausible and consistent with established mechanisms of hematopoiesis (Gropper & Smith, 2021; USDA, 2023).

Beyond the nutritional contribution of mung bean extract, the effectiveness of the intervention was likely enhanced by the continuous nutrition counseling provided throughout the study. The counseling sessions extended beyond the delivery of nutritional information by reinforcing motivation, encouraging adherence to iron tablet supplementation, and promoting healthier dietary habits. According to health promotion theory, sustainable behavioral change is more likely to occur when educational interventions are accompanied by ongoing monitoring and supportive guidance. Consequently, the increase in hemoglobin levels may be attributed to the combined effects of improved nutritional knowledge and sustained positive dietary behavior (Contento, 2020; Notoatmodjo, 2018).

The present findings are consistent with those reported by Fitriani et al. (2021), who found that regular consumption of mung bean extract significantly increased hemoglobin levels among pregnant women with mild anemia. Their study suggested that the iron and protein content of mung beans contributed to enhanced erythrocyte production. The consistency between the two studies further supports the potential use of mung bean-based local foods as complementary interventions in maternal anemia prevention programs. However, the current study extends previous evidence by integrating systematic nutrition counseling with mung bean supplementation, thereby addressing both nutritional intake and behavioral determinants of maternal health.

The results also support the findings of Rahmawati et al. (2022), who reported that local food-based nutritional interventions achieved greater effectiveness when combined with health education. Improved nutritional knowledge is expected to influence maternal attitudes and dietary practices, thereby enhancing the long-term effectiveness of the intervention. These findings suggest that successful improvement in hemoglobin status depends not only on the nutritional value of the foods provided but also on pregnant women's ability to apply dietary recommendations consistently in their daily lives. This approach aligns with contemporary behavior-based nutrition intervention models that are increasingly recommended in maternal healthcare services.

Although most participants achieved normal hemoglobin levels following the intervention, a proportion of pregnant women continued to experience mild anemia. This outcome may be explained by several contributing factors, including gestational age, pre-

pregnancy nutritional status, adherence to iron supplementation, underlying medical conditions, and individual differences in iron absorption and metabolism. Furthermore, anemia during pregnancy is a multifactorial condition; therefore, it cannot always be resolved through a single intervention. Comprehensive prevention and management strategies remain essential, including high-quality antenatal care, adequate nutritional support, and appropriate management of additional risk factors (WHO, 2024; Ministry of Health of the Republic of Indonesia, 2023).

From a theoretical perspective, this study reinforces the concept that behavioral modification and adequate nutritional intake are complementary components in improving maternal health outcomes. Nutrition counseling empowers pregnant women by increasing their understanding of healthy dietary practices, while mung bean extract provides an accessible and culturally appropriate source of essential nutrients derived from locally available foods. The integration of these two approaches demonstrates the potential of combining health education with local food-based interventions to strengthen maternal anemia prevention programs within primary healthcare settings (Contento, 2020; Girard & Olude, 2012).

The findings of this study have both theoretical and practical implications. Theoretically, they provide additional evidence supporting the effectiveness of integrating nutrition counseling with locally available functional foods to improve maternal hemoglobin levels. Practically, this intervention model may be incorporated into routine antenatal care services at primary healthcare centers as a complementary strategy for anemia prevention and management. The use of mung bean extract offers several advantages, including affordability, wide availability, cultural acceptability, and ease of implementation, making it a promising and sustainable approach for improving maternal and fetal health, particularly in resource-limited settings (WHO, 2024; Ministry of Health of the Republic of Indonesia, 2023; Girard & Olude, 2012).

5. Conclusion And Recommendations

This study demonstrated that nutrition counseling combined with mung bean extract supplementation was associated with a significant improvement in hemoglobin levels among pregnant women attending Kelua Primary Healthcare Center, Tabalong Regency. Statistical analysis revealed a meaningful increase in mean hemoglobin concentration following the intervention compared with baseline measurements. These findings suggest that integrating continuous nutrition education with the use of mung bean extract as a locally available food resource may serve as a promising complementary strategy for supporting anemia prevention and management during pregnancy. Nevertheless, the findings should be interpreted with caution because the study was conducted at a single healthcare center using a quasi-experimental design without a control group. Therefore, the generalizability of the results to broader populations remains limited and requires confirmation through further research.

Based on these findings, integrating nutrition counseling with the utilization of locally available foods, such as mung bean extract, should be considered as part of routine antenatal care services in primary healthcare settings to complement existing iron supplementation programs. Healthcare professionals are encouraged to strengthen education on balanced nutrition during pregnancy while promoting greater adherence to dietary recommendations and iron supplementation. This study has several limitations, including a relatively small sample size, implementation at a single primary healthcare facility, and the absence of analyses of additional factors that may influence hemoglobin levels, such as habitual dietary intake, socioeconomic status, underlying medical conditions, and compliance with iron tablet consumption. Future studies are therefore recommended to employ randomized controlled trial designs or controlled experimental studies, recruit larger and more diverse populations across multiple healthcare settings, and account for potential confounding variables to provide more robust evidence regarding the effectiveness of nutrition counseling combined with mung bean extract supplementation in improving maternal hemoglobin levels during pregnancy.

ACKNOWLEDGMENTS

The authors would like to express their sincere appreciation to all individuals and institutions whose support contributed to the successful completion of this study and the preparation of this manuscript. Special thanks are extended to the management and healthcare staff of PMB Bunda Bidan Hj. Mardiah Hayati for granting permission to conduct the study, facilitating the data collection process, and providing continuous support throughout the research activities. The authors are also deeply grateful to all one-month injectable

contraceptive users who voluntarily participated in the study and generously shared the information required for this research.

The authors sincerely acknowledge the invaluable guidance and constructive feedback provided by their academic supervisors and manuscript reviewers throughout the planning, implementation, and manuscript preparation stages. Their insightful comments and recommendations significantly enhanced both the methodological rigor of the study and the quality of the manuscript.

The authors also gratefully acknowledge any institution or funding agency that provided financial support for this research, enabling all stages of the study to be completed as planned. Appreciation is likewise extended to the institutions that provided research facilities, equipment, and other resources essential for data collection and analysis.

This article was developed as an academic research output in partial fulfillment of the requirements for the completion of the authors' academic program. The study was conducted in accordance with accepted scientific principles and applicable research ethics. It is hoped that the findings will contribute to the growing body of evidence in midwifery, particularly in the field of hormonal contraception, and serve as a useful reference for improving the quality of family planning services in healthcare settings.

References

- Contento, I. R. (2020). *Nutrition education: Linking research, theory, and practice* (4th ed.). Jones & Bartlett Learning.
- Fitriani, D., Sari, Y. O., & Ulfah, M. (2021). The effect of iron supplementation and mung bean consumption on hemoglobin levels among pregnant women with anemia. *Jurnal Kebidanan Indonesia*, 12(2), 115–123.
- Girard, A. W., & Olude, O. (2012). Nutrition education and counselling provided during pregnancy: Effects on maternal, neonatal and child health outcomes. *Paediatric and Perinatal Epidemiology*, 26(Suppl. 1), 191–204. <https://doi.org/10.1111/j.1365-3016.2012.01278.x>
- Gropper, S. S., & Smith, J. L. (2021). *Advanced nutrition and human metabolism* (7th ed.). Cengage Learning.
- Husnaini, H., & Prisusanti, R. D. (2025). Effectiveness of spinach extract administration on hemoglobin level improvement in pregnant women with mild anemia at Wiritasi Health Center. *Jurnal Siti Rufaidah*, 3(2), 113–124.
- Keats, E. C., Das, J. K., Salam, R. A., Lassi, Z. S., Imdad, A., Black, R. E., & Bhutta, Z. A. (2021). Effective interventions to address maternal and child malnutrition: An update of the evidence. *Maternal & Child Nutrition*, 17(Suppl. 1), e13182. [https://doi.org/10.1016/S2352-4642\(20\)30274-1](https://doi.org/10.1016/S2352-4642(20)30274-1)
- Kementerian Kesehatan Republik Indonesia. (2023). *Pedoman pencegahan dan penanggulangan anemia pada ibu hamil*. Kementerian Kesehatan RI.
- Kurniawan, D. K., Widiyanto, A., Putri, S. I., & Prisusanti, R. D. (2024). Meta-analysis: The effectiveness of electronic medical records (EMR) on the quality of health service. *Journal of Health Policy and Management*, 9(2), 168–176. <https://doi.org/10.26911/thejhpm.2024.09.02.03>
- Notoatmodjo, S. (2018). *Promosi kesehatan dan perilaku kesehatan* (Edisi revisi). Rineka Cipta.
- Prisusanti, R. D. (2023). Development of implementation instruments for recording and reporting maternal and child health (MCH) cohort registers at Puskesmas in Malang Regency. *Jurnal Kesehatan Amanah*, 7(2), 46–54. <https://doi.org/10.57214/jka.v7i2.742>
- Prisusanti, R. D., & Kurniawan, F. (2025). Influence of mindfulness-based interventions on maternal mental health during pregnancy: A systematic review. *WHNLifeSciences: Jurnal Ilmu-Ilmu Kehidupan*, 1(1).
- Rahmawati, N., Wulandari, D., & Sari, M. (2022). Effectiveness of mung bean juice supplementation on hemoglobin improvement among pregnant women with mild anemia. *Jurnal Gizi dan Kesehatan*, 14(1), 52–60.
- United States Department of Agriculture. (2023). *FoodData Central: Mung beans, mature seeds*.
- World Health Organization. (2020). *WHO guideline: Daily iron and folic acid supplementation in pregnant women*. World Health Organization.
- World Health Organization. (2024). *Anaemia*. World Health Organization.