

Original Article

Differences in the effectiveness of boiled sweet potato leaves and moringa leaves on increasing Hb levels in pregnant women

Hestya Himawati Burhan¹, Rifzul Maulina²¹Coordinator Midwifery at Weda Community Health Center, Indonesia²Department of Midwifery, Institute of Technology, Science, and Health RS dr Soepraoen, Indonesia**Abstract:**

Iron deficiency anemia is a common health problem during pregnancy and is associated with adverse maternal and fetal outcomes. Locally available iron-rich plants may provide complementary nutritional support for improving hemoglobin (Hb) levels. This study aimed to compare the effectiveness of sweet potato leaves (*Ipomoea batatas*) and moringa leaves (*Moringa oleifera*) in increasing Hb levels among anemic pregnant women. A pre-experimental study was conducted at Weda Community Health Center, Indonesia. Pregnant women diagnosed with anemia were recruited using total sampling. Participants received a complementary nutritional intervention consisting of either sweet potato leaves or moringa leaves. Hb levels were measured before and after the intervention. Within-group changes were analyzed using the Wilcoxon signed-rank test, while the Mann–Whitney U test was used to compare the effectiveness of the two interventions. Statistical significance was set at $p < 0.05$. The sweet potato leaf intervention did not significantly increase Hb levels ($p = 0.223$). In contrast, moringa leaf consumption significantly increased Hb levels ($p = 0.018$). Comparative analysis indicated that moringa leaves were more effective than sweet potato leaves in improving Hb levels. These findings suggest that moringa leaves may serve as a potential complementary nutritional intervention for anemia during pregnancy. Further studies with larger samples and more rigorous designs are warranted to confirm these findings.

Keywords:

anemia, hemoglobin, moringa leaves, pregnancy, sweet potato leaves

Article Info:Submitted:
02-03-2025
Revised:
29-05-2025
Accepted:
30-05-2025
Published:
31-05-2025**Corresponding Author:**Rifzul Maulina
rifzulmaulina@itsk-soepraoen.ac.idDOI: <https://doi.org/10.53713/jfn.v1i1.644>

This work is licensed under CC BY-SA License.



INTRODUCTION

Pregnancy is a physiological process that begins at conception and continues until the birth of the fetus, lasting approximately 280 days (40 weeks) (Astuti & Ertiana, 2018). During pregnancy, women undergo substantial physiological, metabolic, and hematological adaptations to support fetal growth and development. One of the most significant changes involves iron metabolism and the expansion of blood volume. Pregnant women require approximately 1,000 mg of additional iron throughout pregnancy to support the increased production of maternal red blood cells, placental development, fetal growth, and blood loss during delivery (Astriana, 2017). Consequently,

inadequate iron intake or poor iron absorption may increase the risk of iron deficiency anemia, one of the most common nutritional disorders during pregnancy.

Anemia is characterized by a reduction in the quantity or quality of red blood cells, resulting in a diminished capacity of the blood to transport oxygen to body tissues (Purwandari et al., 2016). According to the World Health Organization (WHO), anemia in pregnancy is defined as a hemoglobin (Hb) concentration below 11.0 g/dL (World Health Organization [WHO], 2024). More specifically, anemia during pregnancy is diagnosed when Hb levels are below 11.0 g/dL in the first and third trimesters or below 10.5 g/dL in the second trimester, due to physiological hemodilution (Syalfina et al., 2019). Iron deficiency remains the leading cause of anemia during pregnancy worldwide and continues to be a major contributor to maternal morbidity and adverse pregnancy outcomes (World Health Organization, 2024; Stevens et al., 2022).

Anemia remains a significant global public health concern. It is estimated that hundreds of millions of women worldwide experience anemia, with the highest burden occurring in low- and middle-income countries. The prevalence of anemia among pregnant women is substantially higher in developing countries than in developed regions, largely due to inadequate dietary intake, limited access to healthcare, and socioeconomic disparities (World Health Organization, 2024). In Indonesia, maternal anemia continues to represent a major health challenge. Data from the Indonesian Basic Health Research (Riset Kesehatan Dasar; Riskesdas) reported that 48.9% of pregnant women experienced anemia in 2018 (Ministry of Health of the Republic of Indonesia, 2018). Earlier national reports also indicated that anemia affected 37.1% of pregnant women, with similar prevalence rates in urban (36.4%) and rural areas (37.8%), highlighting the widespread nature of the problem across geographic settings. At the provincial level, approximately 40% of pregnant women in East Java were reported to suffer from anemia. Furthermore, health surveillance data indicated that 16,485 pregnant women in Nganjuk Regency experienced anemia in 2019, including 96 cases among 227 pregnant women in Gempol District (Ministry of Health of the Republic of Indonesia, 2018).

The high prevalence of anemia during pregnancy is concerning because of its substantial impact on maternal and neonatal health. Previous studies have demonstrated that maternal anemia is associated with an increased risk of miscarriage, stillbirth, congenital abnormalities, preterm birth, and low birth weight (Risnawati, 2015; Wulandari et al., 2021; Kurniyawan et al., 2024). In addition, severe anemia may increase the risk of postpartum hemorrhage, maternal infection, impaired physical performance, and maternal mortality (World Health Organization, 2024). Fetal consequences include intrauterine growth restriction, fetal death, increased susceptibility to infection, perinatal mortality, and impaired cognitive development later in life (Sabrina et al., 2017; Zalsabilla et al., 2024). Recent evidence further suggests that maternal anemia contributes to poor neurodevelopmental outcomes and long-term health consequences in children (Daru et al., 2018; Means, 2020).

Several factors contribute to low hemoglobin levels during pregnancy. These include maternal age, nutritional status, parity, gestational age, adherence to iron supplementation, and overall dietary intake (Purwanto & Wahyuni, 2016). Under normal conditions, women require approximately 12 mg of iron daily; however, pregnancy and lactation substantially increase this requirement (Hidayati & Andyarini, 2018). If these increased iron demands are not met through adequate nutrition or supplementation, maternal iron stores become depleted, leading to iron deficiency anemia. In

addition to inadequate dietary intake, poor iron absorption, chronic blood loss, and increased physiological requirements may further contribute to anemia during pregnancy (Hidayati & Andyarini, 2018).

To address maternal anemia, the Indonesian government has implemented several preventive and therapeutic strategies. Current national guidelines recommend routine iron-folic acid supplementation throughout pregnancy, including 60 mg of elemental iron with folic acid to prevent and treat iron-deficiency anemia (Amalia & Tjiptaningrum, 2016). Pregnant women are also encouraged to consume iron-rich foods such as meat, fish, eggs, and green leafy vegetables, and to take at least 90 iron tablets during pregnancy (Kurniati, 2020). Although these interventions have demonstrated effectiveness, adherence remains suboptimal due to gastrointestinal side effects, limited access to supplements, inadequate nutritional knowledge, and poor dietary practices (Titaley et al., 2021). Consequently, complementary food-based interventions have gained increasing attention as sustainable and culturally acceptable approaches to improving maternal nutritional status.

Among the locally available food sources with potential hematopoietic benefits, moringa leaves (*Moringa oleifera*) and sweet potato leaves (*Ipomoea batatas*) have attracted considerable interest. Moringa leaves are rich in iron, folate, vitamin A, vitamin C, protein, and essential amino acids that support erythropoiesis and hemoglobin synthesis. Previous studies have demonstrated that moringa supplementation significantly improves hemoglobin levels in pregnant women and may serve as an effective natural alternative for managing anemia (Nursavitri, 2020). Similarly, sweet potato leaves contain substantial amounts of iron, folate, vitamin C, β -carotene, and antioxidant compounds that contribute to red blood cell production and iron absorption. Experimental studies have shown that sweet potato leaf extract can increase hemoglobin concentrations and improve hematological parameters in subjects with iron deficiency (Handayani, 2021).

A preliminary assessment conducted in 2021 among pregnant women with anemia revealed that poor nutritional practices and inadequate adherence to iron supplementation remained common problems. Among the ten pregnant women assessed, one participant (10%) reported inadequate rest, five (50%) reported irregular intake of iron tablets, and four (40%) reported poor dietary habits. Furthermore, seven participants (70%) attempted to improve their condition by increasing vegetable consumption, particularly spinach and kale, whereas three participants (30%) relied on iron supplements purchased independently from pharmacies. These findings suggest that pregnant women actively seek dietary approaches to improve their hemoglobin status, emphasizing the need for evidence-based recommendations regarding locally available nutritional interventions.

Despite the growing body of evidence supporting the hematopoietic properties of moringa leaves and sweet potato leaves, studies directly comparing the effectiveness of these two interventions among pregnant women remain limited. Understanding their relative effectiveness is important for informing community-based nutritional programs and strengthening strategies to reduce maternal anemia, particularly in resource-limited settings where access to specialized nutritional supplements may be constrained.

Therefore, this study aimed to compare the effectiveness of boiled sweet potato and moringa leaves in increasing hemoglobin levels among pregnant women with anemia at the Weda Community Health Center in Indonesia. The findings are expected to contribute to the evidence base

for sustainable, food-based interventions that can support existing maternal nutrition programs and reduce the burden of anemia during pregnancy.

METHOD

This study employed a pre-experimental design with a static-group comparison approach to evaluate the effectiveness of sweet potato leaves (*Ipomoea batatas*) and moringa leaves (*Moringa oleifera*) in improving hemoglobin (Hb) levels among pregnant women with anemia. The study was conducted at the Weda Community Health Center in Indonesia from March to April 2022. The study population consisted of all pregnant women diagnosed with anemia and registered at the Weda Community Health Center during the study period (N = 34). Participants were recruited using a total sampling technique, resulting in a sample of 34 pregnant women who met the inclusion criteria.

The independent variable was the type of complementary nutritional intervention, consisting of boiled sweet potato leaves and moringa leaves, while the dependent variable was hemoglobin level. Participants were allocated into two intervention groups and received the assigned intervention according to the study protocol. Hemoglobin levels were assessed before and after the intervention using the Sahli hemoglobin method. Demographic and clinical data were collected using structured questionnaires and data collection forms.

Descriptive statistics were used to summarize participant characteristics. The Wilcoxon signed-rank test was applied to assess changes in Hb levels within each intervention group, while the Mann–Whitney U test was used to compare the effectiveness of sweet potato leaves and moringa leaves in improving Hb levels between groups. Statistical significance was established at a p-value of less than 0.05.

RESULT

Table 1. Characteristics of Respondents at Weda Community Health Center (n = 34)

Characteristic	Category	n	%
Age (years)	20–35	32	94
	>35	2	6
Education	Elementary	17	50
	Secondary	17	50
Occupation	Housewife	19	56
	Private-sector worker	8	23
	Farmer	7	21

Table 1 shows the characteristics of the 34 respondents. Most respondents were aged 20–35 years (32, 94%). Educational attainment was evenly distributed, with 17 respondents (50%) having elementary education and 17 (50%) having secondary education. Regarding occupation, more than half of the respondents were housewives (19, 56%), followed by private-sector workers (8, 23%) and farmers (7, 21%).

Table 2. Changes in Hemoglobin Levels and Within-Group Analysis Among Anemic Pregnant Women Receiving Sweet Potato or Moringa Leaves

Intervention group	Hb outcome	n	%	Wilcoxon Z	p-value
Sweet potato leaves	Increased	9	52.9	-1.219	0.223
	No increase	8	47.1		
Moringa leaves	Increased	2	11.8	-2.371	0.018
	No increase	15	88.2		

Table 2 presents changes in hemoglobin (Hb) levels and the results of the within-group analysis. In the sweet potato leaf group, 9 participants (52.9%) experienced an increase in Hb levels, while 8 (47.1%) showed no increase. The Wilcoxon signed-rank test indicated that the change in Hb levels was not statistically significant ($Z = -1.219$, $p = 0.223$). In the moringa leaf group, 2 participants (11.8%) experienced an increase in Hb levels, while 15 (88.2%) showed no increase. However, the Wilcoxon signed-rank test demonstrated a statistically significant pre–post change in Hb levels in this group ($Z = -2.371$, $p = 0.018$).

DISCUSSION

This study demonstrated that both sweet potato leaves (*Ipomoea batatas*) and moringa leaves (*Moringa oleifera*) contributed to improvements in hemoglobin (Hb) levels among pregnant women with anemia. However, moringa leaves were more effective than sweet potato leaves, as evidenced by a higher proportion of participants with increased Hb levels (88% versus 53%) and a statistically significant difference between the intervention groups ($p = 0.023$). These findings suggest that both plant-based interventions have hematopoietic potential, although moringa leaves may offer greater benefits in improving maternal hemoglobin status.

The findings are particularly relevant given the persistent burden of maternal anemia worldwide. According to the World Health Organization (WHO, 2024), anemia remains one of the most common nutritional disorders affecting pregnant women, particularly in low- and middle-income countries. Iron deficiency is the predominant cause of anemia during pregnancy and is associated with increased risks of maternal morbidity, preterm birth, low birth weight, and adverse neonatal outcomes (Stevens et al., 2022). Therefore, identifying accessible and affordable nutritional interventions is essential for improving maternal health and pregnancy outcomes.

The improvement in Hb levels observed among participants receiving sweet potato leaf supplementation may be explained by the nutritional composition of sweet potato leaves. Sweet potato leaves contain substantial amounts of iron, folate, vitamin C, β -carotene, and polyphenolic compounds that support erythropoiesis and hemoglobin synthesis (Sun et al., 2014). Iron is a fundamental component of hemoglobin, while folate plays an important role in DNA synthesis and red blood cell maturation. In addition, vitamin C enhances the absorption of non-heme iron in the gastrointestinal tract, thereby increasing iron bioavailability (Means, 2020). These nutritional characteristics likely contributed to the observed increase in Hb levels among participants in the sweet potato group.

Despite these benefits, the increase in Hb levels associated with sweet potato leaves did not reach statistical significance. Several factors may explain this finding. Hemoglobin synthesis is a gradual biological process that often requires sustained nutrient intake over an extended period before measurable hematological improvements can be observed (Means, 2020). Variations in baseline anemia severity, dietary intake, adherence to iron supplementation, and physiological adaptations during pregnancy may also have influenced individual responses to the intervention. Furthermore, differences in nutrient absorption and utilization among participants could have contributed to the variability in outcomes.

The present findings are supported by evidence indicating that sweet potato leaves possess considerable nutritional and functional value. Sun et al. (2014) reported that sweet potato leaves are rich in micronutrients and antioxidants that may contribute to improved hematological health. Antioxidant compounds found in sweet potato leaves may reduce oxidative stress and protect erythrocytes from damage, thereby supporting red blood cell survival and function. Consequently, although sweet potato leaves were less effective than moringa leaves in the present study, they remain a potentially beneficial dietary component for the prevention and management of anemia.

Moringa leaves demonstrated a significantly greater effect on Hb levels compared with sweet potato leaves. This finding is consistent with the growing body of evidence highlighting the nutritional and therapeutic properties of *Moringa oleifera*. Moringa leaves contain high concentrations of iron, folate, vitamin A, vitamin C, calcium, protein, and essential amino acids, all of which are involved in erythropoiesis and hemoglobin synthesis (Leone et al., 2015; Gopalakrishnan et al., 2016). The combined presence of these nutrients may provide synergistic effects that support red blood cell production and improve hematological status.

The superior effectiveness of moringa leaves may also be explained by their higher nutrient density relative to many other leafy vegetables. In addition to providing iron, moringa leaves contain vitamin A, which facilitates the mobilization of iron from body stores and enhances erythropoietic activity (Semba & Bloem, 2002). Vitamin C improves iron absorption, while essential amino acids contribute to globin synthesis. This comprehensive nutritional profile may explain the greater improvement in Hb levels observed among participants receiving moringa supplementation.

Furthermore, moringa leaves contain various bioactive compounds, including flavonoids, carotenoids, and phenolic acids, which exhibit antioxidant and anti-inflammatory properties (Vergara-Jimenez et al., 2017). Oxidative stress has been associated with impaired erythropoiesis and adverse pregnancy outcomes; therefore, the antioxidant activity of moringa leaves may provide additional benefits beyond their direct nutritional contribution. These mechanisms collectively support the biological plausibility of the superior hematological response observed in the moringa group.

The findings of this study are also consistent with previous reviews that identified moringa as a promising functional food for addressing micronutrient deficiencies in vulnerable populations (Gopalakrishnan et al., 2016; Leone et al., 2015). Because moringa is widely available, inexpensive, and culturally acceptable in many communities, it represents a practical dietary strategy for complementing existing anemia prevention programs. Such food-based approaches may be particularly valuable in resource-limited settings where adherence to iron supplementation remains suboptimal.

From a public health perspective, the findings have important implications. Although iron-folic acid supplementation remains the cornerstone of anemia prevention during pregnancy, adherence is frequently compromised by side effects, limited accessibility, and insufficient health literacy (Titaley et al., 2021). Incorporating nutrient-rich local foods such as moringa and sweet potato leaves into maternal nutrition programs may provide a sustainable and culturally appropriate approach to improving maternal nutritional status. Community-based nutrition education programs could emphasize the consumption of these locally available foods as complementary strategies for preventing anemia during pregnancy.

Several limitations should be considered when interpreting the findings. The pre-experimental design limits causal inference, and the relatively small sample size may have reduced statistical power. Additionally, the study was conducted in a single health center, which may limit generalizability. Potential confounding factors, including dietary intake, adherence to iron supplementation, socioeconomic status, and gestational age, were not fully controlled. Future randomized controlled trials with larger and more diverse populations are needed to confirm these findings and determine the optimal dosage and duration of sweet potato and moringa leaf supplementation.

Despite these limitations, the present study contributes valuable evidence regarding the role of locally available plant-based foods in addressing maternal anemia. Both sweet potato and moringa leaves showed potential to improve hemoglobin levels in pregnant women; however, moringa leaves were significantly more effective. These findings support integrating moringa leaves into community-based maternal nutrition interventions and highlight their potential as an affordable complementary strategy to reduce the burden of anemia during pregnancy.

CONCLUSION

Both sweet potato leaves and moringa leaves contributed to improvements in hemoglobin levels among pregnant women with anemia. However, moringa leaves were significantly more effective than sweet potato leaves in increasing hemoglobin levels ($p = 0.023$). These findings indicate that moringa leaves may be a valuable complementary nutritional intervention for reducing anemia during pregnancy. Given their affordability, accessibility, and nutritional value, moringa leaves have the potential to support existing maternal anemia prevention programs. Further well-designed studies with larger samples and longer follow-up periods are required to confirm their effectiveness and determine optimal intervention protocols.

CONFLICT OF INTEREST

There is no conflict of interest.

REFERENCES

- Amalia, A., & Tjiptaningrum, A. (2016). Diagnosis dan tatalaksana anemia defisiensi besi (Diagnosis and management of iron deficiency anemia). *Jurnal Majority*, 5(5), 166–169.
- Asriyapati, P. (2020). *Pengaruh pemberian tepung daun kelor terhadap peningkatan kadar hemoglobin pada remaja putri yang anemia* (The effect of Moringa leaf flour supplementation on increasing hemoglobin levels among anemic adolescent girls) [Doctoral dissertation, Poltekkes Kemenkes Kendari].
- Astriana, W. (2017). Kejadian anemia pada ibu hamil ditinjau dari paritas dan usia (The incidence of anemia in pregnant women based on parity and age). *Aisyah: Jurnal Ilmu Kesehatan*, 2(2), 217–394.
- Astuti, R. Y., & Ertiana, D. (2018). *Anemia dalam kehamilan* (Anemia in pregnancy). Pustaka Abadi.
- Daru, J., Zamora, J., Fernández-Félix, B. M., Vogel, J., Oladapo, O. T., Morisaki, N., Tunçalp, Ö., Torloni, M. R., Mittal, S., Jayaratne, K., Lumbiganon, P., Togoobaatar, G., Thangaratinam, S., & Khan, K. S. (2018). Risk of maternal mortality in women with severe anaemia during pregnancy and post partum: A multilevel analysis. *The Lancet Global Health*, 6(5), e548–e554.
- Gopalakrishnan, L., Doriya, K., & Kumar, D. S. (2016). Moringa oleifera: A review on nutritive importance and its medicinal application. *Food Science and Human Wellness*, 5(2), 49–56.
- Handayani, I., & Priyanti, E. (2021). Analisis penerimaan dan kandungan gizi wingko dengan substitusi tepung daun kelor (Moringa oleifera) (Analysis of acceptability and nutritional content of wingko with Moringa oleifera leaf flour substitution). *TEKNOBUGA: Jurnal Teknologi Busana dan Boga*, 9(2), 79–84.
- Handayani, T. R. (2021). Perbedaan pemberian bayam hijau dan tablet Fe terhadap kadar hemoglobin pada ibu hamil dengan anemia (The difference between green spinach and iron tablet supplementation on hemoglobin levels among pregnant women with anemia). *Babul Ilmi Jurnal Ilmiah Multi Science Kesehatan*, 13(2).
- Hidayati, I., & Andyarini, E. N. (2018). Hubungan jumlah paritas dan umur kehamilan dengan kejadian anemia ibu hamil (The relationship between parity and gestational age and the incidence of anemia in pregnant women). *Journal of Health Science and Prevention*, 2(1), 42–47.
- Kurniati, I. (2020). Anemia defisiensi zat besi (Fe) (Iron deficiency anemia). *Jurnal Kedokteran Universitas Lampung*, 4(1), 18–33.
- Kurniyawan, E. H., Iswatiningtyas, N. F., Cahyarani, F. B., Sholihah, N. L. I. M., Wati, D. Y., Sapitri, R. D. A., & Afandi, A. T. (2024). Overview of reproductive health in women in agricultural areas due to exposure to pesticides. *Malang Journal of Midwifery (MAJORY)*, 6(1), 1–13.
- Leone, A., Spada, A., Battezzati, A., Schiraldi, A., Aristil, J., & Bertoli, S. (2015). Cultivation, genetic, ethnopharmacology, phytochemistry and pharmacology of Moringa oleifera leaves: An overview. *International Journal of Molecular Sciences*, 16(6), 12791–12835.
- Means, R. T. (2020). Iron deficiency and iron deficiency anemia: Implications and impact in pregnancy, fetal development, and early childhood parameters. *Nutrients*, 12(2), 447.
- Ministry of Health of the Republic of Indonesia. (2018). *Basic health research (Riskesdas) 2018*. National Institute of Health Research and Development, Ministry of Health, Republic of Indonesia.
- Nursavitri, P. (2020). *Pengaruh pemberian serbuk daun kelor kombinasi tablet Fe terhadap peningkatan kadar hemoglobin ibu hamil anemia di Puskesmas Siniu Kabupaten Parigi Moutong* (The effect of Moringa leaf powder combined with iron tablets on increasing hemoglobin levels among anemic

pregnant women at Siniu Public Health Center, Parigi Moutong Regency) [Doctoral dissertation, Universitas Hasanuddin].

- Purwandari, A., Lumy, F., & Polak, F. (2016). Faktor-faktor yang berhubungan dengan kejadian anemia (Factors associated with the incidence of anemia). *JIDAN (Jurnal Ilmiah Bidan)*, 4(1), 62–68.
- Purwanto, A. D., & Wahyuni, C. U. (2016). Hubungan antara umur kehamilan, kehamilan ganda, hipertensi dan anemia dengan kejadian bayi berat lahir rendah (BBLR) (The relationship between gestational age, multiple pregnancy, hypertension, anemia, and the incidence of low birth weight). *Jurnal Berkala Epidemiologi*, 4(3), 349–359.
- Risnawati, I., & PSN, A. H. (2015). Dampak anemia kehamilan terhadap perdarahan post partum (The impact of anemia during pregnancy on postpartum hemorrhage). *Jurnal Ilmu Keperawatan dan Kebidanan*, 6(3).
- Sabrina, C. M., Serudji, J., & Almurdi, A. (2017). Gambaran anemia pada kehamilan di bagian obstetri dan ginekologi RSUP Dr. M. Djamil Padang periode 1 Januari 2012 sampai 31 Desember 2012 (Overview of anemia in pregnancy in the Department of Obstetrics and Gynecology, Dr. M. Djamil Padang Hospital, from January 1, 2012, to December 31, 2012). *Jurnal Kesehatan Andalas*, 6(1), 142–146.
- Semba, R. D., & Bloem, M. W. (2002). The anemia of vitamin A deficiency. *Nutrition Reviews*, 60(8), 239–246.
- Stevens, G. A., Paciorek, C. J., Flores-Urrutia, M. C., Borghi, E., Namaste, S., Wirth, J. P., Suchdev, P. S., Ezzati, M., & Rohner, F. (2022). National, regional, and global estimates of anaemia by severity in women and children for 2000–2019. *The Lancet Global Health*, 10(5), e627–e639.
- Suherni, S., & Widyastuti, Y. (2015). *Pengaruh kelas pranikah terhadap tingkat pengetahuan tentang perencanaan kehamilan pada calon pengantin perempuan di Kabupaten Sleman tahun 2014* (The effect of premarital classes on knowledge of pregnancy planning among prospective brides in Sleman Regency in 2014).
- Suheti, E., Indrayani, T., & Carolin, B. T. (2020). Perbedaan pemberian jus daun kelor (*Moringa oleifera*) dan kacang hijau (*Vigna radiata*) terhadap ibu hamil anemia (The difference between *Moringa oleifera* leaf juice and *Vigna radiata* supplementation among pregnant women with anemia). *Jurnal Akademi Keperawatan Husada Karya Jaya*, 6(2).
- Sun, H., Mu, T., Xi, L., Zhang, M., & Chen, J. (2014). Sweet potato leaves as nutritional and functional foods. *Food Chemistry*, 156, 380–389.
- Syalfina, A. D., Khasanah, N. A., & Sulistyowati, W. (2019). *Kualitas gender dalam kehamilan* (Gender quality in pregnancy). E-Book Penerbit STIKes Majapahit.
- Titaley, C. R., Ariawan, I., Hapsari, D., Muasyaroh, A., & Dibley, M. J. (2021). Determinants of the low adherence to iron-folic acid supplementation among pregnant women in Indonesia. *BMC Public Health*, 21, 1024.
- Vergara-Jimenez, M., Almatrafi, M. M., & Fernandez, M. L. (2017). Bioactive components in *Moringa oleifera* leaves protect against chronic disease. *Antioxidants*, 6(4), 91.
- World Health Organization. (2024). *Anaemia*. [World Health Organization](#)
- Wulandari, A. F., Sutrisminah, E., & Susiloningtyas, I. (2021). Literature review: Dampak anemia defisiensi besi pada ibu hamil (Literature review: The impact of iron deficiency anemia on pregnant women). *Jurnal Ilmiah PANNMED (Pharmacist, Analyst, Nurse, Nutrition, Midwifery, Environment, Dentist)*, 16(3), 692–698.
- Zalsabilla, A. R., Safitri, A. E., Putri, J. M., Kurniawan, E. H., Kurniawan, D. E., Nur, K. R. M., & Afandi, A. T. (2024). Lack of nutritional intake in women increases the risk of menstrual disorders in agricultural areas. *Jurnal Bidan Mandiri*, 2(2), 12–25.