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# The Effectiveness of Moringa Leaf Powder Capsules (*Moringa oleifera Lam.)* in Reducing the Severity of Anaemia in Pregnant Women

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Anaemia is an iron deficiency that causes anaemia in pregnant women, which can have a negative impact on foetal or infant growth and development during and after pregnancy. One way to increase haemoglobin levels in pregnant women with anaemia is to consume moringa leaf powder capsules (Moringa oleifera Lam.), which have haematopoietic activity and are beneficial in increasing platelet counts. The purpose of this study was to determine the effect of moringa leaf powder capsules (Moringa oleifera Lam.) on haemoglobin levels in pregnant women with mild to moderate anaemia with haemoglobin levels of 8–11 g/dL at the Reva Medika Clinic, Lebak Regency in 2025. The intervention was carried out for seven consecutive days with a dose of 2 moringa leaf capsules per day. Hemoglobin levels were measured using a digital hemoglobinometer EasyTouch® HB (Taiwan) in accordance with WHO standard procedures to ensure the accuracy of the test results. The sampling technique used was the Ishak and Michel method. The research respondents were pregnant women aged 20–35 years with a gestational age of 20–32 weeks who had mild to moderate anaemia with haemoglobin levels of 8–11 g/dL and no comorbidities. The study was conducted from January to March 2025. The results of the study after administering moringa leaf powder capsules for anaemia in pregnancy showed that the majority of pregnant women experienced mild anaemia (27 people or 84.4%) and severe anaemia (5 people or 15.6%). A significant difference was found between before and after the administration of moringa leaf powder capsules for anaemia in pregnancy. The Wilcoxon Sign Rank test showed a p-value of 0.000  0.05. It can be concluded that the administration of moringa leaf powder capsules had an effect on anaemia in pregnancy at the Reva Medika Clinic, Lebak District, in 2025.

**Keywords:** Pregnant women, Anaemia, Moringa capsules

## INTRODUCTION

Pregnancy is a very long process that takes place in a woman's womb and lasts for 280 days or 40 weeks from the first day of conception. Various physical changes that occur during pregnancy have a significant impact on foetal growth and development. Pregnancy begins with the process of fertilisation, followed by nidation or implantation, and then develops into a foetus that is ready to live outside the womb (Wulandari et al., 2021).

Normal physical conditions during pregnancy are often accompanied by a number of difficulties, especially those related to nutrition. Anaemia is one of the nutritional problems often experienced by pregnant women. Pregnant women often do not consume enough nutrient-dense and healthy foods, which can lead to anaemia during pregnancy. This is because anaemia can hinder foetal growth, increase blood volume, and increase the need for iron to support foetal growth. An improper diet that results in iron deficiency and other important mineral deficiencies can increase the risk of anaemia (Tampubolon, 2021). Menurut World Health Organization (Organization, 2023). The prevalence of anaemia among pregnant women worldwide is 36.5%, with the highest rates in South Asia and Sub-Saharan Africa. (Dametas et al., 2024). In Indonesia itself, based on the results of the 2023 Indonesian Nutrition Status Survey (SSGI), the prevalence of anaemia in pregnant women was recorded at 47.9%, a slight decrease from 48.9% in 2021(Febinia et al., 2025). Meanwhile, data from the Banten Provincial Health Office in 2024 shows that out of 98,150 pregnant women, 15,434 (15.7%) suffered from anaemia; in Lebak Regency, there were 862 cases of anaemia out of 25,541 pregnant women (3.4%).) (Badan Pusat Statistik Provinsi Banten, 2025). This data indicates that anaemia in

pregnant women remains a public health issue that requires effective intervention at both the local and national levels.

Anaemia in pregnant women can increase the risk of premature birth, maternal and infant mortality, and infectious diseases. Iron deficiency, which causes anaemia in pregnant women, can have adverse effects on the growth and development of the foetus or infant during and after pregnancy (Carolin & Novelia, 2021). Anaemia associated with pregnancy can increase the risk of foetal death during the prenatal stage, low birth weight (LBW), postpartum haemorrhage, stroke, hypertension, and heart failure (Azizah et al., 2022).

Factors causing anaemia in pregnant women Insufficient intake of iron from food or iron supplements (iron tablets). Pregnant women who take iron supplements have normal haemoglobin levels because even though iron absorption from food is high, the body cannot meet its iron requirements during pregnancy. Supplements are recommended to ensure adequate nutrition.Factors causing anaemia in pregnant women Insufficient intake of iron from food or iron supplements (iron tablets). Pregnant women who take iron supplements have normal haemoglobin levels because even though iron absorption from food is high, the body cannot meet its iron requirements during pregnancy. Supplements are recommended to ensure adequate nutrition (Hansen et al., 2023). The high rate of anaemia in pregnant women despite iron supplementation is due to the fact that the average number of iron tablets consumed by pregnant women is less than 30 tablets. Compliance with iron tablet consumption will reduce the likelihood of anaemia in mothers. The haemoglobin levels of pregnant women will be greatly affected by iron supplements if they are given in accordance with antenatal care guidelines, which require a minimum consumption of 90 tablets during pregnancy and a healthy diet. Pregnant women can obtain iron from daily foods including beef, spinach, kale, and oranges in addition to using iron tablets. Prevention of anaemia in pregnant women in Indonesia has a positive perception of the use and effectiveness of complementary therapy (Rohmatin et al., 2021).

On the other hand, complementary therapy approaches lead to more holistic treatments, including herbal therapy, which involves consuming plant-based foods such as spinach, dates, guava juice, and moringa leaves (Putri Sayda et al., 2024). One of the plants commonly found in Indonesia is the moringa leaf (Moringa oleifera). Moringa is a tropical plant that is highly nutritious, easy to cultivate, and widely known in traditional medicine and modern nutritional interventions (Putri Sayda et al., 2024). Nutritional analysis shows that dried moringa leaves contain 28.2 mg/100 g of iron, a value that is much higher than most other green vegetables.(Nurhayati et al., 2023). In addition, moringa leaves are rich in vitamin C, which plays an important role in increasing the absorption of non-heme iron by reducing ferric iron ($Fe^{3+}$) to ferrous iron ($Fe^{2+}$), making it easier for the intestinal mucosa to absorb. (Skolmowska & Głąbska, 2022). The combination of iron and vitamin C makes moringa leaves a potential natural ingredient for increasing haemoglobin levels, especially in pregnant women with iron deficiency anaemia (Skolmowska & Głąbska, 2022).

The combination of iron and vitamin C makes moringa leaves a potential natural ingredient for increasing haemoglobin levels, especially in pregnant women with iron deficiency anaemia (Gallaher et al., 2017). Salah satu pendekatan inovatif yang banyak dikembangkan adalah formulasi kapsul serbuk daun kelor, yang memungkinkan pengendalian dosis, meningkatkan stabilitas zat aktif, serta mengurangi rasa dan aroma khas daun kelor yang sering tidak disukai(Masitlha et al., 2024). However, the effectiveness of moringa leaves in increasing haemoglobin levels may vary depending on the processing method and the bioavailability of iron, which is influenced by antinutrients such as phytate and tannin. Modern bioaccessibility studies show that processing techniques such as drying and milling can affect the bioavailability of iron and vitamin C in moringa leaves, making it important to develop more stable and efficient dosage forms.

Based on the results of research conducted by(Triani et al., 2023). Research shows that the increase in haemoglobin in the control group and the intervention group given extra Moringa leaves *(Moringa Olie$fe$ra.L)* resulted in a faster increase in haemoglobin in the group consuming extra Moringa leaves. According to research by Laiskodat (Laiskodat et al., 2021). Administration of 20 grams of fresh moringa leaf soup to pregnant women for one week resulted in an average haemoglobin level of 11.532 grams before and after the intervention, increasing to 12.136 grams. The results of a paired t-test comparing haemoglobin levels before and after moringa leaf administration showed a significance value (p) of 0.000, indicating that moringa leaf administration to pregnant women had a significant effect on their haemoglobin levels. The latest intervention study shows that regular consumption of moringa leaves in fresh or powdered form can significantly increase haemoglobin levels in pregnant women and women of reproductive age. A study conducted in Ethiopia shows that consumption of fresh moringa leaves during pregnancy significantly increases maternal haemoglobin levels (Derbo & Debelew, 2023).

Reva Medika Clinic is a healthcare facility that provides basic or specialised medical services, particularly for pregnant women with anaemia. From preliminary studies conducted by researchers at Reva Medika Clinic, data on pregnant women from January to March 2025 showed that there were 186 pregnant women. Based on the data on pregnant women from January to March 2025, there were 50 pregnant women with anaemia, including 36 with mild anaemia, 10 with moderate anaemia, and 4 with severe anaemia. Based on the above description, the researchers were interested in conducting a study entitled"The Effect of Moringa Oleifera Lam Leaf Powder Capsules on Anaemia in Pregnancy at the Reva Medika Clinic in 2025".

## METHODS

### Research Design and Approach

This study used a quantitative approach with a quasi-experimental design of the *one-group pretest–posttest* type. This design was chosen to evaluate the effect of administering moringa leaf powder capsules (*Moringa oleifera* Lam.) on changes in the anaemia status of pregnant women. Haemoglobin levels were measured before the intervention as a baseline (pre-test) and again after the seven-day intervention period as a final value (post-test), allowing for analysis of the difference in anaemia status before and after treatment.

### Research Time and Location

The study was conducted from January to March 2025 at the Reva Medika Clinic, Banjaririgasi Village, Lebak Gedong Subdistrict, Lebak Regency, Banten Province. The location was chosen based on the high number of visits by pregnant women and the discovery of cases of pregnancy anaemia that met the study criteria.

### Research Population and Sample

The population in this study consisted of all pregnant women who underwent pregnancy check-ups at the Reva Medika Clinic during the study period, with a total of 50 participants. The study sample consisted of 32 pregnant women with mild to moderate anaemia with haemoglobin levels of 8–11 g/dL. The sample was determined using purposive sampling techniques, taking into account the respondents' suitability for the inclusion and exclusion criteria and their willingness to participate in the entire research process.

### Respondent Characteristics

The study respondents were pregnant women aged 20–35 years with a gestational age of 20–32 weeks. All respondents had no comorbidities such as hypertension, diabetes mellitus, or other chronic diseases, and were not taking iron or vitamin C supplements outside of the study intervention. These characteristics were established to minimise confounding factors that could affect haemoglobin levels during the intervention period.

### Research Intervention

The intervention consisted of moringa leaf powder capsules (*Moringa oleifera* Lam.) at a dose of two capsules per day for seven consecutive days. Each capsule contained 500 mg of pure moringa leaf powder that had undergone a drying and grinding process, with natural iron and vitamin C content. During the intervention period, respondents were given instructions on how to consume the capsules and were asked to consume the capsules regularly every day according to the specified dosage.

### Haemoglobin Level Measurement

Haemoglobin levels were measured using a calibrated EasyTouch® HB digital haemoglobinometer (Taiwan). The test was conducted in accordance with standard capillary blood haemoglobin testing procedures, with blood samples taken from the fingertip by trained healthcare personnel. Measurements were taken twice, before administration of the moringa leaf powder capsules and after seven days of intervention, using the same device and procedure to ensure consistency of measurement results.

### Data Management and Analysis

Data obtained from haemoglobin level measurements were categorised into normal anaemia status, mild anaemia, and severe anaemia. Univariate analysis was performed to describe the frequency distribution of anaemia status before and after the intervention. To determine the difference in anaemia status before and after administration of moringa leaf powder capsules, bivariate analysis was performed using the Wilcoxon Signed Rank Test, with a significance level set at p  0.05.

### Research Ethics

This study has obtained ethical approval from the Health Research Ethics Committee of Muhammadiyah University Purwokerto with Number KEPK/UMP/251/VII/2025. Prior to the implementation of the research, all respondents were given an explanation of the objectives, procedures, benefits, and potential risks of the research, and were then asked to sign a written consent form (*informed consent*). The confidentiality of the respondents' identities was maintained through the principle of anonymity, and all research data was used solely for scientific purposes.

## RESULT AND DISCUSSION

**Tabel 1.**
Distribution of Anaemia Status in Pregnant Women Before and After Administration of Moringa Leaf Powder Capsules *(n = 32)*

| Anaemia Status | Before Intervention n (%) | After intervention n (%) |
|---|---|---|
| Normal | 0 (0.0) | 21 (65.6) |
| Mild anaemia | 27 (84.4) | 10 (31.3) |
| Severe anaemia | 5 (15.6) | 1 (3.1) |
| Total | 32 (100.0) | 32 (100.0) |

Table 1 shows that prior to intervention, all pregnant women were anaemic, with the majority experiencing mild anaemia (84.4%). After seven days of administering moringa leaf powder capsules, there was a marked improvement in anaemia status, characterised by an increase in the proportion of pregnant women with normal haemoglobin levels to 65.6% and a decrease in the number of pregnant women with mild and severe anaemia.

Table 2 shows that there is a significant difference between anaemia status before and after administration of moringa leaf powder capsules ($p < 0.05$), indicating that the intervention had an effect.

**Table 2.**
Differences in Anaemia Status Before and After Intervention

| Variable | Mean | SD | p-value |
|---|---|---|---|
| Pre-test | 2.16 | 0.369 | |
| Post-test | 1.38 | 0.554 | 0.000 |

The results of a study of 32 respondents before being given moringa leaf powder capsules showed that some pregnant women experienced mild anaemia (27 people, or 84.4%), while others experienced severe anaemia (15.6%). Anaemia in pregnant women can increase the risk of premature birth, maternal and infant mortality, and infectious diseases. Iron deficiency, which causes anaemia in pregnant women, can have adverse effects on foetal or infant growth and development during pregnancy andsetelahnya (Shaoqi et al., 2020). Factors causing anaemia in pregnant women Insufficient intake of iron from food or iron supplements (iron tablets). Pregnant women who take iron supplements have normal haemoglobin levels because even though iron absorption from food is high, the body cannot meet iron requirements during pregnancy. Supplements are recommended to ensure adequate nutrition (Muliani, 2019).

Based on the results of the research (Purwani & Wijayanti, 2023). Before treatment, almost all pregnant women (93%) had moderate anaemia (Hb 8-11 g/dl), while the rest had severe anaemia (Hb 8 g/dl). Treatment resulted in normal haemoglobin levels in almost all pregnant women (96%), while the rest had moderate anaemia (4%). Based on Jannah et al. (2024)**.** Before the moringa leaf intervention, the average haemoglobin level of pregnant women was 11.532 g%, which falls into the category of mild anaemia, then increased to 12.136 g% after the intervention. According to the researchers' assumptions, the decrease in anaemia in pregnant women was caused by pregnant women's lack of compliance in taking iron tablets**.** This is one of the main factors causing anaemia in pregnancy. The researchers suspect that the low haemoglobin levels in pregnant women before the intervention were closely related to the irregular consumption of iron supplements, which should be taken regularly during pregnancy.

Based on the results Tandirau et al. (2020) showed that after being given moringa leaf powder capsules, 21 respondents (65.6%) did not experience anaemia, 10 respondents (31.3%) experienced mild anaemia, and 1 respondent (3.1%) experienced severe anaemia. Anaemia in pregnant women can increase the risk of premature birth, maternal and infant mortality, and infectious diseases. Iron deficiency causing anaemia in pregnant women can have adverse effects on foetal or infant growth and development during and after pregnancy.

The process of treating anaemia One plant commonly found in Indonesia is the moringa leaf (Moringa oleifera). Due to its high nutritional value, this plant offers many health benefits. Vitamin A, vitamin C, vitamin B, calcium, potassium, fibre, and protein are all abundant in moringa leaves. The human body can easily absorb and utilise these nutrients, making it a good choice for maintaining health. and absorb these nutrients, making it a good choice for improving overall health (Devi et al., 2023).

Based on the research conducted by Research (Satriawati et al., 2021). Stating that prior to therapy, approximately 93% of pregnant women experienced moderate anaemia (Hb 8–11 g/dl) and the remainder experienced severe anaemia. After administering moringa leaves for 2 weeks, haemoglobin levels increased significantly (p=0.000) with an average increase of 2.75 g/dl. According to researcher Isnainy (2019), the Hb of pregnant women (30 people) after being given moringa leaf extract + honey increased from 10.17% to 11.1%. The moringa leaf extract was put into capsules (500 mg per capsule), with a dosage of 2 x 2 per day for 15 days, given together with honey.

According to the researchers' assumptions, the process of increasing Hb in pregnant women after being given moringa leaf powder capsules for 7 days had a significant effect. The results showed an increase in haemoglobin levels because moringa leaf powder capsules contain haematopoietic activity, which is beneficial for increasing platelet counts. This was also influenced by the respondents' cooperation in following the researchers' instructions to consume moringa leaf powder capsules every day, thereby increasing platelet counts. a1>beneficial for increasing platelet count. This is also influenced by the respondents' cooperation in following the researcher's instructions to consume moringa leaf powder capsules daily, resulting in a faster increase than usual.

The results of this study indicate that administration of *Moringa oleifera* leaf powder capsules to pregnant women with mild to moderate anaemia at the Reva Medika Clinic was associated with an increase in haemoglobin levels after intervention, a finding consistent with the cumulative evidence that consumption of moringa leaves can increase haemoglobin levels in pregnant women and women of reproductive age in various geographical contexts (Derbo & Debelew, 2023). These results are consistent with several previous studies that reported the positive effects of Moringa oleifera on increasing haemoglobin levels and improving haematological nutritional status in vulnerable population groups (Rotella et al., 2023). And is also supported by a recent systematic review assessing the intervention of moringa on haemoglobin levels in pregnant women (Rotella et al., 2023). and is also supported by a recent systematic review assessing the intervention of moringa on haemoglobin levels in pregnant women (Kalam et al., 2024). The most plausible physiological explanation bridging these findings is a combination of two mechanisms: the intrinsic iron content in moringa leaves as a source of non-haem iron and the natural vitamin C content which chemically enhances the availability of non-haem iron through the reduction of ferric iron ($Fe^{3+}$) to ferrous iron ($Fe^{2+}$) and the formation of more soluble iron-

ascorbate complexes, thereby improving intestinal absorption (Derbo & Debelew, 2023). In addition, moringa leaves contain other bioactive components (e.g. polyphenols, flavonoids, and potential haematopoietic compounds) that contribute to increased erythropoiesis through the total nutritional and pharmacological support of M. oleifera (Derbo & Debelew, 2023).

The biological power of moringa leaves as a nutritional intervention lies in their combination of mutually supportive micronutrients—not only iron and vitamin C, but also protein, vitamin A, and other minerals that support the general nutritional status of pregnant women—which can improve haematopoietic function in a multifactorial manner. A comprehensive review confirms that the phytonutrient profile of *M. oleifera* makes it an important candidate for local food-based nutritional interventions (Pareek et al., 2023). Namun, bukti kuat tentang kontribusi relatif setiap komponen (misalnya berapa persen kenaikan Hb disebabkan oleh besi dibandingkan faktor hematopoietik lainnya) masih terbatas dan memerlukan uji klinis yang terkontrol dengan analisis biomarker gizi yang lengkap (misalnya feritin, transferrin saturasi, vitamin C serum (Pareek et al., 2023).

The relationship between antioxidant activity and anti-inflammatory effects that may be present in moringa leaf capsules is also consistent with recent literature examining moringa leaf extract not only as a free radical scavenger, but also as an immunomodulator and oxidative stress factor in pathological conditions. The study "In Vitro Antioxidant, Anti-Inflammatory Activity and Bioaccessibility " by Herman-Lara et al. shows that 50–70% ethanol fraction extracts can suppress pro-inflammatory cytokine secretion in cell cultures, even though some of the active content is degraded under digestive conditions (Herman-Lara et al., 2024). This supports the notion that moringa capsules, if they have similar activity, could be potential anti-inflammatory/nutraceutical supplements, particularly in the management of chronic oxidative stress or mild inflammatory conditions.

The use of moringa leaf powder capsules has many benefits, allowing people to make the most of moringa leaves and process them into more practical preparations, such as capsules. They are easy to carry and consume, do not taste bitter, are affordable and easy to obtain. Moringa leaves are usually only processed into vegetables due to an unstable processing history. However, moringa leaves can be used or processed into various other products, such as capsules, tea, flour, pudding, jelly, and masks. Moringa leaf powder contains more nutrients than fresh moringa leaves (Baunsele et al., 2023).

Research related to the use of moringa leaves applies various forms of alternative interventions for moringa leaf consumption, such as administering fresh moringa leaves, moringa leaf tea, and moringa leaf extract. The results of the research indicate that all of these interventions have the potential to serve as non-pharmacological interventions for treating anaemia in pregnant women. It is very important to pay attention to the dosage and method of preparation of moringa leaves so that their benefits can be maximised without causing unwanted side effects (Derbo & Debelew, 2023).

Based on the results of the research (Jannah et al., 2024) there was an effect of extra moringa leaf intake on haemoglobin increase in pregnant women with a p value = 0.000 (0.005). In addition, in the results of Susanti's study (Susanti et al., 2021) The Hb level before administering iron tablets and moringa leaf tea to pregnant women was 10.4 g/dl, and after administration it became 11.5 g/dl. The average Hb level before administering only iron tablets was 10.4 g/dl, and after administration it became 10.8 g/dl, which means that there is a significant effect of administering moringa leaf tea to pregnant women on increasing haemoglobin levels.

Based on the researcher's assumption that administering moringa leaf powder capsules *(Moringa olivera l)* has an effect on anaemia, given the high iron content (±28.2 mg/100 g) in moringa leaves, plus vitamin C, A, protein, and other minerals, makes it very effective in increasing haemoglobin levels in the blood of pregnant women with mild to moderate anaemia. The nutrients in moringa leaves are easily absorbed by the body**,** especially in the form of dried powder/capsules, supporting faster red blood cell regeneration compared to relying solely on iron tablets. Moringa leaf powder capsules are considered easier to consume and more acceptable to pregnant women because they do not cause nausea, are not bitter, are affordable, and can be made and produced locally. This allows respondents to understand the instructions provided and be more cooperative in taking the moringa leaf powder capsules.

In this study, the researcher encountered several limitations, including respondents who suddenly stopped taking moringa leaf powder capsules because they were afraid of harming their babies, as well as those whose husbands did not give their permission, so the researcher had to work extra hard to reassure and persuade the respondents, and in the end, the respondents agreed to take the capsules. Another limitation was the research time, which hindered the recruitment of respondents because the timing of anaemia in pregnant women could not be predicted by the researchers and did not necessarily meet the inclusion and exclusion criteria. Therefore, this research required a considerable amount of time to be maximally effective, approximately 6 months, and was conducted using different research methods.

Data collection for this study was conducted at the Reva Medika Clinic in Lebak Regency in 2025. Data collection was carried out using the Ishak and Michal technique. Based on data from the Reva Medika Clinic, pregnant women with anaemia who met the inclusion and exclusion criteria and were willing to be respondents in the study were selected. All respondents were then given treatment, namely before and after being given moringa leaf powder capsules.

## CONCLUSIONS

The Hb level before administering iron tablets and moringa leaf tea to pregnant women was 10.4 g/dl, and after administration it became 11.5 g/dl. The average Hb level before administering only iron tablets was 10.4 g/dl, and after administration it became 10.8 g/dl, which means that there is a significant effect of administering moringa leaf tea to pregnant women on increasing haemoglobin levels.

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## SUGGESTION

Based on the findings of this study, it is recommended that health workers, especially midwives, consider the use of moringa leaf powder capsules (Moringa oleifera) as a complementary intervention in the treatment of anaemia during pregnancy, especially in resource-limited settings. Health care facilities are expected to integrate nutrition education on the benefits of moringa leaves into antenatal care programmes to increase the knowledge and compliance of pregnant women. Further research with a randomised controlled trial design and a longer intervention period is recommended to evaluate the long-term effectiveness and safety of use. Policy support from local health authorities is also important in encouraging the development, regulation, and distribution of locally sourced plant-based supplements as part of an integrated strategy to reduce the prevalence of maternal anaemia.

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