JKM (Jurnal Kebidanan Malahayati),Vol 10, No. 4. April 2024,
ISSN (Print) 2476-8944 ISSN (Online) 2579-762X, Hal 315-323

COMPARISON OF THE EFFECTIVENESS OF MORINGA AND SPINACH LEAF CAPSULES IN INCREASING HEMOGLOBIN LEVELS AMONG ANEMIC PREGNANT WOMEN IN THE THIRD

Ni Ketut Farida Agustini[1], Sunarsih[2*], Fijri Rachmawati[3], Astriana[4]

[1]Malahayati University Faculty of Health Sciences Midwifery Program
*Correspondence email sunarsih@malahayati.ac.id

ABSTRAK : PERBANDINGAN EFEKTIFITAS KAPSUL DAUN KELOR DAN BAYAM DALAM MENINGKATKAN KADAR HEMOGLOBIN PADA IBU HAMIL ANEMIA KETIGA

Latar Belakang Data Dinas Kesehatan Kota Bandar Lampung tahun 2022 menunjukkan proporsi anemia pada ibu hamil sebesar 37,25% yaitu ibu hamil dengan kadar Hemoglobin < 8 gr%/dl sebesar 2,41%, Hb 8-11gr%/dl sebesar 36,3% . Anemia terjadi pada ibu hamil akibat kurangnya produksi sel darah merah akibat konsumsi nutrisi, terutama zat besi. Zat besi bisa didapatkan dengan mengonsumsi daun kelor. Sayuran lain yang dipercaya banyak mengandung zat besi adalah bayam, khususnya bayam hijau.

Tujuan penelitian untuk mengetahui perbandingan efektivitas kapsul daun kelor dan bayam dalam meningkatkan kadar Hb pada ibu hamil trimester III penderita anemia di Wilayah Kerja Puskesmas Panjang Kota Bandar Lampung Tahun 2023.

Metode Penelitian ini menggunakan jenis penelitian kuantitatif, dengan desain eksperimen semu. Populasi dalam penelitian ini adalah seluruh ibu hamil usia kehamilan trimester III yang melakukan kunjungan ANC di Puskesmas Panjang Kota Bandar Lampung dan mengalami anemia yang berjumlah 47 orang. Sampel sebanyak 36 responden. Teknik pengumpulan data menggunakan lembar angket dan analisis data yang digunakan adalah uji t independen.

Hasil penelitian menunjukkan rata-rata kadar hemoglobin ibu hamil trimester III sebelum mengkonsumsi kapsul daun kelor adalah 10,46 gr/dl, dan pada kelompok daun bayam adalah 10,37 gr/dl. Rata-rata kadar hemoglobin ibu hamil trimester III setelah mengkonsumsi kapsul daun kelor adalah 11,87 gr/dl, dan pada kelompok daun bayam adalah 11,24 gr/dl.

Kesimpulan Terdapat perbedaan efektivitas kapsul daun kelor dan bayam dalam meningkatkan kadar Hb pada ibu hamil TM III anemia di Wilayah Kerja Puskesmas Panjang Kota Bandar Lampung Tahun 2023 (p value 0,000).

Saran Diharapkan kepada tenaga kesehatan dapat mengoptimalkan penyuluhan mengenai konsumsi kapsul daun kelor untuk meningkatkan kadar hemoglobin pada ibu hamil trimester III dengan anemia.

Kata Kunci : Kapsul daun kelor, daun bayam, kadar Hb

ABSTRACT

Background Data from the Bandar Lampung City Health Office in 2022 shows the proportion of anemia in pregnant women is 37.25%, namely pregnant women with Hemoglobin levels < 8 gr%/dl is 2.41%, Hb is 8-11gr%/dl is 36.3%. Anemia occurs in pregnant women due to insufficient production of red blood cells by the consumption of nutrients, especially iron. Iron can be obtained by consuming Moringa leaves. Another vegetable that is believed to contain a lot of iron is spinach, especially green spinach.

The Purpose of the study was to find out the comparison of the effectiveness of moringa and spinach leaf capsules in increasing Hb levels in third trimester pregnant women with anemia in the Working Area of the Panjang Community Health Center, Bandar Lampung City, in 2023.

Methods This study uses a type of quantitative research, with a quasi-experimental design. The population in this study were all pregnant women with their third trimester of gestation who made ANC visits at the Panjang Community Health Center in Bandar Lampung City and experienced anemia with a total of 47 people. A sample of 36 respondents. The data collection technique uses a questionnaire sheet and the data analysis used is the independent t-test.

The results showed that the average hemoglobin level in third trimester pregnant women before consuming moringa leaf capsules was 10.46 gr/dl, and in the spinach leaf group was 10.37 gr/dl. The average hemoglobin

level in third trimester pregnant women after consuming moringa leaf capsules was 11.87 gr/dl, and in the spinach leaf group was 11.24 gr/dl.

Conclusion There is a difference in the effectiveness of moringa and spinach leaf capsules in increasing Hb levels in TM III pregnant women with anemia in the Working Area of the Panjang Community Health Center, Bandar Lampung City, 2023 (p value 0.000).

Suggestion It is hoped that health workers can optimize counseling regarding the consumption of moringa leaf capsules to increase hemoglobin levels in third trimester pregnant women with anemia.

Keywords: Moringa leaf capsules, spinach leaves, Hb levels

INTRODUCTION

Pregnancy occurs when a sperm fertilizes an ovum leading to implantation. According to the international calendar, the duration of a normal pregnancy from fertilization to birth is typically 40 weeks or 9 months. It can be concluded that pregnancy is the process where the egg and sperm unite either inside or outside the uterus, and it concludes with the release of the baby and placenta through the birth canal. (Eniyati, 2019).

During pregnancy, the body undergoes metabolic changes that can make it difficult to diagnose certain blood disorders and assess their severity. One of the most significant changes is the increased demand for oxygen from the mother's body, placenta, and growing fetus. If there aren't enough red blood cells or hemoglobin (which carries oxygen) in the blood to meet the body's needs during pregnancy, it can lead to anemia. (Cunningham dkk, 2013).

According to a study conducted by Bungsu in 2012, 40% of maternal deaths occur due to bleeding during childbirth while an estimated 20% are caused by low hemoglobin levels (nutritional anemia) during pregnancy. Nutritional anemia is often caused by a deficiency of iron, folic acid, vitamin B12, and vitamin A. Among these, iron deficiency is responsible for 75% of nutritional anemia cases during pregnancy. Pregnant women require twice the amount of iron due to increased blood volume without plasma volume expansion, which is necessary for fetal growth and supporting the mother's needs.

According to the World Health Organization (WHO), the prevalence of anemia in pregnant women has been recorded at 4.5% from 2000 to 2019. However, in Indonesia, the incidence of anemia in pregnant women has increased from 42.1% in 2015 to 44.2% in 2019. (WHO, 2020).

According to the Basic Health Research (Riskesdas) conducted in 2018, almost half (48.9%) of pregnant women in Indonesia suffer from anemia. This high prevalence indicates that anemia is a severe public health issue in Indonesia, as it exceeds the anemia prevalence limit of 40%. (Kemenkes RI, 2018).

According to data from the Bandar Lampung City Health Office in 2022, 37.25% of pregnant women suffer from anemia. This means that 2.41% of pregnant women have Hemoglobin levels of less than 8 gr/dl, while 36.3% have Hb levels of 8-11gr/dl. Although the prevalence of anemia in pregnant women has decreased over the years, it still poses a significant risk to pregnant women. Anemia can lead to complications in pregnancy, such as failure to gain weight, increased susceptibility to infections, and premature delivery of a low birth weight (LBW) baby, and even result in abortion. (Dinas Kesehatan Kota Bandar Lampung, 2022).

According to a study conducted at the Panjang Primary Health Care in Bandar Lampung City, among 147 pregnant women who visited the center, 2 of them (1.4%) had moderate anemia, 96 of them (65.3%) had mild anemia, while 51 of them (34.6%) were not anemic. The study was based on the examination of their Hb levels. (Panjang Kota Bandar Lampung, 2022).

Anemia is a condition that occurs when the body doesn't get enough oxygen due to a lack of red blood cells. This can lead to a reduction in physical capability. In pregnant women, anemia can increase the risk of complications during pregnancy and childbirth. These complications can include maternal death, premature birth, low birth weight, and perinatal mortality. Anemic women are also more likely to experience antepartum and postpartum hemorrhage, which can be fatal due to their reduced ability to tolerate blood loss. The effects of anemia during pregnancy can range from mild symptoms to serious complications such as miscarriage, premature labor, bleeding during labor, postpartum infections, low breast milk production, and fetal disorders. These disorders can include miscarriage, growth restriction, congenital defects, low birth weight, and perinatal mortality. (Pujiastutik, 2020).

During pregnancy, some women develop anemia due to insufficient production of red blood cells, particularly caused by the lack of nutrients,

 DOI 10.33024, http://ejurnalmalahayati.ac.id/index.php/kebidanan

especially iron. Iron deficiency anemia is one form of anemia that affects both mothers and children, and is often linked to nutritional issues. There are several factors that can contribute to iron deficiency anemia, including low iron intake due to community consumption patterns, increased body needs caused by ailments, chronic diseases, pregnancy, menstruation, and socioeconomic factors. (Paendong, 2016).

Iron is one of the most important minerals for the body, and it can be found in moringa leaves. Moringa is known for its high levels of antioxidants, particularly in its leaves. Phytochemical tests have revealed that moringa leaves (Moringa oleifera) contain various antioxidants, such as tannins, steroids and triterpenoids, flavonoids, saponins, interquinones, and alkaloids. (Kasolo et al., 2010).

Vitamin C is another important component of Moringa that aids in the dissolution of iron in the human body. When combined with iron, vitamin C forms a soluble iron ascorbate complex, which organs can easily absorb. The conversion of non-heme iron from Ferri to Ferro metabolic compounds is more effective when the stomach has a more acidic pH. Vitamin C can increase the acidity, thus leading to an increase in iron absorption by up to 30%. Folic acid, on the other hand, is crucial for the formation of new cells and can affect Fe in the blood, which is expected to increase hemoglobin levels. (Nur, 2017).

Consuming Moringa (Moringa oleifera) can be an alternative way to address malnutrition in Indonesia. Moringa is a good source of iron (Fe), a micromineral that plays a vital role in the body by helping to build red blood cells. The iron content in Moringa can support the production of heme, which in turn can improve hemoglobin levels.

Scientific research has proven that Moringa leaves are a rich source of nutrients. They contain seven times more vitamin C than citrus fruits, four times more vitamin A than carrots, four times more calcium than milk, three times more potassium than bananas, three times more iron than spinach, and twice as much protein as yogurt or an egg. Moreover, Moringa leaves are free of harmful substances, making them safe for consumption without any side effects. To date, there have been no reports of any cases of poisoning caused by the consumption of Moringa leaves. (Isnainy, 2020).

According to a study conducted by Susiyanti in 2023, consuming moringa can significantly increase hemoglobin levels in pregnant women with anemia in the Lekok Community health center area of Pasuruan Regency. Dried moringa leaves are rich in vitamin C, containing 773 mg of vitamin C per 100 grams of dry matter. Additionally, Moringa leaf extract supplements are considered to be more effective in preventing anemia and maintaining normal hemoglobin levels.

Spinach, particularly green spinach, is another vegetable that is believed to contain a lot of iron, besides moringa leaves. Iron content in spinach plays a significant role in the formation of hemoglobin (Anggraeni, 2018). Spinach (Amaratus sp) is known as the king of vegetables due to its high nutritional value. Spinach is rich in vitamins A, B, and C, and contains important minerals such as calcium, phosphorus, and iron. Spinach is a high source of iron which promotes body growth and maintains good health. The iron content in 100 grams of green spinach is 8.3 mg.

The results of Istiana's research (2019) showed that there was an effect of spinach vegetable consumption on reducing the incidence of anemia in pregnant women at Fatimah Medika Clinic, Terung Kulon Village, Krian District, Sidoarjo Regency.

There is currently a lack of research comparing the effectiveness of using moringa and spinach leaf extract capsules to increase hemoglobin levels in pregnant women. Therefore, it is essential to conduct further studies to investigate the efficacy of these capsules in increasing Hb levels. To address this issue, we are writing an article titled "Comparison of the Effectiveness of Moringa and Spinach Leaf Capsules in Increasing Hemoglobin Levels Among Anemic Pregnant Women in the Third Trimester in the Panjang Community health center Area, Bandar Lampung City in 2023". This study aims to provide valuable information that can help improve the health and well-being of pregnant women who are at risk of anemia.

RESEACRH METHODS

This study is quantitative and was conducted between February and June 2023 at the Panjang Community health center Area in Bandar Lampung City. The research design employed a Quasi-Experimental method, specifically the Pretest-Posttest design with a control group. The population under study were pregnant women in their third trimester who were receiving antenatal care at Panjang Community health center, Bandar Lampung City, and were experiencing anemia. The total number of such women was 47, and the sample size was 36 third-trimester pregnant women with anemia. Out of these, 18 were given moringa capsules, while the remaining 18 were given spinach leaves. The bivariate test used in this study is the Independent T test.

RESEACRH RESULTS

Characteristics of Respondents

It was discovered from the table above that out of the 36 respondents examined, the majority of third-trimester pregnant women in the Panjang Community health center Area of Bandar Lampung City in 2023 were between the ages of 20-35 years old, specifically 21 respondents (58.3%). Additionally, 16 respondents (44.4%) had a high school education, and 24 respondents (66.7%) were unemployed, or were housewives.

Table 1
Characteristics of Third-trimestes Pregnant Women

Characteristics	Total	Percentage (%)
Age		
< 20 years old	10	27.8
20-35 years old	21	58.3
> 35 years old	5	13.9
Education:		
Elementary school	4	11.1
Junior high school	10	27.8
Senior high school	16	44.4
University	6	16.7
Occupation:		
Housewife/ Unemployed	24	66.7
Private Employee	6	16.7
Civil Sevant	2	5.6
Entrepreneur	4	11.1
Others	0	0.0

Univariate Analysis

Table 2
Average Hemoglobin Level in Third Trimester Pregnant Women Before and After Consumption of Moringa Leaf Capsules

Measurement	Hb Levels (gr/dl)				
	n	Mean	SD	Min-Max	95% CI
Before	18	10,46	0,311	10-10,9	10,3-10,6
After	18	11,87	0,346	11,3-12,5	11,7-12,04

According to the table provided, the average hemoglobin level in third trimester pregnant women before taking moringa capsules is 10.46 gr/dl. After taking the moringa capsules, the average hemoglobin level in third trimester pregnant women is 11.87 gr/dl.

Tabel 3
Average Hemoglobin Level in Third Trimester Pregnant Women Before and After Consumption of Spinach Leaf Capsules

Measurement	Hb Levels (gr/dl)				
	n	Mean	SD	Min-Max	95%CI
Before	18	10,37	0,283	10-10,9	10,2-10,5
After	18	11,24	0,495	10,5-12,2	10,9-11,48

Based on the table provided, the average hemoglobin levels of third-trimester pregnant women before consuming spinach leaves was 10.37 gr/dl. After consuming spinach leaves, the average hemoglobin levels of third-trimester pregnant women increased to 11.24 gr/dl.

 DOI 10.33024, http://ejurnalmalahayati.ac.id/index.php/kebidanan

Normality Test

Table 4
Normality Test Results

Variable	Sig	Description
Pre Moringa Leaf Capsules	0,066	Normal
Post Moringa Leaf Capsules	0,721	Normal
Moringa Leaf Capsules Difference	0,121	Normal
Pre Spinach Leaf Capsules	0,098	Normal
Post Spinach Leaf Capsules	0,062	Normal
Spinach Leaf Capsules Difference	0,539	Normal

The table above shows that the normality test Sig value. Shapiro Wilks test > 0.05, so all data is normally distributed.

Bivariate Analysis

According to Table 5, the results showed that the average increase in Hb levels in the moringa leaf capsules group was 1.41 g/dl, with a standard deviation of 0.242 and a standard error of 0.057. In contrast, the average increase in Hb levels in the spinach leaf group was 0.87 g/dl with a standard deviation of 0.370 and a standard error of 0.087. These findings indicate that there is a significant difference in the average increase in Hb levels between the moringa leaf capsule group and the spinach leaf group. The statistical test results showed a p-value of 0.000 (p count < α = 0.05), indicating that at α = 5%, there is a significant difference in the effectiveness of moringa leaf capsules and spinach leaves in increasing Hb levels in third-trimester pregnant women with anemia in the Panjang Community health center Area, Bandar Lampung in 2023.

Table 5
Comparison of the Effectiveness of Moringa Leaf Capsules and Spinach Leaf Capsules in Increasing Hemoglobin Levels in Third Trimester Pregnant Women with Anemia

Increase in Hb Levels	Hb Level (gr/dl)				
	N	Mean	SD	SE	P Value
Moringa Leaf Capsules	18	1.41	0.242	0,057	0.000
Spinach Leaf Capsules	18	0.87	0.370	0,087	

DISCUSSION

Average Hemoglobin Level in Third Trimester Pregnant Women Before Consumption of Moringa and Spinach Leaf Capsules

According to the table presented, the average hemoglobin level in third trimester pregnant women before taking moringa leaf capsules was 10.46 gr/dl, while in the spinach leaf group, it was 10.37 gr/dl.

Hemoglobin is a colored substance found in red blood cells that plays a crucial role in the transportation of oxygen and carbon dioxide in the body (Adriani & Wirjatmadi, 2012). The formation of hemoglobin involves the creation of a pyrrole compound, which then joins together to form a protoporphyrin compound, then binds to iron to form a hem molecule. Finally, it binds to a globin molecule, resulting in the formation of Hb (Sartika, 2021).

Symptoms of anemia include dizziness, fogginess, lethargy, weakness, fatigue, enlarged spleen, lack of appetite, decreased body fitness, and impaired wound healing (Irianto K, 2014). Anemia during pregnancy can lead to complications during childbirth, and increase the risk of maternal and infant mortality (Irianto K, 2014).

Anemia is a common problem in obstetrics, particularly in third-trimester pregnant women, where it is defined as a hemoglobin level of less than 10 g/dl. Despite having adequate iron levels, pregnant women usually have a hemoglobin concentration of around 11-12 g/dl before delivery. However, this is further worsened by blood loss during childbirth and in the postpartum period.

The findings of this study are consistent with Sartika's research (2021), which demonstrates the average Hb levels in first-trimester pregnant women before and after treatment, as well as the impact of moringa leaf extract intervention on increasing Hb levels. The average Hb level before intervention was 11.440 g/dL (SD = 0.7890).

The researcher attributes the low Hb level in participants to the fact that the sample in this study consisted of third-trimester pregnant women, who

experience a physiological process called hemodilution or blood dilution at that stage of pregnancy, resulting in a decrease in Hb levels.

Average Hemoglobin Level in Third Trimester Pregnant Women After Consumption of Moringa and Spinach Leaf Capsules

According to the table above, pregnant women in their third trimester who consumed moringa leaf capsules had an average hemoglobin level of 11.87 gr/dl, while those in the spinach leaf group had an average level of 11.24 gr/dl.

The increase in hemoglobin levels was due to the high iron content in Moringa leaves. In fact, 100 grams of Moringa leaf powder contains 44.1 mg of iron, which is enough to meet 196% of the recommended daily iron requirement. The iron content in dried moringa leaves or moringa leaf flour is 25 times higher than spinach, making it a natural alternative for pregnant women who suffer from anemia.

The study conducted by Handayani and Priyanti (2021) was a quantitative research using The One Group pre-test post-test design. The sample technique used in this study was total sampling/total population of 32. The data was analyzed using the paired t-test statistical test. With a significance level of 0.05, the results showed that the p value was 0.000 (p value <0.05). Therefore, it can be concluded that there is a significant effect of moringa leaf extract consumption on the increase of Hb levels in pregnant women at the Semanu Community health center.

According to Arini's research in 2018, there were notable changes in Hb (Hemoglobin) levels following the administration of moringa leaf flour in both the intervention and control groups. Prior to being given moringa leaf flour, the mean value for Hb levels in the intervention group was 11.248 mg/dl, which increased to 12.27 mg/dl following the treatment. On the other hand, the control group's Hb levels increased from 10.92 mg/dl to 11.15 mg/dl, indicating a smaller increase. The Wilcoxon test results showed that the p-value for the intervention group was 0.000, which is less than the level of significance (α) set at 0.05. Conversely, the control group's p-value was 0.271, which is greater than the level of significance (α) set at 0.05. This suggests that there is a significant difference between the intervention and control groups. Therefore, it can be concluded that moringa leaf flour has an effect on increasing Hb levels in the intervention group. Additionally, the Mann Whitney test results showed a p-value of 0.001, which is less than the level of significance (α) set at 0.05, indicating that there is an effect of moringa flour on increasing Hb levels when comparing the intervention and control groups after the treatment.

Researchers have found that pregnant women who were given moringa leaves experienced an increase in their Hb levels. This increase is due to various factors such as the woman's condition, her consistency in taking blood supplement tablets, and her dietary habits. The consumption of moringa leaves and its consistency also contribute to the increase in Hb levels, which in turn has a positive impact on the mother's immune system. It's important to note that a combination of these factors helps in increasing the Hb levels of pregnant women.

Comparison of the Effectiveness of Moringa Leaf Capsules and Spinach Leaf Capsules in Increasing Hemoglobin Levels in Third Trimester Pregnant Women with Anemia

The study found that there was a difference in the average increase in Hb levels between the moringa leaf capsule group and the spinach leaf group. The average increase in Hb levels after taking moringa capsules was 1.41 g/dl, with a standard deviation of 0.242 and a standard error of 0.057. On the other hand, the average increase in Hb levels in the spinach leaf group was 0.87 g/dl with a standard deviation of 0.370 and a standard error of 0.087. The statistical test results showed a p-value of 0.000 (p count < α = 0.05), indicating that there was a significant difference in the effectiveness of moringa leaf capsules and spinach leaves in increasing Hb levels in third-trimester pregnant women with anemia in the Panjang Community health center Area of Bandar Lampung City in 2023.

Research has shown that the high iron content in moringa leaves makes it effective in overcoming anemia. According to Savitri A (2016), and consistent with research conducted by Sylvie et al (2013), moringa leaf powder can increase hemoglobin levels by 1-3 gr / dL. This can be achieved by taking 2x2 capsules of moringa leaf powder per day for 30 days, with each capsule containing 500 mg of moringa leaf powder.

t is important to note that only 5-15% of dietary iron can be absorbed by adults who have sufficient iron levels. However, in cases of iron deficiency, the absorption can increase up to 50%. The amount of iron that the body needs plays a significant role in this process. When there is a shortage of iron or an increased demand for it, the absorption of non-heme iron can increase up to 10 times while heme iron can increase twice as much (Almatsier S, 2010). Moringa leaves are a great source of the elements needed for the formation of hemoglobin. The process of hemoglobin formation

 DOI 10.33024, http://ejurnalmalahayati.ac.id/index.php/kebidanan

requires a combination of succinate molecules (carbohydrates), glycine (amino acids), iron elements (ferum), globin molecules, and various enzymes and vitamins. These vitamins and minerals include potassium, phosphorus, pantothenic acid, pyridoxine (B6), niacin, folic acid, riboflavin, and vitamin C, which plays a crucial role in facilitating the work of enzymes in carrying out their functions more efficiently.

Consuming moringa leaves can help boost hemoglobin levels. This is because moringa leaves are rich in iron, which is an essential ingredient in hemoglobin formation. The iron content in dried moringa leaves (moringa leaf extract) is about 27.1 grams per 100 grams (Bora, 2017).

During pregnancy, giving moringa and spinach leaves to women can increase their Hb levels. However, moringa leaves are more effective in increasing Hb levels compared to spinach leaves. This is because moringa leaves contain more substances that can increase Hb levels than spinach leaves. Moringa leaves are an excellent source for treating iron deficiency anemia. The iron content in spinach is only 3.9 mg per 100 grams of spinach leaves, which is significantly lower than that of moringa leaves. Therefore, moringa leaves are more influential in increasing Hb levels in pregnant women after consumption.

Iron plays an essential role in the body, including transporting oxygen from the lungs to the body tissues, acting as an electron transporter in cells, and being a part of various enzyme reactions in human body tissues. Hematopoiesis (blood formation) also requires iron, mainly in the synthesis of hemoglobin (Hb). The average amount of iron in the body is 4-5 grams, with approximately 65% found in the form of hemoglobin. About 4% is found in the form of myoglobin, and 1% is found in the form of various heme compounds that can increase intracellular oxidation. Additionally, 0.1% joins the transferrin protein in the blood plasma, and 15-30% is mainly stored in the system.

Iron deficiency can have negative effects on the growth of both body cells and brain cells, as well as lowering body immunity and hemoglobin levels. The body's iron status depends on iron absorption, which can be enhanced by certain factors. Vitamin A and vitamin C are iron enhancers that can improve iron absorption. In addition to iron, Moringa leaves (Moringa oleifera L.) also contain these vitamins. Vitamin A can help with iron excretion from the liver, and supplementing with both vitamins can improve their status in the body. Vitamin C, on the other hand, helps absorb non-heme iron by converting it into a more easily absorbed form.

Moringa leaves also contain protein, which has a crucial role in iron transportation in the body. Without sufficient protein intake, iron transportation can be inhibited, resulting in iron deficiency and lower hemoglobin levels. The amount of protein intake is directly proportional to hemoglobin levels in the blood.

CONCLUSION

The average hemoglobin level of third trimester pregnant women before taking moringa capsules was 10.46 gr/dl, while it was 10.37 gr/dl for those who consumed spinach leaves. After taking moringa capsules, the average hemoglobin level of third trimester pregnant women was found to be 11.87 gr/dl, and it was 11.24 gr/dl for those who consumed spinach leaves. The study conducted in the Panjang Community health center Area, Bandar Lampung City in 2023 shows that there is a significant difference in the effectiveness of moringa leaf capsules and spinach leaves in increasing Hb levels in third trimester pregnant women with anemia (p value 0.000).

RECOMMENDATION

Health Workers especially at Panjang Community health center, Bandar Lampung According to the findings, the intake of moringa capsules helped to raise hemoglobin levels in pregnant women who were in their third trimester and had anemia. This indicates that medical professionals should emphasize the significance of consuming moringa capsules in order to improve hemoglobin levels in such women. Third-trimester Pregnant Women with Anemia. Pregnant women in their third trimester who suffer from anemia are advised to take Moringa leaf capsules for 15 days, along with iron (Fe) tablets. It is important to take the Fe tablets in the right way to ensure proper absorption, such as taking them with water or fruit juice, and not with tea. Other Researchers,The study results showed a significant difference in the increase of Hb levels between pregnant women who were given moringa capsules and those who were given spinach capsules. This difference can be attributed to the significant difference in iron values in moringa and spinach capsules. Moringa capsules contain 28.2 mg of iron and 1125.71 mg of vitamin C while spinach capsules contain only 3.9 mg of iron and 80 mg of vitamin C. Hence, for future studies, it is suggested to use materials with equivalent iron content to avoid any bias in the study results. Additionally, it is recommended to conduct similar research with a more rigorous selection of samples, such as using samples with the same nutritional status (normal).

REFERENCES

Alessandro Leono, et al. (2013). *Moringa oleifera Seeds and oil : Characteristict and Use for Human Health. Article*

Almatsier. (2010). *Prinsip Dasar Ilmu Gizi.* Jakarta : Gramedia Pustaka Utama.

Anggraeni, I. E., Supriyana, S., Rahayu, S., & Suhartono, S. (2014). Pengaruh suplemen bayam (Amaranthus) terhadap perubahan kadar hemoglobin (studi laboratorium mencit). *Bhamada: Jurnal Ilmu dan Teknologi Kesehatan (E-Journal)*, *5*(1), 13-13.

Bungsu, P. (2012). Pengaruh Kadar Tanin pada Teh Celup terhadap Anemia Gizi Besi pada Ibu Hamil di UPT Puskesmas Citeureup Kab Bogor. Tesis. S2 Epidemiologi. FKM UI

Cunningham, et al. (*2013*). *Obstetri Williams* Edisi 23 Volume 1. Jakarta : EGC

Dartiwen & Nurhayati, (2019). *Asuhan Kebidanan Masa Kehamilan. I ed.* Yogyakarta : Graha Ilmu.

Dinas Kesehatan Kota Bandar Lampung. (2020). Profil Kesehatan Kota Bandar Lampung.

Elvi Nola D, (2016). Faktor-faktor yang berhubungan dengan Kejadian Intta Uterine Fetal Death (IUFD). *Jurnal Ilmiah Bidan*, Vol.4. No.1

Eniyati, E., Yulaikhah, L., & Puspitasari, D. (2019). Faktor yang Berhubungan dengan Cakupan K4 di Puskesmas Sedayu II Kabupaten Bantul Tahun 2017. *Jurnal Kebidanan Harapan Ibu Pekalongan*, *5*, 159-164.

Ganatra, T. H. et al. (2012). *A Panoramic View On Pharmacognostic, Pharmacological, Nutritional, Therapeutic And Prophylactic Values Of Moringa oleifera Lam*. IRJP, 3(6).

Gopalan. (2012). *Nutritive Value Of Indian Foods*. India: National Institute Od Nutrition

Hutahaean, S. (2013). *Perawatan antenatal*. Penerbit Salemba Medika: Jakarta

Iskandar, I., et al. (2015). *Effect of Moringa oleifera Leaf Extracts Supplementation in Preventing Maternal Anemia and Low Birth Weight*. *IJSRP,* 5(2), pp. 1-3.

Isnainy, U. C. A. S., Arianti, L., & Rosalia, D. (2020). Pengaruh Konsumsi Ekstrak Daun Kelor Dan Madu Terhadap Peningkatan Hb Ibu Hamil Di Wilayah Kerja Puskesmas Way Halim Kota Bandar Lampung. *Malahayati Nursing Journal*, *2*(1), 57-67.

Istianah, I., Umaroh, M., Manggiasih, V. A., Patmawati, R. M., & Fibriana, F. D. (2019, December). Pengaruh Sayur Bayam Terhadap Kejadian Anemia pada Ibu Hamil di Klinik Fatimah Medika Terung Kulon Krian Sidoarjo. In *Prosiding Seminar Nasional INAHCO 2019* (Vol. 1).

Kasolo, J. N., Bimenya, G. S., Ojok, L., Ochieng, J., & Ogwal-Okeng, J. W. (2010). *Phytochemicals and uses of Moringa oleifera leaves in Ugandan rural communities.*

Kemenkes RI. (2011). *Penerapan Pola Konsumsi Makanan dan Aktivitas Fisik*, Available at: http://gizi.depkes.go.id/download/pedoman gizi/stranas kt penganta.pdf-gabung.pdf.

Kemenkes RI. (2015). *Prevalensi Ibu hamil Di Indonesia.* Jakarta : Badan Litbangkes Kemenkes RI

Manuaba. (2016). *Ilmu Kebidanan Penyakit Kandungan dan KB.* Jakarta : EGC.

Nadiyah, N., Briawan, D., & Martianto, D. (2014). Faktor risiko stunting pada anak usia 0—23 bulan di Provinsi Bali, Jawa Barat, dan Nusa Tenggara Timur. *Jurnal gizi dan pangan*, *9*(2).

Nur, F. (2017). *Uji Daya Hambat dan Analisis KLT Bioautografi Fraksi dari Ekstrak Korteks Kelor (Moringa oleiferal) terhadap Beberapa Mikroba Patogen* (Doctoral dissertation, Universitas Islam Negeri Alauddin Makassar).

Nuryati, N. (2023). *Pengaruh Konsumsi Kapsul Daun Kelor (Moringa Oleifera) Terhadap Kenaikan Kadar Hb Pada Ibu Hamil Dengan Anemia Di Puskesmas Ketapang II Sampit* (Doctoral dissertation, Poltekkes Kemenkes Palangka Raya).

Paendong, F. T., Suparman, E., & Tendean, H. M. (2016). Profil zat besi (Fe) pada ibu hamil dengan anemia di Puskesmas Bahu Manado. *e-CliniC*, *4*(1).

Prasanna, V., & Sreelatha, S. (2014). *Synergistic effect of Moringa oleifera attenuates oxidative stress induced apoptosis in Saccharomyces cerevisiae cells: evidence for anticancer potential*. *Int J Pharm Bio Sci*, *5*(2), 167-177.

Pujiastutik, Y. E., Refina, R. C., Winarno, A. F. P., & Yuliana, E. T. (2020). Efikasi Fortifikasi sebagai Determinan Anemia Kehamilan dengan Biskuit Sweet Potato (Ipomoea Batatas L.). *Jurnal Wiyata: Penelitian Sains dan Kesehatan*, *7*(1), 69-77.

Razis, A. F. A. & Muhammad Din Ibrahim S. (2014). *Health Benefit Moringa oleifera*. *Asian Pac J Cancer Prev*, 15(20), pp. 8571-8576.

Rismawati, R., Jana, V. A., Latifah, N. S., & Sunarsih, S. (2023). Manfaat Kapsul Daun Kelor Dalam Meningkatkan Kadar Hemoglobin Ibu Hamil. *Jurnal Kebidanan Malahayati*, *7*(2), 229-233.

Rohmatika, D., & Umarianti, T. (2017). Uji Laboratorium Pengukuran Kandungan Zat Besi (Fe) Pada Ekstrak Bayam Hijau

 DOI 10.33024, http://ejurnalmalahayati.ac.id/index.php/kebidanan

(Amarathus Hybridus l). *Jurnal Ilmiah Maternal*, *2*(2).

Sari, Y. O., Darmayanti, D., & Ulfah, M. (2023). Pengaruh Pemberian Zat Besi Dan Sayur Bayam Terhadap Peningkatan Kadar Hemoglobin Ibu Hamil Dengan Anemia Di Wilayah Kerja Puskesmas Martapura I. *Jurnal Keperawatan Suaka Insan (Jksi)*, *6*(1), 20-27.

Silva, M. F., Leticia Nishi & Ammad Far. (2014.) *The Many Health Benefits Of Moringa oleifera. JMPI,* 1(3), pp. 9-12

Supariasa, I. D. N., Bakri, B., & Fajar, I. (2016). *Penilaian status gizi* edisi 2. Jakarta: EGC.

Susiyanti, E., & Virgia, V. (2022). Perbedaan Efektifitas Rebusan Kapsul daun kelor Dan Daun Kelor Terhadap Peningkatan Kadar Hb Pada Ibu Hamil. *Jurnal Keperawatan dan Kebidanan*, *14*(2), 7-15.

Syahruni, (2015). *Efek Pemberian Ekstrak Daun Kelor Terhadap Jumlah Eritrosit Dan Kadar Hemoglobin Pada Ibu Hamil Perokok Pasif Di Kab. Takalar*. UNHAS, pp. 12-17. (Skripsi tidak dipublikasi)

Utami, P., et al. 2(013). *The Miracle Of Herbs.* Jakarta Selatan: Argomedia Pustaka.

World Health Organization. (2013). *Guideline:Iintermittent Iron and Folic Acid Supplementation In Menstruating Women_978 92 4 150202*

Wulandari, C. (2019). *Pengaruh Konsumsi Daun Bayam Terhadap Peningkatan Kadar Hemoglobin (Hb) Pada Ibu Hamil Dengan Anemia* (Doctoral dissertation, Poltekkes Tanjungkarang)

Zakaria, et al. 2015. *The Effect of Moringa Leaf Extract in Breastfeeding Mothers against Anemia Status and Breast Milk Iron Content*. IJSBAR, Volume 24, pp. 321-329.