



# Effectiveness of Consumption of Moringa Leaves, Fe Tablets with Dates and Fe Tablets Against Increasing Hemoglobin in Pregnant Women with Anemia

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**Abstract:** Anemia is a significant health issue with serious consequences, including increased maternal and infant mortality and reduced performance in various activities. In pregnant women, nutritional anemia not only jeopardizes the mother's health but also affects fetal development and pregnancy outcomes. This study aimed to assess the effectiveness of consuming Moringa leaves and dates in increasing hemoglobin levels in pregnant women with anemia. A quasi-experimental design with a pre-test and post-test was used, involving 210 pregnant women divided into two groups. Group 1 received Moringa leaves and Fe tablets, while Group 2 received dates and Fe tablets, with interventions lasting 30 days. Initial tests showed moderate anemia in both groups. After the intervention, significant improvements in hemoglobin levels were observed in both groups. However, the combination of dates and Fe tablets proved more effective than Moringa leaves and Fe in raising hemoglobin levels. The findings suggest that both Moringa leaves and dates are effective in combating anemia in pregnant women, with dates showing slightly better results.

**Keywords:** Anemia; Dates; Fe tablets; Moringa leaves; Pregnant women

## Introduction

State Maternal and child health is a top priority for the Ministry of Health. The success of the maternal and child health (KIA) program is an important indicator in the National Long Term Development Plan (RPJPN) 2005-2025. The maternal and infant mortality rate is an important indicator in assessing the progress of health sector development. An area can be said to have better health development if the Maternal Mortality Rate (MMR) in that area is low (Indonesian Ministry of Health, 2019). In the national context, MMR tends to experience fluctuating changes from time to time (Risksedas, 2018; Notoatmodjo, 2018).

Based on data from the Indonesian Basic Health Survey (SDKI) in 2017, the maternal mortality rate in Indonesia in 2012 was recorded at 359 per 100,000 live births (Indonesian Ministry of Health, 2020). However, in 2015, data from the Inter-Census Survey (SUPAS) showed that the maternal mortality rate had fallen to 305 per 100,000 live births. This means that the maternal mortality rate has exceeded the target set in the National Long Term Development Plan (RPJPN) for the 2015-2019 period, the Maternal Mortality Rate target was set at 306 per 100,000 live births. Meanwhile, for long-term goals, the government targets reducing the maternal mortality rate to less than 70 per 100,000 live births by 2030 (Risksedas, 2018).

## How to Cite:

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Anemia in pregnancy occurs when a pregnant woman has a hemoglobin (Hb) level of less than 11 grams per deciliter (gr%) in the first and third trimesters, and less than 10.5 gr% in the second trimester. This is caused by hemodilution, especially in the second trimester. In pregnant women, anemia means the condition of red blood cells or hemoglobin levels in the blood decreases, so that the ability to transport oxygen for the needs of vital organs in the mother and fetus is reduced. Normally, pregnant women should have a minimum Hb level of 11g/dl (Widowati et al., 2019).

Anemia caused by malnutrition is a serious health problem. This condition contributes to an increased risk of maternal and infant mortality, as well as reducing work productivity, performance in sports and ability to work in general. In pregnant women, iron deficiency not only impacts the mother's own health, but also affects fetal development and pregnancy outcomes. To overcome this problem, the government has implemented various policies, including a program of providing a minimum of 90 iron tablets to every pregnant woman. Even though the distribution of iron tablets has increased, the incidence of anemia in pregnant women remains high (Wahyuni et al., 2019).

Providing iron tablets to pregnant women underscores the important role of health workers in determining the success of the program. Several obstacles that hinder the effectiveness of the program in preventing anemia include weak monitoring of drug consumption compliance, lack of optimal counseling and educational media, inadequate recording systems, and non-standard drug storage. Furthermore, the absorption of iron in the body is also influenced by its form in food, the condition of the digestive tract, and the composition of the food itself. High levels of stomach acidity play an important role in increasing the solubility of iron, which in turn increases the bioavailability or the body's ability to absorb and utilize the iron.

Anemia is a medical condition characterized by low levels of hemoglobin in the blood, often caused by a lack of important blood-forming nutrients such as iron, folic acid, or vitamin B12. In pregnant women, iron deficiency anemia is the most common type. This occurs because the need for oxygen increases during pregnancy, which results in increased production of red blood cells. However, plasma volume increases faster than red blood cells, causing a decrease in hemoglobin concentration due to blood thinning. Anemia during pregnancy can have serious consequences, including the risk of a low birth weight baby, premature birth, miscarriage, prolonged labor, weak postpartum uterine contractions, heavy bleeding, and even shock. Furthermore, anemia can have a negative impact on work ability, motor development and mental function

not only in babies, but also in children and adolescents (Widowati et al., 2019).

Several studies, such as those conducted by Rimawati et al. (2018), shows that giving iron (Fe) supplements combined with consuming foods that contain iron, such as sweet potatoes, and foods that contain iron absorption aids (Fe enhancers) such as tinutuan, fruits rich in vitamin C (for example guava juice), red spinach and beets, as well as foods high in vitamins B9 and B12 such as green beans and seaweed, can increase hemoglobin levels in pregnant women. Apart from that, limiting the consumption of foods that contain iron absorption inhibitors also has an effect on optimizing iron absorption in the body.

Another research from Atika et al. (2021) shows that iron tablets will be more effective if taken together with other supplements that help hemoglobin synthesis and iron absorption, one of which is Moringa leaf extract. The compound content in Moringa leaves has been researched and is reported to contain 28.29 mg of iron per 100 grams. Giving Moringa leaf extract is one of the most effective non-pharmacological ways to increase red blood cells or hemoglobin levels in pregnant women. Moringa leaves are a type of food that is widely grown in Indonesia, including in Tasikmalaya Regency. Moringa has nutrients that are good for body health. Various research results show the many benefits of Moringa leaves, including being a very powerful antioxidant and very good for diseases related to digestive problems, can lower blood sugar levels, control blood pressure, prevent cancer and can increase red blood cells or hemoglobin in the mother. pregnant (Satriawati et al., 2021).

Iron-rich fruits, such as dates, play an important role in increasing hemoglobin levels. Dates not only provide iron, but also contain a variety of essential vitamins such as riboflavin, biotin, thiamine, folic acid and ascorbic acid. In addition, dates are a good source of carbohydrates, providing sufficient energy to the body. The sugar content consists of a mixture of glucose, fructose and sucrose. Data from the Hajj Ministry of Health shows that 100 grams of dates contain 0.90 mg of iron, equivalent to 11% of the Nutritional Adequacy Rate (AKG). This iron plays a vital role in transporting oxygen in the blood. Consuming dates can help maintain iron balance in the body, which is very beneficial for pregnant women to reduce the risk of bleeding. Thus, dates are a good fruit choice for increasing hemoglobin levels and maintaining general health (Susilowati, 2017).

Dates are known to be a superior source of carbohydrates, providing adequate energy to the body. The sugar composition includes glucose, fructose and sucrose. The iron contained in dates plays a crucial role in the circulatory system, especially in transporting

oxygen. Adequate iron intake can help maintain the balance of this mineral in the body, which in turn can reduce the risk of bleeding in pregnant women. Consuming dates can be an effective non-pharmacological alternative for treating and preventing anemia, especially in pregnant women. This approach can complement or even replace the consumption of iron tablets which often cause side effects such as nausea, constipation, black stools and diarrhea. Thus, dates offer a natural solution that is friendlier to the body in an effort to increase hemoglobin levels and manage health during pregnancy (Gondokesumo & Susilowati, 2021).

#### *Study Literature*

Hemoglobin (Hb) is a protein that contains iron and plays an important role in transporting oxygen in red blood cells. Hemoglobin's ability to bind with oxygen allows it to transfer oxygen from the lungs to various body tissues. To determine oxygen levels in the blood, the amount of hemoglobin in 100 milliliters of blood can be measured. Chemical methods are used to measure hemoglobin, which indirectly shows how much oxygen is contained in the blood (Irmawati & Rosdiana, 2020).

The main role of hemoglobin is to transport oxygen from the lungs to all parts of the body, while also carrying carbon dioxide from body tissues back to the lungs for elimination. Hemoglobin is also responsible for the characteristic red color of blood. To be able to carry out its function optimally, each red blood cell contains around 640 million hemoglobin molecules. Hemoglobin has several important functions, which will be explained further: Regulates the process of exchanging oxygen and carbon dioxide in body tissues, Oxygen is distributed throughout the body's tissues after being taken from the lungs, Transports carbon dioxide from body tissues as a result of metabolism to the lungs for disposal (Irmawati & Rosdiana, 2020).

Anemia is a condition where the body's physiological needs are not met by the number of red blood cells or the amount of oxygen carriers in the blood (Zares & Simanungkalit, 2021). Meanwhile, according to Fadhila et al. (2023) anemia is a decrease in the number of erythrocytes as indicated by a decrease in hemoglobin, hematocrit and erythrocyte levels. Hemoglobin synthesis requires sufficient availability of iron and protein in the body. Protein plays a role in transporting iron to the bone marrow to form new hemoglobin molecules.

Caused anemia by reduced iron stores in the body, which disrupts hemoglobin synthesis, is known as iron deficiency anemia. The state of anemia is assessed using the hemoglobin component of red blood cells. The normal value for hemoglobin levels in women is 12-16 g/dl. Iron is the main element needed for the formation

of hemoglobin. Decreased iron intake can reduce hemoglobin levels in the body (Nasruddin et al., 2021).

Iron deficiency anemia can be caused by several factors. Low consumption of animal sources of iron (heme iron) is one cause, because this type of iron is more easily absorbed by the body. Meanwhile, non-heme iron sources are difficult to absorb, so more intake is needed. Deficiencies in other nutrients such as protein and vitamin C can also contribute to this condition. Moringa leaves have been identified as a rich source of nutrition, these leaves contain high amounts of vitamins A, C, B, calcium, potassium, iron and protein that are easily digested. Moringa leaves are also rich in antioxidants, including ascorbic acid, flavonoids, phenolic compounds, and carotenoids.

The moringa plant has been the subject of in-depth research by Gopalan and team, with their findings published in "All Things Moringa". This study reveals the rich content of moringa which includes various groups of important compounds. Moringa not only contains basic nutrients, but is also rich in vitamins and minerals. Furthermore, this plant is a good source of antioxidants and contains a variety of amino acids. This diversity of ingredients makes moringa a very interesting plant from the perspective of nutrition and potential health benefits, opening up opportunities for various applications in food and medicine (Rajagopal et al., 2017).

Susilowati (2017) has conducted research on the Effect of Giving Dates to TM III Pregnant Women with Anemia on Hemoglobin Levels. There is an effect of giving dates to pregnant women on increasing hemoglobin levels with an average increase in hemoglobin levels of 1.1%, with a significant value of 0.001. Shows the effect of increasing hemoglobin levels by giving dates, using the Paired t-test and Independent t-test.

Dates contain high carbohydrates so they can provide sufficient energy. Some of the contents of dates consist of glucose, fructose, sucrose. Iron is one of the components in the blood to carry oxygen in the blood, to maintain the balance of iron in the body, thereby reducing the risk of bleeding in pregnant women (Yuviska & Yuliasari, 2020). Iron requirements during pregnancy increase drastically, reaching 800-1040 mg. Distribution includes 300 mg for fetal growth, 50-75 mg for placenta formation, 500 mg to increase maternal hemoglobin mass, 200 mg excreted through the intestines, urine and skin, and 200 mg lost during birth. Although daily food consumption can produce 10-15 mg of iron, the body is only able to absorb 1-2 mg.

## Method

This research design Quasy Eksperimental with pre test and post test namely by using two groups, group 1 was given intervention by giving moringa leaves and Fe tablets and group 2 was given intervention with dates and Fe tablets. In both groups, initial hemoglobin levels were checked (pre), then both groups were given to consume 1 Fe tablet combined with Moringa leaves or dates for 30 consecutive days, then hemoglobin levels were checked again after the intervention (post). The sample was 210 people divided into 2 groups, namely 105 people in the moringa group and 105 people in the date palm group using a purposive sampling technique. The data collection tools used in this research were an SOP checklist for consumption of Moringa leaves and Fe tablets as well as dates and Fe tablets, a hemoglobin level observation sheet and a digital hemoglobin measuring device. Data analysis was carried out to determine the effectiveness of giving leaves Moringa and Fe tablets for group 1 as well as dates and Fe tablets for group 2 for pregnant women who experience anemia. Previously, the research data was tested for normality kologrov-smirnov and homogeneity. Then the researcher tested the differences between before and after treatment using a test Paired Sampel T-Tes, and test the differences between the groups of Moringa leaves and Fe and dates and Fe using the test Independent Sample T-Test.

## Result and Discussion

### Univariate Test Results

**Table 1.** Respondent characteristics

Variable	Category	Group			
		Kelor+Fe		Date+Fe	
		F	%	F	%
Age	< 20	1	1.00	4	3.80
	20-24	32	30.50	34	32.40
	25-28	40	38.10	37	35.20
	29-35	23	21.90	20	19.00
	> 35	9	8.60	10	9.50
Education	< Middle school	22	21.00	25	23.80
	Junior High School	23	21.90	21	20.00
	SMA	41	39.00	45	42.90
	PT	19	18.10	14	13.30
Work	IRT	49	46.70	48	45.70
	Employee	12	11.40	10	9.50
	Self-employed	14	13.30	24	22.90
	ASN	17	16.20	13	12.40
	Others	13	12.40	10	9.50

Variable	Category	Group			
		Kelor+Fe		Date+Fe	
		F	%	F	%
Parity	Primipara	64	61.00	64	61.00
	Multiparous	41	39.00	41	39.00

Based on table above, it can be seen that the majority of respondents in the Moringa leaf and Fe group were 25-28 years old, 40 people (38.10%), likewise in the dates and Fe group, the majority were 25-28 years old, 37 people (35.20%). The highest level of education in the Moringa leaf and Fe groups was high school with 41 people each (39%), likewise for the date palm and Fe groups, the highest were high school graduates with 45 people (42.90%). The majority of respondents' occupation was as a housewife, 49 people (46.70%) in the Moringa leaf and Fe group, while in the dates and Fe group it was 48 people (45.70%). The highest parity was primipara as many as 64 people (61%) in the Moringa leaf and Fe group and 64 people (61%) in the date palm and Fe group.

**Table 2.** Up to hemoglobin

Group	Variable	Mean	Median	Std. Dev
Moringa Leaves + Fe	Pre Test	9.49	9.4	0.96
	Post Test	10.54	10.6	0.98
Date + Fe	Pre Test	9.42	9.4	0.73
	Post Test	10.85	10.7	1.00

Based on the table above, it is known that the average pre-test hemoglobin level for the Moringa leaf group and Fe was 9.49 gr/dl and the post-test was 10.54 gr/dl. Meanwhile, in the dates and Fe group, the average pre-test was 9.42 gr/dl and post-test was 10.85 gr/dl. All respondents in the Moringa group regularly consumed Moringa leaves and Fe tablets (100%) and the date palm group also regularly consumed dates and Fe tablets (100%).

### Bivariate Test Results

**Table 3.** Normality test

Variable	Kolmogrov-Smirnov	
	P <sub>Value</sub>	Conclusion
Pre test Moringa leaf and Fe groups	0.107	Normally Distributed
Post test for Moringa leaf and Fe groups	0.080	Normally Distributed
Pre test group of dates and Fe	0.151	Normally Distributed
Post test group of dates and Fe	0.059	Normally Distributed



Based on the data normality test using the Kolmogrov-Smirnov test, the results showed that all variables in the Moringa leaf and Fe groups as well as the Kurrma and Fe groups in both pre-test and post-test data had  $P_{Value} > \alpha (0.05)$ .

**Table 4.** Homogeneity test

Variable	One Way Anova		
	N	P <sub>Value</sub>	Conclusion
Group of Moringa leaves and Fe	105	0.689	Homogeneous
Date group and Fe	105		

Based on Table 4, a  $P_{Value}$  of 0.689 is obtained, which is greater than alpha (0.05), so it can be concluded that the data is homogeneous or comes from the same group.

**Table 5.** Results of pre test and post test analysis

Group	Variable	Paired Sampel T Tes			
		N	Mean	Std. Dev	P <sub>Value</sub>
Moringa Leaves + Fe	Pre Test	105	9.49	0.96	0.00
	Post Test	105	10.54	0.98	
Date + Fe	Pre Test	105	9.41	0.72	0.00
	Post Test	105	10.85	1.00	

The table above presents the results of the paired t-test carried out on the Moringa leaf and Fe groups. where the results obtained were a mean pre test of 9.49 and a post test of 10.54 so the mean difference was 1.05 and  $P_{Value}$  0.00 ( $P_{Value} < \alpha 0.05$ ) so it was concluded that there was a significant influence on hemoglobin levels in pregnant women who were given Moringa leaves and Fe. results of the paired t-test carried out on the date palm and Fe groups. where the results obtained were a pre-test mean of 9.41 and a post-test mean of 10.85, so it can be concluded that the mean difference was 1.44 and  $P_{value}$  0.00 ( $P < \alpha 0.05$ ). So it was concluded that there was an effect of giving dates and Fe on increasing hemoglobin levels in pregnant women.

**Table 6.** Differences in hemoglobin levels in the Moringa Leaf and Fe groups with those in the Date Palm and Fe groups

Group	Independent Sample T Test			
	N	Mean	Std. Dev	P <sub>Value</sub>
Moringa Leaves + Fe	105	10.54	0.98	0.024
Date + Fe	105	10.85	1.00	

The table above presents the different tests of the Moringa leaf and date group as well as the date palm and Fe group after the intervention, consisting of 105 respondents each. The data analysis used was an independent sample t-test and obtained results for a

$P_{Value}$  of 0.024 ( $P < \alpha 0.05$ ), so it can be concluded that there is a significant difference between the Moringa leaf and Fe group and the date palm and Fe group.

*Discussion*

*Characteristics*

The research results showed that most of the respondents in both groups were aged 25-28 years. According to Majidah et al. (2018) there is no significant relationship between age and anemia in pregnant women. The highest level of education is high school graduation. where previous research by Dwihestie (2018) showed that there was no significant relationship between education and the incidence of anemia. Education is associated with a person's ability to meet their daily needs both financially and with self-awareness to meet nutritional adequacy as well as the ability to understand the counseling provided by health workers. This is also in accordance with Rai et al. (2016) that there is no relationship between pregnant women's education and hemoglobin levels. Education is often associated with ability and the opportunity to get a job to earn a better income. Low education. may have fewer skills and job opportunities. often perpetuating cycles of poverty. The occupation of most respondents is as a housewife. where according to research by Rai et al. (2016) concluded that there is no relationship between the work of pregnant women and hemoglobin levels.

This is also in line with Faatih (2018) who stated that there is no significant relationship between maternal hemoglobin levels and employment. Most parities are primiparous where this is in accordance with the statement of experts who say that first parity has a greater risk of experiencing anemia in pregnancy. if you don't pay attention to nutritional needs during pregnancy. Based on the results of this research. So it can be explained that parity is one of the factors influencing maternal anemia. In line with research conducted by Gopalakrishnan et al. (2016) that parity is the number of children born to a mother, both alive and dead. A mother who frequently gives birth is at risk of experiencing anemia in the next pregnancy if she does not pay attention to nutritional needs. During pregnancy, nutritional substances will be divided between the mother and the fetus. The second and third parities are the safest parities, while the first parities and high parities (more than three) have higher maternal mortality rates.

*Hemoglobin Level Before Treatment*

The average pre-test hemoglobin level of respondents was 9.5 gr/dl, which means the respondent was in a position of moderate anemia. Where anemia is a condition where the number and size of red blood cells or hemoglobin concentration are below normal limit values. As a result, it can interfere with the blood's

capacity to transport oxygen around the body (Madestria et al., 2021; Manggul et al., 2021; Srivastava et al., 2023). Anemia in pregnancy is a condition of the mother with hemoglobin levels below 11g/dL in the first and third trimesters. or a hemoglobin level of less than 10.5 g/dL in the second trimester. In the second trimester, the need for blood-forming substances, especially iron, increases sharply, up to double compared to when you were not pregnant. This situation is caused by the mother's blood volume increasing due to the fetus' need for oxygen and nutrients carried by red blood cells. As for research conducted by Atika et al. (2021), before being given Moringa leaves, there were 18 pregnant women in the mild anemia category (56.3%) and 14 moderate anemia categories (43.8%). Iron deficiency in the body will result in anemia which reduces the maximum amount of oxygen that can be carried by the blood. and also results in reduced iron supplies to meet the mother's needs. fetus and placenta.

#### *Differences in Pre-Test and Post-Test Hemoglobin Levels in the Moringa Leaf and Fe Groups*

For 30 days, all respondents (100%) regularly consumed Moringa leaf vegetables and 1 tablet of Fe 60 mg every day. The results obtained in the Moringa leaf and Fe groups increased from the mean pre test to post test. All researchers concluded that there was a significant influence on hemoglobin levels in pregnant women who were given Moringa leaves and Fe. The large need for iron in pregnant women requires the mother to help absorb the iron she consumes. Because there are several foods and drinks that can interfere with the absorption of iron. Based on research conducted by Atika et al. (2021) stated that giving Moringa leaf vegetables to pregnant women can increase levels hemoglobin. This finding is in line with the study conducted by Atika et al. (2021). In this research. Comparative analysis of hemoglobin levels before and after administration of Moringa leaves using the paired test showed significant results. Hemoglobin levels before intervention were recorded at 11,532. while after giving Moringa leaves it increased to 12,136. The average increase observed was 0.60547. These positive changes indicate that regular consumption of Moringa leaf vegetables can effectively increase hemoglobin levels in pregnant women. Research carried out An article by Rani and colleagues in 2019 revealed the extraordinary nutritional content of the Moringa plant. This study found that moringa has seven times higher vitamin C content than an orange. Vitamin A levels are ten times more than carrots, and calcium levels 17 times higher than milk. Besides that. Moringa also contains nine times more protein than yogurt. Potassium levels are 15 times higher than bananas, and contains 25 times more iron than spinach. These findings indicate that

moringa is a very rich and potential source of nutrients. exceeds some types of food that are generally considered rich in certain nutrients (Chen et al., 2024; Loa et al., 2021; Puspolini et al., 2021).

#### *Differences in Pre-Test and Post-Test Hemoglobin Levels in the Date and Fe Groups*

For 30 days, all respondents (100%) regularly consumed 1 date and Fe 60 mg tablet. tablets every day. In groups Dates and Fe. It was found that there was an increase in the mean from the pre test to the mean post test. All researchers concluded that there was an effect of giving dates and Fe on increasing hemoglobin levels in pregnant women. Several studies support the effectiveness of dates in increasing hemoglobin in pregnant women. Yuviska & Yuliasari (2020) and Sugita & Kuswati (2020) prove that there is a positive effect of consuming dates on hemoglobin levels. Other research shows dates are rich in iron. important for the formation of red blood cells. Thus. Dates can be a non-pharmacological alternative to prevent and reduce anemia in mothers pregnant.

Sugita & Kuswati (2020) strengthens the evidence that consuming dates has a positive impact on increasing hemoglobin levels in pregnant women. Dates are known to contain a variety of important nutrients. including iron which plays a crucial role in increasing hemoglobin levels. This finding opens up new opportunities for pregnant women. especially those who do not take iron supplements or blood-boosting tablets. Dates can be an effective natural alternative to meet iron needs during pregnancy. thus helping prevent the risk of anemia. Dates are not only a healthy snack, but also a potential nutritional solution for pregnant women in maintaining health and preventing deficiency-related complications iron Research shows that the date palm (*Phoenix dactylifera*) is a good alternative to meet iron needs during pregnancy (Anuragi et al., 2022; Ishiekwene et al., 2020; Wright et al., 2017). Regular consumption of dates. both in the form of fruit and drinks. can increase hemoglobin levels in pregnant women. including those suffering from anemia. The effectiveness of dates in increasing hemoglobin is due to their important nutritional content. For optimal results. Consuming dates must be done regularly.

#### *Differences in Hemoglobin Levels in Groups of Moringa Leaves and Fe and Dates and Fe*

The test results were different from the Moringa leaf and date groups and the date palm and Fe group after the intervention, consisting of 105 respondents each. The data analysis used was an independent sample t test and obtained results for a P<sub>Value</sub> of 0.024 (P < alpha 0.05), so it can be concluded that there was a significant difference

between the Moringa leaves and Fe tablets group and the dates and Fe tablets group.

There is an average difference where the consumption of dates and Fe tablets is higher than the average for the Moringa leaf group and Fe tablets. Moringa (*Moringa oleifera* Lam) is a multipurpose plant that has been around for a long time known to be rich in nutrients and medicinal properties. The leaves contain various essential vitamins and minerals in high amounts, including vitamins A, B, C, calcium, potassium, and iron. What stands out most is its iron content which is 25 times higher than spinach. The nutrients in Moringa leaves are easily digested by the human body, making it a potential natural choice for treating anemia in pregnant women (Caspersen & Rasmussen, 2024; Esakkimuthu et al., 2018; Fitriani et al., 2023; Khoja et al., 2021; Meireles et al., 2020).

Study Susiyanti & Hartini (2021) regarding the effectiveness of consuming Moringa leaves in increasing hemoglobin levels in pregnant women who experience anemia also provides supporting results. This study involved 28 respondents who initially suffered from moderate anemia. After intervention with Moringa leaves, 27 of 28 respondents showed an increase in hemoglobin levels. The average increase in hemoglobin levels recorded was quite significant, namely 14.69 g/dL. Several studies have shown the benefits of dates in increasing hemoglobin levels in pregnant women. Yuviska & Yuliasari (2020) found a positive influence from consuming dates on increasing hemoglobin levels in pregnant women. This finding is strengthened by research by Sugita & Kuswati (2020) which shows a significant difference in hemoglobin levels before and after giving dates. Furthermore, another study revealed that dates are rich in iron, an important mineral in the formation of red blood cells and hemoglobin. Therefore, dates can be considered as an alternative non-pharmacological therapy to reduce and prevent anemia in pregnant women.

Statistical tests showed that the effectiveness of consuming dates and Fe tablets was better than Moringa leaves and Fe tablets. It can also be seen from the average difference between the pre-test and post-test for each group. Where in the Moringa leaves and Fe tablets group the results obtained were a mean pre test of 9.49 and a post test of 10.54, so the mean difference value is 1.05. Meanwhile, in the dates and Fe tablets group, the pre-test mean was 9.41 and the post-test mean was 10.85, so it can be concluded that the mean difference was 1.44. There is an average difference of 0.39 where the consumption of dates and Fe tablets is higher than the average for the Moringa leaf group and Fe tablets.

## Conclusion

The average pre-test hemoglobin level of respondents was in the range of 9.5 gr/dl, which means the respondent is in a moderate anemia position. The results of the research after the intervention showed that there was a significant influence on hemoglobin levels in pregnant women who were given Moringa leaves and Fe. Likewise, giving dates and Fe has a significant effect on increasing hemoglobin levels in pregnant women. Both groups experienced an increase in average hemoglobin levels. This shows that giving Moringa leaves and dates is quite effective in increasing hemoglobin levels in pregnant women, and the test results show that the effectiveness of consuming dates and Fe tablets is better than consuming Moringa leaves and Fe to increase hemoglobin in pregnant women. It is hoped that it can become a useful academic document as a reference for the academic community and for other researchers, to strengthen similar evidence and can be used to base subsequent research. And you can carry out further research on other factors related to anemia in pregnant women.

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R.K., N., M.P.N., I.R., R.S., W.R., W.L., & K. contributed to conceptualization, the data collection process, data processing, and article writing.

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## Conflicts of Interest

The authors declare no conflict of interest.

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