

## THE ROLE OF DATE SYRUP AND MORINGA LEAF EXTRACT IN IMPROVING HEMOGLOBIN LEVELS IN PREGNANT WOMEN

Elsa Noftalina<sup>1\*</sup>, Emy Yulianti<sup>2</sup>, Siti Sarah<sup>3</sup>

<sup>1,2,3</sup> Midwery, Health Polttechnic of Pontianak, Pontianak  
Email correspondence: elsanoftalina2015@gmail.com

### ABSTRAK : PERAN SARI KURMA DAN EKSTRAK DAUN KELOR DALAM MENINGKATKAN KADAR HEMOGLOBIN PADA IBU HAMIL

Latar Belakang: Anemia merupakan kondisi dimana jumlah sel darah merah di dalam tubuh masih terlalu sedikit sehingga tubuh kekurangan hemoglobin. Prevalensi anemia ibu hamil di dunia sebesar 38,2%, di Indonesia sebesar 48,9%, dan Kalimantan Barat sebesar 9,2%. Salah satu puskesmas di kota Pontianak dengan prevalensi anemia ibu hamil tinggi yaitu Puskesmas Kampung Dalam sebanyak 32%. Salah satu upaya alternatif mencegah kejadian anemia dengan memberikan makanan ataupun sari buah dengan kandungan zat besi seperti sari kurma dan daun kelor. Tujuan: mengetahui efektivitas Sari kurma dan tablet Fe dengan ekstrak daun kelor dan tablet Fe terhadap kadar hemoglobin ibu hamil.

Metode: *Quasi experiment* metode *nonequivalent control grup design* dengan sampel ibu hamil anemia sebanyak 32 responden yang diteliti di Puskesmas Kampung Dalam Kota Pontianak. Analisis data menggunakan *wilcoxon* dan *mann whitney*.

Hasil: Terdapat perbedaan kadar hemoglobin sebelum dan sesudah pemberian sari kurma dan tablet Fe ( $p < 0.000$ ) serta sebelum dan sesudah pemberian ekstrak daun kelor dan tablet Fe ( $p < 0.000$ ). Penelitian ini menunjukkan bahwa ada perbedaan efektivitas antara Sari kurma dan ekstrak daun kelor terhadap peningkatan kadar hemoglobin pada ibu hamil ( $p < 0.000$ ).

Kesimpulan: Sari kurma dan tablet Fe lebih efektif dibanding ekstrak daun kelor dan tablet Fe terhadap peningkatan kadar hemoglobin pada ibu hamil.

Saran : Sirup kurma dan ekstrak daun kelor dapat digunakan sebagai alternatif terapi non farmakologis untuk mengatasi anemia yang terjadi pada ibu hamil dengan tetap memperhatikan kebutuhan nutrisi lainnya

Kata Kunci : Daun kelor; Hamil, Hemoglobin, Sari kurma

### ABSTRACT

Background: Anemia is a condition in which the number of red blood cells in the body is still too low so the body lacks hemoglobin. The prevalence of anemia in pregnant women worldwide is 38.2%, in Indonesia it is 48.9%, and in West Kalimantan, it is 9.2%. One of the health centers in Pontianak with a high prevalence of anemia in pregnant women is the Kampung Dalam Health Center as much as 32%. An alternative effort to prevent anemia is by providing food or fruit juices with iron content, such as date juice and Moringa leaves.

Purpose: determine the effectiveness of dates juice and Fe tablets with Moringa leaf extract and Fe tablets on hemoglobin levels of pregnant women.

Methods: Quasi-experiment method nonequivalent control group design with a sample of 32 anemic pregnant women studied at the Kampung Dalam Community Health Center in Pontianak City. Data analysis using Wilcoxon and Man Whitney.

Results: There were differences in hemoglobin levels before and after administration of date palm extract and Fe tablets ( $p < 0.000$ ) and before and after administration of Moringa leaf extract and Fe tablets ( $p < 0.000$ ). This study shows a difference in effectiveness between dates extract and moringa leaf extract in increasing hemoglobin levels in pregnant women ( $p < 0.000$ ). Conclusion: Dates extract and Fe tablets were more effective than Moringa leaf extract and Fe tablets in increasing hemoglobin levels in pregnant women.

Suggestion : Date syrup and Moringa leaf extract can be used as alternative non-pharmacological therapy to treat anemia that occurs in pregnant women while still paying attention to other nutritional needs.

Keywords: Moringa leaf, Pregnant, Hemoglobin, Date Syrup

## INTRODUCTION

Anemia during pregnancy is a condition in which the hemoglobin level is  $< 11$  g% during the first and third trimesters or where the hemoglobin level during the second trimester reaches  $< 10.5$  g%. Anemia is the most common hematological issue encountered during pregnancy. The main cause of anemia during pregnancy is iron deficiency due to physiological changes that occur during this period. It is known that various factors, such as socioeconomic conditions, education level, age, parity, etc., influence the hemoglobin levels in pregnant women (Susiloningtyas, 2023). The impact of anemia during pregnancy can lead to low birth weight, placenta previa, eclampsia, bleeding, premature rupture of membranes, and anemia during the intranatal period, which can result in weak labor contractions, intranatal bleeding, shock, and postpartum subinvolution (Priyanto & Irawati, 2020).

Iron tablet supplementation is one of the most effective programs for preventing and addressing iron deficiency anemia, significantly increasing hemoglobin levels in pregnant women and reducing the prevalence of anemia among pregnant women by 20-25% (Susiloningtyas, 2023).. Research conducted by Septiani (2017) on the implementation of iron tablet administration to pregnant women indicated that the success of the iron tablet program is influenced by the role of healthcare workers. Another study by (Rusmiati, 2019) showed that iron tablets would be more effective when consumed alongside other supplements that assist in hemoglobin synthesis and iron absorption.

One alternative to prevent anemia is to provide foods or fruit juices rich in high nutrients and iron that are necessary for the body. Some foods that can help prevent anemia include date juice and moringa leaf extract. Dates contain riboflavin, niacin, pyridoxal, and folate, with 100 grams of dates fulfilling more than 9% of daily vitamin needs. Ripe dates are rich in calcium and iron, containing 1.02 mg of iron, which helps increase hemoglobin levels and prevent anemia (H. Hartati, 2022). Moringa leaves contain essential nutrients such as iron, calcium, and vitamin A. Iron carries oxygen to body cells and removes carbon dioxide from the body, supporting muscle function, enzymes, proteins, and energy metabolism. Iron deficiency leads to anemia, fatigue, weakness, headaches, and apathy (Arma, 2022).

According to research by Murhadi & Hayati, (2023), there is an effect of date juice administration on hemoglobin levels in pregnant women. The study by (Rosdiana, 2020) showed an increase in hemoglobin levels by 1.13 g% after administering date juice to pregnant women. Research conducted by (Arma et al., 2022) found an effect of moringa leaf extract on the

incidence of anemia in pregnant women at the Elviana Midwifery Clinic. The study by Wijayanti et al., (2022) showed that moringa leaves positively affect increasing hemoglobin levels in pregnant women. The research by (Hikmah, 2021) indicated that there is an effect of administering iron tablets and moringa leaf extract on increasing hemoglobin levels in pregnant women, with an average hemoglobin level of  $11.78 \pm 0.58$ .

The prevalence of anemia among pregnant women worldwide is 38.2%, which is one of the most extreme health issues globally, with the highest prevalence in Africa at 44.6%, followed by Asia at 39.3% (WHO, 2017). The prevalence of anemia among pregnant women in Indonesia in 2018 increased, according to Riskesdas data, reaching 48.9% in 2018, up from 37.1% in 2013 (Kemenkes RI, 2018).

The Health Department of West Kalimantan records that nutrition and health issues among pregnant women, according to the Riskesdas 2018 data, show that 48.9 percent of pregnant women experience anemia. In West Kalimantan itself, in 2021, the prevalence of anemia among pregnant women was 9.2 percent. One public health center (Puskesmas) in Pontianak has a higher prevalence of anemia among pregnant women than the national average, with 32% of pregnant women experiencing anemia at the Kampung Dalam Health Center. Therefore, this study aims to investigate the effectiveness of administering date juice and moringa leaf extract on increasing hemoglobin levels in pregnant women at the Kampung Dalam Health Center in Pontianak.

## RESEARCH METHODS

This study was conducted in the working area of the Kampung Dalam Health Center in Pontianak in May 2023. The method used in this research is a quasi-experimental design (semi-experimental) with a nonequivalent control group design. The study population consisted of pregnant women experiencing anemia in the working area of the Kampung Dalam Health Center. Sample determination was done using a sample size formula, resulting in 32 pregnant women divided into two groups: 16 pregnant women for the intervention group and 16 pregnant women for the control group. The sampling technique used was purposive sampling based on the researcher's considerations according to the inclusion criteria: pregnant women willing to be respondents, pregnant women with mild to moderate anemia, pregnant women who regularly consume iron tablets, and pregnant women who are not allergic to date juice and moringa leaf extract. The exclusion criteria included pregnant women with severe anemia and those suffering from diseases related to blood disorders.

The intervention group was given date juice and iron tablets, while the control group received moringa leaf extract and iron tablets. The date juice was administered at a dose of 2 tablespoons (30 ml) once daily in the morning for 14 days, along with iron tablets taken once daily at night for 14 days. The moringa leaf extract was given at a dose of 2 capsules (1000 mg) once daily in the morning for 14 days, along with iron tablets taken once daily at night for 14 days. Data collection was conducted by measuring hemoglobin levels before and after the intervention in both groups. The dietary intake of respondents during the study was not examined. The analysis used in this study included univariate and bivariate analysis. The data in this study were not normally distributed; therefore, the paired data were tested using the Wilcoxon test, while the unpaired data were tested using the Mann-Whitney test. This research has been ethically approved by Poltekkes Pontianak with the number 86 /KEPK-PK.PKP/IV/2023.

## RESEARCH RESULTS

### Univariate Analysis

**Table 1**  
Frequency Distribution Based on Respondent Characteristics of Pregnant Women at the Kampung Dalam Health Center in Pontianak

Characteristics	Frequency	Percentage (%)
Age		
<20 years	2	6,3
20 – 35 years	28	87,5
>35 years	2	6,3
Education		
Elementary	2	6,3
Senior High School	24	75
Higher Education	6	18,8
Occupation		
Employed	10	31,3
Unemployed	22	68,8
Gestational Age		
First Trimester	1	3,1
Second Trimester	17	53,1
Third Trimester	14	43,8

Table 1 shows that the majority of respondents are aged 20-35 years, with 28 individuals (87.5%). Most of the respondents have a secondary education, totaling 24 individuals (75%). The majority of respondents are unemployed, with 22 individuals (68.8%), and most respondents (17 individuals or 53.1%) are in the second trimester of pregnancy.

**Table 2**  
Frequency Distribution of Anemia Incidence Among Pregnant Women at the Kampung Dalam Health Center in Pontianak Before and After Date Juice and Iron Tablets

Anemia Incidence	Before		After	
	n	%	n	%
Mild Anemia	8	50	1	6,3
Moderate Anemia	8	50	1	6,3
No Anemia	0	0	14	87,5

Table 2 shows that before the intervention, pregnant women in the intervention group experienced mild anemia, with 8 respondents (50%), and moderate anemia, with 8 respondents (50%). After the intervention, pregnant women in the intervention group had no anemia, with 14 respondents (87.5%); 1 respondent (6.3%) had mild anemia, and 1 respondent (6.3%) had moderate anemia.

**Table 3**  
Frequency Distribution of Anemia Incidence Among Pregnant Women at the Kampung Dalam Health Center in Pontianak Before and After the Administration of Moringa Leaf Extract and Iron Tablets

Anemia Incidence	Before		After	
	n	%	n	%
Mild Anemia	8	50	7	43,8
Moderate Anemia	8	50	0	0
No Anemia	0	0	9	56,3

Table 3 shows that before the intervention, pregnant women in the intervention group experienced mild anemia, with 8 respondents (50%), and moderate anemia, with 8 respondents (50%). After the intervention, 9 pregnant women (56.3%) did not experience anemia, while 7 respondents (43.8%) had mild anemia.

### Bivariate Analysis

Difference Before and After Intervention of Date Juice and Iron Tablets to Pregnant Women at the Kampung Dalam Health Center in Pontianak

Based on Table 4 above, the normality test results before and after the administration of date juice and iron tablets indicate a p-value < 0.000, leading to the conclusion that the data are not normally distributed.

**Table 4**  
**Normality Test Results Before and After Intervention of Date Juice and Iron Tablets to Pregnant Women at the Kampung Dalam Health Center in Pontianak**

Variabel	Saphiro-Wilk
	P
a. Before Intervention	0.000
b. After Intervention	0.040

**Table 5**  
**Difference in Hemoglobin Levels in Pregnant Women Given Date Juice and Iron Tablets at the Kampung Dalam Health Center in Pontianak**

Variable	Median	SD	Min	Max	p
Pretest	9.950	0.6269	7,8	10,2	0.000
Posttest	11.800	0.6940	9,8	12,5	

Based on Table 5 above, the median pretest hemoglobin level is 9.950 g/dl, indicating that the respondents experienced mild anemia, while the hemoglobin level after the administration of date juice and iron tablets for 14 days shows that the respondents do not experience anemia, with a median value of 11.8 g/dl. The statistical results indicate a p-value = 0.000 < 0.05, leading to the conclusion that there is a difference in hemoglobin levels before and after the administration of date juice and iron tablets for 14 consecutive weeks.

Difference Before and After Administration of Moringa Leaf Extract and Iron Tablets to Pregnant Women at the Kampung Dalam Health Center in Pontianak

Based on Table 6 above, the normality test results before and after the administration of moringa leaf extract and iron tablets indicate a p-value < 0.000, leading to the conclusion that the data are not normally distributed.

**Table 6**  
**Normality Test Results Before and After Administration of Moringa Leaf Extract and Iron Tablets to Pregnant Women at the Kampung Dalam Health Center in Pontianak**

Variable	Saphiro-wilk
	P
a. Before Intervention	0.006
b. After Intervention	0.001

**Table 7**  
**Difference in Hemoglobin Levels in Pregnant Women Given Moringa Leaf Extract and Iron Tablets at the Kampung Dalam Health Center in Pontianak**

Variabl e	Media n	SD	Min	Max	P
Pretest	9,950	0.6542	8,4	10,4	0.000
Posttest	11.000	0.3421	10,0	11,2	

Based on Table 7 above, the median pretest hemoglobin level is 9.950 g/dl, indicating that the respondents experienced mild anemia, while the hemoglobin level after the administration of moringa leaf extract and iron tablets for 14 days shows that the respondents do not experience anemia, with a median value of 11.0 g/dl. The statistical results indicate a p-value = 0.000 < 0.05, leading to the conclusion that there is a difference in hemoglobin levels before and after the administration of moringa leaf extract and iron tablets for 14 consecutive weeks.

Effectiveness of the Interventions Between Date Juice and Iron Tablets Compared to Moringa Leaf Extract and Iron Tablets on Pregnant Women at the Kampung Dalam Health Center in Pontianak

**Table 8**  
**Difference in Effectiveness Between the Administration of Date Juice and Iron Tablets Compared to Moringa Leaf Extract and Iron Tablets on Hemoglobin Levels in Pregnant Women at the Kampung Dalam Health Center in Pontianak**

Variabel	Median	SD	Selisih Median	p
Date Juice and Iron Tablets	11.800	0.6940	1,85	0.000
Moringa Leaf Extract and Iron Tablets	11.000	0.3421	1.05	

Based on Table 8, the median difference in the date juice group is 1.85, while the median difference in the moringa leaf extract group is 1.05. The p-value is 0.000 (p < 0.05), indicating that there is a significant difference in effectiveness between the administration

of date juice and moringa leaf extract, with the date juice group showing a greater increase in hemoglobin levels in pregnant women compared to the moringa leaf extract group.

## DISCUSSION

### **Diference Before and After Date Juice and Iron Tablets on Hemoglobin Levels in Pregnant Women at the Kampung Dalam Health Center in Pontianak**

Table 5 shows that this study found a difference in hemoglobin levels before and after administration of date juice and iron tablets for 14 consecutive weeks. Before the intervention, 50% of pregnant women experienced moderate anemia, but after the administration of date juice and iron tablets, there was an increase in hemoglobin levels, with 87.5% of respondents no longer experiencing anemia, and only 1 person with mild anemia and 1 person with moderate anemia.

The findings of this study are consistent with (Widowati, 2019), which reported a difference in the effect of date juice on hemoglobin levels with a p-value of 0.004. Her research showed an average hemoglobin level of 9.6 g/dL before administering date juice, while after 10 days of consumption, the average level increased to 10.6 g/dL. This study is also in line with the findings of Yulita & Febriani (2020), who reported an influence of iron tablets and date juice on increasing hemoglobin levels in pregnant women, with a p-value of 0.004 ( $p < 0.05$ ), indicating an increase of 1.5 g%.

Date fruit extract has been shown to increase hemoglobin levels in the blood. Hemoglobin is a protein molecule that carries red blood cells as a medium for transporting O<sub>2</sub>, formed in red blood cells in the bone marrow. Failure to form hemoglobin can be caused by a deficiency of protein (Sulaiman, 2022). Ripe dates are rich in calcium and iron. The iron content in dates is about 1.02 mg. The iron content in dates is absorbed by the intestines and carried by blood for hematopoiesis (the process of blood formation). Vitamin C contained in date juice enhances iron absorption, particularly by reducing ferric iron to ferrous iron. Besides its role in converting ferric to ferrous before intestinal absorption, vitamin C also regulates iron homeostasis by inhibiting hepcidin expression (e.g., in HepG2 cells), thus making vitamin C potentially helpful in alleviating iron deficiency (Dinda, 2019).

The production of red blood cells can occur because date juice also contains copper. If there is significant damage to red blood cells, it can lead to anemia in pregnant women (Iaudia Tysara, 2020).

The nutritional fulfillment of pregnant women in this study is also supported by the educational characteristics of the mothers. Most respondents have secondary education, indicating that they have knowledge about their nutritional needs. Education level can influence a person's anemia status regarding food choices. Education level, particularly among women, affects health status because it influences

knowledge and understanding, leading to positive behaviors, including health behaviors. Therefore, it can be said that the higher a person's education level, the better their understanding of anemia (Amini, Pamungkas, & Harahap, 2018; Ristica, 2013).

### **Difference Before and After Moringa Leaf Extract and Iron Tablets on Hemoglobin Levels in Pregnant Women at the Kampung Dalam Health Center in Pontianak**

The research results show that there is a difference before and after the administration of moringa leaf extract and iron tablets, with a p-value of 0.000. It can be concluded that there is a difference after consuming moringa leaf extract and iron tablets on the hemoglobin levels of pregnant women at the Kampung Dalam Health Center. The results indicate that before the study, pregnant women in the intervention group experienced mild anemia, with 8 respondents (50%) having mild anemia and 8 respondents (50%) having moderate anemia. After the intervention, 9 respondents (56.3%) did not have anemia, and 7 respondents (43.8%) had mild anemia.

This finding aligns with research by Sartika (2023), which showed an effect of moringa leaf extract on increasing hemoglobin levels in pregnant women, with a p-value of 0.000. Respondents were given 2 capsules of moringa leaf extract twice daily for 14 days, resulting in an average hemoglobin level of 11.440 g/dL before the intervention and 12.055 g/dL after the intervention. This is also consistent with the findings of Hartati, (2021), which reported a difference in hemoglobin levels in pregnant women with a p-value of 0.000. After consuming moringa leaves for 14 days, an increase of 1.006 g/dL was observed.

Moringa leaves come from the moringa tree and contain various macro and micronutrients as well as active ingredients that act as antioxidants, including essential nutrients such as iron (Fe) 28.2 mg, calcium (Ca) 2003.0 mg, and vitamin A 16.3 mg, rich in  $\beta$ -carotene, protein, vitamins A, C, D, E, K, and B (thiamine, riboflavin, niacin, pantothenic acid, biotin, vitamins B6, B12, and folate) (Maryani 2019).

Most respondents were aged between 20-35 years, which is considered safe and healthy for reproduction. However, from a biological and mental perspective, individuals in this age range may not be optimal, as their emotions can be unstable and immature, potentially affecting their attention to nutritional needs related to decreased immune resistance and various diseases common in this age group (Hamani, 2015).

### Effectiveness of Date Juice and Iron Tablets Compared to Moringa Leaf Extract and Iron Tablets on Hemoglobin Levels in Pregnant Women at the Kampung Dalam Health Center in Pontianak

The study results on the effectiveness of date juice and moringa leaf extract on hemoglobin levels in pregnant women revealed a p-value of 0.000. Based on these results, it can be concluded that there is a difference in effectiveness between date juice and moringa leaf extract on hemoglobin levels in pregnant women at the Kampung Dalam Health Center.

The findings indicate that both date juice and moringa leaf extract significantly influence increasing hemoglobin levels in pregnant women. However, the Mann-Whitney test between the post-test groups of date juice and iron tablets and the post-test groups of moringa leaf extract and iron tablets showed a median difference of 1.85 in the date juice group, while the moringa leaf extract group had a median difference of 1.05. It can be concluded that the administration of date juice and iron tablets is more effective than moringa leaf extract and iron tablets in increasing hemoglobin levels in pregnant women at the Kampung Dalam Health Center.

Based on journal reviews and the researchers' assumptions, the findings conclude that the administration of date juice and iron tablets is effective for pregnant women due to the high content of calcium, iron, vitamin C, and copper in date juice, which can increase hemoglobin levels. The iron from dates is absorbed by the intestines and carried by the blood for hematopoiesis (the process of blood formation). Other studies indicate that methanol extract of raw dates supports the increased synthesis of erythropoietin by the liver, stimulating the bone marrow to produce more red blood cells or hematopoiesis (Megasari, 2022). The vitamin C content of 341 mg/100 g in date juice also enhances iron absorption, particularly by reducing ferric iron to ferrous iron. Moreover, the date juice contains 0.352 mg of copper, which is necessary for red blood cell production (Ma'mum, Kridawati, & Ulfa, 2020).

Moringa leaf extract also contains various macro and micronutrients and active substances that act as antioxidants, including important nutrients such as iron, vitamin C (220 mg/100 g), and copper (0.85 mg). However, the vitamin C content in date juice is higher than in moringa leaf capsules, making vitamin C crucial for iron absorption. The copper content in date juice is also greater than in moringa leaf extract, as copper plays a vital role in red blood cell production.

### CONCLUSION

The conclusion of this study is that date juice and iron tablets are more effective than moringa leaf

extract and iron tablets in increasing hemoglobin levels in pregnant women at the Kampung Dalam Health Center in Pontianak.

### SUGGESTION

It is hoped that date syrup and moringa leaf extract can be used as alternative non-pharmacological therapies to address anemia that occurs in pregnant women. Thus, the use of these natural ingredients can provide benefits in increasing hemoglobin levels and overall health for pregnant women, while still paying attention to other nutritional needs.

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