

Effectiveness giving *cookies* Effect Of Moringa Oleifera Leaves On Increasing Hemoglobin Levels In Adolescent Girls At Private High School Pab 6 Helvetia Medan

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ABSTRACT

Moringa leaf cookies are a food preparation from moringa leaves which contain many nutrients so that they can provide effectiveness for the hematopoiesis process, and the nutrients needed in the process of forming red blood cells so that they can overcome the decrease in hemoglobin levels in iron deficiency anemia for female adolescents. This study aims to determine the effect of giving moringa leaf cookies (moringa oleifera) on increasing hemoglobin levels in female adolescents at PAB 6 Private High School Helvetia Medan in 2025. The design of this study used a Quasi-Experiment with a one group pretest and posttest design. The population in this study were 16 female adolescents, the sampling technique in this study was total sampling where the number of samples equal to the number of population which were 16 respondents. Giving moringa leaf cookies were done for 7 consecutive days as many as 4 pieces in one day. Data analysis in this study used univariate and bivariate analysis. The bivariate analysis used was the paired T-Test. The results of the study showed the average hemoglobin level before the test was (12.2 g/dl) and the result after the test was (12.4 g/dl), with a difference of (0.2 g/dl). Based on the results of the paired sample t-test, a sig value of $(0.000) < 0.05$ was obtained, so it can be concluded that H_a is accepted. The conclusion in this study, there is an effect of giving moringa leaf cookies on increasing hemoglobin levels in female adolescents at PAB 6 Private High School Helvetia Medan. It is suggested that female adolescents can consume moringa leaf cookies as a non-pharmacological alternative to increase hemoglobin levels.

Keywords: Moringa Leaf Cookies, Hemoglobin Levels, Female Adolescents

INTRODUCTION

Anemia in adolescents can negatively impact their health because it can affect the growth and development of brain cells, impacting the immune system, making them prone to fatigue and hunger, impaired concentration, and can lead to decreased productivity. Other,

more serious negative impacts, given that adolescent girls are potential mothers who will become pregnant and give birth, increase the risk of maternal mortality, premature birth, and low birth weight (LBW). Indrawatiningsih Y, 2021).

According to the World Health Organization (WHO, 2021) in world health statistics, it shows that the prevalence of anemia in women of reproductive age (15-49) in the world is around 29.9% and the prevalence of anemia in non-pregnant women aged 15-49 years is 29.6%, which includes the adolescent age category (Aulya Y, 2022).

Prevalence of Anemia in Indonesia, Based on data from the Basic Health Research (Riskesdas, 2024) the prevalence of anemia in adolescent girls in Indonesia reached 32%, which shows that almost a third of adolescent girls aged 15-24 years experience this condition (Syriac Is, 2024).

Based on data from the 2020 North Sumatra People's Welfare Indicator, 54.53 percent of women aged 10-49 in North Sumatra experienced symptoms of anemia. The percentage of women experiencing symptoms of anemia varies by regency/city. North Labuhan Batu Regency has the highest anemia rate at 46.85 percent. Conversely, Samosir Regency has a very low rate, at only 35.78 percent. (Nurrahmaton, 2023).

Based on research by Eka Rati Astuti (2023), besides menstrual patterns, several factors influence the occurrence of anemia in adolescent girls, including diet and nutritional intake. Nutritional intake in adolescents is crucial because nutrition is one of the factors that influence the occurrence of anemia, and adolescents who already suffer from anemia have their activity patterns and learning concentration affected. (Astuti, 2023).

Anemia management includes pharmacological and non-pharmacological approaches to improve hemoglobin levels and overall health. Pharmacologically, iron supplementation in the form of iron tablets (IBT) is a common method used to treat anemia, especially for those with severe iron deficiency. Non-pharmacological approaches, on the other hand, involve lifestyle changes and a healthier diet. Consuming iron-rich foods such as red meat, liver, green leafy vegetables, nuts, and whole grains is highly recommended. Natural sources of iron, such as *Moringa oleifera* leaves, are also an effective alternative. (Syriac, 2024).

Moringa leaves (*Moringa oleifera*) are a plant rich in nutrients. Fresh moringa leaves contain 7 times more vitamin C than oranges, 4 times more vitamin A than carrots, 4 times more calcium than milk, 3 times more potassium than bananas, and 2 times more protein than yogurt. Furthermore, moringa flour contains much higher iron, 25 times more, or about

28.2 milligrams per 100 grams, than spinach, and is absorbed 1.77 times more into the bloodstream. Moringa leaves are easy to find and very abundant in Indonesia. With readily available ingredients and tools, moringa leaves can be created into cookies or pastries that are certainly more popular with teenagers (Selvia, 2024)..

Vegetables are highly sought after by the public due to their nutritional richness and affordability. Some vegetables are high sources of iron, such as moringa leaves (17.2 mg/100 grams), spinach (8.3 mg/100 grams), cassava leaves (7.6 mg/100 grams), katuk leaves (6.25 mg/100 grams), and kale (2.5 mg/100 grams). Several studies have shown that moringa leaves contain the highest iron content compared to other vegetables (Pratiwi, 2021).

In a study conducted by Dewi Indah Sari and Afni Yulianti, entitled "Companion for Making Moringa Leaf Cookies at MTs, Miftahul Hayati, Serang Regency in 2023," the results showed that administering moringa leaf cookies effectively increased hemoglobin levels with an average increase of 2.5 g/dl after administering the cookies for 14 days. Therefore, it can be concluded that administering moringa leaf cookies has an effect on increasing hemoglobin levels in adolescent girls (Sari, 2023).

METHOD

This research uses an experimental method (Quast Experiment) using a One Group Pretest-Posttest design. The design is a research activity that provides an initial test (pretest) before treatment is given, and after treatment is given, a final test (posttest) is given. The research design began with a hemoglobin (Hb) test, followed by the administration of moringa leaf cookies and subsequent blood tests on the adolescent girls. The research location was PAB 6 Helvetia Private High School, Medan.

The sample in this study used purposive sampling, where in selecting the sample the researcher made considerations, so that the number of samples was 16 female adolescents to be given a pre-test and post-test blood examination (Hemoglobin). The sampling criteria included: female adolescents in grades X and XI, female adolescents who were willing to be respondents, not consuming iron-boosting tablets. The inclusion criteria in this study were: female adolescents in grade XII, adolescents who were sick, and drinking turmeric and ginger herbal medicine.

In this study, the data obtained from the research instrument were processed and analyzed using a statistical test, namely the paired t-test. Before conducting the hypothesis test, the data analysis requirements were submitted first, namely the Shapiro-Wilk normality test to determine whether the data obtained were normally distributed or not.

RESULTS AND DISCUSSION

Research results regarding Effectiveness Giving Cookies Effect of Moringa Oleifera Leaves on Increasing Hemoglobin Levels in Adolescent Girls at PAB 6 Helvetia Private High School, Medan presented in the following table:

1. Univariate Analysis

Table 1. Hemoglobin Levels and Mean in Adolescent Girls Pre and Post Test

No. Respondent	Hemoglobin Level		Mean	
	<i>Pre-test</i> (g/dl)	<i>Post-test</i> (g/dl)	<i>Pre-test</i> (g/dl)	<i>Post-test</i> (g/dl)
1.	13.9	14.0		
2.	12.9	13.0		
3.	13.2	13.5		
4.	11.7	12.0		
5.	12.4	12.5		
6.	11.4	11.7		
7.	12.0	12.1		
8.	10.0	10.7	12.2	12.4
9.	12.5	12.6		
10.	14.5	14.5		
11.	11.7	12.0		
12.	12.1	12.4		
13.	10.7	11.0		
14.	13.6	13.6		
15.	10.8	11.0		
16.	12.6	13.2		

Based on the table above, from 16 respondents The Hb levels of respondents at PAB 6 Private High School (100%) experienced changes, with an average pre-test of 12.2 g/dl and an average post-test of 12.4 g/dl.

2. Bivariate Analysis

To know the Effectiveness Giving *Cookies* Effect of Moringa Oleifera Leaves on Increasing Hemoglobin Levels in Adolescent Girls at PAB 6 Helvetia Private High School, Medan can be seen in the table below:

Normality Test

Table 3 Normality Test of Effectiveness Giving *Cookies* Effect of Moringa Oleifera Leaves on Increasing Hemoglobin Levels in Adolescent Girls at PAB 6 Helvetia Private High School, Medan

No	Group	Shapiro-Wilk		
		Statistics	f	Sig.
1	Pre-Administration of Moringa Leaf Cookies	0.992	16	1,000
2	Post Giving Moringa Leaf Cookies	0.974	16	0.905

Based on the table above, the results of the normality test show that the Shapiro-Wilk test calculation showed a significant value before the intervention with a pre-test sig value of 0.905 and after the intervention with a value of 1.000 > 0.05 (normally distributed data). Because the data is normally distributed, the test used to draw the hypothesis is using parametric statistical calculations, namely the paired sample t-test.

Table 4 Effectiveness Giving *Cookies* Effect of Moringa Oleifera Leaves on Increasing Hemoglobin Levels in Adolescent Girls at PAB 6 Helvetia Private High School, Medan

Variables		Intervention			Sig.
		Mean	Difference	Elementary School	
Giving Moringa Leaf Cookies	Pre	12,244	0.2375	1,2072	0,000
	Post	12,481		1,0968	

Based on the table above, Effectiveness Giving Cookies Effect of Moringa Oleifera Leaves on Increasing Hemoglobin Levels in Adolescent Girls at PAB 6 Helvetia Private High School, Medan, The average pre-test hemoglobin level was 12.244 and the post-test was 12.481 with a difference of 0.2375.

Effectiveness Giving Cookies Moringa Oleifera Leaves on Increasing Hemoglobin Levels in Adolescent Girls at PAB 6 Helvetia Private High School, Medan, The results of the statistical test using the simple paired t-test obtained a p-value of $0.000 < 0.05$, which indicates effectiveness. The effect of giving moringa leaf cookies on increasing hemoglobin levels in female adolescents at PAB 6 Helvetia Private High School Medan.

DISCUSSION

Hemoglobin Levels in Adolescent Girls Before Being Given Moringa Leaf Cookies and Rosella Drinks PAB 6 Helvetia Private High School Medan

The study revealed that the average hemoglobin level of 16 adolescent girls before being given moringa leaf cookies was 12.2. This was due to the girls' lack of consumption of blood-boosting tablets or foods that can increase hemoglobin levels.

Based on the results of a study by Nur Khofifah and Mardiana in 2023 on the effect of Moringa oleifera leaf cookies on hemoglobin levels in anemic adolescent girls at the Hufadzul Qur'an Al-Asror Islamic Boarding School in Semarang. The results showed that the average hemoglobin level of adolescent girls before the intervention was 10.8 g/dl (Khofifah, 2023). Hemoglobin is a component of red blood cells (erythrocytes) that binds oxygen and transports it to all body tissues. Oxygen is needed by body tissues to perform their functions. A lack of oxygen in the brain and muscles can cause symptoms such as poor concentration and fatigue. Hemoglobin is formed from a combination of protein and iron, which form red blood cells (erythrocytes). Anemia is a symptom that requires an investigation into the cause, and treatment should be tailored to the underlying cause (Chasanah, 2019)..

The results of this study also align with research conducted by Sarni Anggoro, which showed a link or cause of low hemoglobin levels caused by menstrual bleeding, a lack of iron in certain foods, and irregular nutritional intake or eating patterns. This condition is also related to family economic constraints in meeting good and balanced nutritional needs in adolescent girls (Anggoro, 2020)..

Hemoglobin Levels in Adolescent Girls Before Being Given Moringa Leaf Cookies

Increased Hemoglobin Levels in Adolescent Girls in PAB 6 Helvetia Private High School Medan

From the results of the study after being given moringa leaf cookies to 16 teenage girls, it was found that 8 15-year-olds had normal Hb levels (>12 gr/dl), 1 person had mild anemia. 4 16-year-olds had normal Hb levels (>12 gr/dl), 1 person had moderate anemia and 1 person had mild anemia. One 17-year-old had normal Hb levels (>12 gr/dl).

This research aligns with the research conducted by Dewi Indah Sari and Afni Yulianti entitled "Companion for Making Moringa Leaf Cookies at MTs, Miftahul Hayati, Serang Regency in 2023." The results showed that giving moringa leaf cookies effectively increased hemoglobin levels by an average of 2.5 g/dl after giving the cookies for 14 days. Therefore, it can be concluded that giving moringa leaf cookies has an effect on increasing hemoglobin levels in adolescent girls (Sari, 2023)..

Moringa leaves contain quite high levels of iron (Fe). The iron in moringa leaves can aid in the formation of red blood cells, thereby increasing hemoglobin levels in the blood. Moringa leaves can be consumed in various ways. In addition to being consumed fresh, they can be made into various preparations aimed at increasing Hb levels. For example, they can be dried and made into tea or capsules, or ground into flour and used in other preparations. Each preparation has a different ability to increase Hb levels, depending on the type of treatment, duration, and characteristics of the research respondents (Priyas Hastuti, 2022).

Effectiveness of Providing Cookies Effect of Moringa Oleifera Leaves on Increasing Hemoglobin Levels in Adolescent Girls at PAB 6 Helvetia Private High School, Medan

Based on the results of the study, it shows that there is a significant influence between the hemoglobin levels of respondents before and after being given Moringa leaf cookies for 7 days, with a p value of 0.000 (<0.05), it can be concluded that there is an influence of giving Moringa leaf cookies on increasing hemoglobin levels in female adolescents at PAB 6 Helvetia Medan private high school.

This research also aligns with the 2022 study by Ana Novitaroh et al. on the Sensory Properties, Protein, and Iron Content of Moringa Leaf Cookies. The results of the study using a paired simple t-test showed that the addition of moringa leaves to cookies affected iron levels, as indicated by $p = 0.000$ ($p < 0.05$). It can be concluded that the addition of moringa

leaves increases iron levels in cookies and can increase hemoglobin levels in adolescent girls (Novitaroh, 2022).

Moringa leaves have excellent potential to supplement the body's nutritional needs, increase energy and endurance in adolescents, and address mineral deficiencies such as iron deficiency, which can lead to anemia. Dried moringa leaves contain high levels of protein, iron, vitamins A, and C, making them highly effective in treating iron deficiency anemia. Furthermore, these leaves contain no harmful substances, so they have no side effects (Nurita, 2025).

CONCLUSION AND SUGGESTIONS

From the research results obtained in the research on Effectiveness Giving Cookies Moringa Oleifera Leaves on Increasing Hemoglobin Levels in Adolescent Girls in PAB 6 Helvetia Private High School Medan The results showed that the average hemoglobin level during the pre-test was 12.2 gr/dl and the average hemoglobin level during the post-test was 12.4 gr/dl. The results of the T-Test statistical test showed a p-value of $0.000 < 0.05$. The conclusion is that there is effectiveness giving cookies Moringa oleifera leaves on increasing hemoglobin levels in adolescent girls in PAB 6 Helvetia Private High School Medan It is recommended that health workers be more proactive in providing education to female students at school about the importance of maintaining the health of adolescent girls by increasing hemoglobin levels and women's reproductive health. Female students can increase their knowledge by consuming Moringa leaf cookies to increase hemoglobin levels.

BIBLIOGRAPHY

- Indrawatiningsih Y, Hamid Sa, Sari Ep, Listiono H. Factors Influencing the Occurrence of Anemia in Adolescent Girls. *J Ilm Univ Batanghari Jambi*. 2021;21(1):331.
- Aulya Y, Siauta Ja, Nizmadilla Y. Analysis of Anemia in Adolescent Girls. *J Nurse Research Prof*. 2022;4(4):1377–86.
- Suryani Is, Nurakillah H, Maharani A, Kencana Ub, Kusuma U, Surakarta H, et al. The Effectiveness of Moringa Leaves in Increasing Hemoglobin Levels in Adolescent Girls. *J Pharmacopolium*. 2024;7(1):69–74.
- Nurrahmaton N, Harahap Nr, Sartika D, Lucitari Am. Giving Beetroot Pudding (Beta Vulgaris) to Increase Hemoglobin Levels in Adolescent Girls with Anemia. *J Midwifery*. 2023;12(2):119–24.
- Astuti Er. Literature Review: Factors Causing Anemia in Adolescent Girls. *Jambura J Heal*

Sci Res. 2023;5(2):550–61.

- Selvia D, Andini Ndp, Rofifah Kn, Zahra Sf, Putri Ip, Anjani Su, Et Al. The Effect of Giving Moringa Leaf Flour to Prevent Anemia in Adolescent Girls: Systematic Literature Review. *J Ilm Wahana Pendidik*. 2024;10(18):376–86.
- Pratiwi Aw, Nofita N, Winahyu Da. Comparison of Iron (Fe) Content in Moringa Oleifera Leaves Growing in the Highlands and Lowlands Using Atomic Absorption Spectrophotometry (AAS). *J Anal Farm*. 2021;6(2):102–8.
- Sari Di, Yulianti A. Assistant in Making Moringa Leaf Cookies at Mts. Miftahul Hayati, Serang Regency. *J Menara Pengabmas*. 2023;01(02):15–9.
- Khofifah N, Mardiana M. Moringa Oleifera Leaf Biscuits Affect Hemoglobin Levels in Anemic Adolescent Girls. *Action Aceh Nutr J*. 2023;8(1):43.
- Chasanah Su, Basuki Pp, Dewi Im. Anemia Causes, Prevention Strategies, and Management for Adolescents. *Angew Chemie Int Ed*. 2019;6(11):951–2.
- Anggoro S. Factors Affecting the Incidence of Anemia in High School Students. *J Ilm Permas J Ilm Stikes Kendal*. 2020;10(3):341350.
- Sari Di, Yulianti A. Assistant in Making Moringa Leaf Cookies at Mts. Miftahul Hayati, Serang Regency. *J Menara Pengabmas*. 2023;01(02):15–9.
- Priyas Hastuti A, Novita Sari A. The Effect of Moringa Oleifera L. Leaf Tea on Increasing Hemoglobin Levels in Anemia Patients. *Avicenna J Heal Res*. 2022;5(1):27–36.
- Novitaroh A, Sulistiani Rp, Isworo Jt, Syadi Yk. Sensory Properties, Protein and Iron Content of Moringa Leaf Cookies. *J Nutrition*. 2022;11(1):32.
- Nurita Sr, Perwitasari T. Moringa Leaves as Complementary Therapy for Obstetrics. 2025;