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THE EFFECTIVENESS OF MORINGA LEAF TEA IN INCREASING HEMOGLOBIN LEVELS IN ADOLESCENT GIRLS WITH ANEMIA

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ABSTRAK : EFEKTIVITAS TEH DAUN MORINGA DALAM MENINGKATKAN KADAR HEMOGLOBIN PADA REMAJA PEREMPUAN DENGAN ANEMIA

Latar Belakang: Anemia didefinisikan sebagai kondisi di mana jumlah sel darah merah tidak mencukupi untuk memenuhi kebutuhan fisiologis tubuh. Penanganan anemia pada remaja telah dilakukan melalui pemberian tablet suplemen zat besi (IST), namun konsumsi IST belum sepenuhnya optimal karena alasan yang berkaitan dengan rasa dan efek selanjutnya. Daun moringa (Moringa oleifera) dikenal memiliki berbagai komponen nutrisi, termasuk zat besi, vitamin C, protein, dan vitamin A.

Tujuan: Tujuan penelitian ini adalah untuk menyelidiki efektivitas teh daun moringa dalam meningkatkan kadar hemoglobin pada remaja putri dengan anemia di SMP Negeri 1 Seputih Raman, Kabupaten Lampung Tengah.

Metode: Penelitian ini menggunakan pendekatan kuasi-eksperimental dengan Desain Pretest-Posttest Satu Kelompok. Populasi penelitian ini terdiri dari seluruh remaja putri dari SMP Negeri 1 Seputih Raman, Kabupaten Lampung Tengah. Teknik pengambilan sampel yang digunakan adalah total sampling, yang melibatkan total 36 responden. Variabel independen dalam penelitian ini adalah pemberian teh daun moringa, sedangkan variabel dependen adalah kadar hemoglobin. Analisis bivariat dilakukan dengan menggunakan Uji T.

Hasil: Penelitian ini mengungkapkan peningkatan kadar hemoglobin sebelum dan sesudah pemberian teh daun moringa sebesar 1,69 ± 0,546 g/dl. Analisis statistik menggunakan uji t berpasangan menghasilkan nilai p 0,00 ($p < 0,05$), menunjukkan pengaruh signifikan pemberian teh daun moringa terhadap peningkatan kadar hemoglobin pada remaja putri dengan anemia di SMP Negeri 1 Seputih Raman.

Kesimpulan: Pemberian teh daun moringa dapat meningkatkan kadar hemoglobin pada remaja putri dengan anemia.

Rekomendasi: Teh daun moringa dapat digunakan sebagai minuman harian untuk meningkatkan kadar hemoglobin pada remaja putri.

Kata kunci: Anemia, Ekstrak daun moringa, Kadar hemoglobin.

ABSTRACT

Background: Anemia is defined as a condition where the number of red blood cells is insufficient to meet the physiological needs of the body. The management of anemia in adolescents has been pursued through the administration of iron supplementation tablets (IST), but the consumption of IST has not been fully optimized due to reasons related to taste and subsequent effects. Moringa leaves (Moringa oleifera) are known to possess various nutritional components, including iron, vitamin C, protein, and vitamin A.

Objective: The purpose of this study was to investigate the effectiveness of moringa leaf tea in increasing hemoglobin levels among adolescent girls with anemia at Junior High School 1 Seputih Raman, Central Lampung Regency.

Method: This research employed a quasi-experimental approach with the One Group Pretest-Posttest Design. The population of this study consisted of all female adolescents from Junior High School 1 Seputih Raman, Central Lampung Regency. The sampling technique used was total sampling, involving a total of 36 respondents. The independent variable in this study was the administration of moringa leaf tea, while the dependent variable was the hemoglobin level. Bivariate analysis was conducted by using the T-Test.

Results: This study revealed an increase in hemoglobin levels before and after the administration of moringa leaf tea by 1.69 ± 0.546 g/dl. The statistical analysis using paired t-test yielded a p-value of 0.00 ($p < 0.05$), indicating a significant influence of moringa leaf tea administration on the increase in hemoglobin levels among female adolescents with anemia at Junior High School 1 Seputih Raman.

Conclusion: The administration of moringa leaf tea can increase hemoglobin levels in female adolescents with anemia.

Recommendation: Moringa leaf tea can be used as a daily beverage to enhance hemoglobin levels in adolescent girls.

Keywords: Anemia, Moringa leaf extract, Hemoglobin levels.

INTRODUCTION

Anemia is defined as a reduction in hemoglobin levels or the number of red blood cells in the blood, leading to insufficient oxygen levels in the body (Arulprakash & Umaiorubahan, 2018). The issue of anemia is not only prevalent in developing countries but also in developed nations. Anemia can affect various age groups including school-age individuals, adolescents, women of reproductive age, and pregnant women. Among these groups, adolescent girls aged 10-19 years are particularly susceptible to experiencing anemia (Permatasari et al., 2020).

Anemia is a condition characterized by a decrease in hemoglobin per unit volume of blood below the predetermined normal levels for specific age and gender groups. The criteria for anemia occurrence are when the hemoglobin level is below 12 g/dl for females and below 14 g/dl for males, along with a hematocrit level below 34% (Kaimudin et al., 2017). Based on World Health Organization (WHO) data from 2015, the global prevalence of anemia is estimated to be between 40-88% of the population. In Southeast Asia, 25-40% of adolescent girls experience mild to severe anemia. The national prevalence of anemia across all age groups was 21.7%. The prevalence of anemia is relatively higher in females, reaching 23.90%, while in males, it was 18.40%. According to Riskesdas 2018 data, the national prevalence of anemia was 48.9%, while the prevalence of anemia in adolescent girls in 2018 was 26.50% (Priyanto, 2018). By 2020, almost 23% of adolescent girls in Indonesia suffer from anemia, which accounts for over 21 million individuals. Among them, approximately 4.8 million have a deficiency of red blood cells (which contain the protein hemoglobin, Hb) (Sunarsih et al., 2020). In 2021, the prevalence of anemia in Indonesia for adolescents aged 5-14 years was 26.4%, and for those aged 15-25 years, it was 18.4%. According to Riskesdas 2018 data, Lampung Province ranks first in the Sumatra region with the highest prevalence of anemia at 63%, and among them, 24.3% are adolescent girls (aged 10-19 years).

The impacts of anemia include disrupted growth and development, fatigue, increased susceptibility to infections due to weakened immune systems, decreased body function and resilience against toxins, and impaired cognitive function (Yunita et al., 2021). Common symptoms include lethargy, weakness, fatigue, tiredness, and forgetfulness which occur as a result of reduced oxygen levels in the blood needed by tissues in the body, including muscles for physical activity and the brain for cognitive functions, as oxygen transport is facilitated by hemoglobin (Triwinarni et al., 2017).

The issue of anemia among adolescents needs to be addressed and managed promptly. There are several actions that can help increase hemoglobin levels in the blood, both through pharmacological and non-pharmacological approaches. Pharmacological therapy that can be implemented in accordance with the decisions and regulations of the Ministry of Health includes the consumption of iron tablets, such as 60 mg of FeSO4 and folic acid (0.400 mg), taken once a week and daily during menstruation for adolescent girls and women of reproductive age (Permenkes, 2014). On the other hand, non-pharmacological therapy options for adolescents include consuming fruits, vegetables, dates, hibiscus tea, and also moringa leaf extract. These ingredients can be turned into juices, puddings, or brewed teas, which can be appealing and suitable for consumption by adolescents (Resmi & Setiani, 2020).

According to the research by Fauziandri (2019), one of the preventive and treatment methods for anemia involves the use of moringa leaves (Moringa oleifera L.). This is because 100 grams of fresh moringa leaves contain approximately 28.29 mg of iron, which is equivalent to the iron content in a 30 mg Fe tablet. The World Health Organization (WHO) even recommends the consumption of moringa leaves to ensure sufficient iron levels in the body, especially for individuals with iron-deficiency anemia. Various studies have demonstrated the effectiveness of using moringa leaf as a therapeutic approach for treating anemia in various forms and preparations.

Moringa leaves contain a relatively high amount of iron (Fe). The iron content in moringa leaves can aid in the production of red blood cells, thereby increasing hemoglobin levels in the blood.

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Supplementation with moringa leaf extract in the form of capsules with optimized doses can be more efficient in preventing anemia and maintaining normal hemoglobin levels. Common symptoms of anemia include paleness (of lips, gums, eyes, nails, and palms), fatigue, and rapid heartbeat during mild activities, dizziness, chest pain, cold hands and feet, and blurred vision (Zidni et al., 2019).

Consuming moringa leaves can be done through various methods. Apart from consuming them fresh, moringa leaves can be processed into different forms aimed at increasing hemoglobin levels. For example, they can be dried and made into tea, capsules, or powder used for various culinary purposes. Each form has varying abilities to increase hemoglobin levels, depending on the type of treatment, duration, and characteristics of the research participants (Hastuti & Sari, 2022).

According to Yulianti et al. (2016), one tea bag of moringa leaves contains 2.5 grams of dried moringa leaf powder. For antioxidant, anti-inflammatory, and high-nutrient benefits, consuming moringa leaf tea twice a day, in the morning and afternoon, is recommended. The preparation involves steeping the tea bag in about 250 ml of hot water until the solution changes color and is ready to be consumed while still warm (Pratiwi & Nurjanna, 2019). Several factors differentiate the current study from previous research, including the characteristics of the participants, the size of the population, the research methodology employed, and the duration of moringa leaf tea administration to the participants.

Based on the preliminary study conducted at Junior High School 1 Seputih Raman, Central Lampung Regency, on January 8, 2023, among 10 adolescent girls, it was found that they experienced anemia symptoms referred to as the "5L" symptoms (weakness, fatigue, lethargy, tiredness, and lassitude). It was identified that only 10% of the adolescent girls never experienced the “5L” symptoms, 20% rarely experienced them, 40% experienced them occasionally, and 30% of the adolescent girls frequently experienced the “5L” symptoms. The underlying causes of these symptoms were attributed to their physical activities at school from morning to afternoon, inadequate dietary intake among adolescents, and menstrual periods. Furthermore, according to statements from the adolescent girls, on average, they tend to ignore and neglect the symptoms they experience. Instead, they resort to resting and sleeping as a way to cope. They mentioned that there hasn't been any previous research involving the provision of moringa leaf tea to address these concerns.

RESEARCH METHODS

The research methodology employed in this study was a quasi-experimental design with the One Group Pretest-Posttest Design method. The population of the study consisted of all female adolescents attending Junior High School 1 Seputih Raman, Central Lampung Regency. The sampling technique used was total sampling, involving a total of 36 respondents. The independent variable in this study was the provision of moringa leaf tea, while the dependent variable was the hemoglobin (Hb) level. Hemoglobin levels were measured using the GCHb method. The moringa leaf tea used in the study was in a prepared form, with each tea bag containing 2.5 grams of moringa leaf powder. The administration of moringa leaf tea was at a dosage of 5 grams per day, which was equivalent to 2 tea bags (5 grams in total). The tea bags were steeped in 250 ml of boiling water in the morning and afternoon for duration of 2 weeks. The collected data were analyzed using a bivariate analysis, specifically the T-Test.

RESULTS

Respondent Characteristics

Table 1
Frequency Distribution of Respondent Characteristics

Age	Frequency	Presentation
12 th	3	8,3
13 th	20	55,6
14 th	11	30,6
15 th	2	5,6

Based on the table above, it explains that out of 36 respondents, the majority of respondents are 13 years old, with 20 individuals (55.6%).

Univariate Analysis

Based on the table 2 above, it can be observed that the average Hb level of the respondents before being administered Moringa leaf tea was 10.2 g/dl. The standard deviation was 0.823, with a minimum Hb level of 8.9 g/dl and a maximum of 11.60 g/dl.

Table 2
Frequency Distribution of Hb Levels Before Administering Moringa Leaf Tea to Adolescent Girls with Anemia at Junior High School 1 Seputih Raman, Central Lampung Regency

Hb Level	N	Mean	SD	Min-Max
Before (Pretest)	36	10,12	0,823	8,9 – 11,60

Table 3
Distribution of Hemoglobin (Hb) Levels after Giving Moringa Leaf Tea to Adolescent Girls with Anemia at Junior High School 1 Seputih Raman, Central Lampung Regency

Hb Level	N	Mean	SD	Min-Max
After (Posttest)	36	11,81	0,693	10,10 – 13,00

Based on Table 3 above, it is evident that after being administered Moringa leaf tea, the average Hb level of the respondents increased to 11.81 g/dl. The standard deviation was 0.693, with a minimum Hb level of 10.10 g/dl and a maximum of 13.00 g/dl.

Bivariate Analysis

Based on Table 4 above, it is shown that the average hemoglobin (Hb) level before giving Moringa leaf tea was 10.12 g/dl, and after giving it, it increased to 11.81 g/dl. The result of the paired t-test analysis yielded a p-value of 0.00 ($p < 0.05$), indicating a significant difference between the Hb levels before and after the administration of Moringa leaf tea. This result indicates that the administration of Moringa leaf tea has a significant effect on increasing hemoglobin levels in adolescent girls with anemia at Junior High School 1 Seputih Raman, with an average difference of 1.69.

Table 4
Hemoglobin (Hb) Levels Before and After Giving Moringa Leaf Tea to Adolescent Girls with Anemia at Junior High School 1 Seputih Raman, Central Lampung Regency

Hb Level	Min-Max	Mean	Difference	P-value
Before (Pretest)	8,9-11,60	10,12	1,69	0,000
After (Posttest)	10,10-13,00	11,81		

DISCUSSION

Respondent Characteristics

Based on the research results, it is known that the majority of respondents are 13 years old, with 20 individuals (55.6%). Based on the research findings, the age of the respondents falls into the category of early adolescence (11-13 years old).

According to Andriani et al., (2022), during the early adolescence phase, there are significant sexual changes between adolescent boys and girls. As a result, adolescents in this phase tend to pay more attention to their body's sexual characteristics and inquire about reproductive changes and sizes.

The researcher's opinion during this phase is that adolescents are more interested in their daily lives and are curious about many things. However, during this time, they still retain some childlike characteristics. The knowledge of adolescents during early adolescence is characterized by the emergence of concrete thinking, but they might not yet fully consider the long-term impacts of their actions or decisions.

Univariate Analysis

Hemoglobin (Hb) Levels before Giving Moringa Leaf Tea

Based on the conducted research, it is evident that the average Hb level of respondents before receiving moringa leaf tea was 10.2 g/dl. The standard deviation was 0.823, with a minimum Hb level of 8.9 g/dl and a maximum of 11.6 g/dl. According to the research findings, the average Hb level of respondents before receiving moringa leaf tea falls within the category of mild anemia.

According to the World Health Organization (WHO), Hb levels are classified as follows: mild anemia with Hb levels of 9-11 g/dl, moderate anemia with Hb levels of 7-8 g/dl, and severe anemia with Hb levels <7 g/dl. Anemia is not only prevalent in adults but also in adolescents. It can manifest during the developmental phase of adolescence due to various factors. Anemia occurs when the body experiences a reduction in the number of red blood cells, falling below the normal

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range. This is often due to a deficiency of hemoglobin (a protein rich in iron), which affects the production of red blood cells. Consequently, oxygen also struggles to reach cells and tissues within the body (Puspita et al., 2022).

Anemia refers to a condition where there is a decrease in hemoglobin per unit volume of blood below the predetermined normal range for specific ages and genders. The criteria for anemia include Hb levels below 12 g/dl for females and below 14 g/dl for males, as well as a hematocrit level below 34% (Kaimudin et al., 2017).

According to Triwinami et al. (2017), the emergence of anemia is marked by symptoms such as fatigue, weakness, lethargy, tiredness, and apathy (referred to as the "5L" symptoms). These symptoms arise due to the decrease in oxygen levels in the blood, which is required by tissues in the body, including muscles for physical activities and the brain for cognitive processes, as oxygen transport is facilitated by hemoglobin.

The results of the research are consistent with the study conducted by Yulianti et al. (2016), where the pre-intervention treatment group consisted of 30 individuals (100%) who had mild anemia. Meanwhile, the study by Hastuty & Nitia (2022) revealed that the average Hb level in adolescent girls with anemia before the administration of Moringa oleifera L. leaf extract was 10.83 g/dl.

The analysis of low Hb levels is attributed to the condition where the body experiences a reduction in the number of red blood cells below the normal range. Factors influencing Hb levels include bleeding, menstruation, and iron deficiency. This is further corroborated by the condition of the respondents experiencing the "5L" symptoms (fatigue, weakness, lethargy, tiredness, and apathy), likely due to the rigorous activities undertaken by the adolescent participants both within and outside of school.

Hemoglobin Levels after Consuming Moringa Leaf Tea

The results of the research indicate that after being given Moringa leaf tea, the average Hb level of the respondents was 11.81 g/dl. The standard deviation was 0.693, with a minimum and maximum Hb level ranging from 10.10 g/dl to 13.00 g/dl. Based on these findings, it is revealed that after the administration of Moringa leaf tea, the average Hb level of the respondents falls within the normal category. The increase in the average Hb level is indicated by the examination results, where some respondents experienced an increase in their Hb levels.

The problem of anemia among adolescents needs to be addressed promptly or managed effectively. The consequences of anemia include disrupted growth and development, fatigue, increased susceptibility to infections due to a weakened immune system, decreased body function and resilience to toxins, and impaired cognitive function (Yunita et al., 2021).

Non-pharmacological therapies that can be adopted by adolescents include consuming fruits, vegetables, dates, roselle tea, and Moringa leaf extract. These ingredients can be transformed into juices, puddings, or appealing herbal teas for consumption by adolescents (Resmi & Setiani, 2020). According to Fauziandri (2019), prevention and treatment of anemia can involve the use of Moringa leaves (Moringa oleifera L.), as 100 grams of fresh Moringa leaves contain approximately 28.29 mg of iron, which is comparable to the iron content in a 30 mg Fe tablet. The World Health Organization (WHO) even recommends the consumption of Moringa leaves to ensure adequate iron levels in the body, especially for individuals with iron-deficiency anemia.

The consumption of moringa leaves can be done in various ways. Apart from consuming them fresh, moringa leaves can be processed into different forms aimed at increasing Hb levels. For instance, they can be dried and used to make tea, capsules, or powdered for other culinary uses. Each form of preparation may have different abilities in increasing Hb levels, depending on the type of treatment, duration, and characteristics of the research participants (Hastuti & Sari, 2022). One common way to consume moringa leaves is by brewing them in boiling water, typically around 250 ml. The mixture is left to steep until the color changes, and it is ready to be consumed while still warm (Pratiwi & Nurjanna, 2019).

The results of this study are consistent with the findings of Tirtawati et al. (2021), which demonstrated an increase in the mean Hb levels before and after consuming moringa leaf tea. Before the intervention, the mean Hb level was 10.71 g/dl. After 15 days of consuming moringa leaf tea, it increased to 11.03 g/dl. Further, after 30 days of intervention, the mean Hb level reached 11.63 g/dl.

An analysis of this research suggests that the observed increase in Hb levels among the respondents after consuming moringa leaf tea can be attributed to their consistent adherence to the recommended tea consumption routine throughout the study period.

Bivariate Analysis

The Effectiveness Before and After Administration of Moringa Leaf Tea on Hemoglobin Increase in Adolescent Girls with Anemia at Junior High School 1 Seputih Raman, Central Lampung Regency.

Based on the conducted research, the results of the paired t-test statistical analysis yielded a p-value of 0.00 ($p < 0.05$), indicating a significant difference between the hemoglobin levels before and after the administration of moringa leaf tea. This demonstrates that there is a substantial influence of administering moringa leaf tea on the increase of hemoglobin levels among adolescent girls with anemia at Junior High School1 Seputih Raman, with an average difference of 1.69. The research findings reveal a noticeable increase in hemoglobin levels both before and after the administration of moringa leaf tea, with an average increment of 1.69 ± 0.546 g/dl.

The presence of essential nutrients, particularly iron, in moringa leaves plays a crucial role in the hematopoiesis process within the bone marrow. Moringa leaves are recognized for their high iron content, and they also contain proteins and amino acids that contribute to hematopoietic growth factors. The abundant protein and amino acid content in moringa leaves serve as critical elements in the proliferation and differentiation of blood cells. Additionally, the presence of vitamin C in moringa leaf extracts enhances the absorption of iron within the body (Mun'im et al., 2016).

Moringa leaves contain a relatively high content of iron (Fe). The iron content in moringa leaves plays a pivotal role as a primary nutrient in the process of hematopoiesis within the bone marrow. Moringa leaves are known for their richness in iron. Moreover, beyond iron, they also harbor essential components such as proteins and amino acids that act as factors promoting hematopoietic growth. Additionally, iron possesses several critical functions within the human body. It serves as a carrier of oxygen from the lungs to the body's tissues, participates in electron transportation within cells, and contributes to various enzymatic reactions occurring in the human body's tissues. Furthermore, iron is crucial for hemopoiesis, which is the formation of blood components, particularly in the synthesis of hemoglobin (Hb) (Rahmad, 2017).

The administration of moringa leaf tea is provided at a dosage of 5 grams per day, equivalent to one tea bag (2.5 grams) in the morning and another in the evening. The dosing of moringa leaf tea is adjusted based on research considerations that ensure safe consumption by adolescent girls. This dosage has the potential to serve as a source of antioxidants, anti-inflammatory agents, and high-nutrition components. Administering moringa leaf tea to anemic adolescent girls is deemed effective, as evidenced by the increase in hemoglobin levels and the regularization of menstrual cycles among those who previously experienced irregular menstrual cycles due to anemia. Moringa leaves are beneficial for anemic patients, both at low and relatively high dosages. The notable increase in red blood cell (erythrocyte) and white blood cell (leukocyte) counts resulting from moringa leaf administration indicates that it is not just a supplement but a primary remedy for anemia (Hamdiyah & Asmah Sukarta, 2019).

The findings of this study are consistent with the research conducted by Yulianti et al. (2016), where their results demonstrated a significant difference in hemoglobin levels among the treatment group, indicated by a p-value of $0.000 < \alpha=0.05$. Specifically, there was a significant increase in hemoglobin levels among the treatment group ($p=0.000$, $p<0.05$), while the control group did not exhibit a significant change in hemoglobin levels following the administration of moringa leaf extract among anemic adolescent girls.

Similarly, in alignment with the study by Hastuti and Sari (2022), their research indicated that the group consuming moringa leaf tea experienced an average increase of 1.3 g/dl in hemoglobin levels, the iron tablet group showed an average increase of 1.6 g/dl, and the gelatin capsule group exhibited a rise of 0.4 g/dl. The duration needed for moringa leaf tea to effectuate a rise in hemoglobin levels in the body was slightly over two weeks.

The analysis of the research results reveals that the increase in hemoglobin levels among adolescent girls is attributed to the multifaceted benefits of moringa leaves. Moringa leaves act as antioxidants, prevent the occurrence of anemia, and help maintain glucose levels in the blood, accelerate the growth of cells and new tissues, possess anti-cancer and anti-tumor properties, prevent bleeding, and offer protection against coronary heart diseases. Moreover, moringa leaves serve as a rich source of dietary fiber and can also serve as an alternative source of iron. Iron holds a crucial role, as it transports oxygen from the lungs to the body's tissues and carries electrons in the energy production process within cells. For oxygen transportation, iron must bind with proteins to form hemoglobin within red blood cells, as well as myoglobin within muscle fibers.

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CONCLUSION

The characteristics of the respondents experiencing anemia indicated that the majority of them were 13 years old, with 20 individuals (55.6%). Based on the research findings, these respondents fall into the category of early adolescents (11-13 years old).

Before the administration of moringa leaf tea, the average Hb level of the respondents was 10.2 g/dl, with a standard deviation of 0.823 and a range of Hb levels between 8.9 g/dl and 11.60 g/dl. After being given moringa leaf tea, the average Hb level of the respondents increased to 11.81 g/dl, with a standard deviation of 0.693 and a range of Hb levels between 10.10 g/dl and 13.00 g/dl.

There was a significant increase in Hb levels before and after the administration of moringa leaf tea, with an average increase of 1.69 ± 0.546 g/dl. The paired t-test statistical analysis yielded a p-value of 0.00 ($p < 0.05$), indicating that there is a significant effect of moringa leaf tea on the increase in hemoglobin levels in adolescent girls with anemia at Junior High School 1 Seputih Raman.

RECOMMENDATIONS

For Research Location

The findings of this study can serve as motivation for educational institutions to enhance education about the deficiency of Hb levels in adolescents due to anemia and ways to address it. One of the steps that can be taken is to develop School Health Units (SHUs) that are more active in providing information and education about anemia to adolescents.

For Adolescent Girls

The results of this study can help improve the understanding of adolescent girls regarding the benefits of moringa leaf tea, encouraging them to incorporate it into their daily lives to address Hb deficiency. Consistently consuming moringa leaf tea can become a part of a lifestyle that helps maintain health and prevent anemia.

For Further Research

The findings from this study can serve as a foundation for further research, with a more in-depth focus, particularly in developing non-pharmacological methods of providing moringa leaf tea to enhance Hb levels in adolescent girls with anemia.

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