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The effect of green bean juice and honey supplementation on hemoglobin (hb) levels in adolescent girls with anemia

Kiswari, Ana Mariza*, Sunarsih, Wayan Aryawati

Universitas Malahayati

Corresponding author: *Email: anamariza@malahayati.ac.id

Abstract

Background: Anemia remains a health concern among adolescents, with a national prevalence of 32% among girls aged 15–24 years. At Roudlatul Qur'an Islamic Boarding School in Metro City, 40% of female students were found to be anemic. Anemia causes fatigue, reduced concentration, poor academic performance, and future obstetric risks. Mung bean juice and honey contain iron, folic acid, and enzymes that support hemoglobin production naturally.

Purpose: To determine the effect of mung bean juice and honey on increasing hemoglobin levels among anemic adolescents.

Method: This study used a quantitative approach with a pre-experimental one-group pretest-posttest design. A total of 26 adolescent girls with mild anemia were selected through purposive sampling. Data were collected using observation sheets and analyzed using a paired sample t-test.

Results: The average Hb level increased from 10.8 g/dL before intervention to 11.77 g/dL after. The statistical test showed a significant effect of mung bean juice and honey on increasing hemoglobin levels ($p\text{-value} < 0.001$).

Conclusion: The administration of mung bean juice and honey effectively increases hemoglobin levels in adolescents with mild anemia.

Suggestion: Adolescents are encouraged to regularly consume mung bean juice and honey. Islamic boarding schools should consider incorporating mung bean-based dishes into weekly meal plans.

Keywords: Adolescent; Anemia; Hemoglobin Level; Honey; Mung Bean Juice.

INTRODUCTION

Anemia is a condition characterized by a reduced number of red blood cells or hemoglobin, which transport oxygen throughout the body. Adolescent girls are particularly susceptible to anemia, not only because they often experience malnutrition but also because they regularly menstruate, which increases the body's need for iron (Fe), which is essential for red blood cell production. When iron intake is insufficient, the risk of anemia increases (Muhayaroh, 2024). The high prevalence of anemia in adolescent girls can be caused by several factors, including chronic blood loss, inadequate iron intake, suboptimal iron absorption, and increased iron requirements during

growth, puberty, and breastfeeding (Rusminingsih, Marwanti, Febriyati, & Salasa, 2023).

According to a World Health Organization (WHO) report, the global prevalence of anemia reaches two billion people. A national micronutrient survey report showed that 18% of women in Ethiopia aged 15–49 years are anemic. In Somalia, the prevalence of anemia reached 34.8%, in Gambella 26.7%, and in Africa 26.2%, which are much higher than the national average (Chisti, Kawser, Rahman, Shahid, Afroze, Shahunja, & Ahmed, 2022). In Indonesia, the prevalence of anemia in women aged 15 years and above reached 23%, higher than neighboring

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countries such as Malaysia (21%) and Singapore (22%). In the 15-24 age range, the prevalence of anemia in Indonesia was recorded at 32% (Marfiah, Putri, & Yolandia, 2023). Based on data from the 2023 Indonesian Health Survey, the incidence of anemia in the 5-14 age group of 5,671 was 16.3%, and in the 15-24 age group of 5,760 respondents, 15.5% experienced anemia. Meanwhile, in terms of characteristics, 18.0% of anemia occurred in women. The coverage of iron supplementation for adolescent girls in Indonesia in 2023 was 78.9%. The highest iron supplementation coverage was achieved in Bali Province (97.5%), while the lowest percentage was in Papua Highlands Province (0.5%) (Ministry of Health of the Republic of Indonesia, 2025).

Lampung Province: Research in Bandar Lampung City showed that the prevalence of anemia in adolescent girls ranged from 21% to 80.9%, indicating that anemia remains a serious health problem in various regions, including Lampung (Mulyani, Lupiana, & Yunianto, 2021). The coverage of iron supplementation for adolescent girls in Lampung Province in 2023 was 69.4% (Ministry of Health of the Republic of Indonesia, 2025). Based on data from 130,685 female students who underwent anemia screening in 2024, 7,889 (12.38%) of them experienced anemia, with 5,303 (67.2%) having mild anemia, 2,461 (31.2%) having moderate anemia, and 125 (1.6%) having severe anemia. In Metro City, 8,849 female students underwent screening, and 687 (18.5%) had anemia, with 385 (56.0%) having mild anemia, 282 (41.0%) having moderate anemia, and 20 (2.9%) having severe anemia (Bandar Lampung City Health Office, 2025).

Anemia in adolescents has broad impacts, including decreased physical capacity, impaired reproductive physiology, and decreased work productivity in adulthood (Chisti et al., 2022). Other impacts include delayed physical growth, behavioral and emotional disorders, and decreased immunity. Adolescents with anemia are more likely to feel weak, tire quickly, have difficulty concentrating, and experience decreased productivity in their studies and work (Sari, 2020). Decreased hemoglobin levels can also cause physical symptoms such as lethargy, tachycardia, and shortness of breath (Bakta, 2019). Furthermore, unmet iron needs in adolescent girls can lead to future obstetric complications, including

low birth weight, premature birth, or even maternal death during childbirth (Chisti et al., 2022).

Several factors contribute to anemia in adolescent girls, including menstruation, increased iron requirements during puberty, and lifestyles and diets that do not support adequate nutritional intake (Sab'ngatun & Riawati, 2021). Other factors, such as inadequate knowledge about nutrition, socioeconomic status, physical activity, and menstrual patterns, also contribute to high rates of anemia. Parental education, family income, and dietary habits are also important risk factors (Sab'ngatun & Riawati, 2021).

The Indonesian government has undertaken various efforts to reduce anemia rates among adolescent girls, one of which is through a program to distribute iron supplements (TTD) in schools, in accordance with Circular Letter No. HK.03.03/V/0595/2016 from the Director General of Public Health, Ministry of Health. This program requires educational institutions to provide a group iron supplementation day for adolescent girls, with a dosage of one tablet per week for women of childbearing age (Ministry of Health of the Republic of Indonesia, 2021). However, despite this program's implementation, many adolescent girls still fail to take their iron supplements. The Indonesian Health Survey revealed several reasons, including the belief that the tablets are unnecessary (12.8%), only taking them during menstruation (7.6%), forgetting to take them (29.2%), the unpleasant taste and odor (29.7%), and side effects such as constipation (8.2%). Other contributing factors include a lack of parental support in providing nutritious food and awareness of the importance of iron tablets (Budiarti, Rustini, & Wirani, 2020).

WHO recommendations for anemia management in adolescents and women of childbearing age focus on promotional and preventive activities, namely increasing the consumption of iron-rich foods, iron supplementation, and increasing food fortification with iron and folic acid. Professional organizations and the private sector are expected to contribute to supporting comprehensive promotional and preventive activities to reduce the prevalence of anemia in adolescents and women of childbearing age (Ministry of Health of the Republic of Indonesia, 2021). One effort to reduce the prevalence of anemia

Kiswari, Ana Mariza*, Sunarsih

Universitas Malahayati

Corresponding author: *Email: anamariza@malahayati.ac.id

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is to provide foods that can increase Hb levels, such as mung bean juice and honey.

One effort to reduce the prevalence of anemia in adolescent girls and women of childbearing age is to increase the intake of iron-rich foods. Iron plays a vital role in the formation of hemoglobin, which carries oxygen throughout the body. Good sources of iron come from animal foods such as red meat, liver, fish, and eggs, as well as plant sources such as nuts, green vegetables, and fortified cereals. However, iron from plant sources tends to be more difficult for the body to absorb than iron from animal sources, so it needs to be combined with vitamin C to increase absorption (Nuraida, Sugesti, & Amelia, 2024).

Among the various food sources that can help increase hemoglobin levels, mung bean juice and honey are good choices. Mung beans are a relatively high source of plant-based iron and also contain folic acid, protein, and B-complex vitamins, which play a role in red blood cell formation. Meanwhile, honey contains iron, copper, and various enzymes that aid iron absorption and boost the immune system (Kurniyati, Setiawati, Suprayitno, & Indriyani, 2021).

The main reason for using the combination of mung bean juice and honey to increase hemoglobin levels is the synergistic effect of the two ingredients. The iron in mung beans acts as a key ingredient in hemoglobin production, while folic acid supports the formation of healthy red blood cells. Honey, in addition to containing iron, also contains copper, which plays a role in iron metabolism and provides additional energy to increase stamina and endurance (Usman, Silfia, Dewie, & Mariani, 2021).

In terms of iron content, a comparison of several food sources is as follows: beef liver: 6.5 mg Fe per 100 g, red meat: 2.7 mg Fe per 100 g, sardines: 2.9 mg Fe per 100 g, spinach: 2.7 mg Fe per 100 g, and honey: 0.42 mg Fe per 100 g. The highest iron content in mung beans is found in the embryo and seed coat, with a total iron content of 6.7 mg per 100 g. Consuming two cups of mung beans daily means consuming 50% of the daily iron requirement, or 18 mg, which can increase Hb levels for 2 weeks. Vitamin C, folic acid, and protein are the main factors that promote the absorption of non-heme iron. Vitamin C increases the absorption of non-heme iron up to fourfold. Ingredients such as citrate, malate, lactate, succinate, and tartaric acid can enhance non-heme iron absorption under certain conditions.

Vitamin C has a reducing factor that helps increase iron absorption by reducing ferric iron to ferrous iron, thus making iron absorption more efficient and effective (Arif, 2023).

While the iron content in honey is lower than other sources, honey has the advantage of aiding iron absorption thanks to its copper content and enzymes that support iron metabolism (Arif, 2023). Therefore, the combination of mung bean juice and honey can be an effective natural alternative to increase hemoglobin levels, especially for individuals with mild anemia or who want to prevent it.

RESEARCH METHOD

This study used a quantitative approach with a one-group pretest-posttest pre-experimental design. This design allows researchers to observe differences before and after the intervention without a control group, allowing the effect of the treatment to be seen from changes in pre- and post-intervention scores. The study was conducted at the Roudlatul Qur'an Islamic Boarding School in Metro City from February 22 to July 11, 2025. The population in this study was all 43 adolescent girls experiencing mild anemia at the boarding school. The sample was drawn purposively, considering the inclusion criteria, resulting in 30 respondents.

Inclusion criteria included adolescent girls aged 12–18 years, living in the boarding school dormitory, having an Hb level between 10–11.9 g/dL based on initial screening, willing to participate by signing an informed consent, and not currently taking other iron supplements. Exclusion criteria included a history of chronic diseases such as thalassemia and kidney disorders, allergies to mung beans or honey, not completing the intervention program, and being menstruating at the time of the Hb test. The independent variables in this study were the administration of mung bean juice and honey, while the dependent variable was hemoglobin (Hb) levels.

The intervention was administered for seven consecutive days at a dose of 250 ml of mung bean juice and 30 ml of honey per day. The mung bean juice was made by boiling 100 grams of mung beans in 400 ml of water, then straining it and serving it with honey. Hb levels were measured before and after the intervention using a Haemocek device. Data collection was conducted in three stages: the initial stage (permitting, respondent recruitment, and

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Universitas Malahayati

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obtaining informed consent), the implementation stage (initial Hb test, intervention administration, and consumption monitoring), and the final stage (post-intervention Hb test and recording results).

Enumerators assisted in the distribution and daily monitoring of the intervention and ensured respondent compliance. During the intervention, respondents were prohibited from consuming foods or beverages that can inhibit iron absorption, such as tea and coffee. The collected data were analyzed quantitatively. The data processing stage included

editing, scoring, tabulation, and cleaning. Data analysis was performed univariately to describe the average Hb levels before and after the intervention, and bivariate to test the effect of the intervention using a paired sample t-test. Normality testing was performed first using the Shapiro-Wilk test. If the data were normally distributed, the paired t-test was used, and if not, the non-parametric Wilcoxon test was used. The entire analysis process was performed using statistical software.

RESEARCH RESULT

Table 1. Characteristics of Respondent (N=26)

Variable	Results	Average Hb Before	Average Hb After
Age (Mean±SD) Years	(15.19 ±1.42) (13-17)		
13	5/19.2	11	11.6
14	3/11.5	11.2	12.1
15	5/19.2	11.3	12.0
16	8/30.7	11.1	11.7
17	5/19.2	10.8	11.7

Based on Table 1, it is known that adolescents who experience anemia are in the age range of 13 to 17 years. The most common age is 16 years old with 8 respondents (30.8%), followed by 13, 15, and 17 years old with 5 respondents (19.2%). Respondents aged 14 years old numbered 3 people (11.5%). This indicates that the incidence of anemia in adolescents in this study was most often found at age 16 years, although in general the age distribution was quite even. The total number of respondents in this study was 26 people (100%).

Table 2. Average Hb Levels of Adolescents with Anemia Before Being Given Green Bean Juice and Honey

Kadar Hb	Mean	SD	Min	Max
Sebelum	11.05	0.46	10.1	11.8
Sesudah	11,77	0.50	10.9	12.7

Based on table 2, the average hemoglobin (Hb) level of adolescents with anemia before being given intervention in the form of green bean juice and honey was 11.05 g/dL with a standard deviation of 0.46. The lowest Hb level found was 10.1 g/dL, while the highest value reached 11.8 g/dL. After being given intervention in the form of green bean juice and honey, the average hemoglobin (Hb) level of adolescents with anemia increased to 11.77 g/dL with a standard deviation of 0.50. The lowest Hb level after the intervention was recorded at 10.9 g/dL and the highest level was 12.7 g/dL.

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Universitas Malahayati

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Table 3. Frequency Distribution of Hb Levels in Adolescents with Anemia Before and After Being Given Green Bean Juice And Honey

Variable	Results
Hb levels Before (n/%)	
10.1	1/3.8
10.2	1/3.8
10.4	2/7.7
10.6	2/7.7
10.8	3/11.5
10.9	1/3.8
11.0	1/3.8
11.1	2/7.7
11.2	2/7.7
11.3	1/3.8
11.4	4/15.4
11.5	4/15.4
11.6	1/3.8
11.8	1/3.8
Hb levels After (n/%)	
10.9	1/3.8
11.0	1/3.8
11.1	2/7.7
11.2	1/3.8
11.3	1/3.8
11.4	2/7.7
11.6	2/7.7
11.7	3/11.5
11.8	1/3.8
11.9	1/3.8
12.0	2/7.7
12.1	4/15.4
12.2	1/3.8
12.3	1/3.8
12.6	2/7.7
12.7	1/3.8

Based on table 3, the frequency distribution of hemoglobin (Hb) levels of adolescents who experienced anemia before the intervention of green bean juice and honey at the Roudlatul Qur'an Islamic Boarding School in Metro City was obtained, amounting to 26 respondents. The lowest Hb level, namely 10.1 g/dL, was found in 1 respondent (3.8%), while the highest Hb level of 11.8 g/dL was also found in 1 respondent (3.8%). Most respondents had Hb levels of 11.4 g/dL and 11.5 g/dL, each amounting to 4 people (15.4%). Hb levels of 10.8 g/dL were found in 3 respondents (11.5%). In addition, Hb levels of 10.4 g/dL, 10.6 g/dL, 11.1 g/dL, and 11.2 g/dL were each found in 2 respondents (7.7%). Hb levels of 10.2 g/dL, 10.9 g/dL, 11.0 g/dL, 11.3 g/dL, 11.6 g/dL, and 11.8 g/dL were found in one respondent (3.8%) each. This distribution indicates that all respondents were in the mild anemia category (Hb levels between 10–11.9 g/dL) before the intervention.

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After the mung bean juice and honey intervention, hemoglobin (Hb) levels increased in 26 anemic adolescents. The lowest Hb level after the intervention was 10.9 g/dL, found in one respondent (3.8%), and the highest Hb level was 12.7 g/dL, also found in one respondent (3.8%). Most respondents had Hb levels of 12.1 g/dL, four of whom (15.4%). Hb levels of 11.7 g/dL were found in 3 respondents (11.5%). Hb levels of 11.1 g/dL, 11.4 g/dL, 11.6 g/dL, and 12.0 g/dL were found in 2 respondents (7.7%) respectively. Meanwhile, Hb levels of 11.0 g/dL, 11.2 g/dL, 11.3 g/dL, 11.8 g/dL, 11.9 g/dL, 12.2 g/dL, 12.3 g/dL, and 12.7 g/dL were found in 1 respondent (3.8%) respectively. Overall, 11 respondents (42.3%) had Hb levels ≥ 12.0 g/dL after the intervention, indicating an improvement in anemia status from mild to normal. This suggests that administering mung bean juice and honey has the potential to increase Hb levels in adolescents with mild anemia.

Table 4. Data Normality Test

Variable	Green Bean And Honey Extract	Shapiro Wilk	Information
Hb Levels	Before	0.143	Normal
	After	0.556	Normal

Based on table 4. above, the data normality test using Shapiro Wilk for the Hb level variable before and after being given green bean juice and honey obtained a significant value > 0.05 , which means the data is normal.

Tabel 5. Uji Bivariat

Hb Levels	Mean	Mean Difference	P- Value
Before	11.05	0.719	<0.001
After	11.77		

Based on table 5, it is known from the test results to determine the effect of the intervention carried out using the paired sample t-test that there was an increase in hemoglobin (Hb) levels in adolescents with anemia after being given green bean juice and honey at the Roudlatul Qur'an Islamic Boarding School in Metro City. The average Hb level before the intervention was 11.05 g/dL, while after the intervention it increased to 11.77 g/dL, with an average difference (mean difference) of 0.719 g/dL. Statistical tests showed that this increase was statistically significant with a p value <0.001 , which means that the administration of green bean juice and honey had a significant effect on increasing Hb levels in adolescents with anemia.

DISCUSSION

Before the intervention, the average Hb level in anemic adolescent girls was 11.05 g/dL. This value is still below the normal limit. Differences in Hb levels between respondents were influenced by age, puberty stage, an unbalanced diet, and menstrual

blood loss. Additionally, environmental and social factors such as nutritional access, hygiene, and psychological stress also played a role. This finding aligns with several previous studies showing low Hb levels in adolescent girls due to high iron requirements and suboptimal nutritional intake.

After a seven-day intervention involving mung bean juice and honey, the average Hb level increased to 11.77 g/dL. Although not all respondents achieved Hb levels ≥ 12 g/dL, all experienced improvement. The effectiveness of this intervention is supported by the iron and other nutrient content of mung beans and honey. Variations in response between individuals are due to differences in metabolism, age, adherence to consumption, and initial nutritional status. Overall, this natural intervention has proven safe and effective in increasing Hb, although it does not completely replace pharmacological therapy.

The results of a paired sample t-test showed a statistically significant increase in hemoglobin (Hb) levels after administering mung bean juice and honey to anemic adolescents, with a p-value of <0.001 . The

Kiswari, Ana Mariza*, Sunarsih

Universitas Malahayati

Corresponding author: *Email: anamariza@malahayati.ac.id

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average Hb level increased from 11.05 g/dL to 11.77 g/dL, with a mean difference of 0.72 g/dL. This finding aligns with several previous studies showing that the combination of mung bean juice and honey can effectively increase Hb levels. The effectiveness of this combination is due to the high iron content in mung beans and the support of folic acid and B-complex vitamins, which play a role in red blood cell formation. Honey also contributes through its enzyme and copper content, which aid iron metabolism. Vitamin C and other organic compounds that increase iron absorption also strengthen the intervention's effect.

This is in line with research, where analysis using the Wolcoxon test showed a $p=0.000$ ($p<0.05$) (Kurniyati et al., 2021). Other research revealed that the results obtained a p value of 0.000 ($\alpha \leq 0.05$) so that H_a was accepted, meaning there was an effect of giving mung bean juice on increasing hemoglobin levels of anemic female adolescents at MAN Model Manado (Mayulu, Djalil, & Ismawati, 2023). Other previous research revealed that there was an effect of mung bean juice and honey on increasing HB levels in female adolescents at MTS Al-Falah Karangtanjung, Pandeglang Regency in 2023 with an increase in hemoglobin levels of 2.873 (Nuraida et al., 2024). A greater increase in Hb occurred in individuals with low initial Hb levels, because the body showed a stronger compensatory response to iron deficiency. Other factors that influence the results include age, metabolism, variation in other food consumption, and compliance in consuming the intervention. Although not all respondents achieved normal Hb levels post-intervention, the increase was quite significant, so the combination of mung bean juice and honey is considered a potential natural intervention to increase hemoglobin levels in adolescents with mild anemia.

CONCLUSION

It is known that the average Hb level of adolescents who experienced anemia before being given green bean juice and honey was 10.8 g/dL with a standard deviation value of 0.46 g/dL, a minimum value of 10.1 g/dL and a maximum value of 11.8 g/dL. It is known that the average Hb level of adolescents who experienced anemia after being given green bean juice and honey was 11.77 g/dL with a standard deviation value of 0.50, a minimum value of 10.9 g/dL

and a maximum value of 12.7 g/dL and there was an effect of giving green bean juice and honey on increasing the Hb level of adolescents who experienced anemia (p -value = <0.001).

SUGGESTION

Adolescents are encouraged to regularly consume mung bean juice and honey. Islamic boarding schools should consider incorporating mung bean-based dishes into weekly meal plans.

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Universitas Malahayati

Corresponding author: *Email: anamariza@malahayati.ac.id

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Universitas Malahayati

Corresponding author: *Email: anamariza@malahayati.ac.id

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