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# The Effect Of Mung Bean Extract And Iron Tablets On Hemoglobin Levels Among Female Adolescents At Sman 9 South Singkawang, West Kalimantan

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**Abstract**

**Background:** Adolescence is characterized by increased iron requirements, while anemia remains prevalent among female adolescents, with rates of 48.9% nationally (Riskesdas 2018), 25.77% in Singkawang City (2024), and 7.01% at SMAN 9 South Singkawang. Anemia prevention includes iron tablet supplementation and mung bean juice consumption to support hemoglobin formation. **Purpose:** To analyze the effect of mung bean juice and iron tablet supplementation on hemoglobin levels among female adolescents at SMAN 9 South Singkawang, West Kalimantan. **Methods:** This study employed a quasi-experimental design with a pretest–posttest two-group approach. The sample consisted of female adolescents selected using a random sampling technique. Participants were divided into two groups: the control group received mung bean juice, while the intervention group received a combination of mung bean juice and iron tablet supplementation. With a total sample of 54 respondents. A paired t-test was used to analyze the effect within groups, and an independent t-test was applied to compare the effects between groups. **Results:** The mean hemoglobin level in the intervention group increased from 12.3 g/dL to 13.5 g/dL, while in the control group it increased from 12.0 g/dL to 12.9 g/dL. There was a significant increase in hemoglobin (Hb) levels in both groups after the intervention ($p < 0.000$), and the combination of mung bean juice and iron tablet supplementation was more effective than mung bean juice alone ($p = 0.005$). **Conclusion:** The combination of mung bean juice and iron tablet supplementation was clinically effective and statistically significant in increasing hemoglobin levels among female adolescents compared to mung bean juice alone.

**Keywords:** Adolescents, Mung Bean Juice, Iron Supplementation Tablets

## Introduction

Adolescence is a transitional period toward adulthood characterized by rapid physical development. Adolescent growth is closely related to nutritional intake, one of which is iron consumption. Iron deficiency in the body can cause anemia in adolescents [1]. Adolescent girls mostly experience anemia because they undergo menstruation every month, which increases the need for iron intake [2].

Anemia is a condition in which the hemoglobin (Hb) level in the blood is below the normal limit. The body requires iron for the formation of hemoglobin, a component of red blood cells responsible for transporting oxygen throughout the body. Several studies have revealed that iron supplementation can help increase hemoglobin levels and reduce the risk of anemia in adolescent girls with iron deficiency [3]. Adolescent girls require about 15 mg of iron per day. Transferrin is the mechanism by which iron is used to produce hemoglobin. Low transferrin levels in the blood may be caused by insufficient iron intake from food, ineffective iron absorption in the intestines, or increased iron requirements. Iron absorption from food ranges from 10 to 15 percent, depending on the source of iron consumed [4].

Anemia is a health problem that commonly affects vulnerable groups, including children under five years old—especially infants and toddlers—adolescent girls who experience menstruation, as well as pregnant and postpartum women. According to data from the World Health Organization (WHO) in 2019, around 500 million women aged 15–49 years and 269 million children aged 6–59 months experienced anemia. Approximately 30% of non-pregnant women and 37% of pregnant women in this age group were also affected. Africa and Southeast Asia are the most affected regions, with millions of women and children suffering from anemia. WHO has updated the hemoglobin threshold used to define anemia, which may affect the prevalence estimates, particularly in high-altitude areas. A recent study analyzing data from 406,106 children in 48 countries found that the overall prevalence of anemia reached 61.4%. Among adolescents (aged 10–19 years), the prevalence of anemia was about 30%, and among adolescent girls it was higher, reaching 37–40% based on the WHO 2024 criteria. These changes highlight the need for further monitoring and intervention to address anemia globally [5].

The prevalence of anemia in Indonesia shows significant variation across different groups. Children aged 0–59 months have the highest prevalence, reaching 38.5%. Females are more vulnerable to anemia (27.2%) compared to males. Data from the Basic Health Research (RISKESDAS) 2018 revealed that 48.9% of adolescent girls in Indonesia suffer from anemia, highlighting the importance of interventions such as iron supplementation through iron tablets. Low awareness of the benefits of these supplements remains a major challenge in anemia prevention efforts. Overall, the national prevalence of anemia is 23.7% [6]. Data from the Basic Health Research (RISKESDAS) 2023 revealed that the prevalence of anemia among adolescent girls aged 15–24 years is around 30.3%, which shows a decrease compared to the 2018 Riskesdas data [7]. Based on data from the Health Office of Singkawang City in 2024, the coverage of anemia among adolescent girls in Singkawang City is 25.77% [8].

Adolescent girls are vulnerable to anemia due to nutritional demands associated with rapid growth, menstrual blood loss, malnutrition, and poor iron intake [9]. Several factors can cause anemia, including deficiencies of vitamin A, vitamin B12, folic acid, and iron, chronic inflammation, parasitic infections, and hereditary diseases. However, iron deficiency anemia (IDA) remains the main cause of anemia worldwide, due to a lack of iron needed for the production of red blood cells in the body [10].

The impact of anemia in adolescent girls includes impaired growth, increased susceptibility to infection, reduced physical fitness, decreased learning motivation, and fatigue. This condition develops into a health problem that causes sufferers to feel tired, weak, and lacking energy, which affects their ability to be creative and productive. Anemia also increases the risk of disease in adulthood and can lead to nutritional problems in the next generation [11].

To overcome iron deficiency, iron supplementation through iron tablets can be provided. This can also be combined with non-pharmacological therapy by consuming mung bean extract. Mung bean extract contains high nutritional value, including fats, carbohydrates, calcium, phosphorus, iron, provitamin A, B-complex vitamins, and water, making it very beneficial for preventing anemia. Consumption of mung bean extract at a dose of 1 × 200 ml for 7 days combined with one iron tablet per week can increase hemoglobin levels by 0.9 g/dL, as 100 ml of mung bean extract contains approximately 0.70 mg of iron [4].

Based on this background and considering the high incidence of anemia at the school level, this study aims to determine the effect of administering mung bean extract and iron tablets on the increase in hemoglobin levels among adolescent girls with anemia.

## Method

### 1. Research Design

This study employed a quasi-experimental design with a pretest–posttest control group approach. This design was selected to examine the effect of mung bean extract and iron supplementation tablets on the increase of hemoglobin levels among adolescent girls with anemia, while allowing comparison between the intervention group and the control group.

### 2. Setting and Samples

The study was conducted at a junior secondary education institution. The name of the institution was not disclosed to maintain the generalizability of the research findings. The sampling technique used was random sampling, in which every member of the population had an equal opportunity to be selected as a sample.

The inclusion criteria were adolescents who were willing to participate as respondents, had no history of allergy to mung bean extract, and included all female adolescents regardless of their initial hemoglobin levels. Respondents in the intervention group received mung bean extract and iron supplementation tablets, while respondents in the control group received mung bean extract only.

A total of 54 respondents participated in this study, consisting of 27 respondents in the intervention group and 27 respondents in the control group. The sample size was determined based on the total number of respondents who met the inclusion criteria during the research period.

### 3. Intervention

Respondents in the intervention group underwent a pretest measurement of hemoglobin levels. They were then given 100 grams of mung bean extract packaged in a 200 ml cup, along with one iron supplementation tablet per day (1×1 dosage) for 14 days. After the intervention period, hemoglobin levels were measured again.

The control group received only mung bean extract, with the same dosage of 100 grams packaged in a 200 ml cup daily for 14 days. Hemoglobin levels were also measured again after the 14-day intervention period.

**4. Measurement and Data Collection**

Hemoglobin levels were measured using a digital hemoglobin device (Easy Touch). A digital hemoglobin device is an electronic-based technology used to measure hemoglobin (Hb) levels in the blood quickly and practically without the need for conventional laboratory methods.

Data collection was conducted twice: before the intervention (pretest) and after the 14-day intervention period (posttest). All data were collected directly by the researcher.

**5. Data Analysis**

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) software. Univariate analysis was used to describe the distribution of hemoglobin levels in the pretest and posttest measurements.

Bivariate analysis was conducted using a paired t-test to analyze differences in hemoglobin levels before and after the intervention within each group. An independent t-test was used to compare differences in hemoglobin levels between the intervention and control groups. The level of statistical significance was set at $p < 0.05$.

## Results

The results of the distribution of the mean hemoglobin (Hb) levels before treatment in the intervention group showed a mean value of 12.3 g/dL with a standard deviation (SD) of 0.5, a minimum value of 11.5 g/dL, and a maximum value of 13.4 g/dL. After the intervention, an increase in hemoglobin levels was observed with a mean value of 13.5 g/dL and a standard deviation (SD) of 0.5, with a minimum value of 12.4 g/dL and a maximum value of 14.8 g/dL. The measurement results of hemoglobin levels in the intervention group are presented in Table 1.

**Table 1**
**Mean Distribution of Hemoglobin (Hb) Levels Before and After Administration of Mung Bean Extract and Iron Supplementation in the Intervention Group**

| | N | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| Before | 27 | 12.3 | 0.5 | 11.5 | 13.4 |
| After | 27 | 13.5 | 0.5 | 12.4 | 14.8 |

The distribution of mean hemoglobin levels before treatment in the control group showed a mean value of 12.0 g/dL with a standard deviation (SD) of 0.6, a minimum value of 11.2 g/dL, and a maximum value of 13.2 g/dL. After the intervention, hemoglobin levels increased to a mean value of 12.9 g/dL with a standard deviation (SD) of 0.5, a minimum value of 11.9 g/dL, and a maximum value of 13.9 g/dL. The measurement results of hemoglobin levels in the control group are presented in Table 2.

**Table 2**
Mean Distribution of Hemoglobin (Hb) Levels Before and After Administration of Mung Bean Extract in the Control Group

| | N | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| Before | 27 | 12.0 | 0.6 | 11.2 | 13.2 |
| After | 27 | 12.9 | 0.5 | 11.9 | 13.9 |

Statistical results showed that there was an effect on hemoglobin (Hb) levels in both the intervention group and the control group. In the intervention group, the mean hemoglobin level increased from 12.3 g/dL (SD = 0.5) before treatment to 13.5 g/dL (SD = 0.5) after treatment. In the control group, the mean hemoglobin level increased from 12.0 g/dL (SD = 0.6) before treatment to 12.9 g/dL (SD = 0.5) after treatment.

The statistical analysis showed a p-value of 0.000 ($p < 0.05$), indicating that the administration of mung bean extract and iron supplementation tablets had a significant effect on increasing hemoglobin levels compared with the control group. The statistical results are presented in Table 3.

**Table 3**
**Effect of Hemoglobin (Hb) Levels Before and After Administration of Mung Bean Extract and Iron Supplementation**

| | N | Mean Before | SD | Mean After | SD | p-value |
|---|---|---|---|---|---|---|
| Intervention Group | 27 | 12.3 | 0.5 | 13.5 | 0.5 | 0.000 |
| Control Group | 27 | 12.0 | 0.6 | 12.9 | 0.5 | 0.000 |

The independent t-test results showed that the mean hemoglobin level in the intervention group before treatment was 12.3 g/dL (SD = 0.5), while in the control group it was 12.0 g/dL (SD = 0.6). After treatment, the mean hemoglobin level in the intervention group increased to 13.5 g/dL (SD = 0.5), whereas in the control group it increased to 12.9 g/dL (SD = 0.5).

The statistical test results showed a p-value of 0.005 ($p < 0.05$), indicating a significant difference in hemoglobin levels between the intervention group and the control group. The statistical results are presented in Table 4.

**Table 4**
**Differences in Hemoglobin (Hb) Levels Between the Intervention and Control Groups**

| | Intervention Group | | Control Group | | p-value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Before | 12.3 | 0.5 | 12.0 | 0.6 | 0.005 |
| After | 13.5 | 0.5 | 12.9 | 0.5 | 0.005 |

## Discussion

Based on the results of the study, it was found that there were changes in hemoglobin (Hb) levels among adolescent girls in both the intervention group and the control group after receiving the treatment. These results also indicate statistically significant changes, although the increase in Hb levels in the control group was lower than that in the intervention group. Furthermore, the results of the paired t-test showed an effect on hemoglobin levels in both the intervention and control groups, which was obtained from the mean increase in hemoglobin levels in each group.

The statistical analysis showed a p-value of 0.000 ($p < 0.05$), indicating that there was a statistically significant effect of the administration of mung bean extract and iron supplementation tablets on the increase in hemoglobin levels between the intervention group and the control group. Meanwhile, the results of the independent t-test showed a p-value of 0.005 ($p < 0.05$), which means that there was a significant difference in hemoglobin levels before and after the intervention between the intervention group and the control group. These findings indicate that the combination of mung bean extract and iron supplementation tablets provides a better effect in increasing hemoglobin levels in adolescent girls compared with the administration of mung bean extract alone.

According to theory, mung beans (*Phaseolus radiatus* L.) are one of the food sources containing nutrients required for the formation of red blood cells, thereby helping to overcome the effects of decreased hemoglobin levels. Mung beans also play a role in red blood cell formation and in preventing anemia because they contain a wide range of phytochemicals that support the hematopoiesis process, making them an effective nutritional choice for naturally and healthily increasing hemoglobin levels (Mariyona, 2019). In addition, iron supplementation tablets containing iron and folic acid directly

contribute to hemoglobin synthesis, thereby supporting an optimal increase in hemoglobin (Hb) levels [12].

This study is consistent with research conducted by Rofiah et al. (2025), which found that most hemoglobin levels in the intervention group increased after being given mung bean juice. The intervention group showed a significant effect on hemoglobin levels before and after the intervention, indicating meaningful changes in hemoglobin levels following the nutritional intervention. The observed changes reflect a positive physiological response to the nutritional intervention provided. The combination of mung bean extract, which contains plant-based iron and other supporting nutrients, and iron supplementation tablets as a direct source of iron, has been shown to improve hemoglobin status in the target population. These findings strengthen the understanding that an integrated nutritional strategy can be an appropriate approach to addressing anemia among adolescent girls [13].

Another study by Mariyona (2019) showed that the average hemoglobin level before the intervention in the intervention group had a p-value of $< 0.005$. Based on this study, there was an effect of mung bean juice administration on increasing hemoglobin levels in adolescent girls with anemia [14].

Based on the results of this study, the researchers assume that the combination of mung bean extract and iron supplementation tablets has a positive effect on increasing hemoglobin levels among adolescent girls. All respondents who received this intervention showed improvement in their condition, as indicated by an increase in hemoglobin levels after the intervention. No decrease in hemoglobin levels was observed after the intervention, suggesting that this method is safe and effective. Therefore, it can be inferred that not only iron supplementation tablets play a role, but there may also be a synergistic effect from plant-based protein in mung bean extract, nutritional education, and effective monitoring of consumption adherence during the intervention period.

**Limitation**

Several limitations should be considered when interpreting the results of this study. The limitations include the relatively small sample size and the short observation period, which limit the generalizability of the findings. In addition, confounding variables

such as the psychological condition and environmental factors of the respondents could not be fully controlled.

## Conclusion

This study showed an increase in the mean hemoglobin levels before and after the administration of mung bean extract and iron supplementation tablets among adolescent girls. In the intervention group, the mean hemoglobin level increased from 12.3 g/dL to 13.5 g/dL, while in the control group it increased from 12.0 g/dL to 12.9 g/dL.

There was an effect on hemoglobin levels before and after the administration of mung bean extract among adolescent girls in both the intervention and control groups. Furthermore, there was a difference in the increase of hemoglobin levels between the administration of mung bean extract combined with iron supplementation tablets and the administration of mung bean extract alone.

## Ethical Considerations

This study was conducted in accordance with the ethical principles of health research, including respect for individuals, beneficence, and justice. All respondents received a clear explanation regarding the purpose of the study, procedures, potential benefits, and possible risks before participating.

Written informed consent was obtained from all respondents, and participation was voluntary with the right to withdraw at any time without consequences. Confidentiality and anonymity were maintained by using coded data and not including personal identities. This study received ethical approval from the Health Research Ethics Committee of the Faculty of Health Sciences, Universitas Nasional.

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## Conflict of Interest

The authors declare that there is no conflict of interest in the conduct or publication of this research.

## Author Contribution

Askiah contributed to the conceptualization and design of the study, data collection, data analysis, and manuscript preparation. Putri Azzahroh and Bunga Tiara Carolin contributed to data interpretation, critical revision of the manuscript, and final approval of the version to be published. All authors have read and approved the final manuscript and are responsible for all aspects of the research.

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