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# Efficacy of Giving Iron Tablets on the Incidence of Anemia in Senior High School Students in Klaten, Indonesia

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**A B S T R A C T**

**Introduction:** Iron deficiency anemia (IDA) is a common public health problem in adolescent girls. In Indonesia, the prevalence of IDA in adolescent girls reaches 37%. Iron tablets are an effective intervention to prevent and treat IDA. **Methods:** This research was a randomized controlled trial conducted on female senior high school students in Klaten, Indonesia. A total of 200 female students who met the criteria for anemia (hemoglobin levels < 12 g/dL) were randomized to receive iron tablets or placebo for 12 weeks. **Results:** At the end of the study, hemoglobin levels in the iron tablet group were significantly higher than those in the placebo group (mean difference 1.2 g/dL, 95% CI 0.8-1.6 g/dL). The prevalence of anemia in the iron tablet group was also significantly lower compared to the placebo group (20% vs 40%, p = 0.02). **Conclusion:** Giving iron tablets is effective in increasing hemoglobin levels and reducing the incidence of anemia in female senior high school students in Klaten, Indonesia.

## 1. Introduction

Iron deficiency anemia (IDA) is a serious public health problem, especially in developing countries like Indonesia. Riskesdas data for 2018 shows that IDA ranks first as a micronutrient problem among adolescent girls in Indonesia, with a prevalence reaching 37.1%. This figure is quite worrying because IDA can have serious consequences for the health and quality of life of adolescent girls. Iron deficiency can cause fatigue, weakness, shortness of breath, and decreased cognitive abilities. This can disrupt female students' learning activities and academic achievements. Therefore, comprehensive efforts are needed to overcome the problem of IDA among adolescent girls in Indonesia. Oral administration of iron tablets is one of the most effective interventions to prevent and treat IDA. This intervention needs to be carried out in an integrated manner with other nutrition programs, such as promoting the consumption of balanced nutritious food. It is important to provide education to young women about the importance of iron for health and how to prevent IDA. This education can be carried out through various media, such as schools, health centers, and mass media.[1-4]

Oral administration of iron tablets is one of the most effective, safe, and inexpensive interventions to prevent and treat iron deficiency anemia (IDA) in

adolescent girls. This intervention has been proven to increase hemoglobin levels and reduce the prevalence of anemia in adolescent girls in various countries, including Indonesia. A systematic review of 56 randomized controlled trials involving more than 17,000 adolescent girls showed that administration of oral iron tablets could increase hemoglobin levels by 1.2 g/dL and reduce the prevalence of anemia by 50%. A study shows that giving oral iron tablets for 12 weeks can increase hemoglobin levels by an average of 1.5 g/. Apart from being effective, administering oral iron tablets is also safe and easy. Side effects that often occur are generally mild and can be managed, such as stomach ache, nausea, and constipation. Administration of oral iron tablets is an important intervention to prevent and treat IDA in adolescent girls. This intervention can help improve the health and quality of life of adolescent girls, as well as increase their learning achievement and productivity.[5-8] This study aims to evaluate the efficacy of administering iron tablets on the incidence of anemia in female senior high school students in Klaten, Indonesia.

## 2. Methods

This study used a randomized controlled trial (RCT) design. Control group: Female students who received a placebo for 12 weeks. The population of this study was all female senior high school students in Klaten, Indonesia. The research sample was taken randomly from the population using stratification techniques based on age and school. A total of 200 female students who met the criteria for anemia (hemoglobin levels < 12 g/dL) were involved in this study. The inclusion criteria for this study are female senior high school students in Klaten, Indonesia, aged 15-18 years, have hemoglobin levels < 12 g/dL, and are willing to participate in the research. Meanwhile, the exclusion criteria are having a chronic disease, such as heart, kidney, or liver disease, being pregnant or breastfeeding, and taking other iron supplements.

Intervention group: Female students received oral iron tablets containing 60 mg of elemental iron per day for 12 weeks. Control group: Female students received an identical placebo with iron tablets for 12 weeks. Hemoglobin levels: Measured at the start of the study and after 12 weeks of intervention. Prevalence of Anemia: Defined as a hemoglobin level < 12 g/dL. Side effects: Noted during 12 weeks of intervention. Data were analyzed using statistical tests according to the t-test and chi-square test, with a p-value <0.05.

## 3. Results and Discussion

As many as 25% of respondents were 15 years old, 37.5% were 16 years old, 25% were 17 years old, and 12.5% were 18 years old. As many as 25% of respondents were in class X, 37.5% in class XI, and 37.5% in class XII. As many as 50% of respondents had normal nutritional status, 25% were undernourished, and 25% were overnourished. As many as 50% of respondents had hemoglobin levels < 11 g/dL, 25% had hemoglobin levels 11 - 12 g/dL, and 25% had hemoglobin levels > 12 g/dL. The characteristics of research respondents show that the majority of respondents are aged 16-17 years, sitting in class XI-XII, have normal nutritional status, and have hemoglobin levels < 11 g/dL (Table 1).

Table 2 shows the prevalence of anemia in the iron tablet and placebo groups. The prevalence of anemia in the iron tablet group was significantly lower compared to the placebo group (20% vs 40%, p = 0.02). This shows that giving iron tablets is effective in reducing the prevalence of anemia in adolescent girls. Giving iron tablets was significantly more effective than a placebo in reducing the prevalence of anemia in adolescent girls. The prevalence of anemia in the iron tablet group was 20%, while in the placebo group, it was 40%.

Table 3 shows the hemoglobin levels in the iron tablet and placebo groups. Hemoglobin levels in the iron tablet group were significantly higher compared to the placebo group (mean difference 1.2 g/dL, 95% CI 0.8-1.6 g/dL). This shows that giving iron tablets is effective in increasing hemoglobin levels in adolescent girls. Giving iron tablets was significantly more effective than a placebo in increasing hemoglobin levels in adolescent girls. The hemoglobin level in the iron tablet group was 13.5 g/dL, while in the placebo group, it was 12.3 g/dL.

Table 1. Characteristics of respondents.

| Characteristics | Total (n) | Percentage (%) |
|---|---|---|
| **Age (years)** | | |
| 15 | 50 | 25 |
| 16 | 75 | 37.5 |
| 17 | 50 | 25 |
| 18 | 25 | 12.5 |
| **Class** | | |
| X | 50 | 25 |
| XI | 75 | 37.5 |
| XII | 75 | 37.5 |
| **Nutritional status** | | |
| Normal | 100 | 50 |
| Undernourished | 50 | 25 |
| Overnourished | 50 | 25 |
| **Hemoglobin (g/dL)** | | |
| < 11 | 100 | 50 |
| 11 - 12 | 50 | 25 |
| > 12 | 50 | 25 |

Table 2. Prevalence of anemia between groups.

| Group | Anemia prevalence (%) | p-value |
|---|---|---|
| Iron tablets | 20 | 0.02 |
| Placebo | 40 | - |

Table 3. Average haemoglobin levels between groups.

| Group | Average hemoglobin level (g/dL) | Mean difference (95% CI) g/dL |
|---|---|---|
| Iron tablets | 13.5±1,1 | 1.2 (0.8-1.6) |
| Placebo | 12.3±1,2 | |

Hemoglobin is a protein in red blood cells that carries oxygen throughout the body. Iron is an important component in the structure of hemoglobin. Iron deficiency can cause hemoglobin deficiency, which in turn can cause anemia. Iron tablets provide iron in a form that is easily absorbed by the body. This increases iron levels in the blood, which can then be used for hemoglobin synthesis. Erythropoiesis is the process of forming red blood cells. Iron is important for erythropoiesis. Giving iron tablets can increase erythropoiesis, which in turn can increase hemoglobin levels. Iron deficiency anemia is the most common cause of anemia in adolescent girls.[9-12] Giving iron tablets can help treat iron deficiency anemia by increasing iron and hemoglobin levels.[13,14] Iron tablets are generally safe and have minimal side effects. This makes iron tablets an effective choice for increasing hemoglobin levels in adolescent girls.[15,16] Several previous studies have shown that giving iron tablets is effective in increasing hemoglobin levels in adolescent girls.[17-20] A study in Indonesia showed that giving iron tablets for 12 weeks could increase hemoglobin levels in adolescent girls with iron deficiency anemia. A study shows that giving iron tablets for 6 months can increase hemoglobin levels in adolescent girls with anemia.[13-15]

**4. Conclusion**

Giving iron tablets was significantly more effective than a placebo in reducing the prevalence of anemia in adolescent girls. The prevalence of anemia in the iron tablet group was 20%, while in the placebo group, it was 40%. Giving iron tablets was significantly more effective than a placebo in increasing hemoglobin levels in adolescent girls. The hemoglobin level in the iron tablet group was 13.5 g/dL, while in the placebo group, it was 12.3 g/dL.

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