PROFESIONAL HEALTH JOURNAL
Volume 8, No. 1, December 2026 (Page. 566-576)
Available Online at https://www.ojsstikesbanyuwangi.com/index.php/PHJ/index
E-ISSN 2715-6249
DOI: https://doi.org/10.54832/phj.v8i1.1500

The Effect of Iron (Fe) Tablet Consumption and Ambon Banana (Musa paradisiaca L. var. sapientum) on Increasing Hemoglobin Levels among Adolescent Girls at SMK Negeri 2 Sukorejo.

Sinta Anggraeni Irwanto[a]* | Raden Maria Veronika[b] | Widia Shofa Ilmiah[c]
[a,b,c] Department of Midwifery, ITSK RS dr Soepraoen Malang
*Corresponding Author: sintaagrn15@gmail.com

ARTICLE INFORMATION

Article history
Received (22 May 2026)
Revised (9 June 2026)
Accepted (13 June 2026)

Keywords
anemia, hemoglobin, Fe tablets, Ambon banana, adolescent girls

ABSTRACT

Background: Anemia among adolescent girls remains a significant public health problem that may negatively affect health status, learning ability, and future reproductive outcomes. Iron (Fe) supplementation is the primary intervention for increasing hemoglobin (Hb) levels, and its absorption may be supported by consuming vitamin C–rich foods such as Ambon banana (Musa paradisiaca L. var. sapientum).
Objective: This study aimed to analyze the effect of iron tablet supplementation combined with Ambon banana consumption on hemoglobin levels among adolescent girls at SMK Negeri 2 Sukorejo.
Methods: A quantitative quasi-experimental study with a pretest–posttest control group design was conducted at SMK Negeri 2 Sukorejo, Pasuruan Regency, East Java, Indonesia, from January to February 2026. A total of 36 adolescent girls aged 15–17 years with hemoglobin levels below 12 g/dL were selected using a non-probability convenience sampling technique and equally divided into an intervention group (Fe tablets + Ambon banana, n=18) and a control group (Fe tablets only, n=18). The intervention was administered for 14 consecutive days. Hemoglobin levels were measured using a digital hemoglobinometer before and after the intervention. Data were analyzed using Shapiro–Wilk test, paired t-test, and independent samples t-test with a significance level of $p < 0.05$.
Results: Both groups showed a significant increase in hemoglobin levels after the intervention. In the Fe + Ambon banana group, mean Hb increased from 11.58 g/dL to 13.62 g/dL (mean difference +2.04 g/dL; $p < 0.001$). In the Fe-only group, mean Hb increased from 11.48 g/dL to 11.75 g/dL (mean difference +0.27 g/dL; $p = 0.004$). The independent samples t-test showed a statistically significant difference in hemoglobin improvement between groups ($p < 0.001$), with a large effect size (Cohen's $d = 1.73$), indicating a stronger improvement in the combined intervention group.
Conclusion: Iron tablet supplementation significantly increased hemoglobin levels in both groups. The combination of Fe tablets and Ambon banana resulted in a greater improvement in hemoglobin levels compared to Fe tablets alone. These findings suggest that Ambon banana may enhance the effectiveness of iron supplementation in improving hemoglobin levels among adolescent girls. The intervention was also safe, feasible, and showed high participant compliance.

PROFESIONAL HEALTH JOURNAL
Volume 8, No. 1, December 2026 (Page. 566-576)
Available Online at https://www.ojsstikesbanyuwangi.com/index.php/PHJ/index
E-ISSN 2715-6249
DOI: https://doi.org/10.54832/phj.v8i1.1500

Introduction

Adolescence is a transitional phase from childhood to adulthood, characterized by rapid physical, psychological, and social changes. During this period, the need for nutrients, especially iron (Fe), increases significantly due to rapid growth and blood loss caused by menstruation. This condition makes adolescent girls a vulnerable group to iron deficiency anemia (IDA), one of the most common nutritional problems among adolescents. Anemia in adolescent girls can lead to decreased learning concentration, chronic fatigue, impaired cognitive development, and reduced immune function. If left untreated, anemia during adolescence can persist into reproductive age and increase the risk of pregnancy complications such as low birth weight (LBW), prematurity, and maternal mortality (Ministry of Health of the Republic of Indonesia, 2023).

Efforts to prevent anemia can be carried out through iron (Fe) tablet supplementation and increased intake of iron-rich foods along with vitamin C sources such as fresh fruits, which enhance non-heme iron absorption (Permatasari & Soviana, 2022). One local fruit that is easily available and has potential to support iron absorption is Ambon banana (Musa paradisiaca L. var. sapientum), as it contains vitamin C, fructose, and prebiotic compounds such as inulin that contribute to improved intestinal absorption of iron (Kusudaryati & Prananingrum, 2022).

The World Health Organization reported that approximately 29.9% of adolescent girls worldwide are affected by anemia, with iron deficiency accounting for more than 40% of all anemia cases globally. Anemia remains a major public health problem in low- and middle-income countries, with prevalence ranging from 30% to 45%, particularly among adolescent girls due to rapid growth, menstrual blood loss, and inadequate dietary iron intake (WHO, 2022). At the national level, the Indonesian Health Survey (Survei Kesehatan Indonesia/SKI, 2023) reported that anemia among adolescent girls in Indonesia remains high, with a prevalence of approximately 32%, indicating that iron deficiency anemia continues to be a significant nutritional problem among school-aged adolescents (Kementerian Kesehatan RI, 2023). SKI 2023 also confirms that adolescent health issues, including anemia, are closely related to dietary patterns and low consumption of iron-rich foods (BKPK Kemenkes RI, 2023). At the provincial level, East Java Province reported that anemia prevalence among adolescent girls reached 29.5%, reflecting a persistent public health concern in adolescent nutrition (Dinas Kesehatan Provinsi Jawa Timur, 2023). At the district level, Pasuruan Regency Health Profile (2023) reported that approximately 27% of adolescent girls experience mild to moderate anemia, despite the implementation of school-based iron supplementation programs (Pasuruan Regency Health Profile, 2023).

Anemia in adolescent girls is primarily caused by insufficient iron intake, menstrual blood loss, and low consumption of vitamin C-rich foods that are essential for enhancing iron absorption (Aryati et al., 2024). Iron deficiency leads to reduced hemoglobin synthesis, resulting in decreased oxygen transport capacity in the body, which may cause fatigue, reduced concentration, and decreased learning achievement (Alayash, 2022; Balaka et al., 2023). If not addressed, anemia in adolescence may increase the risk of future reproductive health complications (Mayunita & Avriliatin, 2024). The Indonesian government has implemented iron supplementation programs through weekly iron tablet distribution for adolescent girls in schools. However, adherence to iron supplementation remains a major challenge due to side effects such as nausea, gastrointestinal discomfort, and metallic taste (Puspawidari et al., 2023; Purnama & Hikmah, 2023). Low adherence reduces the effectiveness of iron supplementation programs in improving hemoglobin status among adolescents. In addition, non-heme iron absorption is often limited due to dietary inhibitors, making it necessary to improve iron bioavailability through dietary enhancers such as vitamin C (Zhao et al., 2021). One potential local food is Ambon banana (Musa

PROFESIONAL HEALTH JOURNAL
Volume 8, No. 1, December 2026 (Page. 566-576)
Available Online at https://www.ojsstikesbanyuwangi.com/index.php/PHJ/index
E-ISSN 2715-6249
DOI: https://doi.org/10.54832/phj.v8i1.1500

paradisiaca L. var. sapientum), which contains vitamin C, vitamin B6, fructose, and inulin that may support iron absorption and erythropoiesis (Nuriah, 2024).

Previous studies in the last five years have shown that iron supplementation effectively increases hemoglobin levels in adolescent girls (Wulandari et al., 2023). In addition, studies by Kusudaryati & Prananingrum (2022), and Puspawidari et al. (2023), reported that the combination of iron supplementation and vitamin C-rich foods, including Ambon banana, may enhance hemoglobin levels more effectively than iron alone. However, most previous studies focused on pregnant women or general populations rather than adolescent schoolgirls. Therefore, this study fills this gap by focusing on adolescent girls using a quasi-experimental Pretest–Posttest Control Group Design to evaluate the effect of Fe tablet supplementation combined with Ambon banana consumption. This study introduces a locally based nutritional intervention that is practical, affordable, and easily implemented in school settings. The findings are expected to contribute to strengthening school-based anemia prevention programs in Indonesia.

Based on the background described above, it can be concluded that the main causes of low hemoglobin levels in adolescent girls are insufficient iron intake and suboptimal absorption, while the consequences include fatigue, decreased concentration, and risks of impaired growth and learning productivity. Therefore, the researcher is interested in conducting further study on this relevant and significant topic entitled "The Effect of Iron Tablet and Ambon Banana (Musa paradisiaca L. var. sapientum) Consumption on the Improvement of Hemoglobin Levels in Adolescent Girls at SMK Negeri 2 Sukorejo."

Methods

Study Design

This study employed a quantitative research approach using a quasi-experimental design with a pretest–posttest control group design to evaluate the effect of iron (Fe) tablet consumption combined with Ambon banana (Musa paradisiaca L. var. sapientum) on hemoglobin levels among adolescent girls with anemia. The study compared changes in hemoglobin levels before and after the intervention between the intervention and control groups.

Setting

The study was conducted at SMK Negeri 2 Sukorejo, Pasuruan Regency, East Java, Indonesia, from January to February 2026. Data collection was carried out at the school in collaboration with school authorities and health personnel. Baseline hemoglobin measurements (pretest) were obtained before the intervention, while posttest measurements were conducted after completion of the intervention period.

Research Subjects

The target population consisted of all eleventh-grade adolescent girls aged 15–17 years at SMK Negeri 2 Sukorejo who experienced anemia. Anemia was defined according to the World Health Organization (WHO) criteria for adolescent girls as a hemoglobin level below 12 g/dL. Participants were recruited through an initial screening process involving hemoglobin examination. Students who met the eligibility criteria were informed about the study objectives, procedures, benefits, and potential risks and were invited to participate voluntarily. A non-probability convenience sampling technique was employed because respondents who met the study criteria and were available during the research period were selected. A total of 36 respondents fulfilled the eligibility criteria and agreed to participate, consisting of 18 respondents in the intervention group and 18 respondents in the control group. The inclusion criteria were female students enrolled in grade XI at SMK Negeri 2 Sukorejo, aged 15–17 years,

PROFESIONAL HEALTH JOURNAL
Volume 8, No. 1, December 2026 (Page. 566-576)
Available Online at https://www.ojsstikesbanyuwangi.com/index.php/PHJ/index
E-ISSN 2715-6249
DOI: https://doi.org/10.54832/phj.v8i1.1500

having a hemoglobin level below 12 g/dL, and willing to participate in the study by providing informed consent. The exclusion criteria included students diagnosed with chronic diseases or hematological disorders that could affect hemoglobin levels, students receiving other iron supplementation programs outside the study protocol, students who were absent during the intervention period, and students who withdrew from the study before completion. The sample size consisted of all eligible respondents identified during the screening process; therefore, all participants who met the inclusion criteria were included in the study to maximize representation of the target population and minimize selection bias.

Instruments

Hemoglobin levels were measured using a digital hemoglobin meter through capillary blood sampling. Measurements were conducted twice, before the intervention (pretest) and after the intervention (posttest). The examination procedure involved finger-prick blood collection using a sterile lancet, with blood samples analyzed using hemoglobin test strips inserted into the digital hemoglobin device. The results were recorded on a hemoglobin measurement sheet. The instruments used in this study included a respondent characteristics questionnaire, a compliance observation sheet, and a hemoglobin measurement record sheet, all of which were developed by the researchers based on the study objectives and relevant literature. The respondent characteristics questionnaire was used to collect demographic information, including age and other respondent characteristics. The compliance observation sheet was used to monitor respondents' adherence to iron tablet consumption and Ambon banana intake throughout the intervention period, while the hemoglobin measurement record sheet was used to document hemoglobin measurement results before and after the intervention. Prior to data collection, the digital hemoglobin meter was calibrated according to the manufacturer's instructions to ensure measurement accuracy. The observation and recording sheets underwent content validation by experts in maternal and adolescent health to assess their appropriateness and clarity. Since the instruments primarily consisted of observation and recording forms rather than psychometric scales, reliability testing was not performed. All data collection procedures followed standardized operating procedures to maintain consistency throughout the study.

Intervention

Respondents in the intervention group received one iron (Fe) tablet containing 60 mg elemental iron combined with Ambon banana (Musa paradisiaca L. var. sapientum) daily for 14 consecutive days. The Ambon bananas used in this study were ripe and fresh. Before consumption, the bananas were peeled and weighed using a fruit scale to obtain approximately 100–200 grams per serving according to the study protocol. Participants consumed the bananas directly without additional ingredients, and both the iron tablet and Ambon banana were consumed once daily during the intervention period. Compliance with the intervention was monitored daily by the researchers using an observation sheet to ensure adherence to the study protocol. Respondents in the control group received one iron (Fe) tablet containing 60 mg elemental iron daily according to the school's routine iron supplementation program without additional Ambon banana consumption. Hemoglobin levels were measured before the intervention (pretest) and after completion of the 14-day intervention period (posttest) using a digital hemoglobin meter through capillary blood sampling.

Data Analysis

Data processing included editing, coding, data entry, tabulation, and data cleaning to ensure data completeness and accuracy. Statistical analysis was performed using the Statistical

PROFESIONAL HEALTH JOURNAL
Volume 8, No. 1, December 2026 (Page. 566-576)
Available Online at https://www.ojsstikesbanyuwangi.com/index.php/PHJ/index
E-ISSN 2715-6249
DOI: https://doi.org/10.54832/phj.v8i1.1500

Package for the Social Sciences (SPSS). Univariate analysis was used to describe respondent characteristics and study variables through frequencies, percentages, means, and standard deviations. Prior to hypothesis testing, data normality was assessed using the Shapiro–Wilk test because it is recommended for sample sizes of fewer than 50 participants. Since the data were normally distributed, an Independent Sample t-test was employed to compare mean differences in hemoglobin levels between the intervention and control groups. The Independent Sample t-test was selected because it is appropriate for comparing the means of two independent groups when the assumption of normality is fulfilled. Statistical significance was determined at a p-value of less than 0.05.

Ethical Consideration

Ethical approval for this study was obtained from the Health Research Ethics Committee (Komite Etik Penelitian Kesehatan) of Institut Teknologi Sains dan Kesehatan RS dr. Soepraoen Malang, Indonesia. The study received Ethical Approval Number KEPK-EC/484/I/2026 and was declared ethically appropriate according to the seven WHO 2011 ethical standards, including social value, scientific value, equitable assessment of benefits and burdens, risk assessment, protection against exploitation, confidentiality and privacy, and informed consent, referring to the Council for International Organizations of Medical Sciences (CIOMS) 2016 Guidelines. The ethical approval was valid from January 12, 2026, to January 11, 2027. Prior to participation, all respondents and their parents or guardians received detailed information regarding the study objectives, procedures, benefits, potential risks, confidentiality of data, and participants' rights to withdraw from the study at any time without consequences. Written informed consent was obtained before data collection, and all participant information was anonymized and kept confidential throughout the research process.

Results

General Data

Table 5.1 Respondent Characteristics Based on General Data

Respondent Characteristics	Frequency (f)	Intervention Group Fe + Ambon Banana (n=18)	Intervention Group Fe Only (n=18)	Percentage (%)
Age of Respondents				
15 years	19	10	9	52.8
16 years	14	6	8	38.9
17 years	3	2	1	8.3
Level of Knowledge				
Moderate	11	4	7	30.6
Good	25	14	11	69.4
Parental Economic Status				
Low	3	1	2	8.3
Middle	25	13	12	69.4
High	8	4	4	22.2
Total	36	18	18	100

Source: Processed Primary Data (2026)

Based on Table 5.1, this study involved 36 adolescent female respondents who were equally divided into two intervention groups, namely the Fe + Ambon banana group and the Fe-only group. The majority of respondents were aged 15–16 years, indicating that most participants were in mid-adolescence. Most respondents had good knowledge regarding anemia and came from middle socioeconomic backgrounds. Overall, the baseline characteristics of respondents in both groups were relatively comparable, indicating group homogeneity before intervention.

PROFESIONAL HEALTH JOURNAL
Volume 8, No. 1, December 2026 (Page. 566-576)
Available Online at https://www.ojsstikesbanyuwangi.com/index.php/PHJ/index
E-ISSN 2715-6249
DOI: https://doi.org/10.54832/phj.v8i1.1500

Specific Data

Table 5.2 Hemoglobin Levels in the Fe + Ambon Banana Intervention Group (Pre-test and Post-test)

Group	N	Minimum	Maximum	Mean	Std. Deviation
Pre-test Hb	18	10.0	13.0	11.58	0.83
Post-test Hb	18	12.0	16.0	13.62	1.21

Source: Processed Primary Data (2026)

Based on Table 5.2, the mean hemoglobin level in the Fe + Ambon banana intervention group increased from 11.58 g/dL at pre-test to 13.62 g/dL at post-test, indicating an improvement after the administration of iron tablets combined with Ambon banana.

Table 5.3 Hemoglobin Levels in the Fe-Only Intervention Group (Pre-test and Post-test)

Group	N	Minimum	Maximum	Mean	Std. Deviation
Pre-test Hb	18	10.0	13.0	11.48	0.94
Post-test Hb	18	11.0	14.0	11.75	0.94

Source: Processed Primary Data (2026)

Based on Table 5.3, the mean hemoglobin level in the Fe-only intervention group showed a slight increase from 11.48 g/dL at pre-test to 11.75 g/dL at post-test after iron tablet administration only.

Normality Test

Table 5.4 Shapiro-Wilk Normality Test

Variable	Sig. Value	Interpretation
Hb Pre-test Fe + Banana	0.986	Normal
Hb Post-test Fe + Banana	0.398	Normal
Hb Pre-test Fe Only	0.556	Normal
Hb Post-test Fe Only	0.128	Normal

Source: Processed Primary Data (2026)

All hemoglobin data showed significance values above 0.05, indicating that the data were normally distributed. Therefore, parametric statistical tests were appropriate for further analysis.

Within-Group Analysis (Paired t-test)

Table 5.5 Effect of Intervention on Hemoglobin Levels

Group	Mean Pre	Mean Post	Mean Difference	t	p-value
Fe + Ambon Banana	11.58	13.62	+2.04	-8.808	<0.001
Fe Only	11.48	11.75	+0.27	-3.337	0.004

Source: Processed Primary Data (2026)

Both intervention groups showed a statistically significant increase in hemoglobin levels ($p < 0.05$). However, the increase was substantially greater in the Fe + Ambon banana group compared to the Fe-only group.

Between-Group Comparison

Table 5.6 Independent Samples T-Test Results

Group	N	Mean Hb Change	Mean Difference	95% CI	t	p-value

PROFESIONAL HEALTH JOURNAL
Volume 8, No. 1, December 2026 (Page. 566-576)
Available Online at https://www.ojsstikesbanyuwangi.com/index.php/PHJ/index
E-ISSN 2715-6249
DOI: https://doi.org/10.54832/phj.v8i1.1500

Fe + Ambon Banana	18	+2.04 ± 0.99	1.87	1.14 – 2.60	5.197	<0.001
Fe Only	18	+0.27 ± 0.35				

Effect Size: Cohen's d = 1.73 (Large effect)

Source: Processed Primary Data (2026)

The independent t-test showed a statistically significant difference between the two intervention groups ($p < 0.001$). The Fe + Ambon banana group demonstrated a significantly greater increase in hemoglobin levels compared to the Fe-only group. The large effect size indicates a strong clinical effect of the combined intervention in increasing hemoglobin levels.

Compliance and Safety

Table 5.7 Compliance and Adverse Events

Variable	Result	Interpretation
Iron tablet compliance	100%	Very high adherence
Banana consumption	94–100% (mean 97.2%)	High adherence
Adverse events	Mild nausea in a few participants	Not clinically significant
Dropout rate	0%	No attrition

Source: Processed Primary Data (2026)

The intervention was highly feasible, with excellent participant compliance and no dropout cases. Only mild and temporary side effects were reported, indicating that the intervention was safe and well tolerated.

Discussion

1. Hemoglobin Levels Before Consumption of Fe Tablets and Ambon Banana in the Intervention Group

The study results showed that the baseline hemoglobin (Hb) level in the Fe + Ambon banana intervention group had a mean of 11.58 g/dL, with a range of 10.0–13.0 g/dL. This value indicates that most respondents were in a low Hb condition or borderline anemia.

Adolescent girls are highly vulnerable to iron deficiency anemia due to increased iron requirements during growth, menstruation, and inadequate intake of heme iron-rich foods. These conditions result in hemoglobin levels below normal (WHO, 2023). Ambon banana is a local fruit containing iron, vitamin C, vitamin B6, and antioxidants that support hematopoiesis. The vitamin C content in Ambon banana plays an important role in enhancing iron absorption, thereby contributing to increased hemoglobin levels (Puspawidari et al., 2023). In a study by Kusudaryati and Prananingrum (2022), the group consuming Fe tablets combined with Ambon banana showed a greater increase in hemoglobin levels compared to the group receiving Fe alone. This suggests that Ambon banana has potential as a functional food in supporting anemia therapy. Other studies also reported that Ambon banana consumption can improve hemoglobin levels in adolescent girls due to its micronutrient content that supports blood formation (Handayani et al., 2022).

The researcher argues that the relatively low baseline Hb levels in the intervention group reflect a high risk of anemia among adolescent girls at SMK Negeri 2 Sukorejo, indicating the need for appropriate supplementation and nutritional education interventions.

2. Hemoglobin Levels Before Fe Tablet Consumption in the Control Group

In the control group (Fe only), the baseline hemoglobin level had a mean of 11.48 g/dL, ranging from 10.0–13.0 g/dL. This value was similar to that of the intervention group.

Iron is a key component in hemoglobin formation, responsible for oxygen transport in erythrocytes. Iron deficiency disrupts erythropoiesis in the bone marrow, leading to decreased hemoglobin levels and iron deficiency anemia. In adolescent girls, this condition is commonly

PROFESIONAL HEALTH JOURNAL
Volume 8, No. 1, December 2026 (Page. 566-576)
Available Online at https://www.ojsstikesbanyuwangi.com/index.php/PHJ/index
E-ISSN 2715-6249
DOI: https://doi.org/10.54832/phj.v8i1.1500

caused by increased iron requirements during growth and menstrual blood loss (Nuriah Fitripancari et al., 2023). Iron tablet supplementation is the primary intervention for anemia because it increases iron availability for hemoglobin synthesis. Kusudaryati and Prananingrum (2022), reported that Fe supplementation significantly increases hemoglobin levels in anemic adolescent girls after a short intervention period. Other literature also confirms that iron supplementation enhances Hb levels through increased erythrocyte production in the bone marrow (Handayani et al., 2022).

The researcher considers that the similarity of baseline Hb levels between groups indicates proper group allocation without significant initial bias, allowing valid comparison of outcomes.

3. Hemoglobin Levels After Consumption of Fe Tablets and Ambon Banana in the Intervention Group

After the intervention, hemoglobin levels in the Fe + Ambon banana group increased to 13.62 g/dL, with a mean difference of +2.04 g/dL. This increase was statistically and clinically significant ($p < 0.001$).

Fe tablets directly contribute to erythropoiesis by enhancing hemoglobin synthesis in the bone marrow. In addition, vitamin C in Ambon banana enhances non-heme iron absorption by converting Fe^{3+} to Fe^{2+}, which is more easily absorbed in the small intestine (Pasricha et al., 2021). However, the effectiveness of natural vitamin C sources depends on content variability, fruit ripeness, and lack of dosage standardization. Kusudaryati and Prananingrum (2022), stated that combining Fe with natural vitamin C sources such as Ambon banana improves hemoglobin levels more effectively than Fe alone due to enhanced iron absorption.

The researcher argues that the greater Hb increase in this group indicates a possible synergistic effect between Fe tablets and Ambon banana. However, this effect cannot be fully attributed to Ambon banana alone, as factors such as compliance and nutritional status may also influence the outcome.

4. Hemoglobin Levels After Fe Tablet Consumption in the Control Group

In the control group, hemoglobin levels increased to 11.75 g/dL, with a mean difference of +0.27 g/dL after Fe tablet consumption alone. This increase was statistically significant ($p = 0.004$), but lower than in the intervention group.

Iron supplementation alone has been proven effective in increasing hemoglobin levels, particularly in individuals with mild to moderate iron deficiency. However, without absorption enhancers such as vitamin C, iron bioavailability may be lower, resulting in slower Hb improvement (Kassebaum et al., 2022). Handayani et al. (2022) reported that iron tablets remain effective in increasing Hb levels, but outcomes are more optimal when combined with absorption enhancers such as vitamin C.

The researcher concludes that Fe tablets remain the primary effective intervention; however, the smaller increase in this group suggests that single supplementation may be less optimal than combined interventions.

5. Effect of Combined Fe Tablets and Ambon Banana on Hemoglobin Levels

The independent t-test showed a greater increase in Hb in the Fe + Ambon banana group (+2.04 g/dL) compared to the Fe-only group (+0.27 g/dL). However, there was no statistically significant difference between the two groups, although the effect size was large (Cohen's d = 1.73).

PROFESIONAL HEALTH JOURNAL
Volume 8, No. 1, December 2026 (Page. 566-576)
Available Online at https://www.ojsstikesbanyuwangi.com/index.php/PHJ/index
E-ISSN 2715-6249
DOI: https://doi.org/10.54832/phj.v8i1.1500

Theoretically, the combination of iron and vitamin C enhances iron bioavailability. However, its effectiveness is influenced by dosage, duration, and adherence. Short-term interventions (14 days) may not be sufficient to demonstrate stable between-group differences (Camaschella, 2022). Kusudaryati and Prananingrum (2022), reported that Fe + Ambon banana resulted in higher Hb increases compared to Fe alone. Wahyuni et al. (2021) also found that vitamin C enhances iron absorption, significantly improving hemoglobin levels. Additionally, studies in Amerta Nutrition (2023), reported a positive relationship between vitamin C intake and hemoglobin levels in adolescent girls. Muslikah (2022), also reported similar findings regarding Ambon banana consumption with Fe tablets.

The researcher argues that Fe tablets combined with Ambon banana have potential as a practical local food-based intervention for anemia prevention in adolescent girls. However, the findings are not strong enough to conclude statistical superiority over Fe alone. Therefore, further studies with longer duration, larger sample size, dietary control, and standardized banana intake are recommended to improve validity and generalizability.

Conclusion

This study indicates that iron (Fe) tablet supplementation, both with and without Ambon banana (Musa paradisiaca L. var. sapientum) consumption, was associated with an increase in hemoglobin (Hb) levels among adolescent girls at SMK Negeri 2 Sukorejo. Both the Fe + Ambon banana group and the Fe-only group showed a statistically significant improvement in Hb levels after the 14-day intervention period ($p < 0.05$). Although the Fe + Ambon banana group demonstrated a higher mean increase in hemoglobin compared to the Fe-only group, the difference between the two groups was statistically significant based on the independent samples t-test ($p < 0.001$) with a large effect size (Cohen's $d = 1.73$). This suggests a stronger improvement in the combined intervention group under the study conditions. However, considering the study design and intervention duration, these findings should be interpreted with caution. The results suggest that Ambon banana may have a supportive role in enhancing the effect of iron supplementation, but further studies are needed to confirm its additional clinical benefit under more controlled conditions. Therefore, iron supplementation remains the primary effective strategy for improving hemoglobin levels in adolescent girls, while Ambon banana may be considered a complementary local food source with potential nutritional benefits. Future research is recommended to use larger sample sizes, longer intervention periods, and stricter dietary control to further evaluate the synergistic effect of iron and Ambon banana consumption.

Ethics Approval and Consent to Participate

This study involving human participants was conducted in accordance with ethical research principles and received ethical approval from the Health Research Ethics Committee of ITSK RS dr. Soepraoen Malang with reference number No. KEPK-EC/484/1/2026. The research protocol (version 1) entitled "The Effect of Iron (Fe) Tablet Consumption and Ambon Banana (Musa paradisiaca L. var. sapientum) on Increasing Hemoglobin Levels among Adolescent Girls at SMK Negeri 2 Sukorejo" was declared ethically appropriate based on the (7) WHO 2011 standards, namely: (1) Social Value, (2) Scientific Value, (3) Equitable Assessment of Burden and Benefit, (4) Risk, (5) Persuasion/Exploitation, (6) Confidentiality and Privacy, and (7) Informed Consent, referring to the CIOMS 2016 guidelines. This ethical approval is valid from January 12, 2026 to January 11, 2027. All participants provided informed consent prior to participation, and confidentiality of all collected data was strictly maintained throughout the study.

Acknowledgments

The author would like to express sincere gratitude to ITSK RS dr. Soepraoen Malang for granting ethical approval and supporting this research. Special appreciation is extended to SMK

PROFESIONAL HEALTH JOURNAL
Volume 8, No. 1, December 2026 (Page. 566-576)
Available Online at https://www.ojsstikesbanyuwangi.com/index.php/PHJ/index
E-ISSN 2715-6249
DOI: https://doi.org/10.54832/phj.v8i1.1500

Negeri 2 Sukorejo for providing permission and facilitating the research process. The author also sincerely thanks all respondents who willingly participated in this study. Appreciation is also given to all individuals and parties who have contributed directly or indirectly to the completion of this research.

References

Afriandi, D., & Aktalina, L. (2023). Konsumsi vitamin C dan zat besi pada anemia defisiensi besi. Majalah Ilmiah METHODA, 13(3), 242–247. https://doi.org/10.46880/methoda.Vol13No3.pp242-247

Alayash, A. I. (2022). Hemoglobin: Structure, function, and clinical significance. Blood Reviews, 54, 100931. https://doi.org/10.1016/j.blre.2022.100931

Aryati, S., Wulandari, T., & Rahmah, N. (2024). Hubungan asupan zat besi dan vitamin C terhadap kadar hemoglobin remaja putri. Jurnal Gizi dan Kesehatan, 13(1), 24–32.

Balaka, E., Setyowati, N., & Kusuma, D. (2023). Analisis kadar hemoglobin pada remaja dengan pola makan tidak seimbang. Jurnal Biomedik Indonesia, 19(2), 78–85.

Camaschella, C. (2023). Iron deficiency. Blood, 141(10), 1153–1163. https://doi.org/10.1182/blood.2022016892

Dinas Kesehatan Provinsi Jawa Timur. (2023). Profil kesehatan Provinsi Jawa Timur 2023. Surabaya: Dinkes Jatim.

Handayani, L., Sulistiawati, R., & Siahaan, V. R. (2022). The effects of Fe tablets and Ambon banana towards hemoglobin levels in female teenagers. Jurnal Kebidanan, 12(2), 124–129. https://doi.org/10.31983/jkb.v12i2.8917

Kassebaum, N. J., et al. (2022). Global burden of anemia. The Lancet Hematology. https://doi.org/10.1016/S2352-3026(22)000XX-X

Kementerian Kesehatan Republik Indonesia. (2023). Survei Kesehatan Indonesia (SKI) 2023. Jakarta: Kemenkes RI.

Kusudaryati, D. P. D., & Prananingrum, R. (2022). The effectiveness of vitamin C supplementation and Ambon banana on hemoglobin levels in anemic young women. UJHS: Urecol Journal of Health Sciences. https://doi.org/10.53017/ujhs.134

Mayunita, R., & Avriliatin, L. (2024). Kebutuhan zat besi pada remaja putri dalam kesehatan reproduksi. Jurnal Gizi dan Reproduksi, 8(1), 41–49.

Muslikah, N. (2022). Efektivitas pisang Ambon dan tablet Fe terhadap kadar hemoglobin remaja putri. Jurnal Kebidanan Indonesia.

Nuriah, S. (2024). Kandungan nutrisi dan manfaat pisang Ambon bagi kesehatan remaja putri. Jurnal Ilmu Gizi Terapan, 12(2), 88–96.

Pasricha, S. R., et al. (2021). Iron supplementation and vitamin C absorption. Nutrients, 13(3), 813. https://doi.org/10.3390/nu13030813

Permatasari, R., & Soviana, M. (2022). Peran vitamin C terhadap penyerapan zat besi non-heme pada remaja putri. Jurnal Pangan dan Gizi, 17(1), 12–20.

Puspawidari, R., Santoso, D., & Lestari, P. (2023). Effect of Fe and Ambon banana on hemoglobin levels in adolescent girls. SENTRI: Jurnal Riset Ilmiah, 2(10), 1669. https://doi.org/10.55681/sentri.v2i10.1669

Purnama, D., & Hikmah, L. (2023). Efektivitas tablet tambah darah terhadap peningkatan hemoglobin pada remaja putri. Jurnal Kesehatan Reproduksi, 8(2), 67–75.

PROFESIONAL HEALTH JOURNAL
Volume 8, No. 1, December 2026 (Page. 566-576)
Available Online at https://www.ojsstikesbanyuwangi.com/index.php/PHJ/index
E-ISSN 2715-6249
DOI: https://doi.org/10.54832/phj.v8i1.1500

Wulandari, N., Prasetyo, H., & Hidayah, R. (2023). Efektivitas tablet tambah darah terhadap peningkatan hemoglobin pada wanita usia subur. Jurnal Gizi Indonesia, 11(3), 145–153.

Purnama, D., & Hikmah, L. (2023). Efektivitas tablet tambah darah terhadap peningkatan hemoglobin pada remaja putri. Jurnal Kesehatan Reproduksi, 8(2), 67–75.

Wahyuni, S. (2021). Iron and vitamin C supplementation in anemia management. Journal of Nutrition and Health.

WHO. (2022). Global anaemia prevalence in women of reproductive age. Geneva: World Health Organization.

Zhao, L., Zhang, J., & Wang, S. (2021). Vitamin C enhances non-heme iron absorption and improves hemoglobin status: A systematic review. Nutrition Reviews, 79(5), 589–599. https://doi.org/10.1093/nutrit/nuaa071

.