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The Relationship Between Dragon Fruit Consumption and Hb Levels in Adolescent Girls Aged 13 to 14 Years at Public Yunior High School-4 Lemo

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Abstract. *Anemia remains a common nutritional problem among adolescent girls, particularly during early adolescence when iron requirements increase due to rapid growth and the onset of menstruation. This study aimed to analyze the effect of dragon fruit consumption on hemoglobin levels among adolescent girls aged 13–14 years at SMPN 4 Lemo. An analytical observational study with a pre–post design was conducted involving 30 adolescent girls selected through total sampling. Dragon fruit consumption was administered, and hemoglobin status was measured before and after the intervention. Data were analyzed using univariate analysis and the Wilcoxon Signed-Rank Test. The results showed that before dragon fruit consumption, most respondents were classified as anemic. After the intervention, the majority of respondents experienced an improvement in hemoglobin status, shifting from anemia to normal levels. The Wilcoxon Signed-Rank Test indicated a statistically significant difference in hemoglobin levels before and after dragon fruit consumption ($p < 0.05$). These findings demonstrate that dragon fruit consumption is associated with an improvement in hemoglobin levels among adolescent girls. In conclusion, dragon fruit consumption has the potential to be used as a local food–based nutritional intervention to improve hemoglobin status and reduce anemia among early adolescent girls. However, further studies with stronger research designs and control of confounding factors are recommended to confirm a causal relationship.*

Keywords*: Adolescent Girls; Anemia; Dragon Fruit; Hemoglobin; Nutrition.*

1. INTRODUCTION

Anemia remains one of the major nutritional problems commonly found among adolescent girls, particularly in developing countries. This condition is characterized by low hemoglobin levels in the blood, which play a crucial role in oxygen transport to body tissues (Apriyani E et al., 2024). In adolescents, anemia not only affects physical conditions such as fatigue and decreased immunity but also influences learning concentration, academic performance, and future reproductive health readiness (Muthoharoh & Khasanah, 2022). Therefore, anemia among adolescent girls constitutes an important public health issue that requires serious attention (Tusiana et al., 2021).

Adolescence is a period of rapid growth (growth spurt), during which nutritional requirements, especially iron, increase significantly. In adolescent girls, iron requirements are further elevated due to the onset of menstruation, which causes monthly blood loss (Aisyah et al., 2025). When iron intake is insufficient or iron absorption is suboptimal, the risk of anemia increases (Olii, 2020). This condition is often exacerbated by unbalanced dietary patterns among adolescents, including low consumption of iron-rich foods, skipping meals, and high intake of nutrient-poor processed foods (Tusiana et al., 2021).

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Various efforts have been implemented to prevent anemia, one of which is iron supplementation through iron tablets. However, the effectiveness of this program is frequently constrained by low compliance, perceived side effects, and limited knowledge among adolescents regarding the importance of iron intake (Azizah et al., 2024). Consequently, alternative approaches utilizing natural and locally available food sources are considered more sustainable and acceptable to adolescents. Food-based approaches also offer advantages, as they can be integrated with nutrition education and healthy eating habits (Sadiah et al., 2024).

Dragon fruit is one of the fruits that is widely available in the community and contains nutrients that potentially support hemoglobin formation. It contains iron, vitamin C, and antioxidant compounds that play a role in enhancing the absorption of non-heme iron in the body (Nurbaiti et al., 2023). Vitamin C is known to reduce iron into a more absorbable form, suggesting that dragon fruit consumption may theoretically contribute to increased hemoglobin levels. Thus, dragon fruit has the potential to serve as a natural nutritional intervention for anemia prevention among adolescent girls (Made et al., 2025).

Nevertheless, most previous studies have primarily focused on iron supplementation or general dietary intake, while research specifically examining the relationship between dragon fruit consumption and hemoglobin levels among adolescent girls remains limited, particularly at the junior high school level and in rural or semi-rural settings(Fitroh et al., 2025; Hasyim, 2024; et al., 2020). Furthermore, local data describing the initial prevalence of anemia are often insufficiently documented as a basis for planning nutrition intervention studies.

Based on a preliminary study conducted in October 2025 at SMPN 4 Lemo, the prevalence of anemia among adolescent girls aged 13–14 years was found to be relatively high. More than half of the students aged 13 years were anemic, and a similar condition was observed among those aged 14 years. These findings indicate that anemia is a tangible health problem among adolescent girls at this school and may be associated with suboptimal daily nutritional intake.

However, this preliminary study has not yet examined specific dietary factors, including dragon fruit consumption, nor has it directly analyzed their relationship with hemoglobin levels. In other words, a research gap remains between the high prevalence of anemia among adolescent girls and the limited empirical evidence regarding the role of dragon fruit consumption as a nutritional source that may influence hemoglobin levels.

Therefore, further research is needed to analyze the relationship between dragon fruit consumption and hemoglobin levels among adolescent girls aged 13–14 years. This study is expected to provide scientific evidence to support the development of local food-based nutritional interventions aimed at preventing anemia among adolescent girls.

2. RESEARCH METHOD

This study employed an analytical observational design with a cross-sectional approach to examine the relationship between dragon fruit consumption and hemoglobin levels among adolescent girls. The research was conducted at SMPN 4 Lemo in October 2025. The study population consisted of all female students aged 13–14 years enrolled at the school. Participants were selected using total sampling, as all eligible students who met the inclusion criteria were included in the study.

Dragon fruit consumption was assessed using a structured dietary questionnaire to capture the frequency and pattern of consumption over a specified period. Hemoglobin levels were measured to determine anemia status, following standard health measurement procedures. Adolescent girls were classified as anemic or non-anemic based on established hemoglobin cut-off values appropriate for their age group. Data collection was carried out with assistance from relevant school and health personnel to ensure accuracy and compliance with ethical considerations.

Data analysis was performed using descriptive and inferential statistical methods. Descriptive analysis was used to summarize participant characteristics, dragon fruit consumption patterns, and hemoglobin levels. Inferential analysis was conducted to assess the relationship between dragon fruit consumption and hemoglobin levels among the participants. The results of this analysis were used to determine whether a statistically meaningful association existed between the variables studied.

3. RESULTS AND DISCUSSION

Univariat Analyze

Univariate analysis was conducted to describe the general characteristics of the respondents and the distribution of hemoglobin status before and after dragon fruit consumption among adolescent girls aged 13–14 years at SMPN 4 Lemo.

Table 1. Distribution of Respondents by Age.

Age (Years)	Frequency (n)	Percentage (%)
13	17	56.7
14	13	43.3
Total	30	100.0

As shown in Table 1, most respondents were 13 years old (56.7%), while 43.3% were 14 years old. The mean age of the respondents was 13.43 years with a standard deviation of 0.504. This relatively homogeneous age distribution indicates that the participants were in early adolescence, a developmental stage characterized by increased iron requirements due to rapid growth and the onset of menstruation.

Table 2. Distribution of Respondents by Grade Level.

Grade Level	Frequency (n)	Percentage (%)
Grade VII	17	56.7
Grade VIII	13	43.3
Total	30	100.0

The majority of respondents were enrolled in Grade VII (56.7%), while 43.3% were in Grade VIII. This distribution corresponds with the age range of the respondents and reflects that most participants were in the early stage of junior high school, a period during which dietary habits and nutritional awareness are often still developing.

Table 3. Distribution of Hemoglobin Status Before Dragon Fruit Consumption.

Hemoglobin Status	Frequency (n)	Percentage (%)
Anemia	28	93.3
Normal	2	6.7
Total	30	100.0

Table 3 shows that before dragon fruit consumption, the majority of respondents (93.3%) were classified as anemic, while only 6.7% had normal hemoglobin levels. The mean hemoglobin status score before intervention was 1.07 with a standard deviation of 0.254. This finding indicates that anemia was highly prevalent among adolescent girls aged 13–14 years at SMPN 4 Lemo, suggesting a substantial issue related to insufficient iron intake or absorption.

Table 4. Distribution of Hemoglobin Status After Dragon Fruit Consumption.

Hemoglobin Status	Frequency (n)	Percentage (%)
Anemia	2	6.7
Normal	28	93.3
Total	30	100.0

After dragon fruit consumption, a marked improvement in hemoglobin status was observed. As shown in Table 4, 93.3% of respondents were classified as having normal hemoglobin levels, while only 6.7% remained anemic. The mean hemoglobin status score increased to 1.93 with a standard deviation of 0.254. This shift indicates a substantial improvement in hemoglobin status following dragon fruit consumption.

Bivariat Analyze

One core statement and numerous supporting sentences make up each paragraph. The explanations ought to be given methodically and should explain what the writers do in relation to the data, techniques, or stages of the research.

Bivariate analysis was conducted to examine differences in hemoglobin status before and after dragon fruit consumption among adolescent girls. Since the data were paired and did not meet the assumptions for parametric testing, the Wilcoxon Signed-Rank Test was applied to assess changes in hemoglobin status following the intervention.

Table 5. Wilcoxon Signed-Rank Test Results for Hemoglobin Status Before and After Dragon Fruit Consumption.

Comparison	Rank Type	N	Mean Rank	Sum of Ranks
Hemoglobin after – before consumption	Negative ranks	0	0.00	0.00
	Positive ranks	26	13.50	351.00
	Ties	4	–	–
	Total	30		

The Wilcoxon Signed-Rank Test results indicate that 26 respondents showed an improvement in hemoglobin status after consuming dragon fruit, as reflected by positive ranks. No respondents experienced a decrease in hemoglobin status, while 4 respondents showed no change. The dominance of positive ranks suggests a consistent upward shift in hemoglobin status following the intervention.

Further statistical testing revealed a Z value of −5.099 with a p-value of 0.000 ($p < 0.05$), indicating a statistically significant difference in hemoglobin status before and after dragon fruit consumption. This result confirms that the observed improvement in hemoglobin levels was unlikely to have occurred by chance.

The findings of this bivariate analysis demonstrate that dragon fruit consumption was significantly associated with an increase in hemoglobin status among adolescent girls aged 13–14 years. This result supports the hypothesis that dragon fruit, which contains iron and vitamin C, may enhance hemoglobin formation by improving non-heme iron absorption. When

interpreted alongside the univariate findings, the bivariate analysis provides stronger evidence that dragon fruit consumption has a meaningful effect on improving hemoglobin status in this population.

Discussion

Based on the findings of this study, most adolescent girls aged 13–14 years were classified as anemic before dragon fruit consumption. The proportion of respondents with low hemoglobin levels was substantially higher than those with normal hemoglobin levels. This indicates that anemia is a prominent health problem among early adolescent girls at the study site. The condition suggests an imbalance between increased iron requirements during early adolescence and the adequacy of daily nutritional intake.

After dragon fruit consumption, a marked improvement in hemoglobin status was observed among the respondents. The majority of participants who were previously anemic shifted to the normal hemoglobin category. In addition, the Wilcoxon Signed-Rank Test demonstrated a statistically significant difference in hemoglobin levels before and after dragon fruit consumption, with most respondents showing an increase and none experiencing a decrease. These results indicate that dragon fruit consumption is associated with improved hemoglobin status among adolescent girls aged 13–14 years.

The findings of this study can be interpreted in light of previous research. Priyanti et al., (2023) reported that adolescent girls in early puberty have elevated iron requirements due to rapid growth and menstrual blood loss, which, if not adequately met, can lead to decreased hemoglobin levels. This explanation aligns with the high prevalence of anemia observed before the intervention in the present study.

Further support is provided by the study conducted by Tirtawati et al., (2023), which found that anemia among adolescent girls was associated with low intake of iron-rich foods and vitamin C. Their research showed that adolescents who rarely consumed fruits had lower hemoglobin levels compared to those who regularly consumed fruits. This finding helps explain the improvement observed in this study following dragon fruit consumption.

From a physiological perspective, the increase in hemoglobin levels after dragon fruit consumption can be explained by iron absorption mechanisms. Ajeng Sakti Wulandari et al., (2024) stated that vitamin C enhances the absorption of non-heme iron by converting it into a more readily absorbable form in the intestine. Since dragon fruit contains vitamin C, its consumption may facilitate improved iron utilization, leading to increased hemoglobin levels as observed in this study.

The significant difference in hemoglobin levels before and after dragon fruit consumption is also consistent with findings by Ratnaindah (2024), who reported that food-based interventions aimed at improving iron absorption resulted in significant improvements in hemoglobin levels, particularly among individuals with low baseline iron status. This condition closely resembles the characteristics of respondents in the present study, most of whom were anemic prior to the intervention.

Nevertheless, the results of this study should be interpreted with caution. (Mely et al., 2025) emphasized that hemoglobin status is influenced by multiple factors, including overall dietary patterns, baseline nutritional status, and individual health conditions. Therefore, while dragon fruit consumption appears to contribute to improved hemoglobin levels, it should be considered as one component of a broader nutritional approach rather than the sole determinant of anemia improvement.

4. CONCLUSION

Based on the results of this study, most adolescent girls aged 13–14 years at SMPN 4 Lemo were anemic before dragon fruit consumption. After consuming dragon fruit, an improvement in hemoglobin status was observed in the majority of respondents, as indicated by a shift from anemic to normal hemoglobin levels. The bivariate analysis using the Wilcoxon Signed-Rank Test demonstrated a statistically significant difference in hemoglobin levels before and after dragon fruit consumption, indicating that dragon fruit consumption was associated with improved hemoglobin status among adolescent girls.

These findings suggest that dragon fruit consumption has the potential to serve as a local food–based nutritional intervention for the prevention and improvement of anemia in early adolescent girls. However, the results should be interpreted with caution, as hemoglobin levels may also be influenced by other factors. Therefore, further studies employing stronger research designs and controlling for potential confounding variables are recommended to confirm the causal relationship and to strengthen the scientific evidence regarding the role of dragon fruit consumption in improving hemoglobin levels.

Acknowledgement

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