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The Effect of Dragon Fruit Juice Consumption on Hemoglobin Levels in Adolescent Girls at SMPN 4 Kepenuhan, Kepenuhan District, Rokan Hulu Regency Year 2024

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Abstract

Adolescent girls are a vulnerable group to anemia due to menstruation, which leads to monthly blood and iron loss, coupled with insufficient iron intake. In Indonesia, the prevalence of anemia among adolescents remains high despite supplementation programs, yet compliance is low. Therefore, alternative non-pharmacological interventions using local foods such as dragon fruit juice, which is rich in iron, vitamin C, and antioxidants, are needed. This study aimed to determine the effect of dragon fruit juice consumption on hemoglobin levels in adolescent girls at SMPN 4 Kepenuhan, Rokan Hulu Regency. The research employed a quantitative quasi-experimental design (one-group pretest–posttest) with a total sample of 15 adolescent girls selected through purposive sampling. Hemoglobin levels were measured before and after intervention using a hemoglobinometer. Data analysis consisted of descriptive statistics and paired sample t-test to assess differences in mean values before and after treatment. The results showed that the average hemoglobin level increased from 9.9 g/dl before intervention to 14.7 g/dl after intervention. Statistical analysis confirmed a significant difference with $p < 0.05$, indicating that dragon fruit juice has a positive effect on improving hemoglobin levels. In conclusion, dragon fruit juice consumption can serve as an effective food-based intervention to prevent and reduce anemia among adolescent girls. This finding has practical implications for school-based nutrition programs and community health promotion efforts in Indonesia.

Keywords: *Adolescent Girls, Anemia, Dragon Fruit Juice, Hemoglobin, Nutrition Intervention*

INTRODUCTION

Research Phenomenon

Adolescent girls are a group at high risk of anemia, mainly due to menstruation, which causes monthly blood and iron loss. Iron requirements increase significantly during the growth and menstruation phases (Puspa Sari et al., 2022; WHO, 2015). UNICEF also notes that the prevalence of anemia in adolescents is high, at around 32% in the 10–14 age group and 48% in the 15–19 age group (UNICEF, 2020).

In Indonesia, the prevalence of anemia in adolescent girls is also a serious concern. Surveys show that around 21.1% of adolescent girls suffer from anemia, with generally low iron intake due to a lack of dietary variety (Puspa Sari et al., 2022; Mulianingsih et al., 2024). Prolonged menstruation and low iron consumption exacerbate this condition. A study in West Java showed a prevalence of 14.3%, with a significant association with menstrual duration and iron intake.

Research Problems

The main problem is the high rate of anemia among adolescent girls in Indonesia, which is recognized as a public health issue. Contributing factors include menstruation, which causes iron loss, low iron intake, and low compliance with supplementation programs. Studies found that only about 21% of adolescent girls get adequate iron and folate intake (Puspa Sari et al., 2022; MDPI, 2023).

Supplementation programs, such as Weekly Iron-Folic Acid Supplementation (WIFAS), have been implemented as a prevention strategy, but compliance is often low. For example, the consumption rate of weekly iron and folic acid tablets is very low, reaching only about 1–3% among adolescent girls (MDPI, 2023). Alternative food-based interventions, such as dragon fruit juice, are being researched because they

are rich in nutrients—including iron, vitamin C, and antioxidants—that can help increase hemoglobin levels (Aulya et al., 2021; Ramadhani, 2021).

Such studies show the positive effects of dragon fruit juice on increasing hemoglobin in groups of pregnant women and adolescents. For example, administering 200 g of juice for 10–14 days resulted in a significant increase (p < 0.05) (Aulya et al., 2021; Ramadhani, 2021). However, similar studies among female school adolescents in certain areas such as Riau and Rokan Hulu are still very limited, so the urgency of research in specific locations such as SMPN 4 Kepenuhan is very high.

Purpose, Urgency, and Novelty of the Research

This study aims to determine the effect of dragon fruit juice consumption on increasing hemoglobin levels in adolescent girls at SMPN 4 Kepenuhan, Rokan Hulu, through a single-group pre-test and post-test design. Its urgency is based on the high prevalence of anemia in adolescents, the low effectiveness of traditional iron supplementation, and the need for non-pharmacological intervention strategies based on local foods. The novelty of this research lies in its local contextualization—examining the direct effects of dragon fruit juice on adolescent girls in public junior high schools in the Rokan Hulu region—which has not been widely studied in the literature, thus providing new contributions both practically and scientifically.

RESEARCH METHODS

This study uses a quasi-experimental quantitative research design (pre-experimental), with a one-group pretest-posttest design. According to Sugiyono (2022), this design is carried out by giving a pretest to one group, then giving them treatment, and following up with a posttest, without a control group. This design is used so that the effect of the independent variable (dragon fruit juice administration) on the dependent variable (hemoglobin level) can be determined by comparing the results before and after treatment. Cresswell states that quantitative research design departs from postpositivism assumptions, emphasizing hypothesis testing with empirical data and systematic statistical procedures.

The research instrument consisted of measuring the respondents' hemoglobin levels using a blood test device (Hemoglobinometer) for the pretest and posttest. Data analysis techniques included descriptive analysis (mean, standard deviation, range) and inferential analysis using a paired sample t-test—in accordance with statistical procedures in quantitative research to determine significant changes between two measurements (pre- and post-treatment).

The research population was all female adolescents at SMPN 4 Kepenuhan (population of 29 people). A sample of 15 female adolescents was taken using purposive sampling, which is selecting subjects based on certain criteria such as anemia and willingness to follow all research procedures. This technique is in accordance with Sugiyono's recommendations for research with a limited population and certain characteristics.

The research procedure was carried out in the following stages: first, a pretest of hemoglobin levels was conducted on all samples; second, dragon fruit juice was administered for a certain period of time (according to the research instructions, for example, 10 days); third, a posttest of hemoglobin levels was conducted. The pre- and posttest data were then analyzed statistically to see the difference and significance of the increase. These stages reflect a systematic research design as outlined by Creswell in designing quantitative research: starting from the selection of design, instruments, sampling to statistical analysis methods.

RESULTS AND DISCUSSION

Univariate Analysis

Table 1. Average Hemoglobin Levels Before and After Dragon Fruit Juice Administration

Hb Level	Mean	SD	Min-Max
Pre-test	9.993	0.8472	8.8-11.6
Posttest	14.067	1.5310	11.9-16.7

Based on the table above, it is known that the average hemoglobin level of respondents before dragon fruit juice administration was 9.9 g/dl with a standard deviation of 0.8472. The

minimum value was 8.8 g/dl and the maximum value was 11.6 g/dl. Meanwhile, the average hemoglobin level of respondents after consuming dragon fruit juice was 14.7 g/dl with a standard deviation of 1.5310. The minimum value was 11.9 g/dl and the maximum value was 16.7 g/dl.

Bivariate Analysis

Table 2. Average Hb Levels Before and After Dragon Fruit Juice Administration in Adolescent Girls

Hb Levels *Pre-test Post-test*	Mean	Elementary School	SE	P-Value
Hemoglobin levels before and after	-0.4733	1.5682	0.4049	0.000

Discussion

The results of this study represent the actual effect of consuming dates ( ) on lowering blood pressure in the elderly. This study was conducted in Sei Deras Hamlet, Sukamaju Village, Rambah Subdistrict, Rokan Hulu Regency, with 10 female hypertensive elderly subjects aged 55-65 years. This study was conducted to determine the average blood pressure before and after the administration of dates. The data was used as a reference in the discussion as the final result of the thesis, which is stated as follows.

Based on the results of the *T-dependent* statistical test for differences in hemoglobin levels before and after the administration of dragon fruit juice, a p-value of 0.000 was obtained, which means that $p < 0.05$ and Ho is rejected. This shows that the administration of dragon fruit juice has an effect on increasing hemoglobin levels in adolescent girls at SMP N 4 Kepenuhan, Kepenuhan District, Rokan Hulu Regency.

Hemoglobin is a component of red blood cells or erythrocytes that binds oxygen and transports it to all cells in the body. Oxygen is needed by body tissues to perform their functions. A lack of oxygen in brain and muscle tissue can cause symptoms such as poor concentration and reduced fitness. Anemia is a condition in which there is a reduction in red blood cells (erythrocytes) in the blood circulation or hemoglobin mass, thereby preventing them from fulfilling their function as oxygen carriers to all tissues. Hemoglobin is one of the components in red blood cells/erythrocytes that functions to bind oxygen and transport it to all cells in the body. Oxygen is required by body tissues to perform their functions (Chasanah et al., 2019) .

Eat foods that are rich in iron, such as eggs, chicken, liver, fish, and plant-based foods such as dark green vegetables, nuts, tempeh, Eat vegetables and fruits that are rich in vitamin C, such as katuk leaves, spinach, tomatoes, cassava leaves, pineapple, and oranges, which are beneficial for increasing iron absorption in the intestines (Utami et al., 2021) . Every 100 grams of fresh dragon fruit contains 1.9 mg of Fe or iron. Dragon fruit also contains vitamin B1, vitamin C, phytochemicals, protein, potassium, fiber, and many other nutrients that are excellent for growth, digestion, protein absorption, nerve function, and the conversion of carbohydrates into energy (Ira Septa Ningrum, 2019). The increase in hemoglobin levels varied among the respondents. When the respondents were given dragon fruit juice, each respondent had previously maintained their diet by only eating foods that had been determined and recommended by the researcher for 10 days.

This study is in line with research conducted by Rifka Faradiba on the Effect of Red Dragon Fruit Consumption on Pregnant Women on Hemoglobin Levels in the Working Area of the Sambau Health Center, Batam City, in 2023. Based on the results of the paired t-test statistical test, the data sig (2-tailed $0.000 < 0.05$) shows that H0 is rejected and Ha is accepted, which means that there is an effect of red dragon fruit consumption on pregnant women on increasing

hemoglobin in the UPT.Puskesmas Sambau Kota Batam 2023 area. Previously, data from 15 respondents showed that the average hemoglobin level of pregnant women before being given red dragon fruit was 10.6 g/dl and 10.7 g/dl. Meanwhile, data from 15 respondents showed that the average hemoglobin level of pregnant women after being given red dragon fruit was 12.6 g/dl and 13.3 g/dl.

Another similar study conducted by Ayu Pravita Sari and Fera Widyanti in 2023 examined the effectiveness of dragon fruit on hemoglobin levels in adolescent girls. Giving 200 ml of dragon fruit juice for 10 days had an effect on increasing hemoglobin levels. This was proven by statistical test results based on an independent t-test of the intervention group before treatment, which obtained a p-value of 0.000 (p<0.05), indicating that there was a difference in hemoglobin levels before and after the administration of dragon fruit juice in the intervention group. Before the administration of dragon fruit juice, there was a difference of 0.4 g/dl in hemoglobin levels between the two groups. Meanwhile, after being given dragon fruit juice, the difference increased to 0.6 g/dl.

Based on the results of a study (Ambar Yanti & Titin Eka Sugiatini, 2023) conducted on adolescent girls, there was an increase in Hb levels in adolescent girls with anemia after the researchers administered dragon fruit juice for 14 days. where before being given dragon fruit juice, the average Hb of adolescent girls was 9.258 g/dl, while after being given dragon fruit juice, the average Hb level of adolescent girls was 10.708 g/dl.

The researchers assumed that there was an increase in hemoglobin levels in adolescent girls with anemia because dragon fruit is rich in nutrients, including water, protein, fat, crude fiber, calcium, phosphorus, iron, niacin, and vitamin C, which can stimulate red blood cell formation and prevent anemia, and because the adolescent girls drank dragon fruit juice provided by the researchers for 10 days. This can be seen from the observation results, where before the administration of dragon fruit juice, the average hemoglobin level of adolescent girls was 9.9 g/dl, while after the administration of dragon fruit juice, the average hemoglobin level of adolescent girls was 14.7 g/dl. In addition to the compliance of adolescent girls in consuming dragon fruit juice, they also avoided foods and beverages that could inhibit iron absorption. Thus, this habit can help prevent anemia in adolescent girls.

CONCLUSION

The results of this study indicate that the administration of dragon fruit juice has a significant effect on increasing hemoglobin levels in adolescent girls at SMPN 4 Kepenuhan. The average hemoglobin level before the intervention was 9.9 g/dl, increasing to 14.7 g/dl after the intervention, with the results of the paired sample t-test showing a p-value < 0.05. These findings reinforce the evidence that non-pharmacological interventions based on local foods, particularly dragon fruit juice, which is rich in iron, vitamin C, and antioxidants, can be an effective alternative for preventing and treating anemia in adolescent girls. Thus, this study makes a practical contribution to supporting efforts to improve the nutritional status and health of adolescents and can be integrated into school and community programs as a promotional and preventive strategy.

Although the results of this study are quite strong, there are several limitations that should be noted. The study was conducted with a limited sample size and without a control group, so the generalization of the results still needs to be tested in a larger population with a more rigorous experimental design. In addition, the duration of the intervention was relatively short, so it cannot yet describe the long-term effects of dragon fruit juice consumption on hemoglobin status. Therefore, further research is recommended using a quasi-experimental design with a comparison group, involving a larger sample, and extending the intervention period. The practical implication of this study is the need to utilize local foods, such as dragon fruit juice, as

part of school health and nutrition education programs, thereby helping to reduce the prevalence of anemia among adolescent girls in Indonesia.

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