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The Effect Of Giving Red Dragon Fruit Pudding With Young Coconut On Hemoglobin Levels In Adolescent Girls

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ABSTRACT

Adolescent girls are more at risk of experiencing anemia compared to adolescent boys because adolescent girls generally experience menstruation which causes a decrease in hemoglobin levels. The results of the Riskesdas prevalence of anemia in 2018 were 84.6% of young women experiencing anemia. According to its chemical composition, dragon fruit contains minerals, iron and vitamin C which have the effect of preventing anemia. Vitamin C, folic acid, and protein are the main factors that promote iron absorption. Vitamin C increases iron absorption up to four times. Young coconut contains various ingredients that can help in blood formation, namely folic acid which is the main component for the formation of cell nuclei, magnesium, copper, zinc, vitamin C and vitamin B complex.

This research method is quasi-experimental by planning 2 groups, namely the treatment group and the control group. The sample consisted of 40 young women at SMP Negeri 3 Bitung who were selected through Stratified Random Sampling. Data analysis used a parametric test, namely the paired T-test, where if the p value < α (0.05), it was concluded that there was an effect of giving red dragon fruit pudding with young coconut on the hemoglobin levels of adolescent girls.

The results of this study were that the treatment group had an influence on Hb levels in young women who experienced an increase in Hb levels of 1.04 g/dl compared to the control group. Based on the results of the data analysis test, the ρ value was 0.000 < 0.05. So it can be concluded that there is an average difference between pre-test hemoglobin levels and post-test hemoglobin levels, which means that there is an influence of giving red dragon fruit pudding with young coconut on hemoglobin levels in young women at SMP Negeri 3 Bitung.

Keywords: Red Dragon Fruit, Young Coconut, Hemoglobin, Adolescent Girls.

1. INTRODUCTION

According toThe World Health Organization (WHO) recognizes anemia as a health problem, but efforts to reduce its prevalence remain slow. Anemia is a global public health problem when Hb levels fall below 13 g/dl in adult men and below 12 g/dl in non-pregnant adult women. Anemia is typically caused by iron deficiency. Iron deficiency is not limited to low socioeconomic status in rural areas but is increasingly common in affluent and developing societies. This can be influenced by unhealthy eating habits and lack of physical activity.(Ministry of Health of the Republic of Indonesia, 2018).

TeenagerGirls are at greater risk of anemia than boys because menstruation generally causes a decrease in hemoglobin levels. The effects of anemia on the body, especially in girls, include reduced productivity and decreased academic performance. Anemia can also inhibit growth in height and weight, reduce immunity, and increase susceptibility to illness. In girls, anemia increases the risk of maternal death, premature birth, and low birth weight (Ministry of Health of the Republic of Indonesia, 2021).

WHO data from 2017 shows that the prevalence of anemia in adolescents worldwide ranges from 40-88%. WHO data in 2018 shows that the prevalence of anemia in adolescent girls in developing countries is around 53.7% of all adolescent girls. The results of the Basic Health Research (Riskesdas) prevalence of anemia in 2018 was 32%, meaning 3-4 out of 10 adolescents suffer from anemia, and 84.6% of adolescent girls suffer from anemia. Data from the North Sulawesi Provincial Health Office in 2022 showed 673 cases of anemia in adolescent girls. Bitung City, in particular, is among the top 10 cities still experiencing anemia in adolescent girls, with 17 cases (North Sulawesi Health Office, 2022).

Ripe red dragon fruit contains many minerals such as organic acids, protein, potassium, magnesium, calcium, iron, and vitamin C. According to its chemical composition, dragon fruit contains minerals, iron, and vitamin C, which have the effect of preventing anemia. Ascorbic acid or vitamin C, folic acid, and protein are the main factors that promote the absorption of non-heme iron. Vitamin C increases iron absorption up to fourfold. Vitamin C has a reducing factor that increases iron absorption by reducing ferric iron to ferrous iron, making iron absorption more effective and efficient.(Rimawati, 2018).

Young coconut water (Cocos nucifera L.) contains various nutrients that can help in blood formation, including folic acid, a key component for cell nucleus formation, magnesium, copper, zinc, vitamin C, and B-complex vitamins (B1, B2, B3, B5, B6, and B12). Coconut water also contains sugar (ranging from 1.7 to 2.6%) and protein (0.07 to 0.55%). Young coconut flesh contains essential amino acids, which are essential for the body. Amino acids can help produce hemoglobin and red blood cells. Due to this nutritional composition, coconut water has the potential to be used as a raw material for healthy food products.(Ketaren, 2016).

Pudding is a semi-solid dish with a chewy texture. It is a dessert typically served at the end of a meal or party. Pudding is a popular dessert due to its sweet taste and soft texture. Pudding is prepared using a boiling technique and is usually served cold with a variety of fillings and shapes.(Darmawan et al., 2014).

The aim of this study was to determine the effect of giving red dragon fruit pudding with young coconut on hemoglobin levels in female adolescents at SMP Negeri 3 Bitung.

This research was conducted with the approval of the Health Research Ethics Commission of the Manado Ministry of Health Polytechnic No. KEPK.01/10/411/2023.

2. METHOD

The type of research is researchquasi-experimentalwith a two group pre-test and post-test design. This research was conducted at SMP Negeri 3 Bitung on February 13, 2024 to February 26, 2024. The independent variables in this study arered dragon fruit pudding with young coconut, while the dependent variable isHemoglobin levels in female adolescents at SMP Negeri 3 Bitung. The population of this study isall 64 young women at SMP Negeri 3 Bitung.Therefore, the sampling technique used isStratified Random Samplingwhich is a sampling process through the process of dividing the population into strata, selecting a simple random sample from each stratum to obtain a proportional sample from each class..The number of samples in each treatment and control group was 40 people. The treatment group consisted of 8 people from class VII, 7 people from class VIII, and 5 people from class IX. The control group consisted of 7 people from class VII, 7 people from class VIII, and 6 people from class IX. The instrument used wasinformed consent sheet, Easy Touch Blood Hemoglobin hemoglobin measuring device, observation sheet containing respondent data and the results of respondent hemoglobin measurementsThe study will be conducted for 14 days. Organoleptic data will be obtained from the organoleptic test form. Hemoglobin level data will be obtained from the results of hemoglobin level examinations before and after the intervention. Data analysis will be carried out.The parametric test used is the paired T-test which is analyzed to see the difference in pretest and posttest results on the independent variable to the dependent, where if the p value $<\alpha$ (0.05) then it is concluded that there is an effect of giving red dragon fruit pudding with young coconut on the hemoglobin levels of teenage girls. And if the results obtained $p > \alpha$ (0.05) then there is no effect of giving red dragon fruit pudding with young coconut on the hemoglobin levels of teenage girls.

3. RESULTS AND DISCUSSION

Respondent Characteristics

The respondents were female adolescents attending SMP Negeri 3 Bitung, selected using stratified random sampling. The sample consisted of 40 respondents, divided into two groups: the treatment group and the control group. Respondent characteristics are shown in Table 1.

Table 1. Distribution of respondents' ages

Age (years)	Treatment Group		Control Group	
	n	%	N	%
12	7	35	7	35
13	8	40	7	35
14	5	25	6	30
Amount	20	100	20	100

Based on the table above, there were 7 people (35%) aged 12 years in the treatment group, 7 people (35%) aged 12 years in the control group, 8 people (40%) aged 13 years in the treatment group, 7 people (35%) aged 13 years in the control group, 5 people (25%) aged 14 years in the treatment group, and 6 people (30%) aged 14 years in the control group.

1. Organoleptic Test Results

Organoleptic tests were conducted on two samples of red dragon fruit and young coconut pudding products with different compositions. Product 1 with a composition of 150 grams of red dragon fruit, 30 grams of granulated sugar, 50 grams of young coconut flesh, 150 ml of young coconut water, 20 ml of sweetened condensed milk, and vanilla to taste. Product 2 with a composition of 170 grams of red dragon fruit, 35 grams of granulated sugar, 60 grams of young coconut flesh, 150 ml of young coconut water, 20 ml of sweetened condensed milk, 10 ml of liquid milk, 2 grams of cornstarch, 1 gram of cheese, and vanilla to taste.

ResultsThe organoleptic assessment of 25 panelists showed that product 2 was preferred and product 2 was used as the intervention product in the treatment group research sample. The organoleptic test results can be seen in the table below.

Table 2. Organoleptic test results of red dragon fruit and young coconut pudding

Flavor	Formula 1		Formula 2	
	N	%	n	%
Kinda dislike	0	0	2	8
Neutral	6	24	2	8
Kinda like it	6	24	4	16
Like	13	52	17	68
Total	25	100	25	100
Aroma	Formula 1		Formula 2	
	N	%	n	%
Neutral	7	28	5	20
Somewhat Like	4	16	6	24
Like	14	56	14	56
Total	25	100	25	100
Color	Formula 1		Formula 2	
	N	%	n	%
Somewhat Dislike	1	4	0	0
Neutral	2	8	2	8
Somewhat Like	7	28	6	24

Like	15	60	17	68
Total	25	100	25	100
Texture	Formula 1		Formula 2	
	N	%	n	%
Neutral	6	24	5	20
Somewhat Like	5	20	4	16
Like	14	56	16	64
Total	25	100	25	100

Based on the table above shows the results of organoleptic tests on taste, it can be seen that the most preferred flavor of red dragon fruit pudding with young coconut is formula 2 with 17 people (68%) while in formula 1 it is 13 people (52%). The results of organoleptic tests on aroma, it can be seen that the aroma of red dragon fruit pudding with young coconut is in the category of liking equally, namely 14 people (56%) in formula 1 and 14 people (56%) in formula 2. The results of organoleptic tests on color, it can be seen that the color of red dragon fruit pudding with young coconut that is most preferred is formula 2 with 17 people (68%) while in formula 1 it is 15 people (60%). And the results of organoleptic tests on texture, it can be seen that the texture of red dragon fruit pudding with young coconut that is most preferred is formula 2 with 16 people (64%) while in formula 1 it is 14 people (56%).

2. Hb levels before and after intervention in the treatment group.

Table 3. Descriptive Statistics of Hb Levels in Treatment Groups

Hemoglobin Level	n	Minimum	Maximum	Mean	Difference in Hb levels (g/dl)
Pre-Treatment Hb Level	20	10.5	12.5	11.8	1.04
Post-Treatment Hb Level	20	11.2	14.9	12.8	

Based on the table above, there were 20 respondents in the treatment group. Before treatment, the minimum Hb level was 10.5 g/dl and the maximum was 12.5 g/dl, with a mean of 11.8 g/dl. After treatment, the minimum Hb level was 11.2 g/dl and the maximum was 14.9 g/dl, with a mean of 12.8 g/dl. The difference in Hb levels was 1.04 g/dl.

Table 4.Paired Samples Test Treatment Group

	Mean	95% Confidence Interval of the Difference		T	Sig. (2-tailed)
		Lower	Upper		
Pre-Treatment Post Treatment	-1.0400	-1.4476	-.6324	-5,341	0.000

Based on the table above, the Sig value (2-tailed) is 0.000 < 0.05.The mean paired differences value is -1.040. This value indicates the difference between the average pre-test Hb level and the average post-test Hb level and the difference between -1.4476 and -0.6324 (95% Confidence Interval of the Difference Lower and Upper). The calculated t value is negative, namely -5.341. The calculated t value is negative because the average value of the pre-test hemoglobin level is lower than the average post-test hemoglobin level.

3. Hb levels before and after intervention in the control group

Table 5. Descriptive Statistics of Hb Levels in the Control Group

Hemoglobin Level	n	Minimum	Maximum	Mean	Difference in Hb levels (g/dl)
Pre-Control Hb Level	20	12.8	15.7	14.0	-0.74
Post-Control Hb Level	20	12.1	15.4	13.3	

Based on the table above, there were 20 respondents in the control group. Before treatment, the minimum Hb level was 12.8 g/dl and the maximum was 15.7 g/dl, with a mean of 14.0 g/dl. After treatment, the minimum Hb level was 12.1 g/dl and the maximum was 15.4 g/dl, with a mean of 13.3 g/dl. The difference in Hb levels was -0.74 g/dl.

Table 6.Paired Samples Test Control Group

	Mean	95% Confidence Interval of the Difference		T	Sig. (2-tailed)
		Lower	Upper		
Pre-Control Post Control	0.7450	0.2225	0.8275	3,633	0.002

Based on the table above, the Sig value (2-tailed) is 0.002 < 0.05.The mean paired differences value is 0.7450. This value indicates the difference between the average pre-test hemoglobin level and the average post-test hemoglobin level, and the difference ranges from 0.2225 to 0.8275 (95% Confidence Interval of the Difference Lower and Upperr). The t-count value is positive, namely 3.633. The t-count value is positive because the average value of the pre-test hemoglobin level is higher than the average value of the post-test hemoglobin level.

Discussion

Hemoglobin Levels Before and After Intervention

Based on Table 3, the average hemoglobin level of adolescent girls in the treatment group before the intervention was 11.8 g/dl, and after the intervention, the average Hb level was 12.8 g/dl. The difference in hemoglobin levels before and after the intervention in the treatment group was 1.04 g/dl. Statistically,Sig value, (2-tailed) is 0.000 < 0.05, so it is rejected and$H_0 H_1$accepted. So it can be concluded that there is an average difference between the pre-test hemoglobin levels and the post-test hemoglobin levels in the treatment group and this means there is an influence.Effect of red dragon fruit pudding with young coconut on hemoglobin levels in female adolescents at SMP Negeri 3 Bitung.

Increased hemoglobin levels occur due to the nutritional content of dragon fruit and young coconut. Based on research conducted by (Sonawe, 2017)In 100 grams of dragon fruit contains 1.9 mg of iron and 20.5 mg of vitamin C and research conducted(Arianti and Herlina, 2020)Coconut water contains 2 mg of iron per 100 grams. This iron content means that consuming it can increase hemoglobin levels..

Giving dragon fruit helps increase the amount of vitamin C intake consumed by adolescent girls. Vitamin C is a nutrient that can help accelerate the absorption of iron for the body to increase hemoglobin levels in the body of vitamins A, E, B1, B2, B3 (6). The role of vitamin C is to help accelerate the absorption of iron (Fe) in the body and functions in transporting iron into the blood, as well as mobilizing iron stores (hemosiderin and spleen). Ascorbic acid (Vitamin C) is one of the components that can trigger the strongest iron absorption. Ascorbic acid works by increasing the solubility of iron by converting ferric iron (Fe3+) into ferrous iron (Fe2+) and can form a soluble ascorbate-iron complex, so that iron is easily absorbed by the intestines.(Pravita Sari, Widyanti, Department of Nutrition and Ministry of Health, Bengkulu, 2023).

Based on research conducted by (Ayu Pravitas Sari, 2023), administering 200 grams of dragon fruit for 10 days can increase Hb levels in adolescent girls. The p-value was 0.000 ($p < 0.05$), indicating a difference in hemoglobin levels before and after dragon fruit administration in the intervention group.

Research conducted(Jenita Rio, 2022)regarding the effect of dragon fruit on hemoglobin levels in female adolescents at the Rakut Besi Community Health Center, it was concluded that female adolescents who consumed dragon fruit for 2 weeks experienced an increase in hemoglobin levels with the results of the paired T-test analysis showing that the results of the 2-tailed significance value with a p value = 0.001. If the significance value of p value (0.001) <sig. (0.05), then Ho is rejected, which means there is a significant influence on two variables, namely the effect of dragon fruit juice consumption on hemoglobin levels in female adolescents at the Rakut Besi Community Health Center. Pamatang Silimakuta District, Simalungun Regency in 2021.

Young coconuts contain several nutrients that aid hematopoiesis. These include folic acid, amino acids (arginine, aspartic acid, glutamic acid, glutamine, glycine, histidine, isoleucine, leucine, lysine, phenylalanine, proline, serine, tyrosine, and tryptophan), iron, vitamin B12, and vitamin C. The iron contained in coconut water is thought to play a role as a major component of the chemical bonds of hemoglobin, a component of red blood cell formation. Iron and heme bind to globulin proteins to form hemoglobin. The absorption of iron from food, which is used in hemoglobin formation, is thought to be influenced by another substance, namely vitamin C. The vitamin C contained in coconut water is thought to play a role in increasing the process of iron absorption in the body to accelerate hemoglobin synthesis.(Ketaren, 2016). The research conducted (Ketaren, 2016) showed that in all dose groups there was an increase in the amount of hemoglobin after being given young coconut water for 10 days, but there was no significant difference between dose groups ($p > 0.05$).

Coconut contains 0.2% iron, 0.2% protein, 0.15% fat, 7.27% carbohydrates, sugar, vitamins, electrolytes and growth hormones. The maximum sugar content is 3 grams per 100 ml of coconut water. The types of sugar contained are sucrose, glucose, fructose and sorbitol. Various sources of Fe in nature, one of which is from coconut water, the Fe content of coconut water is 2 mg/100 grams. From the Fe content, it can be ensured that if consumed regularly it can increase hemoglobin levels ((Achmad Djaeni Sediaoetama, 1989 inArianti and Herlina, 2020).

In research(Arianti and Herlina, 2020)Most postpartum mothers who consumed coconut water experienced an increase in hemoglobin, namely 86.4% (38 people), while most postpartum mothers who did not consume coconut water did not experience an increase in hemoglobin, namely 77.3% (34 people), so it can be concluded that there is a relationship between coconut water consumption and an increase in hemoglobin with a p-value (0.000) smaller than the α value (0.05).

Based on table 5, the average hemoglobin level of female adolescents in the control group before the intervention was 14.0 g/dl and after the intervention the average Hb level was 13.3 g/dl.With a difference in hemoglobin levels before and after the intervention in the control group of -0.74 g/dl.Statistics show the Sig value, (2-tailed) is $0.002 < 0.05$.So it can be concluded that there is an average difference between the pre-test hemoglobin levels and the post-test hemoglobin levels of the control group.

A study of hemoglobin levels in the control group conducted at SMP Negeri 3 Bitung showed a decrease because it did not examine nutritional intake and factors that inhibit hemoglobin formation. Low hemoglobin levels in the sample can occur due to insufficient food intake, lack of knowledge about anemia, and poor dietary habits such as frequent consumption of beverages containing tannins, such as tea and coffee, which can inhibit iron absorption. In line with a study conducted on adolescent girls at SMK Kesehatan Citra Medika Sukoharjo in 2018, there was no effect on hemoglobin levels in the control group because the study did not examine nutritional intake and factors that inhibit hemoglobin formation (Sulistiyani, 2018).

This study concluded that giving red dragon fruit pudding with young coconut can prevent anemia in adolescent girls because the dragon fruit and young coconut contain vitamin C, iron, and other nutrients that can support the formation of red blood cells in the body.

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