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RED DRAGON PUDDING (HYLOCEREUS POLYRHIZUS) ON HEMOGLOBIN LEVELS OF ANEMIA ADOLESCENTS

Indah Putri Ramadhanti*[1], Desri Nova H[1], Debby Ratno Kustanto[2], Mimi Fitriani[1]
[1]Faculty of Midwifery, Universitas Prima Nusantara Bukittinggi, Jl. Kusuma Bhakti No.99, Kubu Gulai Bancah, Mandiangin Koto Selayan, Bukittinggi, Sumatera Barat 26111, Indonesia
[2]Faculty of Nursing and Public Health, Universitas Prima Nusantara Bukittinggi, Jl. Kusuma Bhakti No.99, Kubu Gulai Bancah, Mandiangin Koto Selayan, Bukittinggi, Sumatera Barat 26111, Indonesia
*indahputriramadhanti1305@gmail.com

ABSTRACT
WHO data in 2022 stated that anemia in adolescents aged 13-18 years was 23%, developing countries 53.7% in 2018. Based on the 2023 SKI, anemia in adolescents in Indonesia is quite high, which is 32% at the age of 15-24 years, which has an impact on adolescent health. The iron and vitamin content of dragon fruit affects the process of hemoglobin formation in red blood cells. This study aims to determine the effect of giving dragon fruit pudding on hemoglobin levels in anemic female adolescents. Quantitative research type, Pre-Experimental Design method, One-Group Pretest-Posttest Only Design. The infinite population of all anemic female adolescents in the Koto Lolo Health Center work area, Sungai Penuh City with a purposive sampling technique obtained 16 respondents in 2024. The instrument uses POCT (Easy Touch GCHb Brand) and observation sheets. Data is not normally distributed, using the Wilcoxon test. Univariate analysis obtained the average hemoglobin level before being given dragon fruit pudding was 9,81 + SD 0.832 and after being given dragon fruit pudding was 11,81 + SD 0.758. There was an increase of 2 gr/dl in Hb levels. The results of the bivariate analysis obtained a p value of 0.001 which means ($p \leq 0.05$). There is an effect of giving dragon fruit pudding on the hemoglobin levels of anemic adolescent girls in the Koto Lolo Health Center work area in 2024. It is hoped that giving dragon fruit pudding as one of the alternative companion therapy programs to increase Hb levels in anemic adolescent girls.

Keywords: adolescents; anemia; hemoglobin level; red dragon pudding

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INTRODUCTION

Worldwide, anemia is a significant health problem affecting women and children throughout their life cycle. In terms of nutrition, health, education, and growth and development, adolescent girls are more vulnerable and more neglected (Moore Heslin & McNulty, 2023). When the normal red blood cell count (less than 4.2 million/l) or hemoglobin (Hb) is less than 12 g/dl in a typical woman, this is called anemia (Vaira et al., 2022). By 2019, 40% of all children aged 6-59 months, 37% of pregnant women, and 30% of women aged 15-49 years will be anemic worldwide (WHO, 2024). The 2023 Indonesian Health Survey found anemia prevalence of 16.3% of children aged 5-14 years and 15.5% of those aged 15-24 years, meaning that 1-2 out of 10 people suffer from anemia (Kemenkes.RI, 2024). In 2018, 23.9% of adolescent girls in Jambi Province were anemic. This was higher than the previous year, with ages 10-14 years (19.5%) and 15-24 years (84.6%) (DINKES Jambi, 2024).

Adolescent girls experience menstruation every month and maintain their appearance by wearing a strict and unhealthy diet (Yuniarti & Zakiah, 2021). Insufficient iron intake, insufficient intake of vitamins A, C, B2, B9, and B12, and consumption of substances that inhibit iron absorption, such as tannins and phytates in tea (Wardani et al., 2024). Adolescent anemia limits development, learning ability, work productivity, physical fitness, school

dropout rates, and susceptibility to infections (National Health Mission, 2021).One of the government programs to reduce anemia is the provision of blood supplement tablets (TTD). However, this program has not succeeded in reducing the number of anemia. The number of adolescent girls in West Sumatra is 46.6%, in Riau Islands 44.7%, in Babel Islands 49.5%, and in Jambi is the 13th lowest with 42% (Kemenkes.RI, 2024). Koto Lolo Health Center has a coverage of adolescent girls who consume fe tablets as much as 49.57% in 2022, according to data from the Sungai Penuh City Health Office. According to Jambi Province RISKESDAS data in 2018, the causes of adolescent girls who did not drink or finish the blood supplement tablets given by the school were only taken during menstruation by 2.88%, forgot by 20.28%, smelly and unpleasant taste by 48.13%, side effects by 7.11%, not yet finished by 0.57%, felt no need by 18.45%, and other reasons by 2.59% (DINKES Jambi, 2024).

The government has been trying to prevent adolescent anemia regularly by providing Blood Additive Tablets to schools. That program in Indonesia is still very low (Helmyati et al., 2023). One of the reasons for this is tablets that are too large or unpleasant to taste, as well as side effects such as nausea, dyspepsia, and constipation, which make teenage children uncomfortable (Silitonga et al., 2023). Red dragon fruit, which is rich in compounds for hemoglobin synthesis, contains 60.4 milligrams of iron and 9.4 milligrams of vitamin C in 100 grams of red dragon fruit, which reduces iron to ferrous ascorbate. Dietary nutrition management is also very important (Intan et al., 2023). Dragon fruit juice processing can increase hemoglobin in pregnant women with mild anemia by 1.82 grams, when compared to sweet potatoes (0.57 grams), ambon bananas (1.65 grams), and dates (1.14 grams) (Ardiani et al., 2023). Jukut fern can only increase adolescent hemoglobin levels by 1.26 grams, which is a limitation of this study, because not all regions in Indonesia produce jukut fern (Ramadhanti et al., 2023). The processing of dragon fruit pudding has not been compared with juicing and eating directly. Seaweed promotes hematopoiesis, which is the formation of red blood cells, and can stabilize the number of hemoglobin, erythrocytes, and leukocytes (Untari Anggeni et al., 2024).

The results of a preliminary study conducted at the Koto Lolo Health Center showed that out of 30 female students examined, 7 were anemic, with 6 having mild anemia and 1 having moderate anemia. Some adolescent girls said that they often experienced the 5L symptoms (weak, tired, lethargic, fatigued, and inattentive) during physical activities at school from morning to evening. They also said that they did not consume enough food to meet their nutritional needs, and they did not have normal menstruation. Therapy consisted of resting in the UKS and administration of blood-boosting tablets, but these were taken irregularly due to dislike. There was no previous intervention with red dragon pudding. Based on this background, the purpose of this study was to determine the effect of giving red dragon pudding (Hylocereus polyrhizus) on the hemoglobin levels of adolescent girls in the Koto Lolo Health Center working area in 2024.

METHOD

Pre-experimental research method one group pretest and posttest design. The dependent variable is hemoglobin level and the independent variable is red dragon pudding (Hylocereus polyrhizus). The research was conducted in the working area of the Koto Lolo Health Center, Sungai Penuh City, Jambi Province with an infinite population of mild anemia adolescents during the June-July 2024 period. Samples were obtained as many as 16 respondents with 2 backup samples through:

Federer formula $= (n-1)\,(t-1) \geq 15$

$= (n-1)\,(2-1) \geq 15$

$n = 16$

Drop out formula =

$$n' = \frac{n}{1-f} = \frac{16}{1-0,1} = 18$$

The sample technique used was purposive sampling with inclusion criteria: Adolescent girls who are willing to become respondents in the study through filling informed consent, Adolescent girls in good health or not suffering from serious diseases such as leukemia and cancer, willing to take deworming medication, willing to comply with the rules of moringa pudding consumption as specified, aged 13-15 years. Exclusion criteria: have mental illness (depression), adolescent girls with a history of red dragon and agar allergy, do not have a history of hereditary diseases that affect heme (crescent anemia, thalassemia, leukemia), do not suffer from comorbidities (magh, diarrhea, or nutritional diets). Drop out criteria: adolescents did not complete the intervention according to standard operating procedures and experienced health problems while the intervention continued that could worsen health conditions.

This research has passed the research ethics committee with ethical clearance number: 201/KEPK/UPNB/VII/2024 at Prima Nusantara University, in Bukittinggi. Data collection techniques include informed choice and informed consent, measurement of pretest Hb levels, provision of interventions, and measurement of posttest HB levels. Instruments with observation sheets, food recall forms entered into the Nutri Survey application, calibrated POCT Hb level checker (Easy Touch GCHb Brand).The procedure of this study is the first day of education about anemia, Hb examination and deworming. Giving dragon fruit 300 grams on the second day until the 15th day (for 14 days of intervention) giving red dragon pudding. On the 16th day, the hemoglobin level was measured. The preparation procedure is 250 grams of red dragon fruit, 1 white agar-agar plan, 100 grams of full cream liquid milk, ½ packet of vanile powder. And 3 HR of granulated sugar. Each 100 grams of dragon fruit pudding was given 3 servings after breakfast, lunch and dinner, not accompanied by tea/coffee. Univariate analysis of dependent variables assessed mean, SD, and min-max. Saphiro wilc test results are not normally distributed with a pretest p-value of 0.002 ($p<0.05$) and a posttest p-value of 0.004 ($p<0.05$) Bivariate analysis with wilcoxon test.

RESULT

Table 1.
Mean hemoglobin level before intervention

Hb levels	n	Mean	SD	Min-Max
Pre-test	16	9,81	0,834	9-11

Table 1 shows that the mean Hb before the intervention was 9.81 with the lowest Hb being 9 (mild anemia) and the highest Hb being 11 (mild anemia) with a standard deviation of 0.834.

Tabel 2.
Mean hemoglobin level after intervention

Hb levels	n	Mean	SD	Min-Max
Post-test	16	11,81	0,750	11-13

Table 2 shows that the average Hb after the intervention was 11.81 with the lowest Hb being 11 (mild anemia) and the highest Hb being 13 (no anemia) with a standard deviation of 0.750.

Tabel 3.
Red dragon pudding (Hylocereus polyrhizus) on hemoglobin levels

Hemoglobin Level of Adolescent Girls	n	Mean	Mean Rank	Standard Deviation	*Z*	*p-value*
Pre-test	16	9,81	8,50	0.832	-3,819	0,001
Post-test	16	11,81	0,00	0,758		

Based on table 3, the results of statistical tests using the Wilcoxon Test test obtained a p value of 0.001 which means ($p \leq 0.05$) Ha is accepted Ho is rejected, namely there is an effect of giving red dragon pudding (Hylocereus polyrhizus) on hemoglobin levels of anemic adolescent girls in the Koto Lolo Health Center working area in 2024.

DISCUSSION

Mean Hemoglobin Level before Feeding Red Dragon Pudding

Based on the research, out of 16 respondents, the average Hb before being given red dragon pudding was 9.81 gr/dl with the lowest Hb was 9 gr/dl and the highest Hb was 11 gr/dl with mild anemia category.Lower than normal hemoglobin levels are known as mild anemia. This condition indicates that the body does not have enough oxygen supply to make healthy red blood cells. When tissues and organs lack red blood cells, they do not get enough oxygen to perform their functions properly (WHO, 2021). Anemia is most common in adolescents. Iron requirements increase as adolescent girls entering puberty experience rapid growth. Adolescent girls also often follow the wrong diet with the aim of losing weight, including by reducing the consumption of animal protein, which is important for the formation of blood hemoglobin (Novelia et al., 2022). Adolescent girls also experience menstruation, which causes heavy blood loss every month, so their iron needs are doubled. In addition, sometimes adolescent girls experience disorders such as menstruation that lasts longer than usual or bleeds more blood than usual (Sukartiningsih & Amaliah, 2018).

Adolescents are in dire need of nutrients due to their rapid physical, cognitive and psychosocial growth. Iron is a necessity for adolescents (Wardani et al., 2024). Poor nutrition education and iron supplementation today can lead to a cycle of iron deficiency and anemia. In adolescent girls, adequate iron intake before and during pregnancy is also important to meet growth needs (National Health Mission, 2021). Intestinal parasitic infections increase the risk of anemia by 2.84 times in adolescents. Parasitic infections may interfere with nutrient absorption and metabolism or increase nutrient losses (Simangunsong & Puspitasari, 2024). This is in accordance with previous research (Ramadhani, 2021) on the administration of dragon fruit juice as much as 300 grams for 14 days on hemoglobin levels in 32 adolescent samples in West Pasaman Regency obtained a mean before intervention of 11.16 gr / dl in the mild anemia category. Adolescent girls need a good intake of nutrients, such as iron and supporting vitamins, to get the blood needed to make hemoglobin. It is also important to understand the importance of maintaining a healthy diet to prevent anemia, such as helminthiasis.

Mean Hemoglobin Level after Feeding Red Dragon Pudding

Based on the research, out of 16 respondents, the average Hb after being given red dragon pudding was 11.81 gr/dl with the lowest Hb was 11 gr/dl and the highest Hb was 13 gr/dl with the category not anemic. The previous difference was 2 gr/dl.One of the best times to intervene is during adolescence, not only because of the growth and development period, but also because you can easily find them by participating in school health programs and getting good results (Bindra, 2017). Most of the iron in the human body is found in the form of a protein called hemoglobin, which is found in red blood cells, and one of the essential nutrients (also referred to as body gold) that the body needs because the human body cannot produce it

on its own. The nutrient content of dragon fruit, namely iron and vitamin C, leads to an increase in hemoglobin levels (National Health Mission, 2021). By converting ferric iron to ferrous, vitamin C has reducing properties that help increase iron absorption by four times. As a result, iron absorption in the small intestine becomes better and more effective (Qurniasih et al., 2024). Deworming drugs increase Hb levels. One of the main causes of anemia and iron deficiency in children is hookworm infection. This varies depending on various factors, including the species and number of worms, duration of infection, iron stores in the body, dietary intake and absorption, and physiological iron requirements. Mild hookworm infection can cause anemia in people who have low iron intake and stores (Wijaya et al., 2020). This is in accordance with previous research (Priyanti et al., 2023) on the administration of dragon fruit juice as much as 200 grams and iron tablets for 7 days on hemoglobin levels in 40 adolescent samples in Garut Regency obtained an average after the intervention of 12.280 gr / dl category not anemic, with a difference before the intervention of 1.55 gr / dl.

After being given dragon fruit pudding, the Hb level of each respondent increased variably. In addition, dietary monitoring during the 14-day intervention with deworming before administration can reduce the cause of anemia. For 3x24 hours, food recall form was used to control the dietary intake of adolescent girls. It was found that the intake of protein, iron, and vitamin C was below the RDA. This therapy can increase the Hb level of adolescent girls so that they do not experience anemia.

Effect of Red Dragon Pudding on Hemoglobin Level of Adolescent Girls

Based on the research, there is a p-value of 0.001 ($p \leq 0.05$), which means that there is an effect of giving red dragon pudding (Hylocereus polyrhizus) on the hemoglobin levels of anemic adolescent girls in the Koto Lolo Health Center working area in 2024.Dragon fruit contains vitamins B6 and B12, which are necessary for making hemoglobin. The initial reaction of heme formation consists of vitamin B6 and amino acids and glycine. Furthermore, the reaction between heme and globin will produce hemoglobin (Intan et al., 2023). Red dragon fruit is rich in anthocyanins, which protect erythrocytes and prevent erythrocyte hemolysis caused by free radicals. It does so by protecting the erythrocyte membrane from oxidative damage (Jayanti, 2010). The main ingredients of dragon fruit pudding are dragon fruit and seaweed, or agar-agar. There are a lot of omega-3 and omega-6 in seaweed, which are very important fats for the body, especially as the formation of blood plasma, nerves, eye retina, brain membranes, and reproductive organs. Seaweed contains vitamins B6 and B12 necessary for the synthesis of hemoglobin; vitamin B6 and amino acids and glycine are involved in the initial reaction of heme formation; and vitamin B12 is necessary for the synthesis of globin, which results from the interaction between heme and globin which then produces hemoglobin (Olii et al., 2019).

This is in accordance with previous research (Ramadhani, 2021) on the administration of dragon fruit juice as much as 300 grams for 14 days on hemoglobin levels in 32 adolescent samples in West Pasaman Regency obtained p-value = 0.001 ($p < 0.05$) with the results of the effect of giving dragon fruit juice in increasing hemoglobin levels. Other research (Sari & Widyanti, 2023) stated that giving dragon fruit juice as much as 200 grams for 10 days to adolescent girls can prevent anemia with a difference of 1.1gr / dl. Other research (Gusriani et al., 2022) on seaweed feeding on hemoglobin levels of 10 pregnant women for 7 days obtained p value <0.0001 ($p < 0.05$) with a difference of 1.1 gr / dl, concluded significant results. The intervention of giving red dragon through juice and pudding processing has an impact on increasing hemoglobin levels. There has been no previous research with red dragon pudding processing on hemoglobin levels.

One of the ways health workers protect adolescent girls from severe anemia is by feeding them dragon fruits, which increase their hemoglobin levels. Eating Red Dragon fruit regularly will help the body overcome anemia and increase red blood cell production. To prevent anemia in girls, processing red dragon fruit in different ways can help prevent boredom. A combination of baga fruit and seaweed can provide a balanced nutritional intake instead of iron tablets.

CONCLUSION

There is an effect of giving red dragon pudding (Hylocereus polyrhizus) to the hemoglobin levels of anemic adolescent girls in the Koto Lolo Health Center working area in 2024 with an increase in hemoglobin levels by 2 gr% for 14 days of intervention. The existence of further researchers with a larger sample and monitoring the daily nutritional needs of adolescent girls through monitoring ferritin levels in the blood. There is a sustainable program in collaboration with the school canteen in providing red dragon pudding and continuous counseling from the School Health Unit.

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