

CONSUMPTION OF RED SPINACH AND BEETROOT JUICE TO PREVENT ANEMIA IN ADOLESCENTS AT AL-AZIZI ISLAMIC BOARDING SCHOOL IN 2023

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Abstract

Anemia is a disease characterized by low hemoglobin and red blood cell levels compared to normal levels. This disease generally affects many people worldwide, especially in developing countries. One of the non-pharmacological steps to prevent anemia by increasing iron levels is to consume red spinach and beetroot juice. Red spinach contains calories, carbohydrates, protein, fat, vitamins, and minerals. The iron content in red spinach is relatively high compared to other vegetables. Meanwhile, beets contain vitamins, carbohydrates, protein, and fat, which are helpful for body health. This study aimed to analyze the effect of red spinach and beet juice on preventing anemia in adolescents. This research uses a group Pretest Posttest design. The sample consisted of 30 people using a total sampling technique. Test the research hypothesis using the Wilcoxon test. The Wilcoxon test results show $p\text{-value} = 0.000$, which means there is an influence on hemoglobin levels before and after administration of Red Spinach and Beetroot Juice. There was an average increase in hemoglobin levels before and after treatment of $2.04 \pm 0.2 \text{ gr/dl}$. It was concluded that there is a significant difference in hemoglobin levels before and after consuming red spinach and beetroot juice

Keyword: Anemia, red spinach juice, beetroot, Al-Azizi Islamic Boarding School

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1. Introduction

Adolescence is recognized as a crucial transitional phase from childhood to adulthood characterized by significant physical and emotional changes. Indrawatiningsih [1] described it as a period that shapes the maturity and development of individuals as they progress toward adulthood. The World Health Organization (WHO) categorizes adolescence into two phases: early adolescence, spanning from 11 to 14 years, and late adolescence, covering the ages of 15 to 19 [2].

According to Santrock (2002), adolescence signifies a critical stage of human growth and development that necessitates attention to nutritional needs. Unfortunately, many adolescents exhibit suboptimal health behaviors, such as frequent consumption of fast food and inadequate intake of fiber-rich foods, leading to various health issues, including anemia [3].

Anemia is a condition characterized by low hemoglobin (Hb) levels and red blood cells compared to the norm. It is a prevalent health concern

globally, particularly affecting populations in developing countries and socioeconomically disadvantaged groups. The average range of hemoglobin levels varies by age and gender [4]. For instance, in adults, normal Hb levels typically exceed 12 mg/dl in women and 13 mg/dl in men. For children aged six months to 14 years, the range varies from >11 mg/dl to >12 mg/dl [5,6]. Arisman (2019) underscores the significant prevalence of anemia in Indonesia across various age groups, with adolescent girls (10-18 years) exhibiting an exceptionally high prevalence rate of 57.1%. This indicates a higher susceptibility to anemia among females across different life stages, emphasizing the importance of addressing nutritional deficiencies and promoting healthy dietary habits to mitigate the burden of anemia in vulnerable populations [1,7].

Kasus anemia sangat menonjol pada remaja, terutama remaja putri. Hal ini terjadi karena meningkatnya kebutuhan zat besi akibat adanya pertumbuhan dan menstruasi. Dinkes tahun 2012 juga menyatakan jika mengkonsumsi minuman yang menghambat absorpsi zat besi akan mempengaruhi hemoglobin seseorang. Dampaknya akan berpengaruh pada kehidupan dan aktivitas sehari-hari. Karena itu perlu pencegahan yang dilakukan agar terhindar dari kekurangan gizi, termasuk anemia gizi [2,8].

Salah satu masalah gizi yang sering terjadi di masyarakat Indonesia yaitu masalah anemia gizi. Contoh penyakit dari anemia gizi itu sendiri ialah kurangnya kalori protein, defisiensi vitamin A, dan gondok endemic. Menurut Arisman (2019) penyebab dari anemia gizi sendiri karena defisiensi zat besi, asam folat, atau vitamin B12 yang kesemuanya berakar pada asupan yang tidak kuat. Selain tiga hal yang disebutkan, penyebab dari anemia gizi juga tak urung dari cara masyarakat dalam mengkonsumsi suatu makanan. Hal ini terjadi karena masyarakat itu sendiri yang tidak peduli kesehatan ataupun faktor lain seperti rendahnya

ekonomi yang membuat mereka menomor duakan dalam mengkonsumsi makanan sehat. Pun demikian, ketidakpedulian masyarakat dalam memprioritaskan makanan sehat pun perlu dipertanyakan, terutama pada kalangan remaja yang mana mereka jarang memilah dalam hal mengkonsumsi makanan. Jika makanan itu yang ia suka, maka ia akan memilihnya tanpa memikirkan sehat atau tidak dan efek yang terjadi setelahnya ketika ia mengkonsumsi makanan tersebut. Padahal, ada banyak berbagai makanan sehat yang kaya akan nutrisi. Selain itu, makanan ini juga mudah untuk ditemui dan dikonsumsi, salah satunya adalah bayam merah dan buah bit [9].

Red amaranth, a high-fiber vegetable from the *Amaranthaceae* family, is commonly grown in high and lowlands. It is a popular choice in households due to its nutritional value, providing calories, carbs, lipids, fats, essential vitamins (A, B1, E, C, and Folate), and minerals (Calcium, Phosphor, and Iron). Notably, red amaranth stands out for its abundant iron content compared to other vegetables ⁽¹⁰⁾. For these reasons, it is common for individuals to use red spinach as a natural method to prevent or manage anemia. Processing red spinach is straightforward, as it can be mashed, grated, or juiced. In Indonesia, another plant often used for anemia prevention is beets [8]. *Beta Vulgaris*, or beetroot. This fruit, commonly used as a natural food coloring, also offers various health benefits [11].

Beets contain essential vitamins, carbohydrates, proteins, and fats that are beneficial for overall health. This fruit also boasts a range of minerals such as iron (Fe), sodium (Na), zinc (Zn), calcium (Ca), potassium (K), magnesium (Mg), and phosphorus (P). Similar to red spinach, beets belong to the *Amaranthaceae* family [10,12]. Beetroots are rich in folate, a potent nutrient known for its efficacy in preventing heart disease and anemia [13]. This fruit is easily cultivated and

commonly found in the surrounding environment [8]. Given its abundant benefits and ease of processing, it is regrettable if we do not fully harness its potential. Moreover, consuming beets or red spinach can effectively prevent red blood cell deficiencies, especially anemia among adolescents [14].

Based on a preliminary study conducted in Al-Azizi Islamic boarding school, involving 30 adolescent girls complaining of frequent dizziness and visual disturbances, 20 individuals were identified. The objective of this research is to investigate the impact of consuming red spinach and beetroot juice on preventing anemia in adolescents at Al-Azizi Islamic boarding school.

2. Method

This study utilized a single-group pretest-posttest design, an experimental approach without a control group. It involves an initial test, followed by treatment, and then a posttest to assess treatment effects with specific experimental impact. The study was conducted at Al-Azizi Islamic Boarding School in Cileungsi, Bogor, involving 30 female students. Convenience sampling was employed, and data analysis will involve univariate and bivariate analysis using SPSS.

3. Results and Discussion

Univariate

Table 1. Characteristics of Respondents

Variable	f	%
Age		
14	21	70.00
15	8	26.7
16	1	3.3
Total	30	100
Menarche Age		
10	5	16.7
11	14	46.7
12	5	16.7
13	5	16.7
14	1	3.3
Total	30	100
Dysmenorrhea:		
Yes	6	20
No	24	80
Total	30	100

BMI		
Underweight	13	43.3
Normal	16	53.3
Overweight/Obesity	1	3.3
Total	30	100

Table 1 delineates the distribution of respondents' age groups, revealing that the preponderance of participants were aged 14 years, constituting 21 individuals (70%), while the demographic with the least representation was the age group of 16 years, encompassing merely one respondent (3.3%). With regard to the onset of menarche, the data elucidates that the plurality of respondents experienced menarche at 11 years of age, accounting for 14 individuals (46.7%). Conversely, the minority reported commencement of menarche at the age of 14 years, with only one participant (3.3%). Analyzing the table relating to dysmenorrhea, a notable observation is that the majority of respondents reported no incidence of dysmenorrhea, with 24 individuals (80%) indicating an absence of symptoms, while a smaller cohort of six respondents (20%) reported experiencing dysmenorrhea. Regarding BMI, the predominant nutritional status among respondents was normal for 16 individuals (53.3%), whereas underweight status was reported by 13 people (43.3%), with overweight/obesity status represented by one person (3.3%).

Table 2. Blood hemoglobin levels before consumption of red spinach and beetroot juice

Hb Category	n	%
Normal	12	40
Low	18	60
Total	30	100

Based on Table 2, all respondents had low hemoglobin levels before treatment; 18 respondents (60%) were anemic, while 12 respondents (40%) were not anemic.

Table 3. Blood hemoglobin levels after consumption of red spinach and beetroot juice

Kategori kadar hemoglobin darah	n	%
Normal	30	100
Low	0	0
Total	30	100

According to Table 3, after treatment, all respondents had normal hemoglobin levels; 30 respondents (100%) were in the normal HB category, and none were anemic.

Bivariat

Table 4. Wilcoxon Test On Blood Hemoglobin Levels Before and After Consuming Red Spinach and Beetroot Juice

	t	p*
Before and after intervention	-4.291	0,000

*Uji Wilcoxon

According to the statistical analysis in Table 4, the Wilcoxon test yielded a p-value = 0.000, indicating a notable variance in hemoglobin levels pre and post-red spinach and beetroot juice intake.

Table 5. Hemoglobin levels before and after consumption of red spinach and beetroot juice

	$\bar{x} \pm SD$ (gr/dl)	Selisih (gr/dl)
Before Intervention	10.72 $\pm$ 1.06	2.04 $\pm$ 0,2
After Intervention	12.76 $\pm$ 1.26	

Adolescence signifies a critical phase characterized by the intricate progression from childhood to adulthood, epitomizing a period of remarkable physical and emotional metamorphosis. The noteworthy surge in physical growth experienced during adolescence necessitates a heightened demand for energy and essential nutrients. Regrettably, myriad factors, including lifestyle choices, often impede the fulfillment of nutritional requisites during this pivotal developmental stage,

rendering adolescents susceptible to anemia.

Hemoglobin is an iron-containing compound in red blood cells that transports oxygen. The amount of Hb per deciliter of blood indicates its oxygen-carrying capacity, a crucial measure for anemia screening [12,15]. Iron intake is a key factor in hemoglobin production. However, insufficient intake does not directly impact hemoglobin levels since the body's iron stores are primarily in the liver as ferritin and hemosiderin [5,7,16]. Besides iron intake, hemoglobin levels are influenced by poor iron absorption, iron's interaction with other nutrients, increased requirements, and blood loss [2,4].

Before administering red spinach and beet juice, 18 individuals (60%) had anemia with low hemoglobin levels, while 12 (40%) showed no signs of anemia and had normal levels. Following the red spinach and beet juice intake, hemoglobin levels normalized in all 30 participants (100%). Statistical analysis using the Wilcoxon test revealed a significant difference in hemoglobin levels before and after the intervention, with a p-value of 0.000 [8,17]. This study aligns with the previous research showing that consuming red spinach can increase Hb levels in anemic young women. Red spinach is a rich source of protein, fat, carbohydrates, potassium, calcium, manganese, phosphorus, iron, amaranthine, folate, purine, niacin, and vitamins A, B1, B2, C, carotene, chlorophyll, and saponin [12].

Iron, a vital mineral necessary for oxygen transport in the body [6], plays a crucial role in hematopoiesis - the production of blood, particularly hemoglobin synthesis. Various factors influence the absorption of iron in the body [5,17].

The study findings align with research by Patimah [10,12] indicating that spinach consumption can boost hemoglobin levels. Spinach, a fiber-rich vegetable, contains 2.8 grams of fiber per 100 grams. It is a natural source of iron, vitamin A, vitamin C, calcium,

carotenoids, and flavonoids, showcasing antioxidant properties. Boiled red spinach is particularly effective in elevating internal hemoglobin levels, thus serving as an alternative iron source for anemic adolescents [4,10,12]. Hemoglobin, crucial in determining anemia prevalence [11,16,18], is responsible for oxygen transport in red blood cells. Adequate consumption of fruits rich in essential minerals like iron (Fe), sodium (Na), zinc (Zn), calcium (Ca), potassium (K), magnesium (Mg), and phosphorus (P) is recommended. For instance, red beets offer 10.2% vitamin C and 34% ascorbic acid, vital for cell growth and repair. Vitamin C significantly enhances non-heme iron absorption by up to four times, playing a pivotal role in reducing ferric iron (Fe^{3+}) to ferrous iron (Fe^{2+}) in the small intestine for improved absorption, especially under higher stomach pH conditions. It can also boost acidity, increasing iron absorption by 30% [1,4,5,18].

4. Conclusion

In conclusion, adolescence presents a critical juncture marked by substantial physical transformations and heightened nutritional demands. Anemia, a prevalent concern during this developmental phase, underscores the significance of hemoglobin, the key molecule responsible for oxygen transport in red blood cells. Iron intake, essential for hemoglobin synthesis, plays a vital role, although hemoglobin levels are influenced by a myriad of factors beyond just iron consumption. The study demonstrating the efficacy of red spinach and beet juice in normalizing hemoglobin levels among anemic adolescents underscores the potential of dietary interventions to address nutritional deficiencies. Overall, a holistic understanding of hemoglobin, iron metabolism, and nutrient interactions is imperative in promoting optimal health outcomes during adolescence and beyond.

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