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Effectiveness of Beetroot Juice Administration on Increasing Hemoglobin Levels in Adolescent Girls with Mild Anemia

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ABSTRACT

The prevalence of anemia in all age categories in the country is 21.70%. Women are more likely to experience anemia compared to men, with a rate of 23.90% for women compared to 18.40% for men. Based on the place of residence, anemia is more prevalent (22.80%) in rural areas than in urban areas (20.60%), and it is more common (22.70%) in women aged 15 and above. This study aims to determine the effectiveness of beetroot juice administration in increasing hemoglobin levels in adolescent girls with mild anemia in the PMB S working area in 2023. The research method is a case study literature review that measures before and after the intervention, allowing the assessment of effectiveness between the situations before and after the intervention and obtaining a more accurate overview of the intervention results. The results showed that the hemoglobin levels of the respondents increased after receiving the intervention for 7 days with the administration of 100 grams of beetroot juice per day. There was a significant difference in the increase in hemoglobin levels between adolescent girls 1 after receiving beetroot juice and adolescent girls 2 after receiving counseling and health education in adolescents with mild anemia in PMB S Cianjur District in 2023. The difference between the two respondents was quite significant, with respondent 1 showing an increase in Hb levels of 1.1 g/dl, and respondent 2 showing an increase in Hb levels of 1.3 g/dl.

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1. Introduction

According to the World Health Organization (WHO) in 2016, the global prevalence of anemia was 33%. The incidence of anemia in women is twice as high as in men, mainly due to the influence of changes, especially during the reproductive period. The prevalence of anemia worldwide is 30.2% for women and 12.7% for men. Meanwhile, in Indonesia, the recorded prevalence of anemia is 23.9% for women and 18.4% for men (Hidayati & Andyarini, 2018; Kaimudin et al., 2017).

In Indonesia, the prevalence of anemia remains relatively high. This was demonstrated by the Ministry of Health (Depkes) in 2020, with the incidence of anemia among toddlers at 47.0%, adolescent girls at 26.50%, women of reproductive age (WUS) at 26.9%, and pregnant women at 40.1% (Suandika et al., 2023). The prevalence of anemia in all age categories in the country is 21.70%, according to the Ministry of Health of the Republic of Indonesia (2017). Women are more likely to experience anemia compared to men (23.90% for women compared to 18.40% for men). Based on residence, anemia occurs

more frequently (22.80%) in rural areas compared to urban areas (20.60%), and it is more prevalent (22.70%) in women aged 15 years and older (Sulistiana & Sari, 2022).

The incidence of anemia in West Java in 2020 reached 57.1%. One of the highest occurrences of anemia was in the Cianjur region, ranking third after Cirebon and Majalengka. Anemia in adolescent girls in Cianjur Regency continues to be a public health issue as its prevalence is over 15%. Based on the results of an anemia examination survey in 2016 conducted by the Promotion Section of the Cianjur Health Office on 1200 adolescent girls (students) in 12 schools, including 2 in Cianjur Regency, it was found that 559 individuals (46.58%) of adolescent girls experienced anemia. This is attributed to low economic factors leading to inadequate nutritional intake (Dinas Kesehatan Provinsi Jawa Barat, 2021).

Based on a preliminary study in the working area of the Karang Tengah Community Health Center, interviews with the midwife coordinator and nutritionist revealed that, from January to September 2020, four students had been hospitalized due to anemia. Until now, the community health center has not conducted a comprehensive nutritional status measurement. It is expected that a complete nutritional measurement will be carried out. In a comparative study at the Cianjur Utara Community Health Center and the Cianjur Kota Community Health Center, there have been no reports of students being hospitalized due to anemia. The research is focused on adolescent girls to obtain homogeneous data, considering the differences between adolescent boys and girls, particularly girls experiencing menstruation and being more vulnerable to anemia. Therefore, this study only examines adolescent girls.

The incidence rates in the PMB S (Independent Midwifery Practice "S") work area in 2020 showed that there were 137 adolescent girls with anemia, and in 2021, the number decreased to 121 adolescent girls with anemia. In 2022, there were a total of 124 adolescent girls who experienced mild anemia at 45%, moderate anemia at 32%, and severe anemia at 28%. The incidence rate of anemia in the PMB S work area from January to April 2023 includes 23 adolescent girls suffering from mild anemia with an Hb level of 9-10 mg/dl.

Factors contributing to the high incidence of anemia in adolescents include low intake of iron and other nutrients such as vitamin A, vitamin C, folate, riboflavin, and B12. Errors in iron consumption, such as consuming iron along with other substances that may interfere with its absorption, also contribute to this condition. (Julaecha, 2020; Nasruddin et al., 2021).

The management of anemia can be carried out through two approaches, namely pharmacological and non-pharmacological methods (Resmi & Setiani, 2020). Pharmacological intervention involves the use of iron tablets (Fe); however, this method is often disliked due to its tendency to cause nausea and vomiting because of the iron's odor (Julianawati et al., 2023). Therefore, a healthy and safe breakthrough is needed, such as consuming beets (Beta vulgaris). Beets are rich in nutrients essential for the formation and maturation of red blood cells (Putri et al., 2020).

Beetroot (Beta Vulgaris) is one of the fruits commonly used as a natural colorant in various types of foods, rich in folate that is effective in preventing heart disease and anemia. The purple or reddish-purple color produced by beets is excellent for natural food or beverage coloring (Apidianti & Yunita, 2020; Suryandari & Happinasari, 2015). Beetroot, known as beetroot or red beet, is a plant from the Amaranthaceae group with the Latin name Beta Vulgaris. This fruit contains both soluble and insoluble fiber, where insoluble fiber aids in promoting intestinal function, while soluble fiber helps maintain stable levels of blood sugar and cholesterol (Willa Anggraini et al., 2019). The plant grows underground as a tuberous root with a reddish-purple color, most commonly found in North America and England (Sastrapradja, 2012)

With the increasing incidence of anemia that continues to surge in the PMB S working area from year to year, researchers feel the urgency to delve deeper and seek concrete solutions to this issue. Awareness of the health impact caused by anemia in adolescents drives the researchers to identify issues arising from this condition. Therefore, the researchers decide to focus on a study aimed at increasing hemoglobin levels in the bodies of adolescents using beets. This decision is taken as a crucial initial step in addressing the serious health challenges faced by adolescents in that area.

The researcher conducted a case study at PMB S on adolescent girls experiencing mild anemia. The patient management involved non-pharmacological therapy. This research not only aims to enhance understanding of anemia in adolescents and the impact of increasing hemoglobin levels through the use of beets. Beyond that, the study is expected to broaden the knowledge base in the field of adolescent health as a whole. By delving into it, the researchers strive to explore various related aspects so that the outcomes not only provide information on the positive effects of beets on hemoglobin levels but also contribute to a general understanding of adolescent health issues.

Through this research, it is anticipated that new insights will emerge, serving as a foundation for further solutions in addressing anemia in adolescents. The information obtained from this study is also expected to offer a deeper understanding, provide the necessary knowledge support to solve issues related to anemia, and establish a foundation for decision-makers in the healthcare field to design more effective strategies in enhancing adolescent health. Thus, the specific benefits of this research include knowledge enrichment, problem-solving capabilities, and information support that can have a positive impact on overall adolescent health.

2. Methods

This research is qualitative with a study case literature review research method that measures before and after the intervention to assess the effectiveness between the situations before and after the intervention and to obtain a more accurate picture of the intervention outcomes (Notoadmodjo, 2012). The population in this study is all anemic adolescents from January to April 2023 in the PMB S work area, consisting of 23 adolescent girls with mild anemia. The sample used in this study includes two adolescent girls with mild anemia who will be respondents according to inclusion data. Data collection in this study is divided into two parts: primary data and secondary data. Primary data is collected through interviews with respondents and checking Hb levels in each anemic adolescent. Meanwhile, secondary data is obtained from the Cianjur Health Office and from the local area to determine the population of adolescents in the PMB S work area.

3. Results and Discussion

3.1 Result

Table 1.
Midwifery Care Results of Respondent 1 with Beetroot Juice Intervention

Respondent 1	Days	Hemoglobin Levels
Beetroot Juice Intervention	1	10,0 gr/dl
	4	10,7 gr/dl
	7	11,1 gr/ dl

From the above table, it can be observed that the hemoglobin levels of respondent 1 increased after the intervention of consuming 100 grams of beetroot juice per day. Before the intervention, the hemoglobin level of respondent 1 on the first day was 10.0 g/dl. After the intervention, the results on the 4th day were 10.7 g/dl, and on the 7th day, it increased to 11.1 g/dl.

Table 2.
Midwifery Care Results of Respondent 2 with Nutrition Counseling and Iron Tablet Intervention

Respondent 2	Days	Hemoglobin Levels
Nutrition Counseling and Iron Tablet Intervention	1	10,0 gr/dl
	4	10,9 gr/dl
	7	11,3 gr/ dl

From the table above, it can be observed that the hemoglobin levels of respondent 2 increased after the intervention of nutrition counseling and iron tablet consumption (TTD) of 100 grams per day. Before the intervention, the hemoglobin level of respondent 2 on the first day was 10.0 g/dl. After the intervention, the results on the 4th day were 10.9 g/dl, and on the 7th day, it increased to 11.3 g/dl.

Table 3.
Comparison of Hemoglobin Level Improvement Results between Respondent 1 and Respondent2

Participants	Before Intervention	After Intervention	
	Day 1	Day 4	Day 7
Given Beetroot Juice	10,0 gr/dl	10, 7 gr/dl	11,1 gr/dl
Given Nutrition Counseling and TTD	10,0 gr/dl	10,9 gr/dl	11,3 gr/dl

From the above table, it can be seen that there is a difference in the care results for adolescents with mild anemia who were given interventions of beetroot juice and nutrition counseling with iron tablets. The increase in hemoglobin levels for Respondent 1, given beetroot juice, on the 7th day was 11.1 g/dl, while the increase in hemoglobin levels for Respondent 2, given nutrition counseling and TTD, on the 7th day was 11.3 g/dl. Both interventions, beetroot juice, and nutrition counseling with TTD, proved effective in increasing hemoglobin levels, although there were differences in the final results.

3.2 Discussion

This study proves the effectiveness of beetroot juice administration to adolescents with mild anemia who received intervention for 7 days, resulting in an increase in hemoglobin levels by 1.1 g/dl, from 10.0 g/dl to 11.1 g/dl. This finding aligns with the research conducted by Elvida et al. (2022). This research aims to determine the relationship between beetroot juice administration and the increase in hemoglobin levels in adolescent girls attending the Social Studies class at MAN 2 Medan. The pre-experimental design method is used in this research, with a single-group pretest-posttest design methodology. The pre-experimental design involves pre-and post-tests for only one group or class. The layout of the single-group pretest-posttest design is conducted using the Good, Sufficient, and Insufficient techniques (Sulistiana & Sari, 2022).

Based on the research conducted at MAN 2 Model Medan, it was found that 100% of adolescent girls had higher Hb levels after receiving beetroot juice. For seven days, 250 mL of beetroot juice was given once a day. The juice was provided to the respondents, who reported that it tasted pleasant and had a faint aroma. The first respondent underwent an Easy Touch Hb examination before receiving beetroot juice. The check aimed to ascertain whether there was an increase in the Hb levels of adolescents after beetroot juice administration. According to the results, twenty individuals had higher Hb levels on the seventh day of testing, as indicated by the "test statistic" output. Based on the output, Asymp. Sig. (2-tailed) has a value of 0.000 ($P < 0.05$), meaning that Ho is rejected, and Ha is accepted. This implies that there is an influence of beetroot juice administration on the increase in Hb levels in tenth-grade female students of the Social Studies class at MAN 2 Model Medan in 2022. It can be concluded that there is an effect of beetroot juice administration on the increase in Hb levels in tenth-grade female students of the Social Studies class at MAN 2 Model Medan in 2022. Therefore, there is a consistency in the results obtained after the intervention, aligning with the findings of the previous research (Sulistiana & Sari, 2022).

For research on adolescent girls with mild anemia who were given nutrition counseling and iron tablet intervention for 7 days, there was an increase in hemoglobin levels by 1.3 g/dl, from 10.0 g/dl to 11.3 g/dl. This is in line with the research conducted by Ni Luh Arniti et al. (2021). The general objective of this research is to determine whether the anemia prevention and control program for adolescent girls at MAN Labuan Bajo has an impact on knowledge, compliance with iron tablet consumption (TTD), and hemoglobin (Hb) levels of female students. This research is a quasi-experimental study with a one-group pretest-posttest design. The initial sample in the study consisted of 52 tenth-grade female students who volunteered to be respondents, were not suffering from chronic diseases, were not transfer students, and were present during the research implementation. Four participants dropped out because they were absent during the data collection after the intervention and dropped out due to adolescence. The sample was selected using systematic random sampling. The consumed iron tablets contained 60 mg of elemental iron and 0.4 mg of folic acid, obtained from the Community Health Center (Puskesmas)

through the School Health Unit (UKS) provided directly by the UKS teacher once a week, and the iron tablets were taken directly in front of the teacher. (Arniti et al., 2021).

Data on knowledge and compliance were collected by the researcher with the assistance of enumerators, while hemoglobin (Hb) data were collected by a health analyst. The intervention in this study used lecture methods and video presentations on anemia, increasing knowledge. Before the counseling, the average knowledge score of the female students was 47.08, and after the intervention, it increased to 56.88. In this study, there was an increase in Hb levels after counseling and iron tablet supplementation, as evidenced by the average Hb level increasing from 12.9 g/dl to 13.6 g/dl. The statistical test using the paired t-test yielded a p-value of 0.000 (p-value < 0.05). Based on the statistical test results, it is concluded that there is a difference between knowledge before and after the intervention, with a p-value of 0.000. This indicates a significant difference between Hb levels before and after the intervention, meaning that counseling and iron tablet supplementation have an impact on increasing Hb levels. Therefore, there is consistency in the results obtained after the intervention, aligning with the findings of the previous research (Arniti et al., 2021)

The case study research with midwifery care for adolescents with mild anemia also proves the difference in the magnitude of the increase in hemoglobin levels between adolescents given beetroot juice intervention and those given nutrition counseling and iron tablet supplementation, although the difference is not significant. In respondent 1, who received beetroot juice intervention, there was an increase in Hb from 10.0 g/dl to 11.1 g/dl, so the adolescent no longer experienced mild anemia after being observed for 7 days. Meanwhile, respondent 2, who received nutrition counseling and iron tablet supplementation, experienced a higher increase in Hb, from 10.0 mg/dl to 11.3 mg/dl after 7 days of observation. This aligns with the research conducted by Hermiaty Nasrudin et al. (2021). This study aims to determine the prevalence of anemia in adolescents in Indonesia. The research method used in this study is a review article. The data sources for this research come from literature obtained through the internet, including research results from journal publications. The literature used in this study is international and national. The inclusion criteria include variables studied by the researchers. Based on the results of the article review, it can be concluded that the increased prevalence of anemia in adolescents is due to a lack of education about balanced nutritional intake. During adolescence, anemia is estimated to be the biggest nutritional problem. Anemia in adolescents and young adults can have a negative impact on their performance and cognitive growth. Combating anemia in adolescent girls involves increasing iron supplementation. The Indonesian government has implemented an iron supplementation program for female adolescents aged 12-18 in schools, but it is not universally implemented in all schools. Lack of knowledge can affect nutritional status due to the limited application of information about nutrition and health in daily life. Efforts to improve knowledge can be done through nutrition education as early as possible (Nasruddin et al., 2021).

This is in line with the midwifery care observations mentioned above, where the increase in Hb levels in adolescents undergoing interventions such as beetroot juice administration and nutrition counseling, along with iron tablet supplementation, showed an increase in Hb levels within 7 days. Therefore, the author assumes that adolescents with mild anemia can be given non-pharmacological therapy in the form of beetroot juice administration and nutrition counseling, along with pharmacological treatment through iron tablet supplementation, so that mild anemia can be addressed as soon as possible in adolescent girls. This will not pose a potential problem in the future because beetroot juice is a type of food that contains a sufficiently high amount of iron, which can increase hemoglobin levels in the body. It also has a high content of vitamin C, which helps in the absorption of iron in the body.

Therefore, beetroot juice can be an important alternative to increase Hb levels in adolescents with mild anemia. For prevention, this method can be employed if adolescents are unable to take blood-boosting tablets as recommended, ensuring that their daily activities and learning are not disrupted by complaints such as weakness, fatigue, lethargy, and lack of concentration. Thus, mild anemia in adolescent girls can be prevented as soon as possible by consuming beetroot juice at least once a week to maintain a healthy and robust body for their daily activities.

4. Conclusion

Hemoglobin levels increased by 1.1 g/dl in adolescent girls with mild anemia in PMB S, Cianjur Regency, in 2023, after receiving beetroot juice intervention for seven days. The final hemoglobin level was 11.1 g/dl, compared to the initial level of 10.0 g/dl, as assessed through subjective complaints, objective data, and supporting information.

In adolescent girls with mild anemia in PMB S, Cianjur Regency, in 2023, counseling and iron tablet (TTD) intervention led to a significant increase in hemoglobin levels. The initial level of 10.0 g/dl rose to 11.3 g/dl after seven days of intervention, indicating a substantial increase of 1.3 g/dl.

The difference in the increase in hemoglobin levels between the two adolescent girls is significant. Respondent 1 showed an increase of 1.1 g/dl after beetroot juice intervention, while respondent 2 showed a higher increase of 1.3 g/dl after counseling and TTD intervention in cases of mild anemia in PMB S, Cianjur Regency, in 2023.

The results of this research not only identify the positive impact of beet juice consumption on increasing hemoglobin levels but also provide a strong scientific foundation to recommend more effective prevention and treatment strategies. The contribution of this study includes enhancing knowledge on effective ways to address anemia in this adolescent group, offering an in-depth understanding of factors influencing the effectiveness of beet juice, and providing a basis for healthcare practitioners to design appropriate and relevant interventions.

The limitation of this research lies in the restricted timeframe used for data collection. This constraint has resulted in the study's outcomes being more inclined towards counseling and iron tablet interventions, with higher hemoglobin levels as a consequence. The time limitation may have restricted the research framework from exploring more variables or interventions that could have significantly contributed to the improvement of hemoglobin levels in adolescents with mild anemia. Therefore, the interpretation and generalization of the research findings need to be considered in light of the time constraint that posed a challenge in developing a more comprehensive research methodology.

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