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The Role of Beetroot Juice in Increasing Hemoglobin Levels of Pregnant Women: An Educational Approach to Nutritional Interventions in Health Science Education

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Abstract: Anemia during pregnancy is a significant health problem that affects both the mother and fetus. Iron deficiency, as the primary cause, can lead to complications such as premature birth and maternal and neonatal mortality, especially in areas with limited access to adequate nutrition, like Enim Estuary Regency. A natural solution, such as the consumption of beetroot juice, which is rich in iron, folic acid, and vitamin C, has emerged as an alternative for increasing maternal hemoglobin levels during pregnancy. This study aims to assess the effectiveness of beetroot juice consumption in increasing maternal hemoglobin levels at the Tanjung Raya Community Health Center. The research also aims to identify the characteristics of pregnant women, analyze their hemoglobin levels before and after the intervention, and evaluate the difference in mean hemoglobin levels following beetroot juice consumption. This study employs a quantitative approach with a quasi-experimental design using a one-group pretest-posttest format. The study involved 150 pregnant women, selected through total sampling at the Tanjung Raya Community Health Center. The independent variable is beetroot juice consumption, while the dependent variable is hemoglobin (Hb) levels. Data were analyzed using the Wilcoxon Signed Rank Test. The results show that the majority of respondents (93.33%) were aged between 20 and 40 years, with an even distribution across the three trimesters of pregnancy. Regarding education, the majority had completed junior high school and high school (28% each). The analysis revealed a significant improvement in maternal Hb levels after the intervention, indicating that beetroot juice consumption is effective in increasing hemoglobin levels in anemic pregnant women. It is recommended that the Tanjung Raya Community Health Center integrate beetroot juice consumption into their maternal health improvement programs and enhance educational efforts regarding the benefits of consuming nutritious foods.

Keywords: Pregnant Women; Trimester; Beetroot Juice; Hemoglobin; Hb Levels

Introduction

Pregnancy is condition physiological experienced by each woman pregnant, but often accompanied by significant changes in the body that can triggers anemia (Sari et al., 2022). One of change the is improvement need nutrition, especially substance iron, which is important For formation cell blood red and support growth fetus. Substance iron, which is obtained from food nutritious, often not sufficient Because various factors, such as pattern undereating balanced, condition economy, or low awareness about importance intake nutrition during pregnancy (Triharini et al., 2025). Deficiency substance iron become reason main cause of anemia in mothers pregnant, a condition marked with the decline hemoglobin levels in blood down to below normal limits (Maulana et al., 2022).

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Anemia during pregnancy No only influence health Anemia during pregnancy is a significant health problem that affects both the mother and fetus, with iron deficiency being the primary cause (Sufyaningsi & Suriyani, 2024). This condition is associated with various complications such as premature birth, low birth weight, and maternal and neonatal mortality. According to the Indonesian Ministry of Health, the prevalence of anemia in pregnant women increased from 37.1% in 2021 to 48.9% in 2022, highlighting a pressing public health challenge (Kemenkes, 2022). Globally, the World Health Organization (WHO) reports that the prevalence of anemia among pregnant women stands at 41.8%, with Southeast Asia having the highest rates at 48.7% (WHO, 2015).

In South Sumatra, anemia among pregnant women remains a serious concern, with a reported prevalence of 55% in 2020. In the Tanjung Raya Health Center, 20.7% of pregnant women were found to be anemic in 2023 (Raya, 2023). Despite existing programs that distribute iron supplements, many pregnant women still report symptoms such as fatigue, dizziness, and shortness of breath, and lack awareness about the benefits of iron-rich foods such as spinach, red meat, and beetroot juice (Sari Mina & Nababan, 2023).

Beetroot juice has gained attention as a potential solution for improving hemoglobin levels due to its high content of iron, folic acid, and vitamin C, which are essential for blood cell formation and iron absorption. Studies, such as those by Handayani et al. (2024); Ramulondi et al. (2021), have shown that beetroot consumption can significantly improve hemoglobin, ferritin, and serum iron levels (Handayani et al., 2024; Ramulondi et al., 2021). Despite these promising findings, long-term safety and effectiveness studies on beetroot juice consumption in pregnancy remain limited, especially in the context of rural Indonesian communities.

There has been no study to date on the effectiveness of beetroot juice consumption for improving maternal hemoglobin levels at the Tanjung Raya Health Center. This research aims to fill this gap by evaluating the impact of beetroot juice consumption on the hemoglobin levels of pregnant women in Tanjung Raya, Enim Regency, South Sumatra, in 2024. This study will provide valuable information for healthcare providers and contribute to the development of nutritional programs aimed at improving maternal health.

Method

This study uses a quantitative approach with a quasi-experimental design, specifically a one-group pretest-posttest model, without a control group. Measurements were conducted before (O1) and after (O2) the intervention, which involved the consumption of beetroot juice (X), to assess its effectiveness in improving the hemoglobin levels of pregnant women at the Tanjung Raya Health Center.

The population for this study consists of pregnant women attending the Tanjung Raya Health Center. A total of 150 pregnant women were selected using the total sampling technique.

The sample selection was based on the following inclusion criteria: pregnant women diagnosed with anemia, physically and mentally healthy, and willing to complete the pretest and posttest questionnaires. The exclusion criteria included pregnant women who were absent during the study or did not complete both the pretest and posttest questionnaires.

The variables in this study are as follows:
Independent Variable: The effectiveness of beetroot juice consumption.
Dependent Variable: The improvement in hemoglobin levels of pregnant women.

Data were collected using questionnaires administered during the pretest and posttest. Primary data were obtained directly from respondents using these questionnaires, while secondary data were gathered from health reports or personnel at the health center.
Intervention Procedure:

The intervention involved the consumption of beetroot juice, which was administered to participants for a duration of 14 days. Each participant consumed 200 mL of beetroot juice daily, which is a typical recommended dose for improving iron levels. The participants were instructed to consume the juice once per day, preferably on an empty stomach, to enhance the absorption of iron.

The collected data were analyzed using the Wilcoxon Signed Rank Test, appropriate for non-normally distributed data. This test was used to compare the hemoglobin levels of pregnant women before and after the intervention.

Result and Discussion

Study This done use for know effectiveness consumption of beetroot juice against improvement maternal hemoglobin levels pregnant. Research This implemented in September 2024 to November 2024 with amount respondents 150 mothers pregnant in the work area Village Health Post Regency Estuary Enim. Here results study Univariate in form characteristics respondents.

Table 1. Characteristics Respondent Village Health Post Regency Estuary Enim Based on Age

Age	Frequency (f)	Percentage (%)
<20 Years	10	6.67
20 -30 Years	70	46.67
31 - 40 Years	70	46.67
> 40 Years	0	0.00
Total	150	100.00

Table 1 shows characteristics Respondent Village Health Post in Regency Estuary Enim based on age. Majority Respondent be in range ages 20-30 years and 31-40 years, respectively as many as 70 people or 46.67%. Respondent under 20 years old recorded as many as 10 people (6.67%), while No There is respondents who are over 40 years old. This is indicates that Respondent dominated by individuals at the age of productive.

Table 2. Characteristics of Muara Enim Village Health Post Respondents Based on Trimester Age

Trimester	Frequency (f)	Percentage (%)
I	47	31.33
II	52	34.67
III	51	34
Total	150	100.00

Table 2 illustrates characteristics Respondent Village Health Post Regency Estuary Enim based on age trimester of pregnanc. Some big Respondent is in the second trimester as many as 52 people (34.67%), followed by the third trimester with 51 people (34%), and first trimester as many as 47 people (31.33%). Distribution This show representation Respondent from each trimester with relative proportions balanced, even though A little more high in the second trimester.

Table 3. Characteristics Respondent Village Health Post Regency Estuary Enim Based on Last Education

Education	Frequency (f)	Percentage (%)
Elementary School/ Equivalent	32	21.33
Junior High School/ Equivalent	42	28.00
High School/ Equivalent	42	28.00
College	34	22.67
Total	150	100.00

Table 3 presents characteristics Respondent based on education last. Respondent with level junior high and high school education respectively totaling 42 people (28.00%), followed by respondents educated college tall as many as 34 people (22.67%), and elementary school/ equivalent as many as 32 people (21.33%). This data show that majority Respondent own background behind education secondary (junior high and senior high), with higher percentage low on level education basic and college tall.

Table 4. Distribution Frequency of Hemoglobin Levels at Poskedes Regency Estuary Enim

	N	Minimum	Maximum	Mean
Pretest	90	5.50	8.00	6.7373
Posttest	90	6.40	11.00	9.1173

Table 4 shows distribution frequency Hemoglobin levels of respondents at Poskedes Regency Estuary Enim before (pretest) and after (post-test) the intervention. In the pretest, hemoglobin levels had minimum value of 5.50 g/dL, maximum of 8.00 g/dL, and average of 6.7373 g/dL. After the intervention (posttest), there was improvement hemoglobin levels with minimum value 6.40 g/dL, maximum 11.00 g/dL, and average increase to 9.1173 g/dL. This data indicates existence repair hemoglobin levels in respondents after intervention, which can reflect effectiveness of the program or interventions carried out.

Analysis Bivariate

Before done analysis bivariate, necessary normality test was conducted used for know the data that will be analyzed normally distributed or no.

Table 5. Shapiro Wilk Normality

Group	P-Value	Decision
Pretest	0.000	No Normally Distributed
Posttest	0.005	No Normally Distributed

Table 5 shows normality test results with using the Shapiro-Wilk test on pretest and posttest data on respondents' hemoglobin levels at the Poskedes Regency Estuary Enim. In the pretest group, the p value of 0.000 indicates that the data is not normally distributed , because p value more small from level significance of 0.05. This is means distribution hemoglobin levels in the pretest were not follow normal distribution. On the other hand, in the posttest group, the p- value of 0.005 indicates that the data is not normally distributed , because p value more small from 0.05.

Considering the pretest and posttest data No normally distributed, the statistical test used For compare difference between the pretest and posttest is a non- parametric test, namely the Wilcoxon Signed Rank Test.

Table 6. Wilcoxon Statistical Test

Z	-10.626 [b]
Asymp . Sig. (2-tailed)	0.000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Based on Wilcoxon Signed Rank Test results, the Z value obtained is -10.626 with mark Asymp. Sig. (2-tailed) is 0.000. This result show that p-value is higher small from level significance set (0.05), which is 0.000. Therefore that, hypothesis zero (H0) which states that No There is effectiveness to improvement Hemoglobin levels before and after given beetroot juice can rejected. In other words, there is strong evidence that giving beetroot juice has significant influence to improvement maternal hemoglobin levels pregnant at the health center Tanjung Raya Regency Estuary Enim in 2024.

The Z value obtained also shows that difference between Hemoglobin levels before and after giving beetroot juice is enough significant, leading to a decrease large and affirming Z value success intervention this. Decrease significant Hb levels in the posttest illustrate that giving beetroot juice is effective in increase hemoglobin levels in mothers pregnant, which is potentially reduce risk of anemia in mothers pregnant. With Thus, the results of the Wilcoxon test support hypothesis alternative (H1) which states existence effectiveness giving beetroot juice to improvement hemoglobin levels in mothers pregnant at Poskedes Regency Estuary Enim.

The results of this study show a significant improvement in the hemoglobin levels of pregnant women after consuming beetroot juice. The majority of the respondents in this study were aged 20 to 40 years, which aligns with the productive age group typically seen in pregnancy. This age range is generally associated with better physical and mental readiness for pregnancy, along with a more comprehensive understanding of health, including the importance of maintaining optimal hemoglobin levels. Only a small portion of respondents were under the age of 20, which is a population particularly vulnerable to anemia due to inadequate dietary habits and low awareness about nutrition.

Most respondents in this study were in their second trimester (34.67%), followed by the third trimester (34%). The second trimester is a critical period where the demand for iron increases significantly to support fetal growth and development. This increased demand for iron is often associated with anemia, as the body struggles to meet the increased iron requirements. The higher number of visits in the third trimester can be attributed to preparation for delivery and routine monitoring of hemoglobin levels, highlighting the importance of continuous healthcare monitoring during pregnancy. The first trimester, on the other hand, had fewer visits, possibly due to pregnancy-related symptoms such as nausea and vomiting, which are common in the early stages and can reduce a mother's motivation to seek healthcare services.

The educational background of the respondents also played a role in their awareness of health and nutrition. Respondents with secondary education (junior high and high school) accounted for the majority of the sample, which could explain their relatively better understanding of pregnancy health. Higher levels of education are generally associated with better health literacy and more awareness of the importance of nutrition and supplementation, such as iron, during pregnancy. In contrast, respondents with lower educational levels may be at a higher risk of anemia due to limited knowledge about proper nutrition and the importance of maintaining adequate iron levels.

In terms of hemoglobin levels, the pretest data showed that most respondents had mild anemia, with hemoglobin levels ranging from 5.50 to 8.00 g/dL, which is consistent with the findings of Nurbaya et al. (2019), who noted that anemia during pregnancy is often due to inadequate iron intake and poor dietary habits. Anemia is a common health problem, particularly in areas where there is a high prevalence of malnutrition and limited access to proper healthcare services (Annisa et al., 2025).

After the intervention with beetroot juice, the respondents' hemoglobin levels significantly increased, with posttest levels ranging from 6.40 to 11.00 g/dL. This improvement aligns with findings from (Hadijah, 2024), who emphasized that beetroot is a rich source of iron, folic acid, and antioxidants. These components play a vital role in increasing hemoglobin production and improving overall maternal health. In addition to its iron content, beetroot juice has been shown to possess anti-inflammatory properties, which may support overall health during pregnancy and contribute to the reduction of oxidative stress, a common issue that can exacerbate anemia and other pregnancy-related complications (Handayani et al., 2024).

The improvement in hemoglobin levels observed in this study can largely be attributed to the bioactive compounds in beetroot, particularly iron, folic acid, and vitamin C. Vitamin C, in particular, enhances the absorption of iron from the digestive tract, which is critical for maintaining adequate iron levels during pregnancy (Setyawati, 2024). The combination of these nutrients in beetroot juice provides a synergistic effect that supports better iron absorption and overall blood health (Safitri et al., 2024).

These findings are consistent with previous studies, such as (Putri et al., 2021), who found that nutritional interventions like beetroot juice significantly improve hemoglobin levels in a relatively short period. Furthermore, beetroot juice offers the added advantage of better acceptance compared to traditional iron supplements, which are often associated with side effects like nausea and constipation (Dahlia, 2023). This makes beetroot juice a more appealing and sustainable

option for pregnant women, particularly in rural areas where access to healthcare may be limited.

This study's results underscore the importance of educating pregnant women about the benefits of consuming nutritious foods like beetroot, which can help prevent anemia and improve maternal and fetal health. In addition to improving hemoglobin levels, the regular consumption of beetroot juice could also reduce the risk of pregnancy complications such as premature birth and low birth weight, as anemia is a well-known risk factor for these outcomes (Simanjuntak, 2025). These findings further support the integration of beetroot juice into maternal health programs as a natural, effective, and practical intervention for improving maternal nutrition and reducing the prevalence of anemia.

While the results of this study are promising, further research is needed to determine the long-term effects of beetroot juice consumption on maternal and fetal health. Future studies should explore the optimal dosage, frequency, and duration of beetroot juice consumption and its impact on pregnancy outcomes. Additionally, comparative studies with other nutritional interventions, such as iron supplements, are necessary to provide a more comprehensive understanding of the relative effectiveness of beetroot juice. Expanding the sample size and including pregnant women from different regions would also help improve the generalizability of the findings.

Conclusion

This study shows that the majority of respondents were pregnant women in their productive age range, with most of them in the second trimester of pregnancy. A significant portion of the respondents had completed their education at the junior high or high school level, which is associated with a better understanding of health and the importance of monitoring hemoglobin levels during pregnancy.

Before the intervention, the maternal hemoglobin levels were low, indicating that most respondents had mild anemia. After the intervention, which involved the consumption of beetroot juice, there was a significant improvement in the hemoglobin levels. This indicates that beetroot juice can play an important role in improving maternal hemoglobin levels, which is crucial for preventing complications caused by anemia during pregnancy.

Statistical analysis using the Wilcoxon Signed Rank Test confirmed that the administration of beetroot juice had a significant impact on increasing maternal hemoglobin levels. Therefore, the study supports the effectiveness of beetroot juice as an intervention to increase hemoglobin levels and contribute to the prevention of anemia during pregnancy.

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Author Contributions

E & L.F.D., contributed to study conception and design, data collection, analysis and interpretation of results, draft manuscript preparation, reviewed the results and approved the final version of the manuscript. M.H, N & J.N., contributed to data collection, analysis and interpretation of results, draft manuscript preparation, reviewed the results and approved the final version of the manuscript.

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Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

References

Annisa, Z. D., Lestari, A. P., & Anggraini, D. (2025). Hubungan Status Gizi dengan Kejadian Anemia pada Remaja. *Scientific Journal*, *4*(2), 54–62.

Dahlia, B. (2023). *Analisis Daya Terima, Kandungan Gizi, dan Umur Simpan Cookies Substitusi Tepung Buah Bit dan Tepung Daun Kelor untuk Pencegahan Anemia pada Ibu Hamil*. Doctoral dissertation, Universitas Hasanuddin.

Hadijah, E. W. D. (2024). Pengaruh Pemberian Jus Buah Bit (Beta Vulgaris L) Terhadap Kadar Hemoglobin Pada Remaja Putri Dengan Anemia Di Sma Negeri 1 Talangpadang Tahun 2024. *Jurnal Maternitas Aisyah (JAMAN AISYAH)*, *5*(3), 244–255.

Handayani, R. T., Saraswati, V. D., & Putri, A. P. (2024). Buah Bit (Beta Vulgaris) Dan Kenaikan Hemoglobin Pada Ibu Hamil Dengan Anemia: Systematic Review. *Nursing Science Journal (NSJ)*, *5*(1), 10–20.

Kemenkes. (2022). *Anemia dalam Kehamilan*.

Maulana, M. I., Mauliza, M., Mardiati, M., Zara, N., & Iqbal, T. Y. (2022). Hubungan anemia pada ibu hamil terhadap kejadian berat badan lahir rendah di 2 rumah sakit swasta kota Lhokseumawe tahun 2020. *AVERROUS: Jurnal Kedokteran Dan Kesehatan Malikussaleh*, *8*(1), 45–53.

Nurbaya, S., Yusra, S., & Handayani, S. I. (2019). *Cerita Anemia*.

Putri, P. H., Putri, F. K., & Rahmawati, S. R. (2021). Efektivitas Bayam Dan Buah Bit Terhadap Kadar Hemoglobin Ibu Hamil. *Medical Technology and Public Health Journal*, *5*(1), 52–61.

Ramulondi, M., Wet, H. de, & Ntuli, N. R. (2021). Traditional food taboos and practices during

pregnancy, postpartum recovery, and infant care of Zulu women in northern KwaZulu-Natal. *Journal of Ethnobiology and Ethnomedicine*, *17*(1), 15.

Raya, P. T. (2023). *Prevalensi Anemia pada Ibu Hamil*.

Safitri, P. F. A., Pangestu, G. K., & Jayatmi, I. (2024). Efektivitas pemberian jus bayam dan tomat dengan jus umbi bit terhadap peningkatan hb pada ibu hamil anemia di tpmb ny. W kabupaten garut tahun 2024. *Journal of Innovation Research and Knowledge*, *4*(6), 3881–3892.

Sari Mina, G., & Nababan, L. (2023). *Asuhan Kebidanan Komprehensif Pada Ibu Hamil Trimester Ii Dengan Anemia Ringan Di Pmb "O" Kota Bengkulu Tahun 2022*. Doctoral dissertation, Sekolah Tinggi Ilmu Kesehatan Sapta Bakti.

Sari, S. I. P., Harahap, J. R., & Helina, S. (2022). *Anemia kehamilan*.

Setyawati, S. A. (2024). *Hubungan Pengetahuan, Kepatuhan Konsumsitablet Fe, Dan Status Gizi (Kek) Dengan Kejadian Anemia Pada Ibu Hamil Di Wilayah Kerjapuskesmas Ngarip Kecamatan Ulubelu Kabupaten Tanggamus Tahun 2024*. Doctoral dissertation, Poltekkes Kemenkes Tanjungkarang.

Simanjuntak, B. Y. (2025). Pemanfaatan Pangan Lokal sebagai Penanggulangan Anemia Gizi pada Wanita Usia Subur. In *Book Chapter of Anemia*.

Sufyaningsi, U., & Suriyani, A. (2024). Anaemia during pregnancy: an integrated review of threats, impacts, and treatment approaches. *Journal of humanities and social studies*, *2*(1), 275–289.

Triharini, M., Armini, N. K. A., Pradanie, R., Rifai, A., & Muniroh, L. (2025). *MENCEGAH ANEMIA PADA IBU HAMIL-Membangun Persepsi Positif Merawat Kehamilan Melalui Gizi Seimbang*. Airlangga University Press.

WHO. (2015). *The global prevalence of anaemia in 2011*.