

# Comparison of Beetroot and Red Guava Wellness Shots on Hemoglobin Levels in Pregnant Women at Samarang Health Center, Garut Regency

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## Abstract

**Background:** Anemia in pregnant women is a serious health issue with a high prevalence of 61.8% in Garut Regency, Indonesia. Effective and safe interventions are needed to prevent pregnancy complications. Wellness shots made from beetroot and red guava, local food-based non-pharmacological treatments, have potential to increase hemoglobin levels by enhancing iron absorption. **Purpose:** This study aims to compare the effectiveness of beetroot and red guava wellness shots in improving hemoglobin levels among pregnant women with moderate anemia at Samarang Health Center, Garut Regency. **Methods:** A quasi-experimental design with a non-equivalent control group was conducted involving 44 third-trimester pregnant women with hemoglobin levels between 7.0 and 9.9 g/dL. Participants were divided into two intervention groups, each receiving wellness shots for 14 consecutive days. Hemoglobin levels were measured before and after the intervention using a digital hemoglobin meter. Data were analyzed using the Shapiro-Wilk test for normality, paired t-test, and independent t-test, with a significance level of  $p < 0.05$ . **Results:** Both groups showed significant increases in hemoglobin levels. The beetroot group's mean hemoglobin increased from 8.69 to 9.56 g/dL, while the red guava group's mean increased from 8.66 to 9.26 g/dL ( $p < 0.001$ ). Comparison of post-intervention hemoglobin levels revealed a significantly greater increase in the beetroot group compared to the red guava group ( $p = 0.009$ ). **Conclusion:** Wellness shots made from beetroot and red guava effectively increase hemoglobin levels in pregnant women with moderate anemia, with beetroot showing superior effectiveness.

**Keywords:** Beetroot, Hemoglobin, Pregnant Women, Red Guava, Wellness Shot

## Introduction

Anemia is a condition characterized by hemoglobin levels below the normal threshold, leading to a significant reduction in the blood's capacity to transport oxygen throughout the body. Hemoglobin, the main protein in red blood cells, plays a critical role in oxygen delivery from the lungs to body tissues, including the developing fetus. During pregnancy, anemia is commonly caused by iron deficiency, triggered by increased physiological demands. This condition can manifest as fatigue, dizziness, pallor, and shortness of breath, and it raises the risk of serious complications such as preterm birth, low birth weight, and perinatal mortality (World Health Organization [WHO], 2021; Berger & Sweeney, 2020).

Globally, anemia among pregnant women remains an unresolved public health issue. WHO (2021) reports that approximately 36.5% of pregnant women worldwide suffer from anemia, with a meta-analysis by Gebreweld et al. (2022) indicating a similar prevalence of 36.8%. The impact is multidimensional, affecting both maternal quality of life and fetal development. In Indonesia, the situation is even more concerning, with the 2022 Indonesian Nutritional Status Survey (SSGI) revealing a 48.9% prevalence of anemia among pregnant women (Kementerian Kesehatan Republik Indonesia [Kemenkes RI], 2022). Regionally, West Java Province reports a prevalence range of 60–65%, and specifically in the working area of Samarang Health Center, Garut Regency, 61.8% of pregnant women were found to be anemic in the first quarter of 2025.

Clinically, anemia in pregnancy is marked by symptoms such as weakness, fatigue, pallor, and an increased risk of impaired fetal growth. The primary cause is iron deficiency due to increased physiological needs not met by adequate dietary intake. Another contributing factor is poor adherence to iron supplementation programs, often due to side effects like nausea and constipation (Dewi, Salpahany, & Refapriliana, 2022). Therefore, alternative approaches that effectively increase hemoglobin levels while being safe, easily accepted, and aligned with local consumption habits are needed.

Several non-pharmacological interventions have been proposed to address anemia in pregnant women, including improved intake of iron-rich foods, such as green vegetables, chicken liver, legumes, and vitamin C-rich fruits. Food fortification, nutrition education, and utilization of local herbal remedies have also been implemented

as preventive strategies. An innovative approach gaining traction is the use of wellness shots — concentrated natural beverages formulated in small doses to rapidly improve nutritional status. Combining beetroot (*Beta vulgaris*), a source of non-heme iron, and red guava (*Psidium guajava*), a source of vitamin C, is believed to enhance hemoglobin levels by improving iron absorption. Vitamin C acts as a reducing agent converting ferric to ferrous iron, the more absorbable form (Wang et al., 2021). Moreover, the liquid form of wellness shots allows for faster absorption compared to tablets, making it a promising intervention in maternal healthcare.

Previous studies have demonstrated the effectiveness of these ingredients in managing anemia. Widyaningsih and Puspitasari (2021) reported significant hemoglobin increases after beetroot juice consumption in pregnant women. Similarly, Sari and Ningsih (2021) showed that red guava juice effectively enhances iron absorption. Damayanti et al. (2022) found that a functional beverage combining beetroot and guava significantly improved hemoglobin levels in adolescent girls. However, there is limited quantitative research directly comparing the effectiveness of beetroot and red guava wellness shots separately in anemic pregnant women, especially in Garut Regency. This study introduces a novel local food-based wellness shot formulation as a nutritional intervention, addressing a research gap and community health need.

Based on the issues described above, the research question is formulated as follows: *“How does the effectiveness of beetroot wellness shots compare to red guava wellness shots in increasing hemoglobin levels among pregnant women at Samarang Health Center, Garut Regency?”*

Therefore, this study aims to compare the effectiveness of beetroot and red guava wellness shots in increasing hemoglobin levels among pregnant women with moderate anemia at Samarang Health Center, Garut Regency. The results are expected to contribute to scientific knowledge and practical interventions using local food-based, non-pharmacological nutritional strategies.

## **Methods**

This study employed a quasi-experimental design using a non-equivalent control group approach to compare the effectiveness of beetroot and red guava-based wellness

shots on hemoglobin levels in pregnant women. This design was chosen due to field constraints preventing full randomization, while maintaining internal validity by measuring hemoglobin levels before and after the intervention in both groups. The study population consisted of second and third trimester pregnant women actively attending antenatal care at Samarang Health Center, Garut Regency, totaling 76 individuals based on PWS KIA data from January to March 2025. A sample of 44 respondents was selected through purposive sampling according to inclusion and exclusion criteria, including third trimester pregnant women with moderate anemia (Hb 7.0–9.9 g/dL) without medical conditions interfering with intervention consumption. The sample was equally divided into two intervention groups: 22 participants received beetroot wellness shots, and 22 received red guava wellness shots for 14 consecutive days.

The research was conducted at Samarang Health Center, Garut Regency, from May to June 2025. The independent variable was the type of wellness shot administered, while the dependent variable was hemoglobin concentration measured using the EasyTouch® GCHb digital Hb meter before and after the intervention. Intervention adherence was monitored daily using observation sheets. The hemoglobin measuring device was internationally validated, and reliability was ensured through standardized procedures and trained personnel. Data collection involved coordination, recruitment and selection of respondents, initial measurement (pre-test), intervention delivery, final measurement (post-test), and data compilation.

Univariable analysis described respondent characteristics and hemoglobin levels, while bivariate analysis employed paired t-tests to examine pre- and post-intervention differences within groups, and independent t-tests to compare outcomes between groups. Non-parametric tests such as Wilcoxon Signed Rank and Mann-Whitney U tests were applied if normality assumptions were violated. Statistical significance was set at  $p < 0.05$ .

## **Results**

### **1. Univariable Analysis**

The univariable analysis describes the hemoglobin levels of pregnant women before and after intervention in both groups receiving wellness shots made from beetroot and red guava. The data are presented as mean, standard deviation, minimum,

and maximum values (Tables 1 and 2).

**Table 1.**  
**Hemoglobin Levels in the Beetroot Wellness Shot Group**

Variable	N	Minimum	Maximum	Mean	SD
Hb Pretest	22	8,0	9,0	8,69	0,32
Hb Posttest	22	9,0	10,0	9,56	0,44

The mean hemoglobin level before the intervention in the beetroot group was 8,69 (SD = 0,32), increasing to 9,56 (SD = 0,44) after the intervention.

**Table 2.**  
**Hemoglobin Levels in the Red Guava Wellness Shot Group**

Variable	N	Minimum	Maximum	Mean	SD
Hb Pretest	22	8,0	9,0	8,66	0,27
Hb Posttest	22	9,0	10,0	9,26	0,27

Similarly, the red guava group showed an increase from a mean of 8,66 (SD = 0,27) to 9,26 (SD = 0,27) post intervention.

## 2. Normality Test

The Shapiro-Wilk test was performed to assess the normality of hemoglobin data before conducting hypothesis testing. The results indicate normal distribution ( $p > 0,05$ ) for all groups (Table 3).

**Table 3.**  
**Normality Test of Hemoglobin Levels (Shapiro-Wilk Test)**

Group	Variable	p-value	Distribution
Beetroot Group	Hb Pretest	0,363	Normal
	Hb Posttest	0,481	Normal
Red Guava Group	Hb Pretest	0,575	Normal
	Hb Posttest	0,502	Normal

## 3. Effect of Wellness Shots on Hemoglobin Levels

The paired samples t-test showed significant increases in hemoglobin levels in both groups after intervention ( $p < 0,001$ ) (Table 4).

**Table 4.**  
**Paired Samples t-test of Hemoglobin Levels Before and After Intervention**

Group	N	Pretest		Posttest		t	p-value
		Mean	SD	Mean	SD		
Beetroot	22	8,69	0,32	9,56	0,44	-17,098	<0,001
Red Guava	22	8,66	0,27	9,26	0,27	-26,714	<0,001

#### 4. Comparison of Effectiveness Between Groups

Independent samples t-test was used to compare hemoglobin levels between the two groups. Before intervention, no significant difference was found ( $p = 0,797$ ). After intervention, the beetroot group showed a significantly higher mean hemoglobin level compared to the red guava group ( $p = 0,009$ ) (Table 5).

**Table 5.**  
**Independent Samples t-test Comparing Hemoglobin Levels Between Groups**

Variable	N	Beetroot			Red Guava			p-value
		Mean	SD	t	Mean	SD	t	
Hb Pretest	22	8,69	0,32		8,66	0,27		0,797
Hb Posttest	22	9,56	0,44		9,26	0,27		0,009

## Discussion

### 1. Hemoglobin Levels Before and After Consumption of Beetroot Wellness Shot

The analysis revealed that the mean hemoglobin level prior to the intervention was 8.69 g/dL (SD = 0.32), which increased significantly to 9.56 g/dL (SD = 0.44;  $p = 0.000$ ) following the administration of a beetroot wellness shot. These findings indicate a positive impact of beetroot supplementation on hemoglobin levels in pregnant women, demonstrating a measurable biological effect.

This outcome aligns with previous studies. Yuliani et al. (2021) reported a significant increase in hemoglobin levels after 14 days of beetroot juice consumption in second-trimester pregnant women. Similarly, Rahmawati and Setyowati (2022) demonstrated that beetroot-based supplementation effectively reduced the incidence of anemia among pregnant women. Moreover, Carolin et al. (2021) found that mean hemoglobin levels increased from 8.4 g/dL to 11.5 g/dL in the red guava juice group,

and from 8.5 g/dL to 10.1 g/dL in the beetroot group, reinforcing the efficacy of beetroot as a non-pharmacological intervention for improving hemoglobin status.

Mechanistically, the observed hemoglobin enhancement can be attributed to the natural nitrates and betalain pigments in beetroot. Nitrates improve oxygen transport via vasodilation, while betalains provide antioxidant protection to red blood cells. In addition, vitamin C facilitates the conversion of non-heme iron into a more bioavailable form. Collectively, these nutrients likely exert a synergistic effect on hemoglobin synthesis.

The increase in hemoglobin is presumed to be influenced by the complex nutrient composition of beetroot, adherence to the intervention protocol, baseline health status of participants, and external factors such as diet and physical activity.

## **2. Hemoglobin Levels Before and After Consumption of Red Guava Wellness Shot**

The present study demonstrated that pregnant women who consumed red guava juice experienced a significant increase in mean hemoglobin levels, from 8.66 g/dL (SD = 0.27) at baseline to 9.26 g/dL (SD = 0.27) after the intervention ( $p = 0.000$ ). These findings indicate that red guava juice has a considerable potential to improve hemoglobin levels in pregnant women with mild anemia.

This result is consistent with previous studies. Suryani and Pramudito (2020) reported that three weeks of red guava juice consumption led to a significant increase in hemoglobin among anemic pregnant women. Putri et al. (2021) highlighted that red guava serves as a natural source of vitamin C, which enhances the absorption of dietary iron. Moreover, Carolin, B.T., Syamsiah, S., and Deresiyana (2021) observed that mean hemoglobin levels increased from 8.4 g/dL to 11.5 g/dL following red guava juice supplementation, further confirming the efficacy of this intervention in elevating hemoglobin levels in pregnant women.

Nutritionally, the hemoglobin improvement can be attributed to the synergistic effect of vitamin C, iron, and folate contained in red guava. Vitamin C facilitates the conversion of ferric iron into the more absorbable ferrous form, enhancing hemoglobin synthesis. Folate contributes to red blood cell formation and prevents megaloblastic anemia, while antioxidants such as lycopene protect erythrocytes from oxidative damage. Consequently, regular consumption of red guava juice can optimally support hematopoiesis.

The researchers assume that the observed increase in hemoglobin was influenced not only by the nutrient composition of red guava but also by participants' adherence to the intervention, dietary intake of iron-rich foods, and individual variations in metabolism and baseline nutritional status. External factors such as overall diet and physical activity may also modulate the magnitude of hemoglobin improvement..

### **3. Effect of Beetroot Wellness Shot Consumption on Hemoglobin Improvement**

Statistical analysis confirmed a significant effect of beetroot wellness shot consumption on hemoglobin increase in pregnant women ( $p = 0,000$ ). The rise from pretest to posttest reflects the intervention's effectiveness in improving hemoglobin levels from low to near-normal ranges.

This finding supports Puspitasari et al. (2020), who reported that 14-day consumption of beetroot extract increased hemoglobin by an average of 0,8 units in second-trimester pregnant women. Amelia and Santoso (2022) similarly documented significant hemoglobin increases after beetroot-based beverage administration in pregnant women with mild anemia.

Theoretically, beetroot's significant impact on hemoglobin is attributed to its combination of iron, vitamin C, folate, and betalain pigments, all of which directly support red blood cell production. The high antioxidant content prevents hemolysis, while nitrate-induced vasodilation enhances oxygen delivery to tissues, stimulating greater hemoglobin production.

Researchers assume this positive effect depends not only on beetroot's nutrient content but also on respondent adherence to the intervention schedule. Environmental factors and concurrent intake of iron-rich foods likely strengthen the results. Thus, the intervention's success is an interplay between key nutrients in beetroot and external and internal factors.

### **4. Effect of Red Guava Wellness Shot Consumption on Hemoglobin Improvement**

Analysis indicated that red guava wellness shot consumption significantly improved hemoglobin levels in pregnant women ( $p = 0,000$ ). The increase from 8,66 to 9,26 shows that this intervention effectively improves hemoglobin status.

This is consistent with Nugraheni et al. (2021), who reported significant hemoglobin increases in mildly anemic pregnant women after red guava consumption. Mulyani and Harjanti (2022) further confirmed red guava's positive effect on iron

absorption, especially when consumed with non-heme iron sources.

From a theoretical standpoint, red guava's effect on hemoglobin is largely due to its high vitamin C content accelerating iron absorption in the small intestine, supported by folate's role in erythropoiesis. The presence of antioxidants such as lycopene also preserves red blood cell integrity.

Researchers assume the effectiveness of red guava is enhanced by respondents' habits of consuming iron-rich foods, enabling synergistic effects. Individual variability in nutritional status, metabolism, and compliance likely influence the magnitude of hemoglobin increase.

### **5. Comparison of Effectiveness Between Beetroot and Red Guava Wellness Shots on Hemoglobin**

The independent t-test revealed a significant difference in effectiveness between beetroot and red guava wellness shots in increasing hemoglobin levels. Post-intervention, the beetroot group showed a higher mean hemoglobin level (9,56) compared to the red guava group (9,26), with a p-value of 0,009. This indicates that beetroot has a stronger effect on hemoglobin improvement than red guava.

Ismail et al. (2020) support this finding, showing that beetroot-based supplementation resulted in more significant hemoglobin increases than single-source vitamin C interventions like red guava. This is attributed to beetroot's combination of iron, folate, and nitrate, which exerts dual effects on red blood cell production.

From a theoretical perspective, the difference is explained by the distinct nutrient compositions: beetroot contains not only iron and vitamin C but also betalain pigments and natural nitrates promoting vasodilation, whereas red guava is rich mainly in vitamin C and lycopene antioxidants. Beetroot's nutrient profile offers more comprehensive support for hematopoiesis.

Researchers suggest that although both interventions are effective, beetroot's superior effect may result from its higher iron content and additional bioactive compounds. Nonetheless, optimal effectiveness depends on external factors such as balanced diet, adherence, and initial health status.

### **Limitation**

This study employed a quasi-experimental design without full randomization,

which introduces the possibility of selection bias due to non-random allocation of participants. Additionally, the relatively small sample size of 22 participants per group limits the generalizability of the findings to a broader population. External factors such as daily dietary patterns, supportive nutrient intake, and history of infections were difficult to control optimally, potentially affecting the results and introducing bias in data interpretation. Hemoglobin levels were measured using a portable digital device susceptible to technical variations influenced by environmental conditions, operator skill, and timing of measurement; thus, further validation with standard laboratory methods is warranted. Moreover, participant adherence to the intervention was monitored solely through daily reports and field observations without objective biomarker indicators, limiting the accuracy of compliance assessment.

### **Conclusion**

This study demonstrates that the administration of wellness shots derived from beetroot and red guava significantly increases hemoglobin levels in pregnant women with moderate anemia. However, the increase in hemoglobin levels was greater in the group consuming the beetroot wellness shot compared to the red guava group. These findings suggest that beetroot has a greater potential as a nutritional intervention to address anemia in pregnant women. Nonetheless, further research with a more robust design and larger sample size is needed to strengthen these results and to better control external influencing factors.

### **Ethical Considerations**

This study received ethical approval from the Health Research Ethics Committee of Universitas Nasional. All participants were provided with clear information regarding the purpose, procedures, benefits, and potential risks of the study prior to obtaining written informed consent. Participation was voluntary, and participants had the right to withdraw at any time without any consequences. The researchers ensured the confidentiality of participants' personal data by anonymizing the data and using it solely for research purposes. Furthermore, the intervention utilized natural ingredients that had been evaluated for safety, minimizing risks to participants. Ethical principles were strictly adhered to in accordance with the guidelines of the Indonesian Ministry of Health (2016) and the Declaration of Helsinki throughout the study.

### **Conflict of Interest**

The authors declare that there are no conflicts of interest related to this study. All decisions made during the conduct of the research, data analysis, and reporting of results were carried out objectively without any influence from external parties that could affect the integrity of the study.

### **Author contribution**

The first author was responsible for the conception and design of the study, field data collection, as well as data analysis and interpretation. The second author contributed to methodology development, supervision of the research implementation, and critical revision of the manuscript. The third author provided support in statistical analysis and preparation of the final manuscript. All authors have read, contributed to, and approved the final version of the manuscript for publication.

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