Indonesian Journal on Health Science and Medicine
Vol 2 No 2 (2025): October
ISSN 3063-8186. Published by Universitas Muhammadiyah Sidoarjo
https://doi.org/10.21070/ijhsm.v2i2.251

The Impact of Beetroot Juice Supplementation on Hemoglobin Levels in Patients Diagnosed with Anemia

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Abstract. *Anemia is a widespread health problem caused by nutritional deficiencies or chronic diseases, often leading to reduced hemoglobin levels and serious complications if untreated. Beetroot (Beta vulgaris L.) is traditionally used as a dietary supplement due to its high iron, folate, and antioxidant content, which may improve hemoglobin synthesis. Although beetroot juice is consumed for its nutritional benefits, limited clinical evidence exists regarding its effect on hemoglobin levels in anemic and pregnant women in Iraq. This study aimed to evaluate the impact of beetroot juice supplementation on hemoglobin concentration in anemic patients, including pregnant women. Results: A total of 25 anemic participants (15 non-pregnant and 10 pregnant women) were enrolled and received beetroot juice twice daily for four weeks. In non-pregnant anemic patients, hemoglobin levels significantly increased from 10.29 ± 0.25 g/dL to 11.19 ± 0.21 g/dL ($p = 0.0297$). In pregnant women, hemoglobin levels rose from 9.56 ± 0.26 g/dL to 10.23 ± 0.27 g/dL, though the change was not statistically significant ($p = 0.0855$). This study provides one of the first structured evaluations in Iraq demonstrating beetroot juice as a natural dietary supplement capable of significantly improving hemoglobin levels in non-pregnant anemic patients. The findings suggest that beetroot juice may serve as a safe, accessible, and effective nutritional intervention for managing anemia, though further large-scale studies are recommended, particularly for pregnant women.*

Highlights:

1. *Beetroot juice supplementation significantly increased hemoglobin levels in non-pregnant anemic patients ($p = 0.0297$).*

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2. *Pregnant women showed a non-significant rise in hemoglobin after beetroot juice intake (p = 0.0855).*
3. *Beetroot juice represents a safe, accessible, and natural nutritional intervention for anemia management*

Keyword– *Anemia; Pregnancy; Beetroot (Beta vulgaris L.); Hemoglobin.*

Introduction

A growing body of studies submit that anemia is independently related with morbidity and mortality in the popular inhabitants as well as in patients with chronic illness where the frequency of anemia is high [1][2]. The most frequent cause of anemia globally is believed to be iron deficient. Other nutritional gaps like folate, vitamin B12, and magnesium can cause anemia. Anemia occurs when there is a deficiency of red blood cells which are required to supply oxygen to the body for its various functions. The physiological requirements of an individual differ based on their age, gender, residential elevation above sea level (altitude), smoking habits, and other variables. The measurement of hemoglobin concentration is necessary even though not all anemia is caused by iron deficiency [3]. The transport of oxygen from the lungs to the whole body is done by hemoglobin, a protein, Anemia is caused by the functional inability to supply adequate oxygen to all parts of the body, your blood, and its various organs and tissues are not functioning properly in case of oxygen deprivation [4].

Anemia is caused by blood leakage, decreased red blood cell creation, and elevated rates of RBC damage [5]. Several reasons such as lacking adequate diet or insufficient nutrient intake can lead to anemia. Certain infections, inflammations chronic diseases, gynecological and obstetric conditions, and other abnormalities of red blood cells also contribute [6]. Anemia symptoms can be different depending on its cause, with fatigue and weakness being the main symptoms [7]. Anemia can be classified into three elements: blood loss, reduced red blood cell production, and increased damage caused by increased RBC damage. Trauma and gastrointestinal bleeding can cause blood loss, among many other causes, Iron deficiency and vitamin B12 loss can also cause

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decreased production, Genetic factors such as sickle cell anemia, infections like malaria, and certain autoimmune diseases are among the causes of elevated damage [8]. Popular medicine has used beet roots and leaves to treat a wide range of illnesses [9].

Beetroot (*Beta vulgaris L*. subsp. vulgaris), is a traditional and popular vegetable, and is categorised under the family Chenopodiaceae [10]. The biologically active substances found in beetroot include betalains, phenols, carotenoids, B-vitamins (B1, B2, B3, B6 and B12), fibres, folate minerals in large amounts [11]. An anemic condition in pregnant women may increase the risk of prematurity, maternal and infant mortality, and infectious diseases. During and after pregnancy, iron deficiency anemia may hinder the growth and development of the fetus [12].

Material and Methods

Beta vulgaris L., also known as red beet root, was obtained from a local market in Khanaqin-Diyala. Red beetroots were rinsed with running water, peeled, chopped, and mixed with a quantity of water in an electric mixer. Two times a day for four weeks, the juice that is produced is taken in the morning and evening. Blood samples are taken inside the medical laboratory in Khanaqin to record the Hb before and after consuming red beet.

Inclusion criteria: People with anemia of various age groups and pregnant women were included in this study.

Exclusion criteria: People with allergic and diabetes to beetroot juice were excluded in this study. People with anemia of inherited disorders and hemolytic anemia are also excluded.

Statistical Analysis

The Statistical Packages of Social Sciences-SPSS (2019) program [13] was used to detect the effect of difference groups in study parameters. T-test was used to significant compare between means in this study.

Result

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In Al-Diyala Province, twenty-five samples were collected from patients who had low hemoglobin levels for a few months. Fifteen of the samples were from patients with anemia and had no other illnesses. They have symptoms of light hypotension with dizziness, while ten others sample for women pregnant have anemia.

All samples undergo full history were classified according to name, age, gender and clinical symptoms as in Table (4 ,5) in index. The Mean, SE and range of age in sample of patients indicated in table 3.

Table 1: Mean, SE and Range of Age in sample study of patients.

Variable (year)	No	Mean	SE	Range
Age of people patients with anemia	15	29.87	2.32	10 -53
Age of pregnant patients	10	30.80	0.93	23 -35

The mean level of Hb showed significant variation between patients before and after consumption of red beet in cases with anemia , (10.29 vs. 11.19 g/dL); p-value = 0.0297) ,(Table 2).

Table 2: Comparison between before and after consumption of red beet in people patients with anemia in Hb level

Consumption	No	Mean ±SE of Hb (g/dL)
Before	15	10.29 ±0.25
After	15	11.19 ±0.21
T-test	---	0.664 *
P-value	---	0.0297
* (P≤0.05).		

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Table 3 showed NO significant variation in Hb level between patients Comparison before and after consumption of red beet in pregnant cases with anemia, (9.56 vs 10.23) with *P-value* (0.0855).

Table 3: Comparison between before and after consumption of red beet in pregnant patients with anemia in Hb level

Consumption	No	Mean ±SE of Hb (g/dL)
Before	10	9.56 ±0.26
After	10	10.23 ±0.27
T-test	---	0.773 NS
P-value	---	0.0855
NS: Non-Significant.		

Discussion

Anemia is a common dietary deficiency that can affect individuals from all social and economic backgrounds. It is more common among adolescents and children in developing countries. Anemia has a significant impact on teenage girls, but most of the causes of mortality and morbidity in this age group can be prevented. The loss of iron and red blood cells occurs when there is heavy and prolonged bleeding, as well as during pregnancy. Women can also experience a loss of iron and red blood cells due to uterine fibroids, which can cause slow bleeding. The blood volume in women's bodies increases by about 20-30 percent when they become pregnant, which hinders the supply of iron and vitamins needed for hemoglobin, as reported by OWH [14].

Anemia during pregnancy can be caused by other conditions besides iron deficiency, such as parasitic illnesses like hookworm and malaria [15]. In Iraq, many individuals have iron deficiency anemia, Thalassemia, Aplastic anemia, Hemolytic anemia, Sickle Cell anemia, and Pernicious anemia. Iron deficiency anemia is a significant issue for adolescent girls due to the chronic blood loss caused by heavy menstruation and the increasing demand for iron to support

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their rapid development. The end of adolescence and the commencement of women's reproductive age are signified by this age, which means that boys and girls both require iron for growth during this period, and girls must constantly change their iron levels thoroughly during menstruation, as per [16] , and agreement with [17] but not with [18] who stated that anemia is widespread in the elderly and its incidence increases with age.

Maternal mortality can be significantly reduced by increasing hemoglobin by 1 g/dL, which is linked to anemia. Beet juice is regarded as a blood purifier, enhances blood structure, and can heal diseases related to the circulatory system, large intestine, and digestive system. In order to overcome anemia or other blood issues, such as high cholesterol, drinking fresh beet juice may be beneficial. The current review has conducted a thorough assessment of anemia and analyzed the efficacy of beet root juice as a nutritional supplement for increasing blood Hb content and other blood parameters. The studies cited above have concluded that beet root juice supplementation had a mild to significant improvement in blood Hb levels. Iron, potassium, and other minerals, such as calcium, salt, and magnesium, are all found abundantly in beetroot, which alleviates anemia and its symptoms through multiple mechanisms. Raw beetroot consumption has been reported to increase Hb levels. It is rich in vitamins A, C, folic acid, B1, B2, B6, B12, niacin, and biotin. The use of beetroot is one of the most effective ways to increase the Hb level. One reason is that it has an iron content that is equal to 10% the daily requirement. Beet root juice iron content makes it beneficial for human blood and blood formation qualities. [19] gave pregnant women the same intervention of beet juice during trimester III. Beet root juice is a form of iron supplementation that can raise Hb levels. Natural, organic nutrients are significantly easier to absorb than artificial, synthetic versions, as demonstrated by research. Beet root is a great natural remedy for those with low blood Hb and anemia because the iron in it is simplest to absorb into the bloodstream, regardless of age. Beet root's natural iron concentration makes it easier to absorb than manufactured iron.

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Conclusion

Despite the limitations of the study, we have concluded that beetroot juice has the potential to treat anemia by increasing Hb levels faster and more efficiently. Beetroot is a potent dietary remedy for a number of physical ailments. Beetroot is one of the most effective ways to boost Hemoglobin levels.

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Table 4: Show the percentages of Hb before and after consumption of red beet in people patients with anemia

Patients	Age	Before consumption Hb (g/dl)	After consumption Hb (g/dl)
1	10	11.3	12
2	13	9.4	10.6
3	17	10.7	11.5
4	20	8.4	9.7
5	22	9	10.1
6	23	11.6	12.2
7	27	9.8	11
8	28	10.1	10.8
9	30	9.9	11
10	35	11.7	12.4
11	37	10.0	10.8
12	40	11.1	12.3
13	45	10.4	11.2
14	48	9.9	10.5
15	53	11.0	11.7

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ISSN 3063-8186. Published by Universitas Muhammadiyah Sidoarjo Copyright

https://doi.org/10.21070/ijhsm.v2i2.251

Table 5: Show the percentages of Hb before and after consumption of red beet in pregnant patients with anemia

Patients	Age	Before consumption Hb (g/dl)	After consumption Hb (g/dl)
1	23	9.9	10.3
2	26	8.4	9
3	27	10	10.9
4	29	9.2	10
5	32	8.9	9.6
6	33	10.4	11.2
7	34	9.1	9.8
8	34	10.9	11.5
9	35	10.1	10.7
10	35	8.7	9.3