



Research

# The Potential of Beets Ice Cream on Increasing the Number of Erythrocytes for Postpartum Women With Anemia

Sania Lailatu Rahmi<sup>1</sup>, Indrie Aulia Rifni<sup>2</sup>, Eka Rahmiati<sup>3</sup>

<sup>1</sup> Padang Health Polytechnic Ministry of Health, West Sumatera, Indonesia

<sup>2</sup> Universitas Prima Nusantara Bukittinggi, West Sumatera, Indonesia

<sup>3</sup> Achmad Mochtar Hospital, West Sumatera, Indonesia

## ARTICLE INFORMATION

Received: February 01, 2023  
Revised: February 26, 2023  
Accepted: March 29, 2023  
Available online: March 30, 2023

## KEYWORDS

Beets Ice Cream; Anemia; Postpartum Mother

## CORRESPONDING AUTHOR

Sania Lailatu Rahmi

E-mail: [sanialailatul14@gmail.com](mailto:sanialailatul14@gmail.com)

## A B S T R A K

**Background :** Anemia during the postpartum period is one of the causes of maternal death in Indonesia with an incidence rate of up to 30% cases. Most of them are caused by iron deficiency. It can disrupt oxygen transport due to the function of iron as a form of hemoglobin and erythrocyte.

**Goals:** To explain the effect of beets ice cream on the increasing of erythrocyte levels in postpartum mothers with anemia

**Method:** This research is a Quasi experiment type by using a pretest-posttest with a controlled group. The sample of this study was 30 respondents of postpartum mothers with anemia and then divided into 2 groups, they are 15 respondents for treatment groups and 15 respondents for controlled groups. The sampling technique used in this study was accidental sampling and the variables in this study were giving beets ice cream for 7 days as the independent variable and the level of erythrocytes as the dependent variable. The measurement tools for this study included observation sheets, blood sampling tools, and hematology analyzers. The data in this study were analyzed with paired t-tests, independent t-tests, and one-way ANOVA to determine the effect of therapy on the increase in erythrocytes.

**Result:** 11 grams of beets ice cream treatment for 7 days toward postpartum mother can increase the level of erythrocytes up to 1,2907 with a *p-value* of 0,000 ( $p < 0,05$ ). One-way ANOVA test shows a significant result of erythrocytes levels for a group of sampling with ( $p = 0,004$ ).

**Conclusion:** 11 beets ice cream given to postpartum mothers with anemia

## INTRODUCTION

The Maternal Mortality Rate (MMR) in Indonesia is one of the priority issues in the health sector nowadays. The immediate cause of death can be a medical cause or a non-medical cause. The maternal mortality rate is the number of maternal deaths during pregnancy, childbirth, and postpartum caused by several factors during pregnancy, childbirth, postpartum, and their management in 100,000 live births.<sup>[1]</sup> Generally, maternal mortality in Indonesia is caused by direct and indirect obstetric problems. Direct obstetric causes consist of bleeding 28%, preeclampsia/eclampsia 24%, infection 11%, while indirect causes consist of nutritional problems including anemia in pregnant women 40%. Chronic energy deficiency 37%, as well as pregnant women with energy consumption below the minimum requirement of 44.2%.<sup>[2]</sup>

Data from the World Health Organization (WHO) regarding the maternal mortality rate (MMR) in 2015 reported that maternal mortality was 216/per 100,000 live births in the world. While Indonesia itself has an MMR rate of 305/100,000 live births in 2015 and 235/100,000 live births in 2016.<sup>[1]</sup> The prevalence of maternal mortality (MMR) in Central Java showed that there were 619 cases with a mortality rate of up to 111.16/100,000 live births in 2015 and there was decrease in the mortality rate in 2016 with 602 cases with a mortality rate of up to 109.65/100,000 live births. This number was controlled until 2017 with the maternal mortality rate fell to 88.58/per 100,000 live births. .<sup>[3-5]</sup> While the number of maternal mortality rate in Semarang City already decrease from 2015 up to 2017 with the number of the case being 128,05/100.000 live birth (35 people) in 2015 and then 121.5/100,000 live births (32 people) in 2016 and 88.3/100,000 live births (23 people) in 2017.<sup>[6-8]</sup>

The research proved that the risk factor in the quality of health status, consisting of nutritional status, anemia, medical history, and pregnancy complications are 10 times greater risk for maternal mortality cases compared to mothers who have low-risk health status.<sup>[9]</sup> Anemia is mentioned as one of the risk factors. It was explained that nutritional status, several medical histories and pregnancy complications can be associated with anemia.<sup>[9]</sup> Anemia is a condition where the level of hemoglobin is less than normal. Normally it's around 11-12gr/dl before delivery.<sup>[10]</sup> The incidence of anemia is found all over the world, especially in developing countries, it often occurs in reproductive women such as pregnant and postpartum due to iron deficiency. The incidence of anemia in developing countries is 45% and in developed countries is 13%.<sup>[11]</sup> According to WHO the incidence of anemia in postpartum mothers is 56%, in India the cases of maternal mortality due to anemia are 19% of cases in postpartum mothers are 65% -75%.<sup>[15]</sup>

Postpartum maternal mortality in Indonesia due to anemia is 30%.<sup>[3]</sup> Most of the causes of anemia are iron deficiency which is characterized by low levels of hemoglobin, hematocrit, number of erythrocytes, and decreased levels of ferritin. Erythrocytes carry oxygen to the body's tissues while hematocrit measures the condition of the erythrocytes. <sup>[13]</sup> The therapy for anemia can be pharmacological or non-pharmacological. Pharmacological therapy is by consuming Fe tablets for 40 days and non-pharmacological therapy is by using herbs either from animals or plants one of them was using beets. Beets contain 34% folic acid, 14% potassium, 13.6% fiber, 10.2% vitamin C, 9.8% magnesium, 1.4% tryptophan, 7.4% iron, 6.5% copper, phosphorus 6.5%. and other minerals such as Sodium (Na), Zink (Zn), Calcium (Ca), Potassium (K), magnesium (Mg), and Phosphorus (P).<sup>[14]</sup> Beets have a role in cell metabolism to build erythrocyte and stimulate blood circulation because it contains folic acid and B12. <sup>[15]</sup>

The research related to the increase of erythrocyte index for female adolescents with anemia shows that there is a significant increase in the level of the erythrocyte index after consuming beets. The average Hemoglobin level increased by 1.3 g/dl (12%), the hematocrit increased by 4 vol% (13%), and the number of erythrocytes increased by 310,329 cells/ $\mu$ l (8.4%). For the Erythrocyte Index, there was an increase in the average MCV value of 3fl (3.5%), the MCH value increased by 1 pg (3%) and the MCHC value increased by 1 point or 3%.<sup>[16]</sup> The research above is supported by proven research in Purwokerto that 500 ml of beets juice and Fe tablets are given to pregnant women in Purwokerto. It is proven to increase the level of Hemoglobin much higher than giving only Fe tablets. The results of the study obtained an average Hb level of pregnant women in the experimental group before giving beets juice was 9.50 gr/dL and 9.18 g/dL in the control group. After the administration of beets juice there was an increase in Hb levels, where in the experimental group the Hb level was 11.27 gr/dL and in the controlled group was 9.22 gr/dL . The result of statistical test on that research found a significant increase with  $P < 0.05$ .<sup>[16,17]</sup>

## METHOD

The type of this research is a quantitative study using a true experiment design study with a pretest-posttest controlled group design, it is conducting a pretest in both groups (the treatment group and the controlled group) and followed by intervention in the treatment group, then conducted a post-test in both groups after the intervention is complete.<sup>[18]</sup> The reference population in

this study were all postpartum mothers with anemia. While the study population was all postpartum mothers with anemia at the Gunung Pati, Pudukpayung, Kedungmundu, Srandol, and Ngesrep Health Centers from July to September 2019.

The sample in this study were postpartum mothers with anemia as many as 30 respondents and then divided into 2 groups, 15 respondents for treatment groups and 15 respondents for controlled groups. The sampling technique in this study was using accidental sampling and the variables in this study were consuming beets ice cream for 7 days as the independent variable and the level of erythrocytes as the dependent variable. The inclusion criteria for respondents with Hb levels > 8 and ≤ 12 gr/dl, aged 20 to 35 years, did not consume any other supplements except Fe tablets, and were willing to be respondents. The exclusion criteria were postpartum mothers with complications (infection) or other diseases and postpartum mothers who move on from their residence. This research procedure consists of 4 stages. The first is the preparation stage, asking for a research permit and research instruments, then the research stage was filling out an informed consent sheet.

The second step of this research was the intervention stages in Semarang City health center work area. The respondent was divided into 2 groups, they are treatment group belong to anemic postpartum mothers who consumed Fe tablets and given 11 grams of beets ice cream for 7 days and the controlled group belong to postpartum mothers who consumed Fe tablets only for 7 days. The third stage was final observation for respondents who already receive beets ice cream for 7 days. That was measuring hemoglobin levels, hematocrit levels, erythrocyte counts, and ferritin levels on day 8. The fourth stage was collecting the data of erythrocytes level before and after receive beets ice cream.

The instruments of this study were observation sheets, blood sampling tools, erythrocyte count tools (using the Hematology Analyzer method in collaboration with the GAKY UNDIP Semarang laboratory), beets ice cream (made in the Semarang Polytechnic nutrition laboratory assisted by a Semarang Polytechnic nutritionist). Data analysis in this study used paired t-tests, independent t-tests and one-way ANOVA to determine the effect of therapy on the increase of erythrocytes level. Normality test for the data in this study used the Shapiro-Wilk method because the number of samples was less than 50 respondents.

## RESULT DAN DISCUSSION

**Table 1 Normality Test for Erythrocytes Level Before and After Intervention Towards Treatment Group and Controlled Group**

Variable	Group	<i>p</i> *	Keterangan
erythrocytes level	Treatment		
	Pre	0,386	Normal
	Post	0,885	Normal
	Controlled		
	Pre	0,254	Normal
	Post	0,964	Normal

\*: analyzed by *saphiro-wilk*

Table 1 shows a normal distribution towards treatment group and controlled group (*p*>0,05).

**Table 2 Difference Analysis of Erythrocytes Level Before and After Intervention Towards Treatment Group and Controlled Group**

Variable and Group (N=15)	Intervention Mean±SD	Controlled Mean±SD	<i>p-value (uji T)</i>
<b>Erythrocytes Level</b>			
Pre	3,5153 ± 0,27687	3,3953 ± 0,34092	0,441
Post	4,8060 ± 0,46212	4,1860 ± 0,39045	0,004
<b><i>p-value (paired t-test)</i></b>	0,000	0,000	
Deviation	1,2907 ± 0,43200	0,7907 ± 0,24829	0,008

\*: analyzed by *T-dependent test*

**Table 3 ANOVA Test Analysis the Effect of Increasing Hemoglobin Levels, Hematocrit Levels, Erythrocyte Counts, and Ferritin Levels After Receiving Beets Ice Cream**

		<i>Sum of Squares</i>	<i>df</i>	<i>Mean Square</i>	<i>F</i>	<i>Sig*</i>
<b>Erythrocytes</b>	<i>Between Groups</i>	1.298	1	1.298	9.675	.004
	<i>Within Groups</i>	3.756	28	.134		
	<i>Total</i>	5.054	29			

\*: analyzed by *One Way ANOVA*

Table 2 shows the results for treatment group the average number of erythrocytes before intervention was 3.5153 and after intervention was 4.8060, while in the controlled group the average number of erythrocytes before intervention was 3.3953 and after intervention was 4.1860. The mean value of the difference before and after receiving intervention in the treatment group is 1.2907 and in the controlled group is 0.7907. Based on the results of statistical analysis showed that there were differences in erythrocytes in the intervention group that consumed beets ice cream and Fe tablets and the controlled group that consumed Fe tablets only, an independent t-test was performed. Based on the results of the independent t-test in (table 2) it was found that the p-value was  $0.000 < 0.05$ , therefore it can be concluded that regular consumption of beets ice cream and Fe tablets for 7 days had a significant effect on the increased erythrocytes levels. The ANOVA test also showed an increase in erythrocyte levels with a significant increase in hematocrit ( $p=0.004$ ). It can be concluded that beets ice cream at a dose of 11 mg had a significant effect on the increase in erythrocytes in postpartum mothers with anemia.

These results are in accordance with the theory that beets contain most of vitamin A and vitamin C, calcium, iron (Fe), folic acid, vitamin B12, protein, vitamin B6, phosphorus, protein and carbohydrates, and beta-senin. Iron (Fe), vitamin B12, protein and vitamin B6 is helped in the forming of erythrocytes. Vitamin C converts Fe from ferric to ferrous, therefore it is easier for the body to absorb Fe. In addition, beets also have abundant benefits. Researchers from Oxford Brookes University showed that 70 ml of beet juice is containing total antioxidants up to  $697.9 \pm 1.6$   $\mu\text{mol}$ , beets are useful to maintain the balance of free radicals (ex. Reactive Oxygen and Nitrogen Species) to remain within normal limits thereby reducing the risk of stress oxidative.<sup>[19]</sup>

The results of the study by Beshel Nyoh et al (2018) stated that beetroot extracts that were given to rats had an anti-anemia effect and were effective in defending the body against anemia. The erythrocyte index increased in the intervention group compared to the controlled group.<sup>[20]</sup> Irawati, Kartika, and Rokhana showed that there was a significant increase in the erythrocyte index value of young women with anemia after consuming beets. Previous studies have shown that beetroot increased the erythrocyte index. The increase of erythrocytes affects the increase in hematocrit in the blood. Consuming beets along with Fe tablets automatically increases the amount of hematocrit in the blood.<sup>[21]</sup>

The structure of the erythrocyte consists of an outer covering or stroma which contains a mass of hemoglobin. Erythrocytes need protein because their structure is formed from amino acids and also iron for erythropoiesis. Women need more iron than men because some of it is excreted during menstruation, pregnancy, and childbirth. The formation of erythrocytes and their development goes through several stages. First, they are large and contain a nucleus, then they are filled with hemoglobin and finally, they lose their nucleus, and circulate into the blood cycle. The process of erythropoiesis occurs for 7 days, the normal number of erythrocytes produced is 4.5-6.5 million/mm<sup>3</sup> in men while in women it is 3.9-5.6 (million/mm<sup>3</sup>).<sup>[22]</sup>

The function of erythrocytes is to bind oxygen (oxyhemoglobin) from the lungs to be circulated throughout the body and bind carbon dioxide from the body's tissues to be excreted through the lungs.<sup>[22]</sup> Erythrocytes are the most abundant cells in the peripheral blood, the number of erythrocytes in normal adults ranges from 4-6 million cells/ $\mu\text{l}$ . Formation and maturation of erythrocytes in the bone marrow lasts about 7 days, in the peripheral blood the nucleus is generally lost. Reticulocytes are the youngest cells in the peripheral blood. Very fast formation of erythrocytes can cause reticulocyte protanase in the blood

circulation increase up to 30-50% from the total number of erythrocytes. The length of life for erythrocytes after being released from the bone marrow is approximately 120 days.<sup>[23]</sup>

## CONCLUSION

There was an effect of beets ice cream on the average increase in erythrocyte levels for the treatment group compared to the controlled group. Beets are proven to be effective in increasing the number of erythrocytes with  $p=0,004$

## ANNOUNCEMENT

We would like to acknowledge the Poltekkes Kemenkes Semarang and Semarang Public Health Centre for facilitating the provision of data on anemia cases among pregnant women. The Ngesrep Public Health Centre and Diponegoro University for providing technical support for this study.

## REFERENCE

- [1] Kemenkes RI. *Profil Kesehatan Indonesia Tahun 2017.*; 2017.
- [2] Wasfaedy Alamsyah, faktor-faktor yang berhubungan dengan kejadian penyakit anemia pada ibu hamil usia kehamilan 1-3 bulan di wilayah kerja puskesmas bontomarannu kabupaten gowa. 2020;1(2) ; 2722-9475  
file:///Users/kapalocolak/Downloads/48-Article%20Text-115-2-10-20200709.pdf
- [3] Dinas Kesehatan Provinsi Jawa Tengah. *Profil Kesehatan Provinsi Jawa Tengah Tahun 2015.*; 2015.
- [4] Dinas Kesehatan Provinsi Jawa Tengah. *Profil Kesehatan Provinsi Jawa Tengah Tahun 2016.* Published online 2016.
- [5] Dinas Kesehatan Provinsi Jawa Tengah. *Profil Kesehatan Provinsi Jawa Tengah Tahun 2017.*; 2017.
- [6] Dinas Kesehatan Kota Semarang. *Profil Kesehatan Kota Semarang Tahun 2015.*; 2015.
- [7] Dinas Kesehatan Kota Semarang. *Profil Kesehatan Kota Semarang Tahun 2016.*; 2016.
- [8] Dinas Kesehatan Kota Semarang. *Profil Kesehatan Kota Semarang Tahun 2017.* Published online 2017.
- [9] Jayanti KD, N HB, Wibowo A. Faktor Yang Memengaruhi Kematian Ibu (Studi Kasus Di Kota Surabaya). *J Wiyata Penelit Sains dan Kesehat.* 2017;3(1):46-53. <http://ojs.iik.ac.id/index.php/wiyata/article/view/70>
- [10] Perello M, Colona J, Masoller N, Esteve J, M P. Intravenous Ferrous Sucrose Versus Placebo In Addition to Oral Iron Therapy For The Treatment of Severe Posrpartum Anemia: A Randomised Controlled Trial. *J Obstet Gynecol.* 2014;6(121):706-713.
- [11] Pfenniger A, Achuller C, Cristoph P, Surbek D. Safety and Efficacy Of Highdose Intravenous Iron Carboxymaltose VS Iron Sucrose For Treatment of Postpartum Anemia. *Int J Gynecol Obstet.* 2013;6(9):375-380.
- [12] Chandhiok N, Dhillon B, Datey S, Mathur A, Saxena N. Oral Misoprostol For Prevention Of Postpartum Hemorrhage by Paramedical Workers in India. 2013;2(92):170-175.
- [13] Swati. Evaluation of Iron Sucrose For Post Partum Anemia. Published online 2013.
- [14] Midelton. Treatment For Women With Postpartum Iron Deficiency Anemia The Cochrane Library Wiley. Published online 2017.
- [15] Kenjalee A. Dietary Nitrate Supplementation Enhances Exercise Performances In Peripheral Arterial Diseases. *J Appl Physiol.* Published online 2011.
- [16] Ikawati K, Rokhana. Pengaruh Buah Bit (Beta vulgaris ) Terhadap Indek Eritrosit pada Remaja Putri dengan Anemia. *J Nurs Public Heal.* 2018;6(2):60-66. <https://jurnal.unived.ac.id/index.php/jnph/article/view/659/570>
- [17] Wenda S. Efektivitas Pemberian Jus Buah Bit Terhadap Kadar Haemoglobin Ibu Hamil Dengan Anemia. *Univ Riau.* Published online 2018.

- [18] Handiarsa A, Nugroho S, Prawirohartono EPP. Apakah Hipertensi Arteri Pulmonal Merupakan Faktor Risiko Malnutrisi pada Penyakit Jantung Bawaan Asianotik dengan Pirau Kiri ke Kanan. *Sari Pediatr.* 2016;18(1):12. doi:10.14238/sp18.1.2016.12-16
- [19] Nora M, Amalajari G. Perbandingan Efektivitas Madu dengan Ekstrak Buah Bit (Beta Vulgaris) terhadap Peningkatan Kadar Hemoglobin (Hb) Pada Mencit Putih Jantan (Mus Musculus L) Strain Double Ditsch Webster. Published online 2018.
- [20] Nyoh B. The Ethanolic Extract of Beetroot (Beta Vulgaris) Ameliorates Some Red Cell Parameters In Phenylhydrazine-Induced Anaemic Rats. *J Nurs Heal Sci.* Published online 2018.
- [21] Irawati, Kartika, Rokhana. Pengaruh Buah Bit (Beta Vulgaris) Terhadap Indek Eritrosit Pada Remaja Putri Dengan Anemia. *JNPH.* 2018;6(2).
- [22] Made BI. *Hematologi Klinik Ringkas.* EGC; 2006.
- [23] Watters M, Miller G, Worwood F. Serum Ferritin Concentration And Iron Stores In Normal Subjects. *J Clin Pathol.* 1973;10(26):770-772.