The Effect of Beetroot Juice Administration on Hemoglobin Levels in Pregnant Women with Anemia in the Grabag 1 Public Health Center Area, Magelang Regency

Anggita Candra Pratiwi[1], Sulastri[2]
Fakultas Ilmu Kesehatan, Universitas Muhammadiyah Surakarta, Indonesia[1,2]
Email: sulastri@ums.ac.id

ABSTRACT

Anemia in pregnant women is a significant health problem in Indonesia, with a prevalence of 36.3% according to Riskesdas 2018. Iron deficiency is a major cause of anemia, which can increase the risk of pregnancy complications and maternal and neonatal mortality. This study aims to determine the effect of beet juice on increasing hemoglobin levels in pregnant women with anemia at Grabag I Health Center, Magelang Regency. The research method used a quasi-experimental design with one group, involving 31 respondents who were selected by purposive sampling. Beetroot juice was given for seven days, and hemoglobin levels were measured before and after the intervention. The results of the study are expected to make a scientific contribution and become a reference for health workers and related agencies in efforts to handle anemia in pregnant women. This research is also expected to increase the collection of reading materials in the library of the University of Muhammadiyah Surakarta.

| KEYWORDS | *Anemia, pregnant women, beet juice, hemoglobin levels, maternal health.* |

INTRODUCTION

Anemia in pregnant women is a health problem that often occurs in Indonesia. According to Basic Health Research (Riskesdas) in 2018, the prevalence of anemia in pregnant women in Indonesia reached 36.3%. Anemia in pregnant women can lead to the risk of pregnancy complications and increase maternal and neonatal mortality. One of the main causes of anemia is iron deficiency. Anemia is a condition in which red blood cells are insufficient for the physiological needs of the body. These physiological needs are different for each person, which can be influenced by gender, place of residence, smoking behavior, and pregnancy stage. According to WHO, anemia in pregnancy is established when hemoglobin (Hb) levels <11 g/dL. Meanwhile, the Center of Disease Control and Prevention defines anemia as a condition with Hb levels of <11 g/dL in the first and third trimesters,

Hb <10.5 g/dL in the second trimester, and <10 g/dL in the postpartum period. (Of et al., 2022)

The incidence of anemia or lack of blood in pregnant women in Indonesia is still relatively high, which is 48.9% (according to the Indonesian Ministry of Health in 2019). This condition says that anemia is quite high in Indonesia and shows a figure close to a severe public health problem with a prevalence limit of more than 40% (Ministry of Health of the Republic of Indonesia, 2013). Pregnant women with anemia will experience an increased risk of morbidity and mortality, especially an increase in mortality in the event of postpartum hemorrhage, while its impact on the fetus will increase the risk of premature birth, low birth weight, and low Apgar value. (Of et al., 2022)

According to WHO (2015), the prevalence of anemia among pregnant women in the world ranges from an average of 14%, in developed countries 56%, and in developing countries between 35-75%. Globally, 52% of pregnant women in a country suffer from anemia. This figure is greater than the rate of anemia in pregnant women in developed countries which reaches 20%. The country with the highest prevalence of anemia in pregnant women is India (88%), followed by Africa (50%), while Indonesia is ranked 58th with a prevalence of anemia in pregnant women of 44.3% (Khairiah & Butar-Butar, 2023)

Anemia, commonly known as low hemoglobin levels in the blood, reduces oxygen delivery to the body's organs, especially important organs such as the brain and heart. Blood viscosity is affected by anemia. Blood viscosity can decrease up to 1.5 times in severe anemia when compared to water viscosity. This situation reduces peripheral vascular resistance to blood flow, which increases cardiac output because more blood flows from normal tissues and then returns to the heart. Thus, anemia can increase cardiac output and improve the heart's ability to pump (Bangun & Siahaan, 2023). These red blood cells function to deliver oxygen to all body tissues, including the fetus in the womb. If the oxygen supply is not enough, then the fetus can experience slow growth and even its birth is at high risk. One way to prevent or overcome anemia in pregnant women is to give iron supplements regularly every month from the beginning of pregnancy to delivery. But unfortunately, there are still many parents in rural areas who do not pay attention to the importance of giving this supplement to pregnant women so that the number of anemia cases tends to increase. This fact can be seen from the results of interviews conducted with the coordinator of the Grabag sub-district that most pregnant women complain of nausea, dizziness, and often forget to take iron supplements regularly. In addition to iron, pregnant women can also increase iron intake through food. Planned food sources include red meat, processed cow's milk, beef/chicken liver, shellfish, nuts, green vegetables and fruits. Sweet potato is one of all fruits that contains a lot of folic acid, which is 108 mg more than other fruits. Naturopathic experts also recommend this fruit as a colon cleanser (Gustina et al., 2020)

Beets (Beta vulgaris) are non-pharmacological alternative food sources that contain iron, where beets can increase hemoglobin levels in pregnant women. Beetroot also known as sugar beet and radish, is a plant species of the Amaranthaceae family. This plant is one of the most widespread bulbous plants in North America and the United Kingdom. This plant grows in Indonesia in areas that have fertile, loose soil, pH 6–7, sufficient rainfall and at an altitude of more than 100 meters (H. A. Putri et al., 2020). Carbohydrates, vitamins, fats and proteins are

the contents contained in beets, which have beneficial effects on the health of the body (M. C. Putri & Tjiptaningrum, 2016). Beets contain 14.8% potassium, 13.6% fiber, 10.2% vitamin C, 9.8% magnesium, 1.4% tryptophan, 7.4% iron, 6.5% phosphorus, and 6.5% coumarin. The human body needs iron to increase the production of hemoglobin, which is an oxygen-carrying protein in the blood. Hemoglobin is a protein containing iron (metalloprotein) in red blood cells that functions as a carrier of oxygen from the lungs to the entire body. Hemoglobin also functions as a carrier of carbon dioxide back to the lungs to be exhaled out of the body (Ghafouri, 2016). Iron prevents anemia caused by symptoms of low hemoglobin and causes symptoms of fatigue, bad mood, shortness of breath, and heartburn (Hasanah Hasibuan & Wulandary, 2022).). Beetroot contain high levels of folic acid which is very good in improving brain function in babies. Beetroot work by stimulating the circulatory system and helping in building red blood cells because the content of folic acid and vitamin B12 in beetroot are the most important ingredients needed in cellular metabolism and in the development of erythrocytes (Pibriyanti et al., 2021). Beets are well-known in Eastern Europe and are therefore used to treat leukemia (M. C. Putri & Tjiptaningrum, 2016). Previous research conducted by Dina Dewi Anggraini in 2018 explained that the results of a study on Hb levels in pregnant women with anemia after being given beet juice for 7 days, it was known that most (56.2%) pregnant women experienced an increase in Hb levels (Lestari et al., 2022). This is the reason for the researcher to conduct a study entitled "THE EFFECT OF BEET JUICE IN INCREASING HEMOGLOBIN LEVELS OF PREGNANT WOMEN WITH ANEMIA IN THE GRABAG I HEALTH CENTER AREA, MAGELANG REGENCY"

This research aims to find out. Effect of Beetroot Juice in Increasing Hemoglobin Levels of Pregnant Women with Anemia in the Grabag I Health Center Area, Magelang Regency.

The results of this research are expected to make a scientific contribution to the world of education and provide benefits for health workers, especially nursing students. This research is also expected to enrich knowledge and become a reference for future research. This research is expected to provide input for related agencies in setting policies in the health sector. In addition, this research can also add to the collection of reading materials in the Library of the University of Muhammadiyah Surakarta which will be a guide for students and students who will conduct further research. The benefit of this study is to provide additional insight and knowledge in applying the knowledge obtained during the education period at the Midwifery Department of the University of Muhammadiyah Mataram, especially in the field of the influence of beet juice in increasing hemoglobin levels of pregnant women with anemia in the Grabag 1 Health Center area, Magelang Regency.

RESEARCH METHOD

Research Design

This study uses an experimental research design with Quasi Experiment using pretest and postest with one group design.

Location and Time

This research was conducted in the Grabag 1 Health Center Working Area. The research was carried out in February – March 2024.

Population and Sample

1. Population

Population is a generalization area consisting of objects or subjects that have a certain number and characteristics, which are determined by the researcher to be the focus of the study and to draw conclusions. In this study, the population consisted of 150 pregnant women who conducted examinations in the Grabag 1 Health Center Working Area for one year.

2. Sample

The sample is a partial or representative of the population studied (Arikunto, 2018). In this study, sampling was carried out using the Purposive sampling method. The Purposive sampling method is one of the non-random sampling techniques in which the researcher deliberately determines special characteristics that are in accordance with the purpose of the research to select the sample, so that it can provide answers to the problems being studied. The research sample is part of the population that has met the inclusion and exclusion criteria that have been set for this study.

a. Inclusion criteria:
1) All Pregnant Women Are Anemic
2) Be willing to be a respondent.
3) Fully aware and able to answer all questions about his condition.

b. Exclusion criteria:
1) Uncooperative mothers
2) Pregnant women who do not have chronic or degenerative diseases
3) Perform blood transfusions, during the time of the study.
4) Pregnant women are sick/hospitalized
5) Pregnant women who withdraw during data collection

3. Sampling techniques

The population in this study consists of pregnant women who are in the working area of the Grabag 1 Health Center. Then samples were taken from affordable populations that met the inclusion and exclusion criteria. The sampling technique uses pusposive sampling. The sample taken is a minimum sample of 30 people. Keringler and Lee (2000) recommend that the minimum number of samples in a quantitative study is 30 people.

RESULT AND DISCUSSION

The respondents studied were pregnant women in the assisted area of the Grabag 1 Health Center of Magelang Regency who were selected using the purposive sampling technique. The respondents who were sampled in this study were 31 pregnant women with purposive sampling techniques. Before being given beetroot juice, the hemoglobin level had been checked first and also after being

given beet juice, it was checked again. The instrument uses observation. Data analysis using paired t-test.

In this study, the author gave beet juice with a dosage of 60 grams of beets and 200 ml of water then blended and filtered. Beetroot juice was given to each respondent once a day for seven consecutive days.

Table 1. Research Respondents Pregnant women with anemia at Grabag Health Center 1.

It	Pregnant Women's Names	Husband's Name	Age	Residence	GPA	Gestational Age (Sunday)
1	Rina	Fauzi	41	Lengkong, Seworan	321	33
2	Khairunisa	M Zakaria	19	Nasri, Sidogede	100	34
3	Jamilatun Rodiyah	Syahrul Awaludin	19	Kudusan Tirto	100	35
4	Ananda Putri	Iwan	23	Pijahan, Kalipucang	100	30
5	Yeni Minarni	Edi	36	Candilor, Ngasinan	421	33
6	Sri Wahyu W	Hengki	28	Kragan Losari	210	34
7	Akta Dwianti	Anif Fahrudin	34	Kebonsari Citrosono	430	32+4
8	Supianah	Abdul Rasyid	36	Bleder, Ngasinan	210	34+1
9	Atik Masrukatun	Saifudin	34	Mejing Banjarsari	210	34
10	Sofiyati	Slamet	26	Ngaran Ngasinan	100	33+6
11	Wahyuni A	Ahmad Zazuli	29	Ngleter Tlogorejo	210	33+2
12	Nur Halimah	Agus	24	Pampung, Sumurarum	100	31+5
13	Ariza Fitri	Didy Kurniadi	24	Caban Jurang, Kartoharjo	100	33+3
14	Nur Rofilailiyah	Akhmad Khasanudi	30	Seworan	320	33
15	Halida Julia	Didik Prasetyo	21	Ngrancah	100	32
16	Khairunisa	M Zakaria	19	Nasri, Sidogede	100	29
17	Nurul Anriyani	Wahyu	23	Purwogondo, Sumurarum	100	34
18	Atiya Amanah	Nur Kolis	22	Kragan, losari	100	18

19	Luluk	Wahyu	22	Losari	302	10
20	Unaisun	Botok Nursodik	27	Kaligading, Citrosono	210	30
21	Parwati	Saeroji	26	Tempel, Tirto	220	28
22	Septi Laila	Ahranujaza	24	Tirto	100	6
23	Wahyu Lestari	Rendi	19	Sambungrejo	100	29
24	Arifah	Nursodik		Krajan, Kartoharjo	320	28
25	Qilmatus Saadah	M Khoirul	26	Paingan, Kleteran	320	28
26	Laila K	Eko Arfan	31	Kleteran	210	28
27	Syarifah	Agus Fitriyanto	33	Ponggolan, Citrosono	320	24
28	Nurfaizah	Khoirul Anwar	31	Petak, Citrosono	210	33
29	Mughtafiroh	M Hasin Basri	39	Sorobayan, Banaran	320	31
30	Tri Mulyani	Afif Budi	38	Gentan, Tirto	210	30
31	Khasanah	Achmad Irwan	24	Kalipucang, Banyusari	100	36

Table 1 shows the number of respondents to be studied, namely 31 pregnant women in the target area of the Grabag 1 Health Center. The 31 respondents had a history of anemia. The respondents will then be given beet juice.

Table 2. Hb Levels Before Beetroot Juice

No	Pregnant Women's Names	Husband's Name	Age	Residence	GPA	Pregnancy Age (Sunday)	Initial Hb Rate g/dL
1	Rina	Fauzi	41	Lengkong, Seworan	321	33	10,5
2	Khairunisa	M Zakaria	19	Nasri, Sidogede	100	34	10,5
3	Jamilatun Rodiyah	Syahrul Awaludin	19	Kudusan Tirto	100	35	10,5
4	Ananda Pu-tri	Iwan	23	Pijahan, Kalipucang	100	30	10
5	Yeni Minarni	Edi	36	Candilor, Ngasinan	421	33	9,1
6	Sri Wahyu W	Hengki	28	Kragan Losari	210	34	10
7	Akta Dwianti	Anif Fahrudin	34	Kebonsari Citrosono	430	32+4	10,4

8	Supianah	Abdul Rasyid	36	Bleder, Ngasinan	210	34+1	10,8
9	Atik Masrukatun	Saifudin	34	Mejing Banjarsari	210	34	10,7
10	Sofiyati	Slamet	26	Ngaran Ngasinan	100	33+6	10,7
11	Wahyuni A	Ahmad zazuli	29	Ngleter Tlogorejo	210	33+2	8,5
12	Nur Halimah	Agus	24	Pampung, Sumurarum	100	31+5	10,1
13	Ariza Fitri	Didy Kurniadi	24	Caban Ju-rang, Kartoharjo	100	33+3	10,8
14	Nur Rofilailiyah	Akhmad Khasanudi	30	Seworan	320	33	10,2
15	Halida Julia	Didik Prasetyo	21	Ngrancah	100	32	10,4
16	Khairunisa	M Zakaria	19	Nasri, Sidogede	100	29	10,5
17	Nurul Anriyani	Wahyu	23	Purwogondo, Sumurarum	100	34	10
18	Atiya Amanah	Nur Kolis	22	Kragan, losari	100	18	9,6
19	Luluk	Wahyu	22	Losari	302	10	10,3
20	Unaisun	Botok Nursodik	27	Kaligading, Citrosono	210	30	10,6
21	Parwati	Saeroji	26	Tempel, Tirto	220	28	10
22	Septi Laila	Ahranujaza	24	Tirto	100	6	8,6
23	Wahyu Lestari	Randy	19	Sambun-grejo	100	29	10,6
24	Arifah	Nursodik		Krajan, Kartoharjo	320	28	9
25	Qilmatus Saadah	M Khoirul	26	Paingan, Kleteran	320	28	10,4
26	Laila K	Eko Arfan	31	Kleteran	210	28	10,3
27	Syarifah	Agus Fitriyanto	33	Ponggolan, Citrosono	320	24	10,2
28	Nurfaizah	Khoirul Anwar	31	Petak, Citrosono	210	33	10,6
29	Mughtafiroh	M Hasin Basri	39	Sorobayan, Banaran	320	31	10

30	Tri Mulyani	Afif Budi	38	Gentan, Tirto	210	30	10,5
31	Khasanah	Achmad Irwan	24	Kalipucang, Banyusari	100	36	10
			Mean				10,876 g/dL

From table 2, it appears that the Hb level is below 11 g/dL. The average Hb level obtained from the initial data collection was 10.876 g/dL. This shows that the respondents are pregnant women with anemia.

From the initial data, the standard deviation from the formula is obtained as follows.

$$\sigma = = 0,601\sqrt{\frac{\sum_{i=1}^{N} (x_1 - \underline{x})2}{n-1}}$$

Table 3. Hb Levels After Beetroot Juice

No	Pregnant Women's Names	Husband's Name	Age	Residence	GPA	Pregnancy Age (Sunday)	Final Hb Rate g/dL
1	Rina	11,2	41	Lengkong, Seworan	321	33	11,2
2	Khairunisa	11,9	19	Nasri, Sidogede	100	34	11,9
3	Jamilatun Rodiyah	10.8	19	Kudusan Tirto	100	35	10.8
4	Ananda Putri	10,2	23	Pijahan, Kalipucang	100	30	10,2
5	Yeni Minarni	10,8	36	Candilor, Ngasinan	421	33	10,8
6	Sri Wahyu W	12,2	28	Kragan Losari	210	34	12,2
7	Okta Dwianti	11,2	34	Kebonsari Citrosono	430	32+4	11,2
8	Supianah	11,2	36	Bleder, Ngasinan	210	34+1	11,2
9	Atik Masrukatun	12,5	34	Mejing Banjarsari	210	34	12,5
10	Sofiyati	12,2	26	Ngaran Ngasinan	100	33+6	12,2
11	Wahyuni A	10,3	29	Ngleter Tlogorejo	210	33+2	10,3
12	Nur Halimah	10,9	24	Pampung, Sumurarum	100	31+5	10,9
13	Ariza Fitri	11,4	24	Caban Ju-rang, Kartoharjo	100	33+3	11,4

14	Nur Rofilailiyah	11,9	30	Seworan	320	33	11,9
15	Halida Julia	12,1	21	Ngrancah	100	32	12,1
16	Khairunisa	11,2	19	Nasri, Sidogede	100	29	11,2
17	Nurul Anriyani	10,1	23	Purwogondo, Sumurarum	100	34	10,1
18	Atiya Amanah	10,5	22	Kragan, losari	100	18	10,5
19	Luluk	11,7	22	Losari	302	10	11,7
20	Unaisun	12,5	27	Kaligading, Citrosono	210	30	12,5
21	Parwati	11,3	26	Tempel, Tirto	220	28	11,3
22	Septi Laila	9,6	24	Tirto	100	6	9,6
23	Wahyu Lestari	11,9	19	Sambungreo	100	29	11,9
24	Arifah	11		Krajan, Kartoharjo	320	28	11
25	Qilmatus Saadah	11,2	26	Paingan, Kleteran	320	28	11,2
26	Laila K	11,2	31	Kleteran	210	28	11,2
27	Syarifah	11,9	33	Ponggolan, Citrosono	320	24	11,9
28	Nurfaizah	10,9	31	Petak, Citrosono	210	33	10,9
29	Mughtafiroh	12,2	39	Sorobayan, Banaran	320	31	12,2
30	Tri Mulyani	11,2	38	Gentan, Tirto	210	30	11,2
31	Khasanah	11,9	24	Kalipucang, Banyusari	100	36	11,9
	Mean						16,183 g/dL

Table 3 shows data after being given beet juice, as many as 31 respondents experienced an increase in Hb levels.

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Univarat Analysis

Table 4. Average Hb levels before and after beet juice

Average Hb Rate	N	Mean	Std. Deviation	THEY
Before	31	10,876	0,601	0,010
After	31	16,183	0,734	0,131

In tanel 4. It can be explained that the hemoglobin level of pregnant women before being given beet juice in 31 respondents with an average (mean) of 10.876 g/dL with a standard deviation value of 0.601 and S.E mean (Standard Error Mean) of 0.0109.

Meanwhile, hemoglobin levels in pregnant women after being given beet juice in 31 respondents with an average mean of 16.183 g/dL with a standard deviation of 0.734 and S.E mean (Standard Error Mean) of 0.131

Bivariate Analysis

Table 5. Differences in hemoglobin levels before and after being given beetroot juice

Up to Hb	Mean	Std. Deviation	THEY	THERE 95%	P-Value
	5,307	0,133	0,120	5,41	0.000

The results of the analysis in table 5 can be concluded that there is a difference in hemoglobin levels before and after beet juice where before beet juice is given, the average hemoglobin level of pregnant women is 10.876 g/dL after being given beet juice, the average hemoglobin of pregnant women is 16.183 g/dL. This shows a difference in the average increase in hemoglobin for pregnant women of 5.307 g/dL. The results of the bivariate analysis obtained a P-Value of 0.000 (p<0.05), which shows that there is an effect of beet juice in increasing hemoglobin levels of pregnant women with anemia in the Grabag 1 Health Center Area, Magelang Regency.

Discussion

Average Hemoglobin Levels of Pregnant Women Before and After Beetroot Juice

The results of data processing can be explained that the average hemoglobin level in pregnant women with anemia before being given beet juice at the Grabag 1 Health Center, Magelang Regency in 2024 in 31 respondents with an average (mean) of 10.876 g/dL with a standard deviation of 0.601 and a mean SE of 0.010.

Meanwhile, the hemoglobin level in pregnant women after being given beet juice in 31 respondents had an average (mean) of 16.183 g/dL with a standard deviation of 0.734 and a SE Mean of 0.131.

Hemoglobin (red blood cells) abbreviated as Hb is a metalo protein or protein that contains metalo protein or protein or protein that contains iron in red blood cells. Hemoglobin in pregnant women functions to transport oxygen from the lungs to the rest of the body. In addition, hemoglobin has an important role in maintaining the shape of red blood cells. (Oktaviani et al., 2016).

Lack of hemoglobin levels is called anemia. Anemia can cause various complications, including fatigue and stress on the body's organs. Having normal red blood cell levels and preventing anemia requires cooperation between the kidneys, bone marrow and nutrients in the body. If the kidneys and bone marrow are not functioning, or the body is malnourished then the red blood cell count and normal function may be difficult to maintain. (Proverawati, 2018).

The results of this study are in line with a study conducted by Anggraini et al., (2019) with the title The Effect of Giving Beetroot Juice to Pregnant Women on the Increase in Hemoglobin Levels of Pregnant Women in the Third Trimester. After being given beet juice for 7 days, it was found that most (56.2%) pregnant women in the third trimester who experienced mild anemia experienced an increase in hemoglobin levels. Some respondents who were given beet juice mostly succeeded in increasing hemoglobin levels.

Bivariate Analysis

The results of the analysis of the effect of beet juice on the increase in hemoglobin levels in pregnant women at the Grabag 1 Health Center, Mgelang Regency, obtained a hemoglobin level before being given beet juice of 10.876 g/dL after being given beet juice, the average hemoglobin of pregnant women was 16.183 g/dL. This shows a difference in the average increase in hemoglobin for pregnant women of 5.307 g/dL. Result

Beetroot has many benefits for health and medicine. The betacyanin content in beets is useful as an anti-cancer, because these substances can destroy tumor cells and cancer. Beetroot is also useful for preventing stroke, lowering cholesterol, preventing heart disease, strengthening the immune system, removing toxins from the body, treating infections and inflammation, as a producer of energy for the body and increasing the immune system. Beetroot is one of the fruits that has a complete nutritional content and is very good for regular consumption.

The pathophysiology of beets can increase hemoglobin because beets have a fairly high content of folic acid, which is indispensable in the formation of new red blood cells and hemoglobin in the body. The iron content is quite high, which reactivates and regenerates red blood cells and supplies oxygen that is useful for the health of red blood cells. Beets also contain vitamin C which will make it easier for the body to absorb iron, which means that if iron can be absorbed properly, the formation of new red blood cells will also occur properly and smoothly (Anggraini & Saragita, 2019).

So according to the researcher's assumption, some respondents who were given beet juice mostly succeeded in increasing hemoglobin levels. In this case, the results were obtained that there was an effect of beetroot juice given for seven consecutive days to effectively overcome anemia in pregnancy, as shown by the increase in hemoglobin by 5.307 g/dL.

CONCLUSION

After conducting the study, it was concluded that the average hemoglobin level of pregnant women in the Grabag 1 Health Center area before being given beet juice to 31 respondents was 10.876 g/dL with a standard deviation value of 0.601 and SE mean 0.010. 183 g/dL with a standard deviation value of 0.734 and SE mean 0.131. Bivariate analysis obtained a P-Value of 0.000 (p<0.05), this shows that there is an effect of beet juice on increasing hemoglobin levels of pregnant women with anemia in the Grabag 1 Health Center Area, Magelang Regency

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