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THE EFFECTIVENESS OF BEETROOT JUICE (*BETA VULGARIS*) AND IRON TABLETS ON HEMOGLOBIN LEVELS OF PREGNANT WOMEN IN SUB-DISTRICT OF DARUL IMARAH , THE DISTRICT OF ACEH BESAR

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Abstract

Background : The average mortality caused by anemia in Indonesia and Asia is estimated at 7.26%. According to data from the Aceh Besar District Health Office, it is 88 per 100,000 live births. Data on the incidence of anemia at Puskesmas Darul Imarah in December 2018 was 38.8% or 686 women. The main cause of anemia in pregnant women globally is iron deficiency. Iron deficiency occurs as a result of poor diet. One of the efforts made by the Minister of Health of the Republic of Indonesia in the context of preventing and overcoming anemia is by giving 90 tablets of ferrous sulfate tablet.

Purposes : This study aimed to determine the effectiveness of beetroot juice (*beta vulgaris*) and ferrous sulfate tablet (Fe tablet) on hemoglobin levels of pregnant women with mild anemia.

Methods : This research was quantitative research with a *quasi-experimental design* type. This design had a control group, this quasi-experimental research was used to determine the difference between the treated group and the control group. The experimental research design used in this study was in the form of a *nonequivalent control group design*. The samples of this study were pregnant women with mild anemia in the villages of Gue Gajah and Garot Geuce. Total sample were 30 of pregnant women.

Result: There was a significant difference between hemoglobin levels before and after consuming beetroot juice and ferrous sulfate tablets .

Conclusion : Consuming 250 ml of beetroot juice together with ferrous sulfate tablet was effective in increasing hemoglobin levels in mild anemic pregnant women.

Keywords: Beetroot, Fe tablets, Pregnant women, Anemia.

Introduction

The high maternal mortality rate (MMR) in the world is a problem that needs to be taken seriously. Estimates 500,000 maternal deaths worldwide each year. As for 99 percent of them occur in developing countries, it is estimated that almost one mother dies every minute due to pregnancy and childbirth. The maternal mortality rate in developing countries is estimated at 100 to 1,000 more per 100,000 KH. Whereas in developed countries it ranges from seven to 15 per 100,000 KH. This shows that in developing countries the risk of maternal death is one in 29 deliveries, while in developed countries it is one in 29,000 deliveries. [1] According to the World Health Organization (WHO) in 2015 around 800 women died from complications of pregnancy and childbirth. The average mortality caused by anemia in Indonesia and Asia is estimated at 7.26%. Iron deficiency anemia is one of the most common nutritional deficiencies in pregnant women caused by the increased need for iron to 7 mg per day, which is normally 5 mg per day for women of childbearing age, adolescents, and blood donors. [2]

Pregnancy is a unique period in the life cycle of every woman, pregnancy can pose a risk of maternal death. The MMR in Indonesia in 2015 was 305 per 100,000 live births.

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Meanwhile, the MMR in the district of Aceh Besar in 2015 was 88 per 100,000 live births. One of the health thar contribute to maternal mortality is anemia[3]. The main cause of anemia in pregnant women globally is iron deficiency. The iron deficiency occurs due to poor diet. Iron deficiency anemia can also be caused due to family socioeconomic problems including education and low income. Lack of knowledge about nutrition can lead to high prevalence of anemia during pregnancy. Lack of iron in the diet is a common cause of anemia experienced by pregnant women. The need for iron is not added during pregnancy, so it is easy to develop iron deficiency anemia. Therefore, pregnant women should consume foods rich in iron such as green vegetables, dried beans, dried fruit, and red beets. [4]

One of the efforts made by the Minister of Health of the Republic of Indonesia in the context of preventing and overcoming anemia is by giving 90 of sulfa ferrous tablets (Fe tablet) during pregnancy. This tablet is given to pregnant women and consumed one tablet every day during pregnancy. This effort has been carried out for the last 10 years. However, the prevalence of iron deficiency anemia in pregnancy is still high. This research was conducted by Wenda S and Rini H who got the results that the average Hb and hematocrit levels increased after consuming beetroot juice and Fe tablets. Beetroot (Beta vulgaris) is one of the fruits that is often used as a natural colorant for various types of food, rich in folic acid which is effective in preventing heart disease and anemia. The purple or purplish red color produced by beets is very good for natural food and beverage coloring. This beet contains insoluble fiber which is useful to facilitate the work of the intestines, while the soluble fiber is to stabilize blood sugar and cholesterol levels.[5]

Meanwhile, the maternal deaths in Aceh Besar in 2015 were 6 cases. This case increased from 2014, namely 3 cases[6]. The target number of pregnant women at Puskesmas Darul Imarah was 1,492, and the incidence of anemia in December 2018 was 38.8%, or 686 cases. Compared to some Puskesmas in the district of Aceh Besar, the highest number of anemia in pregnancy was at Puskesmas Darul Imarah. A preliminary survey conducted by researchers in the working area of Puskesmas Darul Imarah, found that 10 pregnant women who were interviewed mentioned that they were dizzy, weak, tired quickly, sleepy, and had a decreased appetite. Based on these problems, the researcher was interested in conducting research on the effectiveness of beetroot juice and Fe tablets for pregnant women with mild anemia in the villages of Gue Gajah and Garot Geuce.

Method

Research design: The *quasi-experimental design* was in the form of a *nonequivalent control group design* used to determine the difference between the treated group and the control group. All respondents were divided into two groups, namely the experimental group and the control group. A pretest was conducted to determine the initial state and differences between the treatment groups.

Variables and operational definitions of variables: the independent variables were beetroot juice and Fe tablets. The operational definition of beetroot juice was beetroot which was blended with as much as 200 grams of 50 ml water and added 2 ml of lemon to reduce the aroma of beetroot and then given to respondents every morning for 10 days.

The operational definition of Fe Tablets was tablets were given to pregnant women, 90 tablets during pregnancy, and taken 1 tablet per day. The dependent variable was the hemoglobin level, namely the hemoglobin value in the blood of pregnant women measured before and after the intervention in the control group and the treatment group. Hemoglobin levels were measured using the Easy Touch GCHb which was obtained commercially.

Population and sample: The population in this study were all pregnant women with mild anemia with hemoglobin levels 9-10 gr% in Gampong Gue Gajah and Garot Geuce, sub district Darul Imarah. The total sample was 59

pregnant women. Respondents were divided into two groups; the experimental group of 15 respondents was given beetroot juice and Fe tablets. In the control group, 15 respondents were given Fe tablets.

Sample: The technique sampling for this study was *purposive sampling*, with inclusion criteria: willing to be respondents, signing *informed consent*, pregnant women with mild anemia, and willing to consume beetroot juice and iron Fe tablets. Exclusion criteria: a mother with multiple pregnancies, mother with nausea and vomiting.

Data collection techniques and instruments

The instrument in this study was a hemoglobinometer digital (branded *easy touch GCHb)*, a blender, food scales, measuring cups to measure the amount of beetroot juice, plastic, rubber, and straws. Materials used: 200 grams of beetroot, 50 ml of water, lemon.

Research procedure: Respondents in the treatment group were given 250 ml of beetroot juice to be consumed in the morning and tablets of Fe at night. The control group only consumed Fe tablets at night for 10 days, if the mother did not want to be a respondent in the treatment group, the mother was proposed to be a respondent in the control group and gave *informed consent.*

The process of Beetroot juice was: 200 grams of beetroot and peeling the skin and then crushing it in a blender. After blending the juice was filtered and packaged in plastic then tied with rubber after that it was given to respondents to be consumed every morning for 10 days and evaluated. The researcher evaluated the control group respondents and ensured that the Fe tablets were taken by checking the remaining number of Fe tablets. On day 11 the researchers measured the Hb levels of pregnant women

Data analysis: carried out with *SPSS 20 software for windows* using a two-sample t-test. The data obtained were not normally distributed, so it was continued with the *Wilcoxon signed ranks test* (α = 0.05 and *Confidence Interval* (CI) of 95%.

Results

Univariate Analysis

Initial hemoglobin levels (pretest) in the experimental group and control group are shown in table 1 below:

Table 1. Initial hemoglobin levels (*pre-test*) in the experimental group and the control group

Hb Level (g/dL)	Treatment Group		Control Group	
	n	f(%)	n	f(%)
≥ 9-10	15	100	15	100
≥11	0		0	

All respondents both from the experimental group and the control group had hemoglobin levels between 9-10 %, namely 30 people (100%).

Table 2. Hemoglobin levels (*post-test*) in the experimental and control groups

Hb Level (g/dL)	Treatment Group		Control Group	
	n	f(%)	n	f(%)
≥9-10	0	0	8	53,3
≥11	15	100	7	46,7
Total	15	100	15	100

The hemoglobin level after treatment in the experimental group was 11g/dl, namely 15 people (100%). Respondents in the control group who had normal hemoglobin levels after treatment were 7 people (46.7%).

Table 3. *Pre-test* and *post-test* hemoglobin levels in the experimental group

Hb Level	N	Mean	Deviation Std.	Minimum	Maximum
Pre-Test	15	9,3	0,15	9,1	9,5
Post-Test	15	11,8	0,34	11,0	12,0

The hemoglobin level before treatment in the experimental group was 9.3 with a standard deviation of 0.15. Meanwhile, after being given treatment, the average hemoglobin level became 11.8 with a standard deviation of 0.34.

Table 4. *Pre-test* and *post-test* hemoglobin levels in the control group

Hb Level	N	Mean	Deviation Std.	Minimum	Maximum
Pre-Test	15	9,2	0,18	9,0	9,5
Post-Test	15	10,0	0,20	9,8	10.3

The hemoglobin level before treatment in the control group was 9.2 with a standard deviation of 0.18. Meanwhile, after being given treatment, the average hemoglobin level became 10.0 with a standard deviation of 0.20.

Table 5. Change (Difference) in *Pre-Test* and *Post-Test* Hemoglobin Levels in Each Group

Hemoglobin Level	Mean	Deviation Std.	Max	Min
Experimental Group	0,76	0,091	1	1
Control Group	2,48	0,348	2,8	1,5

The average hemoglobin level in the experimental group was 0.76 with a standard deviation of 0.091. While in the control group the average hemoglobin level was 2.48 with a standard deviation of 0.348.

Bivariate Analysis

Table 6. Normality test of hemoglobin levels before (*pre-test*) treatment in each group

Class	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Pre_Control	,242	15	,019	,832	15	,010
Pre_Eks	,361	15	,000	,709	15	,000

The normality test of the pretest results in the experimental class and control class in the Kolmogorov-Smirnov column, the Sig value in the control class was 0.019 > 0.05 with a distribution frequency was 15, which means that the data was not normally distributed. The significant value in the treatment group at 0.000 = 0.05 with a distribution frequency of 15, showed that the data were normally distributed.

Table 7. Normality test of hemoglobin levels after (*post-test*) treatment in each group

Class	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Post_Control	,203	15	,098	,838	15	,012
Post_Eks	,300	15	,001	,626	15	,000

The normality test of the post-test results in the experimental group and control group in the Kolmogorov-Smirnov, the significant value in the control group was 0.098 > 0.05 with a distribution frequency of 15, that meaning the data was not normally distributed. Meanwhile, in the treatment group, the significant value was 0.001 < 0.05 with a distribution frequency was 15, which showed that the data was normally distributed. The results of the

normality data using the one-sample Kolmogorov-Smirnov test found that the values were not normally distributed.

Table 8. Statistical Test Results (*Wilcoxon Test*) Average Increase in Hemoglobin Levels Before and After Treatment in Each Group

Hemoglobin Level	N	Mean		Z	P Value
		Neg	Pos		
Experimental Group	15	0,0	8,0	-3,438	0,001
Control Group	15	0.0	8,0	-3,455	0,001

The Wilcoxon test showed that there was a significant difference between hemoglobin levels before and after treatment in each group, as seen from the Z value in the experimental group -3.438 and the Z value in the control group -3.455.

Discussion

The results of research conducted in Gampong Gue Gajah and Garot Geuce, in the sub-district of Darul Imarah, showed that there was a significant difference in the administration of beetroot juice on hemoglobin levels in pregnant women with mild anemia. After being given treatment, there was an increase in hemoglobin levels in pregnant women with mild anemia. The results of statistical tests using the *Wilcoxon Signed Rank* Test obtained p = 0.001 (p <0.05) which means that there was an effect between before and after administration of beetroot juice on the hemoglobin levels of pregnant women with mild anemia in the villages of Gue Gajah and Garot Geuce.

The main cause of anemia in pregnant women globally is iron deficiency, iron deficiency occurs as a result of a poor diet. Iron deficiency anemia can also be caused due to family socioeconomic problems including education and low income. Therefore, pregnant women should consume foods with rich in iron such as green vegetables, dried beans, dried fruit, and red beetroots. [4]

Pregnant women should take at least 1 Fe tablet each day up to 90 tablets. As for the non-pharmacological way of treating anemia and its prevention, one of them is by consuming beetroots, among all fruits, beetroots are one of the fruits that have high levels of folic acid, which is 108 mg from other fruits which are very good for helping the formation of the baby's brain and overcoming the anemia[34].

Iron supplements are needed for certain conditions, including pregnant women with severe anemia. The benefit of iron during pregnancy is not to increase or maintain maternal hemoglobin, or to prevent iron deficiency in the mother[11]. Beetroot (*Beta vulgaris*) is one of the fruits that is often used as a natural colorant for various types of food, rich in folic acid which is effective in preventing heart disease and anemia. Beetroots work by stimulating the circulatory system and helping to build red blood cells because the content of folic acid and B12 in beetroots is an important key in cellular metabolism and is needed in the normal development of erythrocytes.[16].

After giving 200 g of beetroot juice for 7 days, it was found that there was an increase in the erythrocyte index. One of the causes of increased erythrocyte index levels after consuming fruit juice was due to the content of nutrients such as iron, vitamin C, amino acids, calcium, phosphorus, sulfur, vitamin A, vitamin B1 and betacyanin as antioxidants[34]. The results of this study are in line with previous research conducted by Stepana W (2017), which obtained the average Hb level of pregnant women in the experimental group before giving beetroot juice of 9.50 gr/dl and 9.19 gr/dl, in the control group. After giving beetroot juice, there was an increase in Hb levels, where the experimental group had 11.27 g/dL and the control group 9.22 g/dL. The results of the statistical test found a significant increase with P < 0.05.

The same study was also conducted by Artathi, Ossie (2015).The researcher giving 500 ml of beetroot juice and Fe tablets to pregnant women in Purwokerto, proved to be able to increase Hb levels higher than the administration of Fe alone.

The researcher assumed that the

statistical test results showed a very significant difference in hemoglobin levels before and after and the difference between the treatment group and the control group. Researchers also assumed that the difference in the increase in hemoglobin levels was much different in the two groups. The difference before and after being given treatment in the treatment group was due to the administration of beetroot juice and Fe tablets in the treatment group, seen from the hemoglobin levels in the *pretest* and *posttest*, which showed that the *posttest* results were higher than the *pretest*, in addition to consuming Fe tablets in the control group, thus helping to improve hemoglobin levels.

Conclusion

There was an effect of giving beetroot juice to increase hemoglobin levels in pregnant women with mild anemia in the villages of Gue Gajah and Garot Geuce, Sub-district Darul Imarah, the district of Aceh Besar. The administration of beetroot juice and Fe tablets in the treatment group was more effective in increasing the hemoglobin levels of pregnant women with mild anemia

Ethical Approval

Ethical approval issued by the Health Research Ethics Commission of the Poltekkes Kemenkes Aceh in 2018

Conflict Of Interest

None declared

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Authors' Contribution

a. Concept & Research Question: Nailul Sakdah
b. Conducting Research: Nailul Sakdah
c. Statistical Analysis: Nailul sakdah, Adri Idiana
d. Report Writing: Nailul Sakdah, Nurdahliana

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