

EFFECT OF BEETROOT JUICE ON THE INCREASE IN HEMOGLOBIN LEVELS AMONG PREGNANT WOMEN AT KEMILING INPATIENT COMMUNITY HEALTH CENTER IN 2022

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ABSTRACT

Anemia in pregnancy is a hemoglobin level below 11gr% in the 1st and 3rd trimesters or <10.5g% in the 2nd trimester. The pharmacological method to treat anemia is by administering Fe tablets and folic acid, while non-pharmacological treatment and prevention of anemia can be done by consuming beetroot. This study aims to determine the effect of beetroot juice on the increase in hemoglobin levels among pregnant women at Kemiling Inpatient CHC in 2022. This was a quantitative quasi-experimental study with one group pre-test and post-test approach. The samples involved 15 pregnant women in the third trimester with mild or moderate anemia at Kemiling Inpatient CHC. The study was conducted in January 2022. Data was collected using observation sheets. Data were analyzed using univariate and bivariate analysis (t-test). The results showed that the mean Hb level before and after the administration of beetroot juice was 10.46 gr/dl and 11.70 gr/dl, respectively. There was an effect of beetroot juice on the increase in hemoglobin levels among pregnant women at Kemiling Inpatient CHC in 2022 with a p-value of 0.000. Pregnant women need to find information about prevention and management of anemia in pregnancy and have regular prenatal checkups.

Keywords: Beetroot juice, Hemoglobin levels, Pregnant women

ABSTRAK

Anemia dalam kehamilan adalah kadar hemoglobin dibawah 11gr % pada trimester 1 dan 3 atau kadar <10,5 gr% pada trimester 2. Cara farmakologis untuk mengatasi anemia yaitu dengan pemberian tablet Fe dan asam folat, sedangkan pengobatan nonfarmakologis dan pencegahan anemia dapat dilakukan dengan mengonsumsi buah bit. Penelitian ini bertujuan mengetahui pengaruh jus buah bit terhadap peningkatan kadar haemoglobin pada ibu hamil di Puskesmas Rawat Inap Kemiling tahun 2022. Jenis penelitian kuantitatif dengan rancangan penelitian quasi eksperimen dan pendekatan *one group pretest and posttest design*. Sampel penelitian adalah 15 ibu hamil trimester III dengan anemia ringan atau sedang di Puskesmas Rawat Inap Kemiling. Penelitian telah dilaksanakan di Puskesmas Rawat Inap Kemiling pada Januari 2022. Pengumpulan data menggunakan lembar observasi. Analisis data secara univariat dan bivariat (Uji t-test). Hasil penelitian diketahui rata-rata kadar Hb sebelum dan setelah diberikan jus buah bit adalah 10,46 gr/dl dan 11,70 gr/dl, masing-masing. Ada pengaruh jus buah bit terhadap peningkatan kadar haemoglobin pada ibu hamil di Puskesmas Rawat Inap Kemiling Tahun 2022 dengan nilai (p-value = 0,000). Ibu hamil perlu mencari informasi tentang pentingnya mencegah serta menanggulangi anemia saat kehamilan dan melakukan pemeriksaan kehamilan secara teratur.

Kata Kunci: Jus bit, kadar hemoglobin, wanita hamil

I. INTRODUCTION

Anemia is a condition in which the circulating mass of erythrocytes and/or Hb cannot fulfill their function of providing oxygen to the body's tissues. A decrease in Hb levels can cause lethargy, fatigue, palpitations, tachycardia, shortness of breath, and angina pectoris [1]. Anemia in pregnancy may have various impacts on pregnant women, including premature birth, caesarean section birth, bleeding and the incidence of infection in infants in the first week of life [2].

The prevalence of maternal deaths due to anemia in pregnancy was 40% (WHO, 2020). Approximately, 95% of cases of anemia in pregnancy is caused by the lack of iron (Fe) due to inadequate food intake, previous pregnancy, and repeated normal blood loss. Consuming foods rich in vitamin C along with iron will increase iron absorption [3].

Prevalence of anemia in the world reaches 29-43%, among n women it ranges from 15% to 18% globally, 29% among non-pregnant women, and 25.4% among pregnant women (RBC). However, a disproportionate increase in plasma volume may result in hemodilution (hydremia of pregnancy occurring in the second trimester). Anemia occurs in 1/3 of women during the third trimester, and the most common cause is iron deficiency [3]. Therefore, to increase Hb levels, the government created a Fe tablet program which is expected to encourage the achievement of the target of quality antenatal care coverage and at the same time may reduce MMR in Indonesia. The recommended number of iron supplements (Fe) taken during pregnancy is 90 tablets (Fe³) [4].

The prevalence of anemia in pregnancy at the Kemiling CHC was 41.98% [5]. About 95% of cases of anemia in pregnancy are due to iron deficiency, usually in relation to inadequate food intake (especially among teenage girls), previous pregnancies, or repeated normal losses of iron during menstrual period (which are close to a certain amount, usually occurring every month and thereby preventing iron storage [3]).

The high prevalence of anemia can be due to several factors such as low intake of iron and other nutrients such as vitamins A, C, folate, riboflavin and B12. Consuming animal food sources as the sources of iron that are

easily absorbed can be done to meet iron needs [6].

Anemia can have adverse effects during pregnancy, childbirth and postpartum period such as stunted fetal growth, low birth weight, fetal death, prolonged labour, postpartum bleeding, prolonged wound healing and so on [7].

Intervention programs to overcome or prevent iron deficiency consist of high-iron diets, food fortification (addition of nutrients to foods with higher levels), supplementation and improvement of public health status globally. Iron-rich foods are livestock meat, red meat, poultry, liver, fish, tuna, salmon, eggs, green vegetables (kale, spinach, katuk), nuts, almonds, and fruits. The iron content in apples is 0.3 mg and the iron content in watermelon is 0.2 mg. Among all fruits, beets are one of the fruits that have a variety of nutrients that provide many benefits. One of the reasons why beetroot can increase hemoglobin levels is that 100 mg of beetroot contain 109µg of folic acid, 0.80 mg of iron and 4.9 mg of Vit C which can help absorb iron perfectly [8].

According to a study conducted by Liawan (2013), there was a difference in the increase in Hb levels between pregnant women who were given Fe tablets and beetroot juice (*Beta Vulgaris*) and pregnant women who were given only Fe tablets with a p-value of 0.023 (<0.05) [9]. Furthermore, a study conducted by Harahap (2020) obtained a p-value of 0.002 (<0.05) based on the analysis of paired t-test. It can be concluded that there was a significant difference in hemoglobin levels between pre-test and post-test [10].

A pre-survey was conducted at Kemiling Inpatient CHC among 15 pregnant women to determine the hemoglobin levels using digital Hb meter (EasyTouch). Based on the results of the assessment survey, it was found that there were 13 pregnant women who experienced anemia, so it could be concluded that there were 70% women with hemoglobin levels below normal. This study is an original work written by the authors.

II. LITERATURE REVIEW

Anemia is a condition in which the circulating mass of erythrocytes and/or hemoglobin cannot fulfill their function of providing oxygen to the body's tissues. In other words, it is described as a decrease of

hemoglobin, erythrocytes and hematocrit (packed red cells) counts below normal levels based on laboratory examination [1]. Anemia is a condition of decreased levels of hemoglobin, hematocrit, and red blood cell count below 11 gr/dl [11].

Anemia is a condition that occurs when the number of red blood cells (erythrocytes) and the amount of Hb found in red blood cells decreases below normal. Red blood cells and hemoglobin contained are needed for the transportation and delivery of oxygen from the lungs throughout the body. Without an adequate supply of oxygen, many tissues and organs throughout the body can be disrupted [12].

Volume of blood increases in pregnancy. However, the increase in blood cells is less compared to the increase in plasma so that blood dilution occurs. Comparison of these increases: plasma by 30%, blood cells by 18%, hemoglobin by 19%. Blood dilution is considered a physiological adjustment in pregnancy and is beneficial for women. First of all, the dilution lightens the workload of the heart, which has to work harder during pregnancy. The work of the heart is lighter when the blood vessels are low. Resistance is also reduced, so blood pressure does not rise. Second, in bleeding during childbirth, the amount of iron that is lost is less than when the blood remains thick [2].

Anemia in pregnancy is a condition wherein a pregnant woman has hemoglobin levels below 11 g% in the first and third trimesters or <10.5 g% in the second trimester (Proverawati, 2018). Anemia in pregnancy can have harmful effects on the mother and fetus. Anemia in pregnant women can increase the risk of postpartum hemorrhage. If occurs early in pregnancy, anemia can cause premature labor [3].

Blood tests should be carried out at least twice during pregnancy, namely in the first trimester and third trimester. With the consideration that most pregnant women experience anemia, 90 tablets of Fe preparations were given to pregnant women at CHC [11].

Beetroot contains high levels of folic acid and iron, both of which are necessary for the formation of new red blood cells and hemoglobin in the body. The content of iron is quite high, which reactivates the regeneration of red blood cells and supplies oxygen which

is useful for the health of red blood cells [13]. In addition, beetroot also contains vitamin C. Vitamin C will make it easier for the body to absorb iron, which means that if iron can be absorbed properly the formation of red blood cells will also occur properly and smoothly [13]. Such fruit is claimed to be able to support red blood cells production and thereby increasing hemoglobin levels in the blood [14].

A study conducted by Zahyrah (2020) showed that *Beta vulgaris L* (beetroot) juice was effective for increasing Hb levels among pregnant women with anemia. This is due to root has many advantages for health and medicine. The content of betanin in beetroot is useful as an anti-cancer, since such substance can destroy tumor cells and cancer [15].

A study conducted by Gyathri Priya (2013) indicated that there was a very significant increase in hemoglobin levels in the experimental group after being given beetroot juice for 20 days in the mid-morning [14]. Furthermore, a study conducted by Artathi Eka Suryandari (2015) entitled "Comparison of Increase in Hb Levels between Pregnant Women administered with Fe and Pregnant Women administered with Fe plus Beetroot juice in the Work Area of the South Purwokerto CHC" obtained a $\rho < 0.009$ (ρ count $< \alpha$), wherein $\alpha = 5\%$. It was indicated that there was a very significant increase in Hb levels among pregnant women who were administered with Fe + beetroot juice [16].

III. METHODOLOGY

This was a quantitative quasi-experimental study with one group pre-test and post-test approach. The samples involved 15 pregnant women in the third trimester with mild or moderate anemia at Kemiling Inpatient CHC who were selected through purposive sampling technique. The study was conducted in January 2022. The independent variable in this study was beetroot juice. The dependent variable in this study was hemoglobin (Hb) levels of pregnant women. Data was collected using observation sheets. Data were analyzed using univariate and bivariate analysis. Univariate analysis used a computer to determine the increase in hemoglobin levels among pregnant women with anemia in the intervention and control groups. After the data regarding the pretest results of hemoglobin

(Hb) levels were collected, the group administered with beetroot juice was tested through the independent t-test using the SPSS computer program. The probability p-value of ≤ 0.05 was considered significant difference between the independent variable and the dependent variable.

IV. RESULTS AND DISCUSSION

The study findings revealed that the mean hemoglobin levels before being given beetroot juice was 10.46 with a standard deviation value of 0.24, a minimum value of 10.1 and value maximum 10.9. Furthermore, the mean hemoglobin levels after being given beetroot juice was 11.7 with a standard deviation value of 0.21, a minimum value of 11.0 and value maximum 12.4.

Such findings are in line with a study conducted by Wening Eka Cahya (2021) which revealed that the minimum and maximum values of Hb levels before being given beetroot was 9.0 and 11.0, respectively, with the mean value of 10.050, median of 10.000 and standard deviation of 0.6355 [17]. The study findings are also in line with a study conducted by Panca Nursela (2021) which showed that the mean value of hemoglobin levels of respondents before being given beetroot juice was 9.835 [18].

Beets have many health benefits and for treatment. The content of betasianin in beets is useful as an anti-cancer since this substance can destroy tumor cells and cancer. Beets are also useful to prevent stroke, reduce cholesterol, prevent heart disease, strengthen the body's resistance, remove toxins from the body, treat infections and inflammation, as a producer of energy for the body and improve the immune system. Beets are one of the fruits that have various nutrients and are very good for routine consumption [19].

Iron in the body joins with protein molecules to form ferritin, which is an iron complex and protein. During its transportation, iron joins protein to form transferrin. Transportation of iron in the blood depends on the function of transferrin, whereas in the sub-mucosal cells, it depends on the of function ferritin. Iron deficiency is related to an increase in hematopoiesis and low iron reserves. Iron transportation is hampered due to lack of protein intake so that an iron deficiency will occur [20].

According to researchers, the lack of Hb levels will have an impact on pregnant women as well as the fetus in the uterus. Additional nutrition for pregnant women such as beetroot is one of the efforts that can increase Hb levels traditionally. Beets contain Vitamins and minerals that have many benefits. Beets are able to stimulate the formation, maintenance, cleansing and strengthening of the circulatory system and red blood cells so that blood can carry body substances and can prevent the lack of red blood cells in the body.

The study findings are in line with a study conducted by Hikmawanti (2021) entitled "Beetroot Extracts as Haematopoietic Agents on Rats" found a significant increase in the number of erythrocytes, haemoglobin, MCV, MCH, MCHC, leukocytes, and platelets in rats that were given each extract compared to the normal group ($p < 0.05$). The ethanolic extract of beetroot increased erythrocytes, haemoglobin, MCV, MCH, MCHC, leukocytes, and platelets by 41.49%, 24.95%, 14.92%, 33.54%, 27.19%, 59.40%, and 35.37%, respectively. It can be concluded that the ethanolic extract of beetroot had the potential as a good natural haematopoietic agent [21].

The result of the paired t-test obtained a Sig. value of 0.000 (< 0.05), meaning that there was an effect of Fe tablets on the increase in hemoglobin levels among pregnant women with anemia.

The study findings are in line with a study conducted by Dina Dewi Anggraini (2019) which obtained a p value was $0.004 < \alpha = 0.05$, which meant that there was a significant effect of beetroot juice on the increase in Hb levels among pregnant women in the third trimester. The study findings are also in line with a study conducted by Wening Eka Cahya (2021) which compared an increase in Hb levels between Group A and Group B. It was obtained a p-value = 0.000, which indicated that there was a significant difference in the two groups. The increase in Hb levels in Group A was higher (1.178gr/dl) than the increase in Hb levels in Group B (0.433gr/dl) which indicated that dates were more effective than beetroot in increasing Hb levels among pregnant women in the second trimester at Karangawen II CHC, Demak Regency.

Beets contain high levels of folic acid and iron, both of which are necessary for the formation of new red blood cells and

hemoglobin in the body. The iron content is quite high, which reactivates the regeneration of red blood cells and supplies oxygen which is useful for the health of red blood cells (Anggraini, 2018).

Beets contain two to four times more vitamin C than oranges. The results of the pervious study found that vitamin C could increase the production of red blood cells by mobilizing stores in the tissues in the form of hemosiderin. The protein content of beets which consists of amino acids together with vitamin C will help the process of reducing ferric (Fe⁺⁺⁺) to ferrous (Fe⁺⁺) so that it is easily absorbed (Sianturi C, 2012).

Based on the study findings, it can be concluded that there was an increase in the mean hemoglobin level of pregnant women with anemia after being given beetroot juice. Consumption of beetroot (which has been made into juice) will increase the concentration of plasma nitrate. The increase in hemoglobin levels in the experimental group was supported by good interaction between researchers and respondents as well as support from the family to consume juice every morning and take Fe tablets every day. For pregnant women, consumption of beets had the effect of improving the immune system, preventing osteoporosis and anemia as well as several other health problems that affect pregnant women. Beetroot is round and elongated in form, it has a purplish-red color and tastes sweet when processed into fruit juice. Processing beets for pregnant women must be done carefully so that the nutritional content in them does not decrease. Beets contain a low glycemic load, so consuming beets during pregnancy helps stabilize blood glucose levels [17].

Field study found that pregnant women were happy to consume beeroot juice because the taste was refreshing, easy to consume and did not provide side effects such as Fe consumption. It also had an effect on the increase in Hb levels of pregnant women. Beets contain antioxidants that are useful to increase the immune system of pregnant women, control blood sugar levels, and prevent anemia. Moreover, beetroot is important to prevent babies in the womb from being born defective due to the fulfillment of folate and iron intake.

The study finding is in line with a study conducted by G Manjulavath (2012) which

indicated that there was a significant difference between the pre-test and post-test [22]. It can be concluded that beets were effective in increasing hemoglobin levels among middle-aged women with iron deficiency anemia. Furthermore, a study conducted by Artathi Eka Suryandari (2015) entitled "Comparison of Increase in Hb Levels between Pregnant Women administered with Fe and Pregnant Women administered with Fe plus Beetroot juice in the Work Area of the South Purwokerto CHC" obtained a $\rho < 0.009$ (ρ count $< \alpha$), wherein $\alpha = 5\%$. It was indicated that there was a very significant increase in Hb levels among pregnant women who were adminisitered with Fe + beetroot juice. This study was conducted among 30 pregnant women in the third trimester, who were assigned in the treatment and the control groups consisted of 15 women, respectively [19].

V. CONCLUSIONS

The study findings revealed that the mean hemoglobin levels before being given beetroot juice was 10.46 with a standard deviation value of 0.24, a minimum value of 10.1 and value maximum 10.9. Furthermore, the mean hemoglobin levels after being given beetroot juice was 11.7 with a standard deviation value of 0.21, a minimum value of 11.0 and value maximum 12.4. It can be concluded that there was an effect of beetroot juice on the increase in hemoglobin levels among pregnant women at Kemiling Inpatient CHC in 2022.

Pregnant women are recommended to consume beetroot juice as an alternative therapy for reducing symptoms of anemia, and increasing the Hb levels during pregnancy. In addition, pregnant women are recommended to increase knowledge about efforts in the management of anemia, including the benefits of beetroot juice as one of the non-pharmacological therapies in increasing Hb levels.

Kemiling Inpatient CHC should make efforts to reduce the incidence of anemia among pregnant women in its area. Aisyah University of Pringsewu should further develop materials for libraries as references to be read by students or parties. Moreover, further researchers may adopt the study results as a reference and literature to conduct similar

research by adding new variables or other therapies to increase hemoglobin levels among pregnant women.

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