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The Effect of Banana and Strawberry Juice in Increasing Hemoglobin Levels in Pregnant Women with Anemia

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Abstract

Background: Herbal therapy for food resources with high vitamin C dose is in demand by the public due to its safety natural materials and easy accessibility. When there is vitamin C deficiency, then the amount of absorbed iron will be reduced and lead to anemia. Bananas and strawberries are fruits that have high nutritional content. Bananas contain vitamin B6, vitamin C, potassium, fiber, phosphorus, protein, fat, calories, iron, folic acid and water, while strawberries contain anthocyanins, ellagic acid, vitamin C, vitamin A, vitamin B1 and minerals. Pregnant women are encouraged to eat healthy and nutritious food, including those that contain vitamin C. Adequate Vitamin C intake will reduce the pregnancy complications such as anemia, pre-eclampsia, and having low weight baby.

Objective: The purpose of this study was to determine the effect of banana and strawberry juice in increasing Hemoglobin levels in pregnant women with anemia.

Methodology: The type of research is analytic. The research was carried out at Rose Health Center, Bogor City. The number of participants was 16 pregnant women with anemia with one pre-test and post-test group and purposive sampling. The instrument used was an observation sheet and data analysis used a hypothesis test (Paired T-test) with SPSS 22.

Result: Before drinking banana strawberry juice, there were 11 (68.8%) pregnant women experienced moderate anemia and 2 (12.5%) pregnant women experienced heavy anemia. After intervention with banana strawberry juice, only 1 (6.3%) participant encountered heavy anemia while 12 (75%) participants had mild anemia.

Conclusion: There was a significant effect of drinking banana and strawberry juice in increasing Hemoglobin levels in pregnant women with anemia at Rose Health Center, Bogor City.

Keywords: *anemia, banana strawberry, hemoglobin, pregnant women*

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Introduction

According to WHO (*World Health Organization*), the prevalence of anemia in pregnant women worldwide is 41.8%. The prevalence of anemia in pregnant women is estimated 48.2% in Asia, 57.1% in Africa, 24.1% in America and 25.1% in

Europe.[1] The prevalence of iron deficiency anemia in Indonesia according to Basic Health Research is 31.7%.[2] Changes in the immune system that occur during pregnancy can make pregnant women more susceptible to bacterial and virus infection and more at risk of experiencing other severe diseases. In addition, high fever that occurs due to viral infection in the first trimester of pregnancy can increase the risk of birth defects in children.[3]

Pregnant women require higher oxygen level. This condition triggers an increase in erythropoietin production. As a result, plasma volume increases and red blood cells level (erythrocytes) increase. However, the increase in plasma volume occurs in a greater proportion when compared to the increase in erythrocytes so that there is a decrease in hemoglobin concentration due to hemodilution.[4] The cause of anemia in pregnancy is due to the threefold increase in iron requirements for fetal growth and development. needs of pregnant women. During pregnancy, the mass of red blood cells increases by about 18%, so that sufficient iron is needed to form red blood cells.[5]

Herbal therapy that contains vitamin C is usually in great demand by the public, apart from its safety because it is made from natural ingredients. If there is a lack of vitamin C, the amount of absorbed iron will be reduced and lead to anemia.[6]

According to Wiyani (2018), banana is one of fruits that contains vitamin B6, vitamin C, potassium, fiber, phosphorus, protein, fat, calories, iron, folic acid and water which can also increase hemoglobin levels in pregnant women.[7]

Strawberry fruit also has high nutritional contents. Strawberries contain phytochemical compounds, namely: anthocyanins, ellagic acid, vitamin C, vitamin A, vitamin B1 and minerals. One piece of banana consists of 100 grams vitamin C and one piece of strawberry has 60 grams vitamin C.[6]

The purpose of this study was to determine the effect of drinking banana and strawberry juice in increasing Hemoglobin levels in pregnant women with anemia.

Materials and Methods

The research was conducted from January to September 2020 at Rose Health Center, Bogor City. The number of samples in this study were 16 participants obtained by purposive sampling technique. The inclusion criteria in this study were pregnant women with moderate anemia, pregnant women without comorbidities, pregnant women willing to be participants, and regular visitors of Rose Health Center, Bogor City.

Researchers asked the participants to sign the informed consent prior to the study. Participants' hemoglobin level was assessed using the Easy Touch tool before drinking banana and strawberry juice. Participants were given bananas and strawberries for two weeks. Participants had to drink the juice for two times in a week. Each participant was given 2 banana combs and 1 kg of strawberries every week along with the recipe for making banana and strawberry juice: mix 200 grams strawberries, 2 bananas and 400 ml water. In 100 grams of banana (1 fruit) contains 73.8 g of water, 0.5 mg of iron, 9 mg of vitamin C, 0.05 mg of vitamin B1, 0.8 mg of vitamin B2, 0.1 mg of vitamin B6 and 28 mg of phosphorus.[8] While in 100 grams of strawberries contain 58.8 mg vitamin C.[9]

Statistical analysis used Sample Paired t-Test. The level of significance obtained $p<0.05$.

Results

Hypothesis testing in this study was determined based on the results of the data normality test. The test showed that the *p-value* = 0.00, which means the data in this study has an abnormal distribution. So that the data analysis in this study used a test non-parametric with the help of SPSS 22.

Table 1. Frequency distribution of Hemoglobin levels in pregnant women with anemia before drinking banana and strawberry juice at Health Center Rose, Bogor City

PreTest	Frequency	Percentage (%)
Mild	3	18.8%
Moderate	11	68.8%
Severe	2	12.5%
Total	16	100 %

Based on Table 1, out of 16 participants, 11 participants (68.8%) experienced moderate anemia and 2 participants (12.5%) had severe anemia.

Table 2. Frequency distribution of Hemoglobin Levels in Pregnant Women with Anemia After Consumption of Banana and Strawberry Juice at Health Center Rose, Bogor City

PostTest	Frequency	Percentage (%)
Mild	12	75.0%
Moderate	3	18.8%
Severe	1	6.3%
Total	16	100%

Table 2 showed that out of 16 participants, 3 participants (18.8%) experienced moderate anemia while 1 participant (6.3%) had severe anemia after drinking banana and strawberry juice at Rose Health Center, Bogor City.

Table 3. The Difference for Before and After Drinking Banana and Strawberry Juice at Rose Health Center, Bogor City

Variable	Mean	N	*P-value*
Pre-test	8.544	16	0.000
Post-test	10.044	16	0.000

Based on Table 3, the mean for pre-test group (before drinking banana strawberry juice) was 8.544 while the mean for post-test group (after drinking banana strawberry juice) was 10.044. The obtained *p-value* = 0.000, which means there was a significant effect of drinking banana and strawberry juice in increasing Hemoglobin levels in pregnant women with anemia at Rose Health Center, Bogor City.

Discussion

a. Frequency Distribution of Hemoglobin Levels in Pregnant Women with Anemia Before Drinking Banana and Strawberry Juice at Rose Health Center, Bogor City

Based on the results of statistical tests, it is known that out of 16 participants, 11 pregnant women (68.8%) were found with moderate anemia. Anemia is a decrease in hemoglobin levels below normal as a result of iron metabolism disorders consisting of absorption, transportation, storage, utilization and expenditure.[10] Iron nutritional anemia occurs because the iron content in the consumed food does not meet the needs. In general, efforts are being made to treat cases of anemia in pregnant women by consuming iron supplements to increase hemoglobin synthesis for both mother and fetus. However, the fulfillment of iron needs with oral iron has many side effects, such as nausea, dyspepsia, and constipation that will lead to discomfort in pregnant women. One alternative is to consume bananas every day to meet iron intake for anemic patients. Moreover, bananas contain folic acid which is easily absorbed by the fetus through the uterus.[11]

Hemoglobin is a protein in erythrocytes that functions as a carrier of oxygen from the lungs to the rest of the body. Hemoglobin also transports carbon dioxide back to the lungs to be removed from the body. In pregnant women there is an increase of 30% to 40% of plasma volume in the blood, resulting in blood thinning (hemodilution) .[12] The increase in blood plasma volume occurs before the production of red blood cells. This condition causes a decrease in hemoglobin and hematocrit levels in the first and third trimesters.[13] An increase in blood plasma volume in pregnant women causes hemodilution which is physiologically aimed at increasing the work of the mother's heart. Hemodilution occurs from 10 weeks of gestation and reaches its peak at 32-36 weeks of gestation. In pregnant women, anemia can lead to miscarriage, low weight baby, bleeding before or during delivery, and maternal death.[15]

In developing countries, including Indonesia, public awareness to consume supplements is still very low. Supplemental deficiency during pregnancy is one of the indirect causes of maternal and child mortality that can still be prevented.[17] Anemia is greatly affected by frequent pregnancy and childbirth. The more often a woman experiences pregnancy and childbirth, the more she is at risk of experiencing anemia due to iron loss of previous pregnancy and childbirth.

b. Frequency Distribution of Hemoglobin Levels in Pregnant Women with Anemia After Drinking Banana and Strawberry Juice at Rose Health Center, Bogor City

Based on the results of study, it is known that the frequency distribution of hemoglobin levels in pregnant women with anemia. showed the results of 12 pregnant women (75%) with mild anemia. In addition to pharmacological therapy, non-pharmacological therapy can also be given. Giving vitamin C in the form of tablets or high vitamin C food can increase the absorption of iron in pregnant women.[18] Banana fruit is one of the non-pharmacological therapies that is consumed as a staple food in the tropics. This banana is fortified with iron which is effective for controlling iron deficiency and almost entirely can be absorbed by the body. Bananas also contain vitamin C which can help increase iron absorption.

Bananas contain iron which will stimulate the production of hemoglobin in the blood and also help prevent anemia, because vitamin C contained in bananas also increases iron absorption and increases blood formation.[6]

The results of this study are in accordance with the results of Achmad Abdul's research (2019) which showed that the average hemoglobin level of pregnant women in the third trimester before being given bananas was 9.333 g/dl and after taking Ambon bananas was 10.933 g/dl. The results of this study are in line with research on the effect of banana consumption on anemia in pregnant women in the first

trimester at the Simpang Empat Care Health Center.[20]

The results of this study are in line with research regarding the effect of giving strawberry juice on hemoglobin levels in third trimester pregnant women at Bujel Pustum, Kediri City (2018).[7]

The hemoglobin of pregnant women is not only influenced by Fe supplements alone but also is supported by food consumption which contains substances needed in the synthesis of hemoglobin. Bananas contain vitamin B6 and B12 which are needed in the synthesis of hemoglobin.[21] Bananas contain lots of folic acid and water-soluble vitamin B6, which are needed to make nucleic acid and hemoglobin in red blood cells. The content of vitamin B6 and vitamin C and iron in bananas can help produce antibodies, metabolize fat, red blood cells, and stimulate the production of hemoglobin in the blood of people with anemia.[22] Vitamin C contained in bananas is also good for health to help rebuild the immune system. [22]

Strawberry is a fruit that is rich in its content. Strawberry contains vitamin C so it can be used as an antioxidant and increase endurance. The high vitamin C in strawberries can help absorb iron so that it can increase hemoglobin levels in the blood.[23]

Conclusion

There was a significant effect of drinking bananas and strawberries juice in increasing Hemoglobin levels of pregnant women with anemia at Rose Health Center, Bogor City.

Source of Funding- Self

Conflict of Interest- None

Ethical Clearance: This research was approved by the Ethics Committee of Wijaya Husada Health Sciences Institute. All participants were briefed regarding the purpose of the study and the voluntary nature of their participation and that they could withdraw from the study at any time. They all signed written consent before participating and were assured of the anonymity and confidentiality of their personal data.

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