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Hemoglobin Enhancement in Pregnancy: A Study on Fe Tablets Combined with Green and Red Bean Juices

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ABSTRACT

Introduction: The proportion of anemia in pregnant women in Indonesia has increased from 37.1% to 48.9% in 2018. This study aimed to determine the difference in the effectiveness of combining green bean (Vigna radiata) or red bean (Vigna angularis) juice with iron (Fe) tablets on hemoglobin (Hb) levels in pregnant women in Pontianak City, Indonesia. **Method:** A quasi-experimental study with a two-group pretest-posttest design was conducted on 32 pregnant women in their second trimester, divided into two groups of 16 each. The intervention group received a combination of green bean juice (300 ml/day) and Fe tablets, while the control group received a combination of red bean juice and Fe tablets for 14 days. Hemoglobin levels were measured before and after the intervention. Data were analyzed using paired and independent t-tests with a 95% confidence level. **Results:** The results showed a significant difference in the increase of Hb levels between the intervention and control groups (p=0.01). The mean Hb level increased from 10.90 to 11.72 g/dL in the green bean group and from 10.78 to 12.41 g/dL in the red bean group. The combination of red bean juice and Fe tablets showed the highest mean difference in Hb levels (1.63 g/dL). **Conclusions:** In conclusion, both combinations of green bean or red bean juice with Fe tablets were effective in increasing Hb levels in pregnant women, with the red bean combination showing a higher effectiveness. These findings provide additional information for healthcare professionals in educating about legumes that can help increase blood Hb levels during pregnancy.

INTRODUCTION

Nutritional problems that are often experienced by pregnant women are anemia. Good nutrition is a factor needed to improve the quality of Human Resources (HR). The quality of human resources should start from an early age, namely during pregnancy. During pregnancy, pregnant women experience very significant changes. This is related to the development of the fetus in the mother's womb (Septiani, 2017). The prevalence of pregnant women worldwide who experience anemia is 41.8%. The combination of south and Southeast Asia contributes up to 58% of the total population with anemia in developing countries (World Health Organization, 2018). Based on the results of Basic Health Research (Riskesdas) in 2013, the prevalence of anemia of pregnant women by 37.1%

increased to 48.9% in 2018. The results of Riskesdas in 2018 also showed that 84.6% of pregnant women aged less than 25 years had anemia and 57.6% of pregnant women aged more than or equal to 35 years of anemia (Kementerian Kesehatan Republik Indonesia, 2018a) West Kalimantan Riskesdas data in 2018 the number of blood-added tablets given to pregnant women in Pontianak City was 74.57%, with the number of anemia cases in pregnant women amounting to 48.9%.

The consequences caused by iron nutrition anemia, namely maternal and infant mortality during childbirth, and Low Birth Weight (BBLR), besides iron nutrition anemia will reduce body resistance, disruption of the labor process, complications that are at risk of miscarriage, bleeding, premature birth and resulting in easy infection (Herawati & Astuti, 2010). The effect of anemia on the results of conception can occur death, fetal death in the womb, fetal death at birth, high perinatal death, prematurity, congenital defects can occur, iron reserves are lacking. While the influence of anemia on pregnancy includes miscarriage, premature partus which causes bleeding, and shock (Chandra et al., 2019).

The government program in overcoming and reducing anemia in pregnant women is by supplementing 90 tablets added blood. Supplementation of blood-added tablets is an effective effort because it can prevent and overcome anemia caused by iron and folic acid deficiency. The specification of blood-added tablets given contains elemental iron 60 mg and folic acid 400 mcg (Kementerian Kesehatan Republik Indonesia, 2018b). In addition to consuming fe tablets, another alternative to meet unmet iron is to eat food sources that contain iron, especially kidney beans. Red beans such as iron, zinc and copper are useful to help the development of red blood cells, enzymes, and bones. Omega 3 and 6 in red beans are useful to help fetal brain health. In fact, the development of red blood cells in infants can be helped if pregnant women consume red beans (Umrah & Dahlan, 2018). Based on research at the United States Department of Agriculture, researchers surveyed 100 different food sources. The results obtained that the content of iron and antioxidants in red beans, exceeds iron and antioxidants such as spinach, cranberries, blueberries and cherries (Umrah & Dahlan, 2018).

According to research by Dewi, et al that after consuming blood-added tablets (TTD) and green beans, hemoglobin levels of pregnant women can increase compared to pregnant women who only consume blood-added tablets (Retnorini et al., 2017). Based on the analysis of the journal Rimawati, et al that have been carried out it was found that increasing hemoglobin in the blood is not only overcome by giving Fe supplements (blood added tablets) but also needed to provide food supplements (Rimawati et al., 2018). The study aims to determine the difference in the effectiveness of giving a combination of green bean and red bean fe tablets on Hb levels in pregnant women in Pontianak City.

METHODS

The study was conducted at the Saigon Public Health Center in Pontianak City in August 2023. The research design employed was a quasi-experimental method with a two-group pretest-posttest approach. The population consisted of all pregnant women residing in the service area of the Saigon Health Center in Pontianak City.

The study sample comprised pregnant women in the second trimester. Based on the sample size formula, 32 participants were selected, consisting of 16 pregnant women in the third trimester for the intervention group and 16 pregnant women in the second trimester for the control group. A purposive sampling technique was applied, with inclusion criteria as follows: pregnant women who visited the Saigon Health

Center during the study period, those diagnosed with moderate anemia, and those willing to participate in the research.

Sampling techniques are based on purposive samplings based on inclusion criteria pregnant women who came for examination at the Saigon Pontianak City Health Center during the research, pregnant women who experience moderate anemia and pregnant women who are willing to become respondents. The intervention group received a combination of green bean juice and Fe tablets, while the control group received a combination of red bean juice and Fe tablets. Green bean juice was provided in a 300 ml glass per day, and Fe tablets were given for 14 days, to be consumed at night.

Data collection involved hemoglobin level testing conducted before and after the intervention for both groups. Dietary intake during the study period was not monitored. Data analysis included univariate and bivariate analyses. Paired sample t-tests were used to evaluate changes in hemoglobin levels within the intervention and control groups, with a 95% confidence interval. Independent t-tests were conducted to compare the effectiveness of the combination of green bean juice and Fe tablets with the combination of red bean juice and Fe tablets in increasing hemoglobin levels among pregnant women. The results are presented in tables and narratives. Ethical approval for this research was obtained from the Ethics Commission of Poltekkes Pontianak, under approval number 05/KEKP-PK.PKP/V/2023.

RESULTS

The results of this study can be presented as follows:

The characteristics of the respondents in this study are depicted in the table below:

Table 1. Respondent Characteristics Based on Mother's Age, Education, and Occupation

Characteristics	Frequency	Percent (%)
Age		
< 20 Years	5	15.6
20-35 Years	24	75.0
> 35 Years	3	9.4
Education		
Low	11	34.4
Medium	17	53.1
High	4	12.5
Occupation		
Unemployed	21	66.0
Employed	11	34.4

Table 1 shows the characteristics of respondents based on the age of the mothers, with the highest number being 24 years old is 75%. For the education characteristic, the most common level is secondary education, with 53.1%, and regarding the mothers' employment status, the highest number is those who do not work, totaling 66%.

Table 2. Average hemoglobin levels of pregnant women before and after being given a combination of green beans fe tablets and red beans fe tablets

Group	Mean	SD	Min	Max	P-value
Intervention					
Pre Test	10.80	1.09	9.04	12.78	0.004
Post Test	11.72	0.73	10.00	12.96	
Mean Difference	0.92				
Control					
Pre Test	10.78	0.75	9.89	12.10	0.000
Post Test	12.41	0.80	11.24	13.70	
Mean Difference	1.63				

From the table above, it can be seen that the mean hemoglobin level of pregnant women before being given a combination of green beans and Fe tablets is 10.80, with the highest hemoglobin content value is 12.78 g/dL and the lowest hemoglobin level is 9.04 g/dL, with a standard deviation value of 1.09. While the mean hemoglobin level of pregnant women after being given a combination of green beans and Fe tablets was 11.72, with the highest hemoglobin content value was 12.96 g/dL and the lowest hemoglobin level was 10.00 g/dL, with a standard deviation value of 0.73.

The mean hemoglobin level of pregnant women before being given a combination of red beans and Fe tablets was 10.78 with the highest hemoglobin content value was 12.10 g/dL and the lowest hemoglobin level was 9.89 g/dL with a standard deviation value of 0.75. While the mean hemoglobin level of pregnant women after being given a combination of red beans and Fe tablets was 12.41 with the highest hemoglobin level value was 13.70 g/dL and the lowest hemoglobin level was 11.24 g/dL with a standard deviation value of 0.80. The results of the analysis with descriptive statistics showed the highest mean difference, namely in the group giving a combination of red beans and Fe tablets with a value of 1.63.

Based on table data showing the results of the paired sample t-test carried out in the intervention group, it was concluded that the P value = 0.004 < (0.05) there was a difference in the increase in hemoglobin levels in the intervention group. Meanwhile, in the control group, Pvalue = 0.000 < (0.05), there is a difference in the increase in hemoglobin levels in the control group

Table 3. The effectiveness of giving a combination of green beans and Fe and a combination of red beans and Fe against the Hb of pregnant women

Group	Mean	SD	Mean Difference	Pvalue
Intervention	11.72	0.73	0.92	0.01
Control	12.41	0.80	1.63	

Based on table 3, it shows that the results of statistical tests using independent t-tests obtained a Sig. (2-tailed) value of 0.01 smaller ($p < 0.05$), so in accordance with the basis for decision making with the test results, it means that there is a significant difference between giving a combination of green beans and Fe tablets and a combination of red beans and Fe tablets to an increase in haemoglobin levels of pregnant women in Pontianak city.

DISCUSSION

Prevention for anemia is always given supplementation of iron tablets and followed by consuming foods rich in iron. The government has tried to reduce the incidence of anemia of pregnant women by providing iron tablet supplementation as much as 90 tablets to pregnant women, but it turns out that the anemia rate of pregnant women is still high. This can be caused by non-compliance of pregnant women in consuming iron tablets (Umrah & Dahlan, 2018). This non-compliance is the result of side effects of iron tablets in the form of unpleasant influences such as bad taste in the solar plexus, nausea, vomiting, and diarrhea (sometimes also constipation). So it needs to be followed by consuming foods rich in iron (Kementerian Kesehatan Republik Indonesia, 2018b).

One type of food that contains high iron is food sourced from beans, namely green beans (Vigna Radiata) and red beans (Vigna Angularis). Green beans contain substances necessary for the formation of blood cells so that they can overcome the effects of lowering Hb. The amount of iron content in green beans as much as 6.7 mg per 100 grams of green beans. While red beans contain carbohydrates, potassium, sodium, calcium, vitamin C, Vitamin B6, magnesium and Iron. According to the Indonesian Food Composition Table (TKPI) in per 100 g of red beans contains 3.7 mg of iron (Andra, 2019).

Red beans or Latin name Phaseolus Vulgaris contains non-heme iron which reactivates and regenerates red blood cells and supplies oxygen that is useful for the health of red blood cells. Red beans also contain Vitamin C as an antioxidant in the body, the content of vitamin C can increase the absorption of iron in the body by reducing ferric iron to ferrous in the small intestine so that it is easily absorbed. The recommended dose of red beans is 30-50 grams per day (Peraturan Menteri Kesehatan Nomor 75, 2014). The dose applied in this study was 50 grams per day combined with Fe tablets for 14 days and was shown to increase hemoglobin levels in pregnant women.

The results of the study found that the average hemoglobin level of pregnant women before being given a combination of green beans and Fe tablets was 10.80. While the average hemoglobin level of pregnant women after being given a combination of green beans and Fe tablets was 11.72. The average hemoglobin level of pregnant women before being given a combination of red beans and Fe tablets was 10.78, while the average hemoglobin level of pregnant women after being given a combination of red beans and Fe tablets was 12.41. This means that there is a difference between before and after giving a combination of green beans and Fe tablets and a combination of kidney beans and Fe tablets to increase hemoglobin in pregnant women.

This study is in line with the research of Wenny Indah Purnama Eka Sari, Almaini and Dahlia in 2020, there was an increase in hemoglobin levels in pregnant women after being given a combination intervention of green bean juice and Fe tablets, namely an average increase in Hb levels of 1.55±0.43 g / dL, with a p-value = 0.000<0.005 which means that there is a difference between Hb levels before and after the intervention of Fe tablets, there is the effect of Fe supplementation with the addition of Green Bean Juice in increasing Hb levels in pregnant women in the Working Area of the Nanti Agung Health Center, Kepahiang Regency in 2019, Bengkulu Province (Sari et al., 2020). Another study conducted by Risza Choirunnisa and Desima Resnawati Manurung in 2020 where the results of the independent statistical test T Test obtained a P-Value of 0.000<0.05 which means that green bean juice affects the increase in Hb levels in pregnant women (Choirunissa & Manurung,

2020).

Hemoglobin levels of anemic pregnant women increased after giving a combination of Fe Tablets and Sarkijo. Giving iron tablets along with multiple micronutrients is more effective in improving iron status, compared to giving iron supplementation in the form of a single dose. In addition to giving Fe 60 mg tablets, efforts to prevent and overcome anemia in pregnant women can be done by increasing the nutritional intake of pregnant women by consuming foods that contain lots of iron such as green beans. The results of the Wilcoxon sign rank test with a level of significance which means that the administration of Fe and Sarkijo tablets is effective against increasing Hb levels of pregnant women at the Pacentan Pustu Tanah Merah Health Center (Mariana et al., 2020).

The results of this study are supported by research conducted by Dewi, Sri & Masini in 2017, where the results showed that hemoglobin levels of pregnant women in the intervention group who consumed Fe Tablets and Green Bean Juice increased by 0.9063, while in the control group who only consumed Fe Tablets increased slightly, namely 0.18. The results of the data analysis test with an independent t-test which means that there is an effect of giving Fe tablets and green bean juice on hemoglobin levels in pregnant women (Retnorini et al., 2017). The results of another study with samples of adolescents aged 12 to 16 years found that green bean juice and blood-added tablets had a significant effect on increasing hemoglobin levels in adolescent girls This can be seen from the increase in the child's hemoglobin from 12 gr/dl to 13 gr/dl (Usman et al., 2021).

Likewise, the results of research conducted by Asti Elfrida Bakara, Rizqi Kamalah and Cory Situmorang in 2022, obtained statistical test results, this means that there is an effect of giving processed red beans on increasing hemoglobin in anemic pregnant women at the Malanu Health Center in Sorong City (Bakara et al., 2022). There is an effect of giving red bean juice on hemoglobin levels in adolescent girls at Nurul Quran Islamic Boarding School, Kokap District, Kulon Progo Regency, Yogyakarta Special Region Province (Fitri et al., 2022). Another study that is in line is a study conducted by indah, surtiningsih & Linda, 2023, where green bean juice is very effective in increasing HB in pregnant women with anemia (Purwati et al., 2023). Another study conducted on adolescent girls by giving bun snacks containing red bean paste, the results showed that by consuming one bun already met the needs of iron nutrition in adolescent girls (Adam et al., 2022).

The results of statistical tests were obtained that the mean Hb levels of adolescent girls which means there is no significant difference between the Hb levels of adolescent girls in giving green beans and kidney beans (Wulan Sari et al., 2020). as an alternative or companion to iron supplementation which is usually recommended by health workers so that it can improve cognitive function and physical stamina, which can support adolescent learning activities.

CONCLUSIONS

Based on the research findings and discussions, it was found that there is a significant difference in the increase of hemoglobin levels between the intervention group and the control group. It can be concluded that the combination of green bean juice and iron tablets, as well as the combination of red bean juice and iron tablets, is effective in increasing hemoglobin levels in pregnant women during the second trimester in the city of Pontianak. It is hoped that the results of this research can provide additional information for healthcare professionals in delivering education about the types of legumes that can help increase blood hemoglobin levels

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