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**ORIGINAL RESEARCH**

# IMPROVEMENT OF HEMOGLOBIN LEVELS IN PREGNANT WOMEN WITH ANEMIA THROUGH DRAGON FRUIT CONSUMPTION

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**ABSTRACT**

Pregnant women are at risk of experiencing anemia, which can have health impacts such as bleeding and giving birth to low birth weight babies (LBW). The global prevalence of anemia is 43%, while in Indonesia it is 37.1%, and in the Rantau Pulung Community Health Center (Puskesmas) area, it is 39.3%. Efforts to address low hemoglobin levels often involve regular consumption of iron tablets during pregnancy. Non-pharmacological interventions include the consumption of dragon fruit, rich in vitamin C, vitamin B1, vitamin B2, vitamin B3, and protein, to increase hemoglobin levels. To determine the influence of dragon fruit on increasing hemoglobin levels in pregnant women with anemia in the working area of the Rantau Pulung Community Health Center. This study utilized a quasi-experimental design with a pre-test post-test non-equivalent control group. The study population included a total of 26 pregnant women with anemia. The sampling technique used was total sampling, resulting in 26 participants divided into an experimental group of 13 and a control group of 13. The measurement tool was observation of hemoglobin levels. Data analysis employed paired t-tests and independent t-tests. There was a difference in hemoglobin levels before and after the administration of iron tablets combined with dragon fruit by 1.1692 g%, and a difference in hemoglobin levels before and after the administration of iron tablets by 0.7077 g%. The administration of iron tablets combined with dragon fruit was effective in increasing hemoglobin levels in pregnant women in the working area of the Rantau Pulung Community Health Center in East Kutai Regency, with a p-value of 0.004. Consuming 500 g of dragon fruit daily can increase the hemoglobin levels of pregnant women due to its content of vitamin C, vitamin B1, vitamin B2, vitamin B3, and protein. The administration of dragon fruit effectively increases hemoglobin levels in pregnant women.

**Keywords**

**Dragon Fruit, Hemoglobin, Pregnant Anemia**

## INTRODUCTION

In 2020, according to the World Health Organization (WHO), the percentage of pregnant mothers in trimesters I-III experiencing anemia was 43%, and 2% of them faced fatal consequences. The highest proportions were observed among pregnant women in the regions of Africa and South Asia, namely 57.1% and 48.2%, respectively. Among South Asian countries, India had the highest prevalence of pregnancy-related anemia, at 49.7%. Pregnant women are highly susceptible to iron deficiency anemia due to hemodilution, which leads to blood dilution. The increase in blood volume does not match the increase in plasma volume. Factors contributing to anemia include inadequate iron intake, increased iron requirements, and digestive

and absorption disorders (Cunningham & Gerry, 2018).

The impact of anemia on pregnant women includes maternal mortality, as well as risks of miscarriage, intrauterine growth retardation, and postpartum hemorrhage. Complications for the infant due to maternal anemia include preterm birth and low birth weight, resulting in adverse birth outcomes (Kumari et al., 2019). Addressing anemia in pregnant women involves a supplementation program with blood-boosting tablets, available during each visit to the Maternal and Child Health (MCH) Clinic. These tablets help prevent both iron and folic acid deficiencies. Pregnant women are advised to consume at least 90 iron tablets throughout their pregnancy. To alleviate side effects like nausea from iron tablet consumption, some pregnant women are recommended to reduce the dosage from 1 x 1 tablet daily to 2 x ½ tablet daily, as iron in prenatal vitamins can lead to constipation or diarrhea (Kusmiyati, 2009 as cited in Nurdin, 2019).

The iron requirement during pregnancy is approximately 1000 mg, with 500 mg needed to support the expansion of red blood cell mass, 3000 mg for fetal transportation during the 12-week pregnancy, and an additional 200 mg to compensate for fluid loss. Iron needs are relatively low during the first trimester, around 0.8 mg per day, and increase significantly during the second and third trimesters, reaching 6.3 mg per day (Rizki, 2017 as cited in Shafa & Putri, 2019). Dragon fruit is one of the cultivated fruits in Indonesia and offers various benefits, particularly for pregnant women. Pregnant women require additional nutrients to facilitate the growth and development of their pregnancy as well as to meet their own nutritional needs (Usman & Kurnaesih, 2019). Dragon fruit has numerous health benefits, containing nutrients such as vitamin C, vitamin B1, vitamin B2, vitamin B3, protein, among others. These benefits include blood sugar regulation, blood cleansing, kidney strengthening, liver health, cholesterol reduction, hemorrhage prevention, and aiding in addressing vaginal discharge (Tusiana et al., 2021).

Based on a study by Aulya (2021), where pregnant women consumed 250 ml of dragon fruit twice daily for 14 days, the average hemoglobin (Hb) level before dragon fruit consumption was 9.62 g/dl, and after consumption, it rose to 11.64 g/dl. This yielded a p-value of 0.001, leading to the rejection of the null hypothesis (Ho) and suggesting that dragon fruit has an impact on the Hb levels of pregnant women. Given the aforementioned background, the researcher is interested in conducting a study on the Effect of Dragon Fruit Consumption on Increasing Hemoglobin Levels in Pregnant Women with Anemia in the Working Area of Rantau Pulung Community Health Center in 2023.

## METHOD

This type of study employs a quasi-experimental method with a non-equivalent control group pre-test post-test design. The population for this research comprises all pregnant women diagnosed with anemia at the Rantau Pulung Community Health Center, documented during the period of November to December 2022, totaling 26 individuals. The sampling technique employed is total sampling, resulting in a sample size of 26 participants. The inclusion criteria encompass pregnant women willing to participate as respondents, those identified with anemia in the Health Center's records, pregnant women with mild to moderate anemia as indicated by their Hb levels at the Health Center, while exclusion criteria involve pregnant women with a history of diseases such as TB, those who dislike dragon fruit, or those consuming supplements or herbal medicines aimed at increasing Hb levels such as blood-boosting tablets. Data was collected using observation sheets recording laboratory results of hemoglobin levels, and the measuring instrument used for Hb levels before dragon fruit consumption, before and after dragon fruit consumption. The dependent variable is the hemoglobin level, while the independent variable is dragon fruit. Univariate analysis was conducted to describe the characteristics of each research variable, including measures of mean, median, standard deviation, minimum and maximum values,

as well as percentages. Bivariate analysis was employed to determine the relationship between the two variables. Univariate data analysis includes mean, median, standard deviation, minimum and maximum values, and percentages. For bivariate data analysis, if the data is normally distributed, a paired t-test is used. If the data is not normally distributed, the Wilcoxon test is utilized.

## RESULTS

***(judul table :bold, table 1, table 2. Font 10)***

**Table 1. Distribution of Respondents' Characteristics in the Working Area of Rantau Pulung Community Health Center, East Kutai Regency, 2023**

| Variable | Category | Experimental Group | | Control Group | |
|---|---|---|---|---|---|
| | | Frequency | Percent (%) | Frequency | Percent (%) |
| Age | < 20 years | 3 | 23,1 | 2 | 15,4 |
| | 20-35 years | 8 | | 9 | |
| | 35 years | 2 | | 2 | |
| Education | Elementary School (SD) | 3 | 16,2 | 3 | 23,1 |
| | Junior High School (SMP) | 4 | | 2 | |
| | Senior High School (SMA) | 6 | | 8 | |
| | Housewife (IRT) | 6 | 46,1 | 7 | 53,8 |
| Occupation | Civil Servant (PNS) | 2 | | 2 | |
| | Contract Employee (Pegawai Honorer) | 3 | 23,1 | 3 | 23,1 |
| | Entrepreneur (Wiraswasta) | 2 | 15,4 | 1 | 7,7 |
| | | 5 | | 4 | |
| | | 8 | | 9 | |
| Parity | Primipara (First-time mother) | 3 | 23,1 | 2 | 15,4 |
| | Multipara (Multiple-time mother) | 8 | 61,5 | 9 | 69,2 |
| **Total** | | **13** | **100** | **13** | **100** |

*Source: Primary Data*

Based on Table 1, it is evident that the majority of respondents, both in the experimental and control groups, are aged between 20-35 years, with 8 individuals (61.5%) in the experimental group and 9 individuals (69.2%) in the control group falling within this age range. Similarly, the majority of respondents in both the experimental and control groups have a Senior High School education, with 6 individuals (46.2%) in the experimental group and 8 individuals (61.5%) in the control group. Furthermore, the majority of respondents in the experimental group are housewives (IRT), amounting to 6 individuals (46.2%), while in the control group, this number is 7 individuals (53.8%). Lastly, most respondents in the experimental group are multiparous, accounting for 8 individuals (61.5%), and in the control group, this figure is 9 individuals (69.2%).

**Table 2. Descriptive Data of Pretest and Posttest Hemoglobin Levels after Administration of Iron Tablet and Dragon Fruit, and Pretest and Posttest Hemoglobin Levels after Administration of Iron Tablet in Pregnant Women with Anemia in the Working Area of Rantau Pulung Community Health Center in 2023.**

| Variable | Hb Levels | Mean | Standard Deviation | Min-Max |
|---|---|---|---|---|
| Administration of Iron Tablet and Dragon Fruit | Pretest | 9.869 | 0.4679 | 9,2-10,6 |
| | Posttest | 11,038 | 0,4753 | 10,3-12,1 |
| Administration of Iron Tablet | Pretest | 9,700 | 0,6532 | 9,0-10,9 |
| | Posttest | 10,408 | 0,5314 | 9,2-11,2 |

*Source: Primary Data*

Based on Table 2, the collected data on Hb levels before the treatment of iron tablet and dragon fruit show that the mean Hb level before the treatment is 9.869 g%, with a minimum Hb level of 9.2 g% and a maximum Hb level of 10.6 g%. After the treatment was administered, the Hb level increased to a mean value of 11.038 g%, with a minimum Hb level of 10.3 g% and a maximum Hb level of 12.1 g%.

**Table 3. Difference in Hemoglobin Levels of Pregnant Women Before and After Administration of Iron Tablet and Dragon Fruit in Pregnant Women with Anemia in the Working Area of Rantau Pulung Community Health Center in 2023.**

| Hb Levels | Mean | Standard Deviation | | | |
|---|---|---|---|---|---|
| Pretest<br>Posttest | 1,1692 | 0,4973 | 0,1379 | 8,477 | 0,000 |

*Source: Independent T-Test Statistical Test*

Based on the analysis using the dependent t-test to observe the difference in hemoglobin levels before and after the intervention, the obtained p-value is 0.000 < α 0.05, and the calculated t-value is 8.477 > t-table (n-2)(1/2α) = 2.201. These results indicate the rejection of the null hypothesis (Ho), which means that there is a significant difference in hemoglobin levels before and after the administration of iron tablet and dragon fruit among pregnant women in the working area of Rantau Pulung Community Health Center, East Kutai Regency.

**Table 4. Difference in Hemoglobin Levels Between the Treatment of Iron Tablet Combined with Dragon Fruit (Experimental) and the Treatment of Iron Tablet Without Dragon Fruit (Control) in Pregnant Women with Anemia in the Working Area of Rantau Pulung Community Health Center in 2023.**

| Hb Levels | Mean | Standard Deviation | Standard Error | t-value | P value |
|---|---|---|---|---|---|
| Experiment<br>Control | 11,038<br>10,408 | 0,6308 | 0,1977 | 3,190 | 0,004 |

*Source: Independent T-Test Statistical Test*

Based on the analysis using the independent t-test to examine the difference in hemoglobin levels between the treatment of iron tablet combined with dragon fruit and the treatment of iron tablet without dragon fruit, the obtained p-value is 0.004 < α 0.05, and the calculated t-value is 3.190 > t-table (n-2)(1/2α) = 2.063. These results indicate the rejection of the null hypothesis (Ho), which means that there is a significant difference in hemoglobin levels between the treatment of iron tablet combined with dragon fruit and the treatment of iron tablet without dragon fruit among pregnant women in the working area of Rantau Pulung Community Health Center, East Kutai Regency.

## DISCUSSION

Difference in Hemoglobin Levels Before and After Administration of Iron Tablet and Dragon Fruit The research findings show a significant difference in Hb levels before and after the administration of iron tablet combined with dragon fruit among pregnant women in the working area of Rantau Pulung Community Health Center, as evidenced by the p-value of 0.000 < α 0.05. This demonstrates that the combination of iron tablet and dragon fruit effectively increases Hb levels in pregnant women.

To address iron deficiency in the body, Tarwoto (2019) suggests consuming 6.3 mg of iron daily and increasing the intake of iron-rich foods. According to Ulfiana et al. (2019), overcoming anemia requires consumption of iron-rich foods, including meat, liver, fish, milk, yogurt, legumes, and green vegetables. Herbal plant-based foods also contain beneficial iron content for managing anemia. Research conducted by Ulfiana et al. (2019) demonstrates a relationship between dragon fruit consumption and increased hemoglobin levels in pregnant women. Similarly, Yuliandani et al. (2017) found that administering dragon fruit led to an average increase in hemoglobin levels.

The research findings reveal a significant difference in Hb levels before and after the administration of iron tablet among pregnant women in the working area of Rantau Pulung Community Health Center, as indicated by the p-value of 0.000 < α 0.05. This indicates that iron tablet administration effectively increases Hb levels in pregnant women with anemia. Administering iron tablets to pregnant women with anemia is essential, as their dietary intake may not meet iron requirements, as Sahfitri (2018) explains. Iron in food exists in heme form, which binds to protein and is found in animal-based foods. Over 35% of heme iron is directly absorbed. Non-heme iron, on the other hand, is an inorganic iron compound complex found in plant-based foods and is only absorbed at a rate of 5%. Pharmacodynamics of iron involves iron replacement primarily to correct or manage iron-deficiency anemia, diagnosed through blood smear preparations. The initial response to successful iron therapy is evident in less than a week, with rapid reticulocytosis occurring, as newly formed hemoglobin-containing red blood cells from the bone marrow enter the bloodstream. Hemoglobin levels will significantly increase within 2-4 weeks (Almatsier, 2019). Based on this research, it can be concluded that iron tablet administration has a significant impact on increasing Hb levels in pregnant women, with an increase of up to 1.1 gr%. This implies that administering iron tablets aids in rapid iron absorption and prevents anemia in pregnant women.

The research findings demonstrate a significant difference in Hb levels between the experimental group (receiving iron tablet combined with dragon fruit) and the control group (receiving iron tablet only) among pregnant women in the working area of Rantau Pulung Community Health Center, as indicated by the p-value of 0.004 < α 0.05. This suggests that the combination of iron tablet and dragon fruit leads to a faster increase in Hb levels compared to administering iron tablet alone. The research results show that iron tablet combined with dragon fruit significantly contributes to a more rapid increase in Hb levels, as well as iron tablet administration alone. The Hb level increase in the group receiving iron tablet combined with dragon fruit is notably faster than in the group receiving iron tablet only, with a difference of 0.6308 gr%.

This research demonstrates that administering iron tablet combined with dragon fruit yields a greater impact or contribution to enhanced iron absorption. Dragon fruit accelerates the hemoglobin synthesis process. Almatsier (2019) explains that hemoglobin synthesis begins with erythroblasts and continues until the normoblast and reticulocyte stages. Isotope investigations reveal that the hem part of hemoglobin is primarily synthesized from acetate and glycine and this process mostly takes place in the mitochondria. The initial step involves the formation of pyrrole compounds. Subsequently, four pyrrole compounds combine to form protoporphyrin, which then binds to iron to create hem molecules. Ultimately, four hem molecules bind to one globin molecule, a globulin synthesized in the endoplasmic reticulum ribosome, to form hemoglobin (Guyton & Hall, 2018). Based on these research findings, it is evident that a significant number of pregnant women in the Rantau Pulung Community Health Center area experience anemia. Administering iron tablets, particularly in combination with dragon fruit, is crucial for improving Hb levels. The addition of dragon fruit to iron tablets could become a program recommended by the community health center to ensure regular consumption among pregnant women with anemia.

## CONCLUSIONS

Based on the analysis results using the dependent t-test, a p-value of 0.004 ≤ α (0.05) was obtained. Therefore, it can be concluded that the administration of iron tablets combined with dragon fruit is effectively proven to increase Hb levels in pregnant women within the working area of Rantau Pulung Community Health Center, East Kutai Regency.

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