

**RELATIVE EFFECTIVENESS OF RED GUAVA FRUIT
(PSIDIUM GUAJAVA L.) AND STAR FRUIT
(AVERRHOA CARAMBOLA L.) ON HEMOGLOBIN
LEVEL IN PREGNANT WOMEN
AT CAMPLONG COMMUNITY HEALTH CENTER,
KUPANG DISTRICT
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ABSTRACT

Background: Anemia in pregnancy increases maternal and child mortality incidence, either directly or indirectly. Non-pharmacological therapy and alternative medicine can be used to overcome iron deficiency in pregnant women. Red guava and star fruits contain a rich number of vitamins and minerals important for blood function and renewal. This study aimed to determine the relative effectiveness of red guava fruit (*Psidium Guajava* L.) and star fruit (*Averrhoa Carambola* L.) on hemoglobin level in pregnant women at Camplong Community Health Center, Kupang, East Nusa Tenggara.

Subjects and Method: A quasi-experimental study with a pretest and posttest with no control design was conducted at Camplong Community Health Center, Kupang, East Nusa Tenggara, from December 2019 to February 2020. A total of 32 pregnant women with anemia was selected by accidental sampling. The dependent variable was hemoglobin level. The independent variables were red guava and star fruit consumption. The data were collected by questionnaires and Hb blood test results. The data were analyzed by paired and independent t-tests.

Results: Mean of Hb level in pregnant women was higher after red guava fruit consumption (Mean= 10.42; SD= 0.74) than before (Mean= 9.76; SD= 0.98), and it was statistically significant ($p= 0.001$). Mean of Hb level in pregnant women was higher after star fruit consumption (Mean= 11.03; SD= 0.55) than before (Mean= 9.76; SD= 0.93), and it was statistically significant ($p < 0.001$). Mean of Hb level in pregnant women was higher in consumption of star fruit (Mean= 11.03; SD= 0.55) than in red guava fruit (Mean= 10.42; SD= 0.74), and it was statistically significant ($p= 0.013$).

Conclusion: Consumption of both red guava fruit and star fruit increases the hemoglobin level in pregnant women. Relative effectiveness shows that Hb level is higher in the consumption of star fruit than guava fruit.

Keywords: guava fruit, star fruit, hemoglobin level, anemia, pregnant women

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BACKGROUND

The pregnancy period is a period that will determine the quality of human resources and the future because the fetal condition very much determines the development of the child in the womb. Maternal nutritional intake during pregnancy greatly affects fetal growth and development, including affecting

maternal health during pregnancy. One of the most important nutrients during pregnancy is iron (Fe). Pregnant women need more iron during pregnancy because there is an increase in the mass expansion of red blood cells, so the need for iron increases. Therefore, pregnant women are very susceptible to anemia due to iron deficiency (Lumbanraja et al., 2019).

Anemia in pregnancy is a public health problem, especially in developing countries (Stephen et al., 2018). Anemia of pregnant women is determined based on hemoglobin levels. Normal if the HB level is >11 g/%, mild anemia if the HB level is 8-11 gr/% and severe anemia if the HB level is <8 g /% (Yuli and Dwi, 2018). Meanwhile, according to WHO, pregnant women suffer from anemia if they have a hemoglobin level of less than 11 g% (WHO, 2005)

Anemia often occurs in pregnant women, but precisely because it happens so often, it is considered “normal” for the community, even though anemia has tremendous dangers, both to mother and baby. Anemia can increase the risk of death in mothers and babies (Allen, 2000; Mbule et al., 2013). Anemia in pregnant women can cause dizziness, weakness, reduce body immunity, increase the incidence of heart disease, and increase death incidence (Stephen et al., 2018). Whereas in infants, anemia can cause premature births, low birth weight babies, IUGR, IUFD, low APGAR scores, and stunting (Guyatt and Snow, 2004; Levy et al., 2005; Kidanto et al., 2009; Msuya et al., 2011; Black, Victora and Walker, 2013; Gebre and Mulugeta, 2015).

From the results of the initial survey conducted by researchers on pregnant women at the Camplong Community Health Center in Kupang Regency, it was found that HB levels <11 g% in December 2019 to February 2020 were as follows: in December 2019, 20 pregnant women visited with anemia (19.1 %), in January 2020 visits of pregnant women with anemia decreased to 15 people (17.1%), in February there were an increase of 30 people (26.1%). Based on the initial survey conducted, it can be concluded that there is still a high number of anemia sufferers in pregnant women and the community does not respond that the incidence

of anemia is a serious matter in the mother's body, where anemia can cause death to the mother and the fetus.

Some of the factors that can increase the incidence of anemia during pregnancy are gravida, too close birth space, malaria infection during pregnancy, work, infectious diseases, additional diet during pregnancy, drinking tea or coffee after meals, meat consumption, and a history of heavy menstrual blood before pregnant (Kassa et al., 2017; Weldekidan et al., 2018). Overcoming anemia in pregnant women by checking hemoglobin in the early trimester. Pregnant women with anemia will receive pharmacological therapy in the form of iron capsules (apart from the mandatory 90 iron tablets during pregnancy), vitamin C, and vitamin B complex. On the other hand, pregnant women can increase Hb levels with non-pharmacological therapy which is more comfortable to consume.

One of the non-pharmacological treatments for anemia is consuming fruits that contain lots of iron and vitamin C to increase hemoglobin in the blood. The choices fall on red guava and/or sweet star fruit (Hariana, 2005). Red guava fruit contains very high vitamin C, which is useful for increasing iron absorption. 100 grams of guava contains 87 mg of vitamin C. This fruit also contains several types of minerals that can prevent various types of diseases and maintain body fitness, and guava contains potassium and iron, which can increase Hb levels (Massaidi, 2011).

Another option is to consume sweet starfruit which is believed to reduce the impact of anemia on pregnant women because in 100 grams of sweet star fruit contains 1.10 mg of iron and 0.90 mg of vitamin C. High iron and Vitamin C are used as antioxidants, and increase endurance and are beneficial for increasing the formation of red

blood cells so that they can affect hemoglobin levels (Rukmana, 2006).

These two local Indonesian fruits are said to have the power to increase hemoglobin levels. This study aimed to determine the differences in the effectiveness of red guava and sweet starfruit on hemoglobin levels in pregnant women at Camplong Community Health Center, Kupang Regency.

SUBJECTS AND METHODS

1. Study Design

This study was a quasi-experimental study with pretest and post group design. The study was conducted on pregnant women diagnosed with anemia and visited the Camplong Community Health Center from December 2019 to February 2020.

2. Population and Sample

A total of 32 pregnant women was selected by accidental sampling. Pregnant women were first given an explanation of the objectives, benefits, and research procedures. Pregnant women who agree to be research subjects will sign the sheet informed consent before taking the research data.

Pregnant women were divided into two groups, as many as 16 pregnant women were given treatment by eating 100 grams of red guava for 1 week, while the remaining 16 pregnant women were given treatment by eating 100 grams of sweet star fruit for 1 week. Pregnant women were checked for hemoglobin levels before and after treatment.

3. Study Variables

The dependent variable was hemoglobin level. The independent variables were red guava and star fruit consumption.

4. Study Instruments

The data were collected by questionnaires and Hb blood test results. The data in the study were taken by researchers through interviews, direct observation, and secondary data regarding laboratory results of maternal Hb levels. Data taken through interviews

with mothers in the form of characteristics of research subjects, while data taken through direct observation was the regularity of the mother in eating red guava and sweet starfruit.

5. Data analysis

Data analysis was performed with the help of the IBM SPSS Statistic 22 application with Confidence Interval 95%(CI). Data on the characteristics of the respondents are explained using a frequency distribution. Data on the effect of consumption of red guava and sweet starfruit on Hb levels were analyzed using a paired-T test, while data on differences in the effectiveness of red guava and sweet starfruit on Hb levels were analyzed using the independent T-Test.

RESULTS

1. Sample Characteristics

Table 1 showed the characteristics of the two sample groups that were given the treatment in the form of consumption of red guava and sweet starfruit consumption. Based on Table 1, the results showed that the majority of pregnant women who received red guava fruit was 20-35 years (87.5%), most had secondary education (87.5%), most of the pregnant women did not work or housewives (87.5 %). Most of the study subjects were primigravida (62.5%) and had gestational age of the 3rd trimester (56.2%).

Pregnant women who received sweet starfruit showed that most of them were 20-35 years old (87.5%) and had secondary education (68.8%). Majority of study subjects were housewives (75.5%). Most of the pregnant women were primigravida (62.5%) and their gestational age was mostly between 14-27 weeks or the second trimester (56.2%).

Table 1. Sample Characteristics (categorical data)

| Characteristics | Categories | Consumption of Red Guava | | Consumption of Sweet Starfruit | |
|----------------------|-----------------------------|--------------------------|------|--------------------------------|------|
| | | N | % | N | % |
| Maternal Age (Years) | <20 | 2 | 12.5 | 2 | 12.5 |
| | 20-35 | 14 | 87.5 | 14 | 87.5 |
| | ≥35 | 0 | 0.0 | 0 | 0.0 |
| Maternal Education | Elementary school | 2 | 12.5 | 5 | 31.2 |
| | Middle school | 14 | 87.5 | 11 | 68.8 |
| | More than High school | 0 | 0.0 | 0 | 0.0 |
| Maternal Occupation | Work | 2 | 12.5 | 4 | 25.0 |
| | Housewife | 14 | 87.5 | 12 | 75.0 |
| Parity | Primigravida | 10 | 62.5 | 10 | 62.5 |
| | Multigravida | 6 | 37.5 | 6 | 37.5 |
| Gestational Age | 1st trimester (<15 weeks) | 0 | 0.0 | 0 | 0.0 |
| | 2nd trimester (14-27 weeks) | 7 | 43.8 | 9 | 56.2 |
| | 3rd trimester (≥28 weeks) | 9 | 56.2 | 7 | 43.8 |

Table 2. Effect of consumption of red guava fruit on hemoglobin levels in pregnant women at Camplong Public Health Center in 2020

| Group | Hemoglobin level | | | | |
|-------------------|------------------|------|------|-------|-------|
| | Mean | SD | Min. | Max. | p |
| Pre intervention | 9.76 | 0.98 | 7.50 | 11.00 | 0.001 |
| Post intervention | 10.42 | 0.74 | 9.00 | 11.70 | |

Table 3. Effect of consumption of sweet starfruit on hemoglobin levels in pregnant women at the Camplong Community Health Center in 2020

| Group | Hemoglobin level | | | | |
|-------------------|------------------|------|-------|-------|--------|
| | Mean | SD | Min. | Max. | p |
| Pre intervention | 9.76 | 0.93 | 8.00 | 11.00 | <0.001 |
| Post intervention | 11.03 | 0.55 | 10.00 | 11.90 | |

2. Bivariate Analysis

Table 2 showed that the results of the analysis of hemoglobin (Hb) levels in pregnant women before and after consuming red guava fruit. The mean of Hb level in pregnant women after consuming red guava fruit was higher (Mean= 9.76; SD= 0.98) than before consuming red guava fruit (Mean= 10.42; SD= 0.74), and it was statistically significant

(p= 0.001). Table 3 showed that the mean of hemoglobin levels (Hb) in pregnant women before and after consuming sweet star fruit. The mean of Hb level in pregnant women after consuming sweet starfruit was higher (Mean= 9.76; SD= 0.93) than before consuming sweet star fruit (Mean= 11.03; SD= 0.55), it was statistically significant (p<0.001).

Table 4. Differences in the effectiveness of consumption of red guava and sweet starfruit on hemoglobin levels in pregnant women at the Camplong Community Health Center in 2020

| Group | Hemoglobin levels | | | | |
|-------------------------------------|-------------------|------|------|------|-------|
| | Mean | SD | Min. | Max. | p |
| Post intervention (red guava) | 10.42 | 0.74 | 9.0 | 11.7 | 0.013 |
| Post intervention (sweet starfruit) | 11.03 | 0.55 | 10.0 | 11.9 | |

Table 4 showed the results of the analysis of the effectiveness of giving red guava and sweet starfruit fruit to hemoglobin (Hb) levels in pregnant women. The mean of Hb level in the group of pregnant women who consumed sweet star fruit was higher (Mean= 10.42; SD= 0.74) than the group of pregnant women who consumed red guava fruit (Mean= 11.03; SD= 0.55), it was statistically significant ($p= 0.013$).

DISCUSSION

The effect of red guava consumption on hemoglobin levels in this study showed the difference in the mean value between measurements before and after consuming guava fruit. Consuming red guava fruit increased hemoglobin levels of pregnant women, and it was statistically significant. Guava fruit contains compounds that can increase hemoglobin levels in the blood, including: iron, vitamin C, vitamin A, copper, phosphorus (Massaidi, 2011; Rusdi and Haninda, 2020).

Iron is a mineral that is needed to carry oxygen throughout the body. Lack of iron in the body can make a person experience a decreased immune system and often feel sluggish. This is also one of the causes of anemia. Apart from iron, vitamin A is also important for increasing the number of red blood cells. Minerals (copper and phosphorus) play a role in maintaining the health and function of red blood cells. Copper also helps in metabolizing iron, while phosphorus helps hemoglobin in delivering oxygen to body tissues (Proverawati and Asfuah, 2011).

The results of this study are in line with research conducted by Yanuaringsih and Nik-mah (2018) and Rusdi and Haninda (2020) which stated that consumption of red guava fruit is effective in increasing hemoglobin levels, and it was statistically significant. Another study conducted by Hardimarta et al. (2018) showed that red

guava fruit can increase erythrocyte levels to prevent anemia.

The effect of sweet star fruit consumption on hemoglobin levels in this study showed the difference mean value between the measurement of hemoglobin levels before and after consuming sweet star fruit. Consuming sweet star fruit increased the hemoglobin levels in pregnant women, and it was statistically significant.

The content of various nutrients in sweet star fruit provides benefits to the body. One of the benefits is that it can increase hemoglobin levels because its content is very good and useful, especially the iron content is sufficient to replace the iron that is lost in the body and enough vitamin C to help iron absorption in the process of forming hemoglobin in the blood, and it tastes good, easy to digest, easy to find, and the price is affordable (Rukmana, 2006).

This research was also supported by previous research conducted by Mulati (2013) which stated that sweet star fruit can increase hemoglobin levels by as much as 60% of the number of research subjects.

This study findings showed the differences in the effectiveness of consumption of red guava and sweet starfruit on hemoglobin level. The mean Hb level of group consuming sweet star fruit was higher than the group consuming red guava fruit. It can be concluded that sweet star fruit is more effective in increasing hemoglobin levels compared to red guava fruit. During pregnancy, there are many physiological changes, especially physiological changes in blood circulation which peak at 32 weeks of gestation where blood plasma increases greater than erythrocytes so that blood dilution can occur, resulting in decreased hemoglobin levels (Manuaba, 2013).

Handling in increasing hemoglobin levels in pregnant women can be done with

pharmacology, by giving Fe tablets and/ or done by using non-pharmacological therapy, one of which is by consuming red guava and/ or sweet star fruit.

The content of various nutrients in guava fruit provides benefits for the body, one of which can increase hemoglobin levels. In 100 grams of guava contains 49 calories, 1 gram of protein, 0.4 grams of fat, 6.8 grams of carbohydrates, 14 grams of calcium, 28 mg of phosphorus, 0.3 mg of iron, 25 SI vitamin A, 0.02 mg of vitamin B1, 87 mg of vitamin C, water 83.3 mg (Budiana, 2013). While star fruit has a high iron content, 100 grams of sweet star fruit consists of: 90.00 mg of water, 0.40 grams of protein, 1.40 grams of fat, 36.00 calories of calories, 4.00 mg of potassium, 12.00 mg of fiber, 0.90 mg of vitamin C and substances. iron 1.1 mg. Normal hemoglobin levels are needed by women who are pregnant, therefore, with non-pharmacological therapy, consuming guava or star fruit is very helpful for pregnant women in overcoming hemoglobin deficiency (Rukmana, 2006).

This is very likely influenced by the amount of iron content in sweet star fruit is greater than the red guava fruit. In 100 grams of sweet star fruit, there is 1.1 mg of iron, while in 100 grams of red guava, there is only 0.3 mg of iron. Thus, pregnant women who consume sweet star fruit are more effective in increasing their Hb levels.

AUTHOR CONTRIBUTION

All authors had the same role in this study, except the first author as the leader who regulated the course of this research.

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CONFLIT OF INTEREST

All authors declared no conflict of interest in this research.

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