

## Red Guava Juice Increased Hemoglobin Levels of Pregnant Women; A Study Case in Public Health Center

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### 1. Abstract

Fruit is one that can increase hemoglobin levels in the blood. One of them is guava, the content chemicals of guava is amino acids (Tryptophan, lysine), calcium, phosphorus, iron, sulfur, vitamin A, vitamin B1, and vitamin C. High vitamin C content in guava can be utilized by pregnant women for the formation of red blood cells. The purpose of this study is to find out the effect of consuming red guava juice on the increase in hemoglobin levels of pregnant women. The research method used is Pre-Experimental Design with the design used by One Group Pretest-Posttest. The population in this study was 460 pregnant women. The sampling method used is purposive sampling with the number of samples is 230 pregnant women who are anemia. The results showed that the average hemoglobin of mothers before the consumption of guava juice was 9.9200, while after the administration of guava juice obtained an average of 11.6650. From the results of the test paired t- test obtained a value of  $q=0,000$ . The  $q$  value is smaller than 0.000 ( $q=0,000 < 0.05$ ). In conclusion, there is an effect of consuming red bean juice on the increase in hemoglobin levels of pregnant women indicated by the increase in hemoglobin. It is recommended that pregnant women can consume guava juice in

order to prevent the insolvency of anemia, and it is expected to be to health officials to counsel about the benefits of guava juice content.

### 2. Background

Pregnancy is the growth and development of the fetus starting from conception and ending until the beginning of childbirth. The period of pregnancy is calculated from the first day of the last period until the start of true childbirth, which marks the beginning of the antepartum period. The antepartum period is divided into three trimesters consisting of thirteen weeks or three months each according to the count of tenders [1-4]. This time sharing is taken from a provision that considers that the length of pregnancy is estimated to be approximately 280 days, 40 weeks, 10 months (based on lunar or lunar turnover) or 9 months from the first day of the last period (with an estimated cycle of 28 days). This makes the pregnancy last approximately 266 days, 38 weeks [5].

Pregnancy is a condition that is very much a condition against all kinds of stress that results in physiological changes and metabolic function. In pregnancy there is also an increase in energy and oxygen needs (Suciani, 2015). Where the placenta also contains many mitochondria that increase oxidative metabolic processes to produce

energy that is ultimately affects the continuity of a pregnancy process (Nurmadinisia, 2012).

In pregnancy there is an increase in energy needs and oxidation (Wagey, 2011). In the metabolic process pregnancy triggers physiological changes that obscure the diagnosis of a number of hematological disorders as well as their assessment. One of the most significant changes is the increased use of oxygen from the mother's body, placenta and child development as well as when the number of red blood cells (erythrocytes) or oxygen carriers in the blood of hemoglobin is insufficient for the physiological needs of the pregnant woman's body it will experience anemia (Cunningham et al., 2013) [6-10].

Anemia is a condition in which the body has too few amounts of red blood cells (erythrocytes), in which red blood cells contain hemoglobin that serves to carry oxygen throughout the body's tissues [15]. The increase in plasma volume is the cause of physiological anemia in pregnancy. Increased plasma volume causes hematocrit, blood hemoglobin concentration, and the amount of erythrocytes dissimulation decreases but does not reduce the absolute amount of hemoglobin or the amount of erythrocytes in the overall circulation. Plasma volume begins to increase from the 6<sup>th</sup> week of pregnancy but does not correspond to the number of red blood cells (erythrocytes). At its peak, plasma volume in pregnant women was 40% higher than in women who were not pregnant (Caroline, 2016) [11].

Anemia occurs in pregnant women due to insufficient production of red blood cells due to factors in the consumption of nutrients, especially iron. The formation of red blood cells depends on the supply of essential basic ingredients, some of which are not available in the body but must be provided through food. One of them is iron deficiency anemia, which occurs if not enough iron is available for the formation process of hemoglobin (Ngrah Rai, 2016). According to regulation of the Minister of Health of the Republic of Indonesia number 88 of 2014 that to protect pregnant women from malnutrition and prevent the occurrence of iron nutrient anemia, pregnant women need to take tablets plus blood. Standard tablets added blood for women of childbearing age and pregnant women are given as much as 1 (one) time a week and 1 (one) time a day during menstruation and for pregnant women given every day during their pregnancy or at least 90 tablets [12-14].

The absorption of iron is strongly influenced by the availability of Red guava which is containing vitamin C in the mother's body. The role of Vitamin C can help reduce ferric iron (Fe<sup>3+</sup>) to Fe<sup>2+</sup> in the small intestine so that it is easily absorbed, the reduction process will be greater when the pH in the stomach is getting acidic. Vitamin C can increase acidity so that it can increase iron absorption by up to 30% (Sari, 2013). The government program that has been run is seen in the coverage figure of Fe tablets in pregnant women in Indonesia in 2012; nationally the coverage of pregnant women got 90 Fe tablets by 86%. The data is close to the program target in 2012 of

90% (Ministry of Health, 2014). However, iron deficiency anemia in pregnant women is still a health problem experienced by women around the world, especially in developing countries (Ministry of Health, 2012) [16].

According to Wirawan S, et al (2015) administration of Fe tablets with the addition of vitamin C can help increase hemoglobin levels in pregnant women. One of the fruits that are very rich in vitamin C is Guava. Vitamin C content in guava is equivalent to 6 times the content of vitamin C in oranges, 10 times the content of vitamin C in papaya, 17 times the content of vitamin C in guava water, and 30 times the content of vitamin C in bananas (Hadieti and Apriyanti, 2015) [17].

The World Health Organization (WHO) reports that the prevalence of mothers with iron deficiency is about 35-37% increasing with the increase in gestational age and an estimated 30-40% cause anemia due to iron deficiency. This abnormality is characterized by decreased serum iron (SI), Total Iron Binding Capacity (TIBC) increased, transferrin saturation decreased, ferritin serum decreased, negative bone marrow iron painting and the presence of response to treatment with iron preparation (WHO, 2013).

Based on the results of Basic Health Research (Riskesdas) in 2013, the prevalence of anemia in pregnant women in Indonesia was 37.1%, this presentation decreased compared to 2011 of 83.3%, after the administration of Fe tablets in Indonesia in 2012 by 85%. Although the government has carried out an anemia prevention program in pregnant women by giving 90 Fe tablets during the gestation period with the aim of lowering the anemia rate of pregnant women, but the incidence of anemia is still high (Ministry of Health, 2013) [18].

South Sulawesi province based on Health Survey in 1992 prevalence of nutritional anemia, especially in pregnant women ranged from 45.5-71.2% and in 1994 increased to 76.17%. 14.3% in Pinrang Regency and 28.7% in Soppeng Regency and the highest was in Bone 68.6% (1996) and Bulukumba 67.3% (1997). While the data report in Maros Regency, especially in Bantimurung district of pregnant women anemia in 1999 by 31.73%, in 2000 increased to 76.74% and in 2001 by 68.65% (Ridwan, 2004). Data obtained from the Health Office of South Sulawesi Province, from 23. 839 pregnant women who were examined hemoglobin levels, there were pregnant women with hemoglobin levels of 8-11 Mg / dl there were 23,478 people (98.49 %) and pregnant women with hemoglobin levels <8 mg / dl there are 361 people (1.15%)(Health Office of South Sulawesi Province, 2015) [19].

Based on the initial data taken at the Antang Public Health Center (APHC) obtained by pregnant women in 2015 as many as 327 people, who experienced anemia as many as 120 people (36.69%), who experienced mild anemia with levels of Hb 9-10 gr% as many as 78 people, moderate anemia with levels of Hb 7-8 gr% as much as 32 people, and severe anemia with a level of <7 gr% as many as 10 people. in 2016 the number of pregnant women as many as 316 peo-

ple, who experienced anemia as many as 98 people (31.01%), who experienced mild anemia with levels of Hb 9-10 gr% as many as 61 people, moderate anemia with levels of Hb 7-8 gr% as many as 30 people, and severe anemia with levels of <7 gr% as many as 7 people and who experienced anemia as many as 117 people (36.90%), who experienced mild anemia with levels of Hb 9-10 gr% as many as 79 people, moderate anemia with levels of Hb 7-8 gr% as many as 23 people, and severe anemia with a level of <7 gr% as many as 15 people and in 2018 pregnant women as many as 360 people, and who experience anemia as many as 135 people (37.5%), who have mild anemia with levels of Hb 9-10 gr% as many as 94 people, moderate anemia with levels of Hb 7-8 gr% as much as 36 people, and severe anemia with a <7 gr% as much as 5 people. (Antang Public Health Center, 2018).

Treatment of anemia carried out by midwives in AHC is by giving Fe tablets to every pregnant woman anemia, and encourages mothers to drink at night after meals before going to bed with a dose of 1x1 / day.

### 3. Statement of the Problem

Based on the background, it can be formulated a problem that is "Is the Influence of Consuming Red Guava Juice Increasing Hemoglobin Levels in Pregnant Women.

### 4. Method of Research

The type of research used is pre-Experimental Design research with the design used by One Group Pretest-Posttest Design, which is a design that is done pretest to find out the initial state of the subject before being treated so that researchers can know the condition of the subject before and after being given treatment whose results can be compared or seen changes (Setiawan and Prasetyo, 2015). This research has been conducted on January 23 to November 23, 2019 in Antang Health Center. Population is the entire research object or object to be studied (Notoatmodjo, 2012).

The population in this study is all pregnant women with anemia as many as 230 pregnant women who visited the ANC in AHC in January-August 2019. Samples are objects studied and considered to represent the entire population (Notoatmodjo, 2012). The number of samples in the study was 230 anemia pregnant women who made an ANC visit at AHC. Sampling techniques in this study is by means of Non probability sampling purposive sampling type that is the technique of determining samples by selecting samples among populations so that the sample can represent population characteristics that have been known before (Carsel Syamsunie, 2017). In other words, purposive sampling is a technique of determining samples with certain considerations or special selection.

#### 4.1. Inclusion Criteria

Inclusion Criteria are a common characteristic of research subjects of a target population to be studied. The criteria for exclusion in this study are: Pregnant women who visited ANC in AHC, Pregnant

women are with Mild and Moderate Anemia, Pregnant women trimester II and III, willing to be a respondent, and pregnant women who don't take Fe tablets.

#### 4.2. Exclusion Criteria

The exclusion criteria are to eliminate or remove those who meet the exclusion criteria from the study due to various things such us; pregnant women with hemoglobin are normal, mothers who are not willing to be respondents and pregnant women who do not like red guava juice.

The way of data collection is done by giving an informed consent and sharing the Observation Sheet to pregnant women at Antang Public Health Center. Only then explain on how to fill it. Respondents were asked to fill in the observation sheet that had been shared, and then the researcher asked for the observation sheet that had been filled in by the respondent at the same time. The data obtained consists of:

- Primary data are basic sources consisting of evidence or main witnesses of the events of the objects studied and symptoms that occur in the field (Sujarmani W, 2014). Primary data is obtained by providing observation sheets to pregnant women.
- Secondary data obtained from the recording (document) in Antang Public Health Center

Processing Method is an attempt to re-examine the correctness of data obtained or collected. Checking questionnaires from respondents whether the answers are complete, clear, relevant, and consistent. Coding is a numerical code giving activity to data consisting of several categories (Notoatmodjo, 2012). Entry Data is the activity of entering data that has been collected into a master table or computer data base using analysis data program package (Notoatmodjo, 2012). Cleaning If all data from each data source or respondents are completed, it is necessary to check again to see the possibility of code errors, incompleteness and so on and then done correction or correlation of this process called data cleaning (Notoatmodjo, 2012). Tabulation data that has been completed in accordance with the required variables then inserted into the frequency distribution table. After obtaining the results by means of calculation then the value is included into the category of values that have been made (Notoatmodjo, 2012) [20].

### 5. Result

The research was conducted in APHC on May 23 to August 23, 2019. APHC is located on Jalan Lasuloro Raya Blok 1 No. 19 Bangkala, Manggala District, Makassar City, South Sulawesi. There are several rooms in APHC, namely General Polyclinics, KIA/KB Polyclinics, Maternity rooms, Emergency Room, Treatment Rooms, and Laboratories.

1. Univariate Analysis, the number of samples studied was 20 people, using observation sheets that had been prepared in advance according to the required data. The data source

used is primary data. Data obtained from the results of the study is then compiled in the form of frequency distribution tables both independent variables and dependent variables.

#### a. Age

From the results of study that has been obtained based on the characteristics of respondents according to the age of the mother is divided into two groups, namely the age of <20 years and 20-35 years in APHC, it can be presented in the (Table 1.1) as follows:

**Table 1.1:** Distribution of Frequency of Respondent Characteristics by Age of Mother in APHC in 2019.

Years	Frequency	%
<20 years	2	10
20-35 years	18	90
Total	20	100

Based on Table 1.1 can be seen that from 20 respondents, the largest number of respondents age is 20-35 years as many as 18 people (90%), while the age of <20 years as much as 2 people (10%).

#### b. Education

From the results of the research obtained based on the characteristics of respondents according to maternal education that is divided into four, namely, elementary, junior high, high school and bachelor at APHC, it can be presented in the (Table 1.2) as follows:

**Table 1.2:** Distribution of Frequency of Respondents' Characteristics according to Maternal Education in APHC on 2019.

Education	Frequency	%
Elementary	4	20
Junior High School	5	25
Senior High School	9	45
Bachelor Degree	2	10
Total	20	100

Based on Table 1.2 can be seen from 20 respondents according to maternal education the highest number of high school as many as 9 people (45%), and the lowest number of bachelor degree as many as 2 people (10%).

#### c. Job

From the results of research that has been obtained based on the characteristics of respondents according to the work of mothers who are divided into two, namely house wife and private worker in APHC, it can be presented in the (Table 1.3) as follows:

**Table 1.3:** Distribution of Frequency of Respondents' Characteristics according to The Job of Mothers in APHC 2019.

Job	Frequency	%
House wife	18	90
Private worker	2	10
Total	20	100

Based on Table 1.3, it can be seen that out of 20 respondents according to maternal work the highest number of house wife as many as 18 people (90%), and the lowest number of private work as many as 2 people (10%).

#### d. Hemoglobin

From the results of the study that has been obtained based on the characteristics of respondents according to hemoglobin who are divided into two, namely increasing and not increasing in APHC, it can be presented in the (Table 1.4) as follows:

**Table 1.4:** Distribution of Frequency of Respondent Characteristics according to hemoglobin of Pregnant Women in APHC 2019.

Hemoglobin	Before	%	After	%
Without increasing	20	100	3	15
Increase	0	0	17	85
Total	20	100	20	100

Based on Table 1.4, it can be seen that out of 20 respondents according to hemoglobin pregnant women after being given pink guava juice there are 3 (15%) pregnant women whose Hemoglobin does not increase or are said to still have anemia.

### 2. Bivariate Analysis

Bivariate analysis is performed to determine the influence of dependent variables with independent variables. Statistic test used is:

- a. Normality test is used to prove that the data obtained has been distributed normally or not. This is done to determine the statistics to be used to analyze the data. So the researchers used the Kolmogorov-Smirnov Test using the statistic program. The results of the calculation are as follows:

(Table 1.5) Results of Normality Test Effect of Consuming Red Guava Fruit Juice on Increasing Hemoglobin Levels of Pregnant Women in APHC 2019

**Table 1.5:** Results of Normality Test Effect of Consuming Red Guava Fruit Juice on Increasing Hemoglobin Levels of Pregnant Women in APHC 2019.

Hemoglobin	Sig ( <i>p</i> )	$\alpha$
Before intervention	0,466	0,05
After intervention	0,353	0,05

Based on the results obtained from the calculation of Kolmogorov-Smirnov Test obtained *p* value for before is 0.466 and after that is 0.353 >  $\alpha$ , it can be concluded that the data is distributed normally, and then the appropriate static test to be used is paired t-test (Paired Sample t-Test).

#### b. Research Statistics Test

Based on the results of research before and after done by using Simple Paired Test t-Test, the results of bivariate analysis can be seen as follows:

(Table 1.6) Effect of Consuming Red Guava Fruit Juice on increasing hemoglobin Levels of Pregnant Women in APHC 2019.

**Table 1.6:** Effect of Consuming Red Guava Fruit Juice on increasing hemoglobin Levels of Pregnant Women in APHC 2019.

Hemoglobin	Total (N)	Mean	$\rho$
Before intervention	20	99,200	0,000
After intervention	20	116,650	

Based on the results of research that has been done before given red guava juice the average value is 9.9200 and after being given pink guava juice the average value is 11.6650. From the results of bivariate analysis using paired sample t-test obtained *p* value is 0.000. This value is less than 0.05 ( $p < \alpha$ ), so  $H_0$  rejected  $H_a$  accepted means there is an influence of consuming red guava juice on the increase of hemoglobin levels of pregnant women who are anemic.

## 6. Discussion

Based on the results of the study on the influence of consuming red guava fruit juice can increase of hemoglobin level of pregnant women in APHC on May 23 to August 23, 2019. Anemia in pregnancy is a condition where pregnant women who have  $hb < 11.00$  gr / dl. The most common pregnancy anemia is anemia due to iron deficiency (Fe). In pregnant women anemia increases the frequency of complications in pregnancy and childbirth. In general, one of the causes of iron deficiency anemia is insufficient iron intake and inadequate absorption (Widyastuti, 2005). The absorption of iron is strongly influenced by the availability of vitamin C in the mother's body. One of the fruits very rich in vitamin C is guava.

Guava has vitamin C content five times more than the content of vitamin C in citrus fruits. In addition, the vitamin A content of this fruit is classified as high with a sugar content of 8%. Pregnant women with the consumption of 100 grams of guava per day on a regular basis can increase hemoglobin levels. This is in accordance with the findings of research conducted by Argana, G, et al in 2004, showing that each increase in the frequency of consumption of foods containing vitamin C 1 time will increase hemoglobin levels by 0.06 gr / dl. That is, the more often a person consumes vitamin C, the higher the hemoglobin levels.

Based on the results of research conducted in APHC, the average hemoglobin levels of respondents before consuming guava juice is 9.9200 and after being given guava juice the average value is 11.6650, which means there is a change in hemoglobin levels. From the result obtained  $q$  value is 0.000. This value is less than 0.05 ( $q = 0.000 < 0.05$ ), so  $H_0$  rejected  $H_a$  accepted, meaning there is an influence of consuming pink guava juice on the increase of hemoglobin level of anemia pregnant women.

The results of this study are in line with research conducted by Esty and Emy (2007) on the influence of hemoglobin levels in pregnant women before and after consuming red guava obtained a  $q$ -value value of 0.002 ( $s = 0.05$ ). This indicates that there is a change in hemoglobin levels in pregnant women before and after consuming red guava in The Village of Bandung District, Ngrampal Sragen Regency. Based on Nurul's research (2017) the average increase in hemoglobin pretest and posttest levels is 10.23 and 11, where the average value of hemoglobin levels before and after is 0.66 with a  $p$ -value = 0.026 < 10 (0.05). The conclusion is that there is an influence of guava juice on changes in hemoglobin levels in pregnant women who consume Fe tablets at the Pakualaman Health Center Yogyakarta.

One of the fruits that can increase hemoglobin levels is guava fruit, the chemical content in guava is amino acids (tryptophan, lysine), calcium, phosphorus, iron, vitamin A, vitamin B1, and Vitamin C. Mineral content in guava fruit can overcome anemia (red blood deficiency) because in the red guava fruit contains also mineral substances that can facilitate the formation of hemoglobin red blood cells.

The content of minerals is such as magnesium, copper, and manganese. Manganese is used by the body as a peer factor for antioxidant enzymes, superoxide dismutase.

Iron needs of the pregnancy trimester vary, in the first trimester iron needs are precisely lower than the period before pregnancy because pregnant women do not have menstruation and the fetus conceived does not need much iron. By the second trimester, the need for iron began to increase, at this time there was an increase in the number of red blood cells. In the third trimester, the number of red blood cells increased by 35%, along with an increase in iron demand of 450 mg, the increase in red blood cells is caused by the increasing need for oxygen from the fetus. Iron absorbed can be increased by cobalt, inosin, etionin, vitamin C, HCL, succinic and other acid compounds. Acid will reduce ferric ions to ferrous and inhibit the formation of Fe complexes with insoluble food (Gunawan, 2007).

Iron needs in pregnant women are twice the normal needs of adults. The need begins the second trimester due to the hypovolemic as a physiological adaptation of her pregnancy. During pregnancy, a pregnant woman stores approximately 1000 mg of iron including for fetal purposes, placenta and hemoglobin itself. (Irianto, 2014). Therefore, mothers need iron 1.5-3 mg per day especially trimester II and III (Hoffbrand and moss 2015).

Age is one of the factors that affect hemoglobin levels. According to Atikah (2009) if the age of pregnant a woman is too young that is less than 16 years where the reproductive organs are not ready for conception and pregnant women over 35 years old become a problem because with age there will be a decrease in the function of the organ that is starting the aging process. Another factor influencing hemoglobin levels is education. In this study, the education of pregnant women who were the respondents was the highest school educated. According to Arianto (2014) education is a process of change towards adulthood. The knowledge possessed by the mother will influence her decisions and behavior. Mothers who have higher education will use rational considerations and knowledge about the nutritional value of food or physiology more prominently.

The tendency of education is higher, so the number of anemia events is decreasing. Education about anemia is not only obtained from formal education. Information about anemia can be obtained from television, radio, newspapers, magazines, health workers and through friends. Nutrition education is one of the efforts to overcome nutrition problems in the community. The existence of education is expected to change behavior towards improving food consumption and nutritional status.

The next factor that can affect hemoglobin according to Rukiyah (2010) is jobs, the type of work in the informal sector with a relatively heavier physical workload, causing a person to sweat a lot. This results in increased iron expenditure along with sweat. Pregnant and lactating women who have to do the workload require a lot of food

for their health condition as well as for their energy needs, so that the nutrients needed must be satisfied. In this study, the majority of pregnant women who were respondents were housewives of 18 respondents (90%).

Based on the above, the researchers assumed that there is an influence of red guava juice on changes in hemoglobin levels in pregnant women who are anemic, because the high content of vitamin C in guava can be utilized by pregnant women for the formation of red blood cells. However, from the researchers observed in the area there were 3 pregnant women who had previously experienced anemia and were given pink guava juice for 7 days. At the time of measured Hb the mother remained anemic. This is due to the low level of maternal education, thus affecting the mother's knowledge about consuming nutritious foods or fruits for increased Hb levels, as well as work factors that are heavier physical workload, causing a person to sweat a lot, resulting in increased iron expenditure along with sweat. It is the meaning that the hypothesis of the research is accepted as cause of there is strongly correlation.

## 7. Research Limitation

There are some respondents who do not understand about what anemia and hemoglobin are as well as the benefits of guava. Because pregnant women just get information about the content of the pink guava juice. Time is very limited so it adjusts to research activities. Availability of the respondents studied cannot observe dietary restrictions containing other iron.

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