

## The Effect of The Combination Juice of Guava and Red Spinach on The Hemoglobin Level of Pregnant Women on Third Trimester in Health Center of Melak

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### Article Information

Submitted: 29 December 2022

Accepted: 04 January 2023

Online Publish: 20 January 2023

### Abstract

**Introduction:** Indonesia is a developing country that has a very high prevalence of anemia in pregnancy. The results of the Riskesdas data show that pregnant women experiencing anemia in Indonesia increased from 37.1% to 48.9%. Anemic pregnant women have difficulty, and bleeding during childbirth. Meanwhile, babies are at risk of being born LBW. **Objective:** The purpose of this study was to determine the effect of giving a combination of red guava juice and red spinach on the Hb levels of pregnant women in the third trimester in the working area of the Melak Health Center. **Methods:** This study uses a quantitative approach, quasi experiment with Non-Equivalent Control Group Design. **Result and Discussion:** The results showed that there were differences in the Hb levels of respondents between the intervention and control groups after being given the research intervention ( $p\text{-value} = 0,000$ ). There was a difference in Hb levels of pregnant women in the third trimester in the intervention group between before and after being given the research intervention. **Conclusion:** It is expected that pregnant women can increase the intake of vegetables that are high in iron and vitamin C such as guava and red spinach, as an effort to prevent and overcome anemia in pregnancy.

**Keywords:** Haemoglobin Level; Pregnant Woman; Guava; Red Spinach;

## **Introduction**

Anemia has become a global health problem. *Global Nutrition Report* data (2020) states that the prevalence of adolescent girls and WUS who experience anemia in the world reaches 613.2 million people (32.8%). The number of anemia cases in pregnant women from this prevalence was 35.3 million people (40.1%). The data also stated that the prevalence rate of anemia in pregnant women was greater than the number of anemia cases in the group of women who were not pregnant with a prevalence of 32.5%. In addition, the majority of cases of anemia in pregnant women (43%) occur in underdeveloped and developing countries located on the African and Asian continents.

Indonesia is a developing country that has a very high prevalence of pregnancy anemia. Pregnant women who experience anemia in Indonesia increased from 37.1% to 48.9% in the 2018 Riskesdas results (Ministry of Health of the Republic of Indonesia, 2019). This prevalence rate makes pregnancy anemia a public health problem in Indonesia because the prevalence rate is more than 20% (UNICEF, WHO, & Bank, 2013). This data makes Indonesia the country with the third highest prevalence of pregnancy anemia in the Southeast Asian region, after Cambodia (55.8%) and Myanmar (53.8%) (Global Nutrition Report, 2020).

East Kalimantan is one of the provinces in Indonesia that has a prevalence of anemia in pregnant women below the national prevalence (18.86%). This figure is still above the national average (14.70 %). Kutai Barat is one of the districts in East Kalimantan that has a prevalence of anemia in pregnant women which is higher than the provincial prevalence (19.27%). Melak Public Health Centre is a Public Health Centre work area in West Kutai which experienced an increase in cases of anemic pregnant women from 2019 by 18.87 to 19.45 in 2020 (East Kalimantan Health Office, 2020).

Fruit and vegetable consumption is an alternative to increasing the iron levels of pregnant women with lower side effects. Juice drinks are processed products from fruits or vegetables that are rich in nutrients and have a refreshing taste. Generally, juice can be made with only one or more types of ingredients and other ingredients can be added. Several research results show the effectiveness of giving fruit, vegetable juices or a combination of the two can increase Hb levels in pregnant women (Murtie, 2020).

One of the sources of iron contained in red spinach *Ferulytyramine* and *Ferrum* (Murtie, 2020). The results of the research of Nasution et al. (2021) in Deli Serdang stated that Hb levels in 15 pregnant women increased by 2.6 g/dl after being given red spinach juice. The results of Ahsan et al. (2019) research in Pakistan showed that Hb levels in 90 children aged 9 to 13 years increased by 5 to 10% after being given red spinach juice.

Red guava and red spinach have also been widely combined with other fruits and vegetables into juice. The results of the research by Wijayanti et al. (2021) stated that the combination of red guava juice and beetroot fruit was able to increase Hb levels for pregnant women in the III trimester by 1.86 g/dl. Meanwhile, the results of Lustiani's research (2019) in Banten stated that the combination of red spinach juice and tomatoes was able to increase Hb levels of pregnant women in the III trimester by 0.36 g/dl. The

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results of some of these studies became the empirical basis for making a combination of red guava juice and red spinach.

## Method

This research uses a quantitative approach andj enis this research is *quasy experimental* research. This type of research was chosen because there are two research groups. The design of this study is *Non-Equivalent Control Group Design*. This study used two research groups consisting of one intervention group and one control group.

The target population in this study was all III trimester pregnant women who were domiciled in the Melak Health Center work area as many as 70 people. The number of samples needed in this study was 18 pregnant women who met the inclusion criteria.

The researcher divided this research instrument into three parts as follows.

1. Questionnaire sheet
2. Hb level measuring device
3. Means of production of a combination of red guava juice and red spinach

## Result and Discussion

### Result

The characteristics of the respondents studied in this study were age, parity, level of education, occupation, and family income.

**Table 1**

Frequency Distribution of Respondent Characteristics

Characteristic	Frequency (f)	Presented (%)
<b>Age</b>		
High risk	8	22,23
Low risk	28	77,77
<b>Parity</b>		
High parity	30	83,33
Low parity	6	16,67
<b>Education Level</b>		
Basis	5	13,88
Intermediate	10	22,23
Tall	21	63,89
<b>Employment Status</b>		
Work	25	69,45
Not working	11	30,55
<b>Sum</b>	<b>36</b>	<b>100</b>

Source: Processed primary data, 2022.

Based on the table above, it is known that most of the study respondents were in the low-risk age group or between the ages of 20 to 35 years which amounted to 28 people (77.77%)., had a high parity status of 30 people (83.33%), had a higher education level of 21 people (63.89%), and had a job status of 25 people (69.46%).

**Differences in Hb Levels of Pregnant Women in the III Trimester of the Intervention Group**

Based on table 2, the increase in Hb levels of the intervention group was 1.72 mg/dl. The results of statistical analysis with paired t-test resulted in a *p-value* of 0.000. This means that there is a difference in the Hb levels of the intervention group respondents between before and after receiving the intervention provided by the researcher. This can be an indicator of the influence of the combination of guava juice and red spinach on the Hb levels of research intervention respondents

**Table 2**

Analysis of differences in Hb levels of pregnant women in the III trimester in the intervention group between before and after being given a combination of red guava juice and red spinach

Measurement results	Hb Level Indicator		Delta	<i>p-value</i>
	Mean	Standard Deviation		
Before	10,23	0,443	1,72	0,000
After	11,95	0,290		

Source: Processed primary data, 2022.

**Differences in Hb Levels of Pregnant Women in the III Trimester in the Control Group**

Based on table 3, the increase in Hb levels of the intervention group was 0.01 mg/dl, which was 10.45 mg. dl during pretest and 10.46 mg. dl during posttest.

Statistical analysis of the Wilcoxon test produce *p-value* of 0.409. This means that there was no difference in Hb levels of pregnant women in the III trimester in the control group between before and after the study. This result can occur due to the absence of research intervention so that the Hb levels of the control group respondents do not change.

**Table 3.**

Analysis of differences in Hb levels of pregnant women in the III trimester of the control group between before and after

No	Group	N	Delta	<i>p-value</i>
1.	Group Intervention	15	1,72	0,003
2.	Control Group	15	0,01	

Source: Processed primary data, 2022.

**Differences in Hb Levels of Third Trimester Pregnant Women in the Intervention and Control Group**

The results of the analysis of differences in Hb levels in the III trimester Hb levels in the intervention and control groups in table 4 below Based on table 4, the results of statistical analysis with the Mann-Whitney test produced a *p-value* of 0.003.

This means that there was a difference in respondents' Hb levels between the intervention and control groups during the posttest. The difference in Hb levels during

posttest can be an indicator of the influence of research interventions in the form of giving a combination of guava juice and red spinach by researchers.

**Table 4.**

Analysis of Differences in Hb Levels of Third Trimester Pregnant Women in the

Measurement results	Hb Level Indicator	Standard Deviation	Delta	<i>p-value</i>
	Mean			
Before	10,45	0.626	0,01	0,409
After	10.46	0,531		

## Discussion

### 1. Analysis of Characteristics of Research Respondents

Based on table 1, the results showed that most of the study respondents were in the low-risk age group or between the ages of 20 to 35 years, totaling 28 people (77.77%), having high parity status as many as 30 people (83.33%), having a higher education level of 21 people (63.89%), and having a job status of 25 people (69.46%).

The results of this study are in accordance with the results of the study (Aryanto, Sugiarto, Darmawan, & Pande, 2021). The results of the study showed that most of the III trimester pregnant women who were respondents to the study were pregnant women who were in the reproductive age group. The results of this study are also in line with the results of the study (Sikoway, Mewo, & Assa, 2020) which shows that most of the third trimester pregnant women in Manado have a higher level of education (high school graduates) and already have jobs.

Women who become pregnant at the age of more than 35 years and have mmultipara status are more at risk of developing anemia. This is related to a decrease in the body's resistance so that it is easily exposed to various health problems during pregnancy. Meanwhile, women who have higher education status are also likely to have good knowledge. This knowledge is important for shaping the preventive behavior of pregnancy anemia. Multipara-based pregnant women will also have experience preventing anemia in previous pregnancies. Working pregnant women will have busier daily activities. This can affect the compliance of pregnant women in taking Fe tablets.

### 2. Hb Levels of Pregnant Women in the III Trimester in the Intervention Group and Control Group between Before and After Treatment

The results showed that the Hb level of respondents in the intervention group during the pretest was 10.23 gr / dL and then increased to 10.85 gr / dL with a delta score or a difference of 1.72 mg / dL. Meanwhile, the Hb level of respondents in the control group was 10.45 gr/dL during the pretest and then increased to 10.46 gr/dL with a delta score (difference) of 0.01 mg/dL. Therefore, the increase in Hb levels of respondents in the intervention group was higher than that of the control group. The existence of a research intervention in the form of a combination of guava juice and red spinach is a possible reason for increasing Hb levels in the intervention group higher.

The results of this study are in accordance with the results of the study (Winarni, Lestari, & Wibisono, 2020). The study stated that the average Hb levels of pregnant women as respondents to the study ranged from 10 to 11 mg / dl. Pregnant women are said to have anemia if their hemoglobin (Hb) or red blood levels are less than 10 grams%. This disease is called severe anemia. If the hemoglobin is less than 6 grams% is called gravis anemia. The normal amount of hemoglobin of a pregnant woman is 12-15 grams% and its hematocrit is 35-54%.

(Wigati & Paradise, 2018) explained that the need for iron in pregnant women is on average close to 800 mg. This need consists of approximately 300 mg required for the fetus and placenta and another 500 mg used to increase the maternal hemoglobin period. The iron is approximately 200 mg will be secreted through the intestines, urine and skin. Pregnant women's food every 100 calories will produce 8-10 mg of iron. The calculation of eating 3 times with 2500 calories produces about 25-30 mg of iron per day. During an average pregnancy of 228 days, pregnant women will produce 100 mg so that iron needs are still in deficit.

The combination of Fe tablet supplementation with other micronutrients has been shown to be effective in improving Hb formation compared to only iron supplementation in single doses (Lestari, 2020). Guava and red spinach in this study were selected as intervention ingredients related to the content of both ingredients that are able to increase the absorption and formation of iron levels of pregnant women.

### **3. Differences in Hb Levels of Third Trimester Pregnant Women in the Intervention Group between Pretest and Posttest**

The results showed that the median Hb level of respondents in the intervention group during pretest was 10.23. This figure then increased to 10.95 during posttest. The results of statistical analysis with the Wilcoxon test produced a *p-value* of 0.000. This means that there was a difference in respondents' Hb levels in the intervention group between before and after receiving the intervention provided by the researcher. This can be an indicator of the influence of the combination of guava juice and red spinach on the Hb levels of respondents who were the intervention of the study.

The results of this study are supported by other studies that state similar facts. The results of a study (Nair et al., 2013) conducted on 296 pregnant women in Pradesh district, India, showed that giving guava juice was statistically able to increase Hb levels of pregnant women with an increase of 3.3 mg / dL. The results of the study (Chakona & Shackleton, 2019) on 94 pregnant women in Eastern Cape, South Africa, also resulted in the fact that local guava consumption is effective in increasing the Hb level of pregnant women. Meanwhile, the results of Wahyuntari and Wahtini (2021) in 29 third trimester pregnant women in Yogyakarta, Indonesia, showed that giving 200 mL of guava juice for 2 (two) weeks succeeded in increasing Hb levels of pregnant women with an increase of 1.18 mg / dL.

During pregnancy there are hematological changes in which the mother's blood volume increases during the first and second trimesters. This increase in blood volume is slow in the third trimester to flattening in the last few weeks of pregnancy. This hematological change is called hemodilution (Garzon et al, 2020). Therefore, pregnant women need Fe tablet supplementation combined with vitamin C to improve the absorption and formation of iron (Garzon et al., 2020)

The combination of Fe tablet supplementation with other micronutrients is more effective in improving Hb formation compared to only iron supplementation in a single dose. Varney (2007) states that iron with vitamin C forms a complex iron ascorbate that is soluble and easily absorbed by organs in the human body. The conversion of non-heme iron in the form of compounds metabolized by Ferri to Ferro will be greater when the pH in the stomach becomes more acidic. Vitamin C can add acidity thereby increasing the absorption of Hb.

The results of this study were influenced by the selection of guava as one of the ingredients of the combination juice. Supriasa, (2016) explained that guava contains a fairly high level of vitamin C. The iron and vitamin C content contained in 100 grams of fresh cooked guava is iron as much as 1.1 mg and vitamin C by 87 mg. Vitamin C inhibits the formation of hemosiderin which is difficult to mobilize to free iron if needed by the body. Iron absorption in non-heme form quadrupled if there is vitamin C.

In addition to Fe tablet supplementation combined with micronutrient intake such as vitamin C, efforts to increase Hb levels in pregnant women can also be done by consuming plant-based intake high in iron such as red spinach. Supriasa and Hardinsyah (2016) explained that red chicken b is a type of alternative medicinal plant that has an iron composition that can increase low Hb levels so that Hb levels can return to normal. Red spinach also contains several substances that the body needs such as proteins, fats, carbohydrates, potassium, amaranthine, purines and vitamins A, B, C, and K.

Various research results also mention the effectiveness of red spinach as a source of intake to prevent anemia of pregnant women. The results of research by Bashir, Banoo, and Pathak (2020) stated that red spinach decoction succeeded in increasing the Hb levels of pregnant women aged 25 - 35 years in Kashmir district, India by 2.70 mg / dL. Meanwhile, the results of Mardiah, Andreyna, and Rismawan's research (2021) stated that Hb levels from 24 third trimester pregnant women in Bandung, Indonesia, changed from mild to normal status after being given an intervention in the form of red spinach juice.

Innovation efforts to increase Hb levels for pregnant women can be done by combining guava and red spinach in the form of juice. The iron content in red spinach combined with the content of vitamin c in guava is proven and is expected to increase the absorption and formation of Hb as an effort to prevent anemia.

#### **4. Differences in Hb Levels of Pregnant Women in the III Trimester in the Control Group between Pretest and Posttest**

The results showed that the median Hb levels of the control group respondents were 10.45 mg / dl during pretest and 10.46 mg / dl during posttest. The results of statistical analysis with the Wilcoxon test produced a *p-value* of 0.409. This meant that there was no difference in respondents' Hb levels in the control group between pretest and posttest. These results can occur due to the absence of research interventions so that the Hb levels of control group respondents do not change statistically.

The control group in this study did not accept the combined juice intervention, but only took Fe tablets. The results of this study are not in accordance with the results of research by Agustina, Indrayani, and Suralaga (2020) which stated that there were differences in hb levels in the control group in their research. However, the results of this study are in line with the results of research by Herdiani, Fitriani, and Ulandari (2019) which stated that there was no difference in Hb levels in the research control group (Herdiani, Fitriani, Sari, & Ulandari, 2019)

Fe tablet supplementation is one of the efforts in preventing anemia in pregnant women. But not all pregnant women are easy to take Fe tablets. This is because some pregnant women experience an allergic reaction after taking Fe tablets. This issue could be the reason pregnant women who were respondents to this study were less compliant or no longer took Fe tablets so that the median value of Hb levels in the control group only rose by 0.05 mg/dL which was not statistically significant.

#### **5. Differences in Average Hb Levels of Pregnant Women in the III Trimester in the Intervention and Control Group**

The results showed that the median value of Hb levels of respondents in the intervention and control groups during pretest was 10.23 mg / dL and 10.45 mg / dL, respectively. The results of statistical analysis with the Mann-Whitney test produced a *p-value* of 0.385. This means that there was no difference in respondents' Hb levels between the intervention and control groups at the time of pretest. The results of this study are a challenge for research interventions based on posttest results.

The results of this study are in line with several research results with similar themes. The results of the study (Rahmadayanti, Pratiwi, & Permadi, 2021) showed that the *mean* Hb levels of 40 third trimester pregnant women in Palembang in the intervention group of the combination of guava juice and spinach with control did not produce a statistical difference during the pretest. The results of the Wigati and Firdaus (2021) study showed that the *mean* Hb levels of 40 third trimester pregnant women in Kediri in the intervention group of the combination of guava juice and spinach with control did not produce a statistical difference during the pretest.

The absence of differences in Hb levels of respondents to the two study groups could be due to the homogeneity of the trimester of pregnancy. All respondents to this study were pregnant women in the III trimester. Aryanto (2021) mentioned that one-third of cases of anemia in pregnancy occur in the III trimester where the amount of plasma and erythrocytes increases causing Hb levels to decrease (Aryanto et al., 2021)



Researchers assumed that the absence of differences in respondents' Hb levels in the intervention and control groups was due to factors of characteristic homogeneity and supplementation of Fe tables. All respondents to this study lived in the same Public Health Centre work area. This forms the similarity of the types of foodstuffs consumed on a daily basis. In addition, all respondents of this study also consumed the same type and amount of Fe tablets. Both of these affected the absence of differences in Hb levels during pretest or before the research intervention.

In addition, all respondents to this study were pregnant women in the III trimester. This can have an impact on the similarity of average Hb levels. Winarni (2020) mentioned that anemia is a condition where the number of red blood cells (erythrocytes) is insufficient to be sufficient to meet the physiological needs of the body. The diagnosis of anemia established Hb concentrations below lower limit values that differed between populations and ages. Anemia is a condition where Hb levels are below 11 mg/dl in the I and III trimesters or below 10.5 mg/dl in the II trimester (Winarni et al., 2020)

In physiological pregnancy there is an increase in blood volume up to 40–45% compared to non-pregnant women, in order to meet the needs of the mother and fetus. This increase in blood volume begins at 12 weeks gestation and peaks at 36 weeks gestation. But the increase in red blood cells is not comparable to the increase in blood plasma, as a result of which there is a decrease in the concentration of Hb. This is what triggers anemia in pregnant women.

The results showed that the median value of respondents' Hb levels in the intervention group during posttest was 10.95 mg / dL and the control group was 10.46 mg / dL. The delta score of the intervention group was 1.72 mg/dl and the control group was 0.01 mg/dl. The results of statistical analysis with the Mann-Whitney test produced a *p-value* of 0.003. This means that there were differences in respondents' Hb levels in the intervention and control groups during the posttest. This could be an indication of the influence of researcher intervention on the intervention group.

The results of this study are in line with several research results with similar themes. The results of the research of Rahmadayanti et al (2021) showed that there was a difference in the *mean* Hb levels of 40 third trimester pregnant women in Palembang in the intervention group of the combination of guava juice and spinach with control during posttest. The results of the Wigati and Firdaus (2021) study showed that there was a difference in the *mean Hb* levels of 40 third trimester pregnant women in Kediri in the intervention group of the combination of guava juice and spinach with control during posttest.

The intervention of this study in the form of a combination juice of guava juice and red spinach was assumed to be a factor that significantly increased the Hb levels of the intervention group respondents. The nutritional content of the two ingredients is beneficial in the absorption and formation of Hb. Supariasa (2016) states that vitamin C in guava increases iron absorption and increases blood Hb levels. While red spinach has a high content of iron and other nutritional content that accelerates the formation of Hb.

Some pregnant women feel afraid to take Fe tablets because they think they are harmful to their babies and traumatized by allergic reactions. The fear of pregnant women is based on the assumption that the Fe tablets come from chemicals that can be harmful to the body. Therefore, it is very necessary to intake iron from vegetable ingredients such as guava and red spinach. The combination of guava juice and red spinach is an innovative effort to overcome anemia in pregnant women.

Red spinach has an iron content of 6.43% mg per 180grams. This high iron content is important because function iron is to form red blood cells. If the production of red blood cells is sufficient, then Hb levels will rise (Arisman, 2007). Iron is a substance that is difficult to absorb. Iron undergoes a reduction process from ferric form ( $\text{Fe}^{3+}$ ) to ferrous ( $\text{Fe}^{2+}$ ) for easy absorption. The iron absorption process requires a catalyst in the form of vitamin C (Patimah, Rahmandari, & Kurnia, 2022)

Red guava contains vitamin C which is quite high and can help the iron absorption process and is able to treat anemia in pregnant women. Winarni (2020). Explaining that the iron contained in foodstuffs will be absorbed with the help of vitamin C. Vitamin C can help reduce ferric iron ( $\text{Fe}^{3+}$ ) to ferrous ( $\text{Fe}^{2+}$ ) in the small intestine so that it is easily absorbed by the body. The reduction process will be greater if the pH in the stomach gets more acidic. Vitamin C increases the pH of the gastric base so that it can increase the iron absorption process by up to 30%.

According to researchers, it can be concluded that giving red guava and red spinach which are rich in vitamins and nutrients can raise hemoglobin levels by helping the absorption of Fe consumed from blood-added tablets and eating iron sources.

## **Conclusion**

Most iii trimester pregnant women are between 20 and 35 years old, have low parity status and have a high level of education and have employment status (69.46%). The mean $\pm$ standard deviation value of respondents' Hb levels in the intervention group and control group was 10.43 mg/dl during pretest and then increased by 0.82 mg/dl to 11.25 mg/dl during posttest. The mean value of respondents' Hb levels in the control group was 10.55 mg/dl during pretest and then increased by 0.05 mg/dl to 10.60 mg/dl during posttest.

There were differences in Hb levels of pregnant women in the III trimester in the group before and after being given a combination of red guava juice and red spinach. There was no difference in Hb levels of pregnant women in the III trimester in the control group between before and after being given a combination of red guava juice and red spinach. There were differences in the average Hb levels of pregnant women in the III trimester in the intervention group and the control group.

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