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# Mix Root Beet and Red Guava's Yogurt Impact on Eligible Women's Haemoglobin Level

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**Abstract**

Nutritional problems in children are closely related to the health and nutrition preparation of a woman to become a mother-to-be, in this case, eligle woman (15-49 year) who do not yet have a legal partner. The results of the Nutrition International survey in 2018 found cases of anemia in eligible wowen's in West Java of 41.93%, this is in line with the target of giving blood supplement tablets to eligible women's, especially the adolescent group, which is still low (25.2%) and still below the target of West Java (52%). There is a need for intervention efforts to prevent anemia by optimizing the provision of iron-containing foods in addition to giving iron tablets. The purpose of this research was to determine the effect of a mix of beetroot and red guava yogurt on hemoglobin levels in eligible woman. The method used is a quasi-experiment with a one-group pre-post design approach. The sample in this study was 30 respondents using a purposive sampling technique with the inclusion criteria of mild and moderate anemia, not having allergies to yogurt ingredients, and not being on medication disease that can cause anemia. Determination of anemia by measuring hemoglobin levels with the POCT (Point of Care Testing) method. The analysis technique uses frequency distribution, normality test, and bivariate test using Wilcoxon test through SPSS version 20.0 computer software. The results showed that all respondents (100%) experienced mild anemia before being given the yogurt mix of beets and red guava. There is a significant change with a p- value of 0.000 < alpha value (0.05). It can be concluded that giving beetroot and red guava yogurt if consumed regularly and appropriately can reduce the incidence of anemia, so it is hoped that this can be used as a policy for intervention in eligible women's with anemia.

*Keywords:* Anemia, Eligible Woman, Red Guava, Root Beets, Yogurt.

## 1. Introduction

The emergence of nutritional problems in children under two years of age is closely related to the health and nutrition preparation of a woman to become a mother-to-be, in this case, eligible woman in the age range of 15-49 years and who do not yet have a legal partner. Basic health research data (Riskesdas) 2019, shows that the prevalence of anemia in eligle women aged 15 years and over is 22.7%. The prevalence of anemia in women (23.9%) is higher than that of men (18.4%). The 2019 Household Health Survey (SKRT) data shows that the prevalence of anemia in teenage girls (ages 10-19 years) is 30%. Research data in various regions in Indonesia shows that the prevalence of anemia in teenage girl ranges from 32.4 to 61% (Prabhakara, 2010).

A medical disease known as anemia occurs when the amount of red blood cells in the blood diminishes or the number of blood cells or hemoglobin is lower than usual (Ministry of Health of the RI, 2018). Women of eligibe age are a high-risk group for anemia, especially in the group of teenage girl. Teenage girl need for iron absorption increases at the age of 14-15 years, while teenage man one or two years later. Women of eligible age experience menstruation every month and especially young women who are in their infancy so they need more iron intake. Eligible woman with anemia during pregnancy are at risk of giving birth to low birth weight babies (LBW) and stunting (Means, 2020).

The cause of anemia in eligible woman, especially in this teenage age group, is generally iron deficiency, in this condition, there is a deficiency of iron reserves in the body. This causes the formation of red blood cells to be not optimal. In this condition, clinical anemia has not yet occurred and this condition is called iron reserves having been depleted, then iron reserves in the body including plasma iron will be increasingly depleted and iron binding for transportation will decrease, resulting in iron deficiency anemia. This situation causes a reduction in red blood cell

mass accompanied by a decrease in hemoglobin concentration below normal so that the capacity of the blood to carry oxygen is also below normal. (Budhathoki et al., 2021).

Handling anemia can be done pharmacologically and non-pharmacologically. Pharmacological treatment is by consuming tablets (Fe), but this method is often not preferred because it often causes nausea and vomiting due to the smell of iron (Ministry of Health of the RI, 2018.) So there need to be other efforts such as providing a variety of food. Diversification of food consumption is not only beneficial from a nutritional point of view but is also essential for realizing food self- sufficiency and family food security. Alternative innovations to help overcome the incidence of rheumatic anemia in meeting iron needs and maintaining the amount of iron in the body by developing foods that are rich in iron and preferred by rheumatism. One of the products that were created as an alternative food product that women enjoy doing is processed yogurt, a snack that is considered to be able to expedite the digestive system so that it helps the body ideal. In this study, plain yogurt made from cow's milk with beets and guava was used. In addition to minerals including iron (Fe), sodium (Na), zinc (Zn), calcium (Ca), potassium (K), magnesium (Mg), and phosphorus, beets also include vitamins, carbs, proteins, and lipids (P). Compared to nuts and dragon fruit, beetroot has a higher iron (Fe) concentration. Dragon fruit and nuts only have around 0.6 mg of iron per 100 grams, compared to 1 mg in 100 grams of beets. While beets contain 10.2% vitamin C and 34% folic acid, which helps the body develop and replace damaged cells (Gheith & El-Mahmoudy, 2018). Meanwhile, guava is rich in iron and vitamin C. Vitamin C is an essential element that is needed by red blood cells, which provides an acidic environment that makes it easier for ferric iron to become ferrous which is more easily absorbed by the intestine. (Nair et al., 2013)

Researchers conducted a preliminary study through literature studies related to research to prevent or increase hemoglobin levels limited to giving beets. The novelty in this study is that the researchers combined beets which are rich in iron, and also red guava which is rich in vitamin C so that it is expected to help the absorption of iron from beets more optimally. Served in yogurt preparations besides being beneficial for health and also attracting teenagers as a contemporary drink. So that with an attractive appearance, women of childbearing age, especially the teenage age group, can consume it and feel its benefits to avoid the problem of anemia which has an impact on pregnancy and her baby later.

## 2. Literature Review

Nutrition is one of the determinants of the quality of human resources. Malnutrition will cause the failure of physical growth and development of intelligence, reduce work productivity and reduce endurance, which results in increased morbidity and mortality. There are two kinds of nutrients, namely macronutrients and micronutrients. Macronutrients or also known as macronutrients consist of protein, fat, and carbohydrates. While micronutrients consist of various kinds of vitamins and minerals. Protein is included in macronutrients, and iron is included in micronutrients. Adequacy of protein and iron is needed by every individual. Protein and iron are closely related to a person's hemoglobin level. Hemoglobin is the oxygen-carrying compound in red blood cells. Hemoglobin levels in the body should be at normal values. If the hemoglobin level decreases, it will cause anemia. Anemia is a condition where the hemoglobin level is lower than the normal value. Anemia also means a condition when there is a deficiency in the size, number of erythrocytes, or hemoglobin content. One group that is vulnerable to nutrition is eligible woman. The existence of health problems in eligible woman will have an impact on the quality of human resources for the generations to be born. Research conducted by Aetekah Owais at all, explained that anemia in eligible women increases in conditions of underutilization of health services during pregnancy or breastfeeding so that it poses a risk to the generation being born, Nutrition Intake, Food Fortification Programs, and eligible women education.(Owais et al., 2021)

The impact of anemia on eligible woman is stunted growth, the body during the 4th growth period is easily infected, resulting in reduced body fitness/freshness, and decreased enthusiasm for work or activity. Ravishankar Suryanarayana in his research stated that There was a significant overall improvement in the hemoglobin levels of pregnant during the follow-up (10.3–10.72 gm%). About 35.6% of the women had maternal or fetal morbidity. Anemia was one of the main pregnancy-related complications (62.3%), other complications include difficult labor (3%), postpartum hemorrhage, and preeclampsia 1.6% each abortions/stillbirths (3.5%). The fetal complications include low birth weight (25.5%) followed by premature delivery (0.2%) and birth asphyxia (0.5%). (Chowdhury & Chakraborty, 2017). Anemia is a condition where the hemoglobin (Hb) level in the blood is lower than normal for groups of people according to age and sex, where the normal Hemoglobin (Hb) value for women is 12-16 mg/dl. Iron anemia can cause a decrease in physical ability, but it can also cause a decrease in antibodies so that you are easily sick due to infection and can cause fatigue, weakness, decreased capacity/ability, or work productivity. The main causes of anemia in women are iron deficiency, chronic blood loss during childbirth, and blood loss during menstruation. Anemia can occur due to nutritional and non-nutritional factors.

Nutritional factors are related to protein, vitamin, and mineral deficiencies, while non-nutritional factors are related to infectious diseases. Protein plays a role in the process of forming hemoglobin, when the body lacks protein for a long time the formation of red blood cells can be disrupted and this causes symptoms of anemia. Protein is a very important nutrient for the body because in addition to functioning as a source of energy in the body it also functions as a builder and regulator. In previous research, the effect of beets on anemia, the finding showed that there was asignificant improvement in level of hemoglobin at $p<0.05$ among experimental group who were administered

beetroot extract (Lisha, 2016). Other studies that support the use of beet for anemia management show that The pre-test results suggest that the experimental group's girls were 13 (56.53%) normal, 7 (30.43%) mildly anemic, and 3 (13.04%) moderately anemic. In the control group, 10 people (43.48%) were normal, 7 people (30.43%) had mild anemia, and 6 people (26.09%) had moderate anemia. After the intervention, 17 (73.92%) of the young women in the interventional group had hemoglobin levels that were normal, 4 (17.39%) had mild anemia, and 2 (8.69%) had significant anemia. In the control group, 10 (43.48%) girls had normal hemoglobin levels, 8 (34.79%) had mild anemia, and 5 (21.73%) had moderate anemia. Hemoglobin levels among females in the intervention group were mean 9.68 and SD 2.54 on the pretest, and mean scores were 11.20 and SD 0.56 on the post-test. Pre- and post- test differences were on average 1.97. The researcher concluded that Beetroot juice can help to increase the Hb level effectively (Mamata Swain, 2020).

Beets significantly contain vitamins A, and C, calcium, iron, phosphorus, potassium, protein, and carbohydrates. Beets are also high in folate, dietary fiber, antioxidants, high in betaine which is prescribed to lower levels of homocysteine (Hcy) toxins which contribute to the development of heart disease. Due to menstruation experienced by young women, beets are rich in nutrients needed for the formation and maturation of cells In 100 g of beetroot material contains 87.6 g of water, 41 kcal of energy, 1.6 g of protein, 0.1 g of fat, 9.6 g of carbohydrates, 1.1 g of ash, 2 mg of calcium, 43 mg of phosphorus. , 1 mg iron, 0.02 mg tamin, and 10 mg vitamin C. Apart from being a natural dye, betacyanin has quite high antioxidant activity (Gheith & El-Mahmoudy, 2018).

The novelty of this research that root beet is mixed with red guava which is processed into yogurt, because anemia is not only related to the adequacy of iron intake but also related to the absorption of iron itself. then the factors that influence the absorption of iron must be sought, namely the presence of vitamin C. This is in accordance with research by Restu that the results of several studies indicate that vitamin C given with iron will have an impact in the form of increased iron absorption. In conclusion, vitamin C helps in the absorption of iron by converting iron from ferric to ferrous so that it is more easily absorbed by the body. Several studies analyzing the content of vitamin C show that red guava has a high vitamin C content compared to mango (88.10 mg/100 mL), lemon (49.32 mg/100 mL), orange (53.00mg/100 mL), and apples (green, red) (29.10 and 28.3 mg/100 mL).However, the analyzed vitamin C content in packed juice samples ofwere 63.89, 47.51, 44.28, 25.30 and 11.90 mg/100mL (Abushusha,et al., 2017).

Meanwhile, red guava is a fruit that is rich in vitamin C. The content of vitamin C in red guava is equivalent to 6 times the vitamin C content in oranges. 100 grams of red guava has a composition of 228 mg of vitamin C, 0.73 mg of vitamin E, 49 µg of folate, 0.26 mg of iron; zinc 0.23 mg of, and lycopene 5204 µg. It also contains antioxidant compounds such as quercetin, guajaverin, gallic acid, leukocidin, and ellagic acid. Vitamin C adds acidity so that it helps the absorption of iron in the stomach by reducing ferric (Fe 3+) to ferrous (2+). In addition, flavonoid compounds are antioxidants that play a role in increasing the erythrocyte membrane to be less prone to lysis caused by free radicals. Guava fruit is also economically relatively cheaper compared to other fruits that are rich in vitamin C (Nair et al., 2013).

## 3. Materials and Methods

### 3.1. Materials

This type of research is a quasi experiment with a pretest and posttest one group design approach. The sample in this study was 30 respondents with a sampling technique using a purposive sampling technique, which is a data collection technique with certain considerations (Kemkes RI.2018). The sampling method met the inclusion and exclusion criteria of the study. The inclusion criteria in this study included women aged 15-30 years who had mild or moderate anemia, not having allergies to yogurt ingredients, and not being on medication disease that can cause anemia. Whereas those included in the exclusion criteria were eligible woman who experienced anemia who did not participate in the intervention according to the research protocol, withdrew and/or lost contact or communication during the research intervention and who did not have a history of allergies to the basic ingredients for making yogurt. The analysis technique uses frequency distribution, normality test, and bivariate test using Wilcoxon test through SPSS version 20.0 computer software.

### 3.2. Methods

Before conducting the research, prospective respondents were explained the purpose and process of the research taking place. After understanding the explanation given, the respondent must sign a consent form if they agree to be involved in the research. The intervention of giving yogurt mix of beets and guava was carried out for 14 days with a large amount of 250 cc. Hemoglobin levels in determining anemia status in respondents used POCT (Point of Care Testing). The POCT method is a simple inspection method using a small amount of sample, which is easy, fast, and effective to do. The POCT method is carried out through examination using a strip test. The respondent's blood sample is placed on the Hb strip then the Hb strip is inserted into the Hb Check tool, then the Hb level value will automatically be detected on the Hb checker.

This research involved 3 parties, namely the first party was the researcher as the person in charge of research in general, the second party namely as a member of the researcher, had a responsible role in data collection and the

students were responsible for data collection. This research was divided into several stages, namely the preparation, implementation and final stages. At the preparatory stage, the following steps are carried out: 1). Preparation of beets and guavas; The beets are sorted and peeled and then washed under running water and then cut into cubes. Likewise, the red guava is washed and cut into pieces. Furthermore, the beetroot and guava are mashed using a juicer. 2). Yogurt making; Heat whole milk over low heat while stirring for 30 minutes. Don't let the milk boil, so the milk protein doesn't break down. After that, remove the milk and cool it to lukewarm temperature at room temperature. Enter the yogurt seeds, then stir evenly using a sterile stirrer. The mixture that has cooled is added to the beetroot extract and guava then mashed using a mixer for 15 minutes. then put into a bottle that has been served, which is then put into the cooling machine.

## 4. Results and Discussion

This study produced data from univariate test results in the form of frequency distributions and also bivariate tests in the form of Wilxocon analysis results which can be seen in the following Table 1.

**Table 1:** Hemoglobin frequency distribution in eligible woman to receiving yogurt flavored with beets and red guava

| Haemoglobin Level | Frequency (F) | Percentage (%) |
|---|---|---|
| Normal | 0 | 0 |
| mild anemia | 30 | 100 |
| moderate anemia | 0 | 0 |
| Total | 30 | 100 |

Table 1, shows that all respondents (100%) showed that their hemoglobin levels were in the category of mild anemia before being given a yogurt mix of beets and red guava in eligible women's.

**Table 2:** Hemoglobin frequency distribution in eligible woman to receiving yogurt flavored with beets and red guava

| Haemoglobin Level | Frequency (F) | Percentage (%) |
|---|---|---|
| Normal | 27 | 90 |
| mild anemia | 3 | 10 |
| moderate anemia | 0 | 0 |
| Total | 30 | 100 |

The average administration of a beetroot and red guava yogurt mix to the hemoglobin levels of women of childbearing age resulted in an average difference before 9.5333 with a standard deviation of 0.50742 and after showing an average value of 11.1333 with a standard deviation of 0.57135, according to the results of bivariate data processing. The alpha value for statistical tests produced a p-value of 0.000. (0.05). This demonstrates that the hemoglobin level of women of reproductive age significantly changed before and after receiving a yogurt mixture of beets and red guava.

The results of the study are shown in the Table 2, found that there was a significant change in the respondents who experienced mild anemia, most of them became normal. Although there is still a small proportion (10%) who still have hemoglobin levels in the category of mild anemia. As well as in the table.3 it can also be seen that the value < alpha value so it can be said that giving yogurt mix of beets and guava can increase hemoglobin levels in eligible women. Hemoglobin is an iron-containing oxygen-carrying metalloprotein in the blood. Hemoglobin is a substance in red blood cells that functions to transport oxygen from the lungs throughout the body. Hemoglobin consists of 4 molecules of iron (heme), 2 molecules of alpha globin chains, and 2 molecules of beta-globin chains. Alpha and beta globin chains are proteins whose production is encoded by the alpha and beta globin genes (Means, 2020).

Anemia is a condition where the level of hemoglobin is less than normal or the level of red blood cells in the blood is reduced. Normal hemoglobin levels generally differ between men and women. Women are said to be anemic if their hemoglobin level is less than 12.0 grams/100 ml. Several types of anemia can be caused by iron deficiency, infection, or genetic disorders, the most common of which is anemia caused by a lack of iron intake (Kemkes RI, 2019). Anemia is a health problem, especially in developing countries like Indonesia. Anemia that is common in the world is deficiency anemia of micronutrients such as iron and affects many adolescents. The National Academy of Sciences recommends an iron intake of 15 mg per day for women. The average supply of iron in food is between 12-15 mg of iron/day, and only 5-10% (0.6-1.5 mg) is absorbed by the body (Means, 2020).

Handling of anemia can be done in 2 ways, namely pharmacological and non-pharmacological. Pharmacological treatment uses tablets (Fe), but among young women this method is often ignored and disliked because it seems to take medicine and the side effects it causes, namely nausea, vomiting (Kemkes RI, 2019). Therefore, a healthy and safe, and contemporary breakthrough is needed to attract young women to consume it. A yogurt mix of beets and guava was chosen because yogurt is a modern drink with the perception that teenagers can lose weight and make the

body ideal. Psychologically, this young woman pays more attention to body image than health (Kemkes RI, 2018). Beets (Beta Vulgaris) is a plant that grows in the soil of a type of purplish-red tuber which is most commonly found in North America and England. Beets significantly contain vitamins A, C, calcium, iron, phosphorus, potassium, protein and carbohydrates. Beets are also high in folate, dietary fiber, antioxidants, high in betaine which is prescribed to lower levels of homocysteine (Hcy) toxins (which contribute to the development of heart disease. Due to menstruation experienced by young women, beets are rich in nutrients needed for the formation and maturation of red blood cells.In 100 g of beetroot material contains 87.6 g water, 41 kcal energy, 1.6 g protein, 0.1 g fat, 9.6 g carbohydrates, 1.1 g ash, 2 calcium mg, phosphorus 43 mg, iron 1 mg, amine 0.02 mg, and vitamin C 10 mg.Apart from being a natural dye, betacyanin has quite high antioxidant activity (Gheith & El-Mahmoudy, 2018). Meanwhile, red guava is a fruit that is rich in vitamin C.

The content of vitamin C in red guava is equivalent to 6 times the vitamin C content in oranges. 100 grams of red guava has a composition of 228 mg of vitamin C, 0.73 mg of vitamin E, 49 µg of folate, 0.26 mg of iron; zinc 0.23 mg of, and lycopene 5204 µg. It also contains antioxidant compounds such as quercetin, guajaverin, gallic acid, leukocyanidin, and ellagic acid. Vitamin C adds acidity so that it helps the absorption of iron in the stomach by reducing ferric (Fe 3+) to ferrous (2+). In addition, flavonoid compounds are antioxidants that play a role in increasing the erythrocyte membrane to be less prone to lysis caused by free radicals. Guava fruit is also economically relatively cheaper compared to other fruits that are rich in vitamin C (Nair et al., 2013). In this study, a yogurt mix of beetroot and guava was given for 7 days as much as 250 cc with a composition ratio of 100 cc of beetroot juice, 100 cc of red guava juice and 50 cc of yogurt. The results showed differences in hemoglobin levels in women of childbearing age who consumed a mix of beetroot and guava yogurt, some had hemoglobin levels in the normal category but some remained categorized, namely in mild anemia but in quantitative terms, the hemoglobin levels tended to increase. The difference in changes in hemoglobin levels based on research by researchers is influenced by eating patterns and healthy living habits of female adolescents.

In women of childbearing age who experienced changes in their hemoglobin levels from mild anemia to normal, it was found that these women of childbearing age received additional Fe from daily food consumption such as consumption of red meat, and gizzard liver. spinach, beans, brown rice, and some who do regular exercise regularly. Whereas in women of childbearing age the increase or change in hemoglobin is less significant or remains in the mild anemia category, this is due to the frequent consumption of soft drinks and tea which can inhibit the breakdown of Fe in the body, besides that frequent consumption of foods that do not pay attention to nutritional adequacy, in other words as long as full.

## 5. Conclussion

Beets and red guava can increase hemoglobin levels in cases of anemia. Serving yogurt is interesting for consumption as a contemporary drink that is popular among women, especially teenagers so, with attractive packaging, maximum benefits can also be obtained. It is hoped that this can be used as a reference in policy making in overcoming anemia in eligible women. For further research, it is hoped that other developments related to anemia prevention interventions can be carried out toward a healthy lifestyle.

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