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The Effect of Healthy Drinks (Dragon Fruit And Soybean) on Hemoglobin Changes in Third Trimester Pregnant Women to Prevent Stunting in Infants

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ABSTRACT

Nutritional deficiency during pregnancy can lead to anemia, which affects fetal growth and increases the risk of stunting in infants. Natural interventions using nutrient-rich foods may provide safe alternatives to address hemoglobin deficiency in pregnant women. Objective: This research aims to evaluate the effect of healthy drinks containing dragon fruit and soybean on hemoglobin level changes in third-trimester pregnant women as a preventive measure against infant stunting. This quantitative research employed a pre-experimental design with a one-group pretest-posttest approach. The sample was selected using a non-probability sampling technique with a total of 24 respondents at the Palembang City Health Center from February to April 2024. This research used instruments for measuring hemoglobin levels and SOPs for administering healthy drinks. The analysis was carried out using the paired samples t-test. The average hemoglobin (Hb) level before administration of red dragon fruit juice in third-trimester pregnant women was 10.58 g/dL, while the average hemoglobin (Hb) level after administration of red dragon fruit juice in third-trimester pregnant women was 10.87 g/dL, with a p-value of 0.000 < 0.05. There was a significant effect of healthy drink administration on hemoglobin levels in third-trimester pregnant women between before and after the intervention.

KEYWORDS *Anemia, Dragon Fruit, Healthy Drinks, Hemoglobin, Pregnant Women, Soybean, Stunting*

INTRODUCTION

Pregnancy with anemia refers to a situation in which the level of hemoglobin (Hb) in the blood circulation of a pregnant woman falls below a certain threshold (Doshi, 2021). More precisely, in the first and third trimesters of pregnancy, Hb values below 11 g/dL are considered to indicate a state of anemia, while in the second trimester, the range is below 10.5 g/dL (Lewkowitz, 2023; de Freitas-Costa et al., 2025). However, it should be noted that at advanced gestational age, a hemoglobin level of 11.0 g/dL is categorized as anemia, but it is not tied to hypervolemia, which is normal in pregnancy (Obianeli et al., 2024; GLOWM, 2024). Globally, the prevalence of anemia in pregnant women is **41.8%** (Garzon et al., 2020; WHO, 2025). Approximately half of all anemia cases are caused by iron deficiency (Nasir et al., 2024; WHO, 2025).

Abnormal Hb levels in pregnant women greatly affect the growth and development of the fetus because blood dilution affects Hb levels in the first and third trimesters (4). During pregnancy, blood volume increases to meet the needs of both mother and fetus. However, there is a disproportionate increase in plasma volume compared to red blood cell mass, resulting in hemodilution and decreased hemoglobin concentration (Young, et al., 2023; Aguree & Gernand, 2019; Merck Manual, 2024; Liu, et al., 2022).

Management of anemia can be achieved through consuming blood-boosting supplements (Fe tablets), improving maternal nutrition, and consuming iron-rich foods that can help increase hemoglobin levels. In addition to medicinal supplements, iron and folic acid can also be obtained from food sources, for example: dragon fruit, avocado, vegetables, chicken, beef, lamb, offal, soybeans, green beans, almonds, wheat, coriander seeds, spinach leaves, tuna, and fermented products such as tofu, tempeh, and others (6) (Haider & Bhutta, 2017; Milman, 2019; Bailey et al., 2019; Mehdaova et al., 2021; Zhou et al., 2019).

According to WHO, the ideal weight gain during pregnancy is 1 kg in the first trimester, 3 kg in the second trimester, and 6 kg in the third trimester (7). Pregnant women have higher nutritional needs for fetal growth, placental development, and metabolic changes, so pregnant women should consume foods that contain abundant nutrients (8). When energy, protein, fat, vitamins, and minerals cannot be met through food consumption, pregnant women will experience malnutrition, which will cause problems including low birth weight (BBLR) (9), premature birth, and birth complications that may result in death (7).

Malnutrition during pregnancy can put pregnant women at risk of complications such as bleeding, inadequate maternal weight gain, and anemia (10). The prevalence of anemia and the risk of chronic energy deficiency in women of childbearing age greatly affect the health condition of the child at birth, including the potential for low birth weight (11).

Another problem that can occur is nutritional problems (stunting) in children (12)(13)(14). This is consistent with the results of Sundari's research and Rahayu's research at the Sungai Karias Health Center, North Hulu Sungai, which found that children with low birth weight are at 5.87 times higher risk of stunting (15). Stunting is a health problem widely found in developing countries, including Indonesia (9). Stunting refers to chronic malnutrition caused by inadequate nutritional intake over a prolonged period, resulting in growth disorders in children, where the child's height is lower than the standard for their age (11).

Dragon fruit contains abundant iron, organic acids, protein, minerals such as potassium, magnesium, calcium, and vitamin C (16). Red dragon fruit contains important nutrients such as vitamin C, vitamin B1 (thiamin), vitamin B2 (riboflavin), carbohydrates, protein, antioxidants, fiber, and iron. The high content of iron and vitamin C in dragon fruit helps increase Hb levels. The vitamin C content in dragon fruit plays a role in iron absorption, increasing blood formation, and maintaining stamina and immune function. Dragon fruit juice is rich in nutrients and is said to be effective in increasing hemoglobin levels in pregnant women (17). The average increase in hemoglobin levels before and after consumption of dragon fruit juice for 7 days was 1 g/dL.

Honey has various health functions as an antibiotic, wound healing agent, treatment for gastrointestinal diseases (diarrhea and gastroenteritis), antifungal agent (for dermatophytes and candidiasis), antiviral agent, antioxidant, and treatment for cardiovascular diseases. According to Nisbet, there are 7 types of honey in circulation, including Manuka, Pasture, Jelly bush, Jungle, Chestnut, Rhododendron, and Blossom (18). Honey with antifungal, antibiotic, and anti-inflammatory properties is the primary choice for disease treatment (19).

Vegetable soybeans (*Glycine max* L.Merill) are one type of legume included in the category of vegetable crops (green soybean vegetable). This vegetable is rich in protein, calcium, iron, vitamins A, B1, and C. In addition to these nutritional contents, vegetable soybeans are also rich in potassium, ascorbic acid, and vitamin E, with a nutritional

composition of 40% protein, 20% fat (without cholesterol), 33% carbohydrates, 6% fiber, and 5% ash (at dry weight). Soybeans are a local food ingredient with nutritional potential for breastfeeding mothers (15). Soybean seeds contain isoflavone compounds that belong to the flavonoid group as natural antioxidant producers (20). Isoflavones are secondary metabolite compounds that, with their antioxidant abilities, can inhibit cancer-causing enzyme activity (anti-cancer), including breast cancer, prostate cancer, and colon cancer. They also prevent degenerative diseases such as premature aging and osteoporosis, reduce cardiovascular disease risk, and reduce menopausal syndrome in women (21). Soybean seeds have effects on increasing public awareness and need for healthy food, promoting hypocholesterolemia, lowering triglyceride levels, and increasing High Density Lipoprotein (HDL) levels (22)(23). The combination of soybeans, dragon fruit, and honey provides the right composition to increase erythrocyte formation, thereby reducing anemia incidence, which can cause stunted growth.

Currently, there are no specific dietary guidelines that can increase pregnant women's weight by utilizing local plants and produce. Dragon fruit is rich in minerals such as calcium and phosphorus, which are important for bone health, and vitamin C, which supports the immune system. Dragon fruit and soybeans provide a suitable composition for use as a nutritional source for pregnant women to increase weight and prevent anemia.

Based on previous research results, soybean honey healthy drinks were effective in increasing Hb changes with a p-value of 0.047 (9)(24). The provision of healthy drinks (dragon fruit and soybeans) is given to help fulfill nutrition in pregnant women in the third trimester. Respondents were given healthy drinks for 7 days, and on the 7th day, a posttest was conducted after the healthy drink intervention.

This research aims to evaluate the effectiveness of healthy drinks containing dragon fruit and soybean in improving hemoglobin levels among third-trimester pregnant women, with the ultimate goal of preventing stunting in their infants. The specific objectives include: (1) measuring hemoglobin levels before and after intervention with healthy drinks, (2) analyzing the statistical significance of hemoglobin changes, and (3) determining the potential of natural interventions in preventing anemia-related complications. The benefits of this research encompass: providing evidence-based natural alternatives for anemia management in pregnancy, contributing to maternal and child health improvement strategies, offering cost-effective interventions for resource-limited settings, and establishing a foundation for larger-scale nutritional intervention programs to prevent stunting.

METHOD

This research employed a quantitative approach with a pre-experimental design using a one-group pretest-posttest design. The study was conducted at Palembang independent clinics/practices from February to April 2024. The research design was selected to determine the effect of healthy drinks on hemoglobin level changes in third-trimester pregnant women, allowing for before-and-after comparison within the same group.

The population of this research consisted of all third-trimester pregnant women recorded in medical records at the Palembang Maternity Clinic. A sample is a portion of the population used as a representation in research, serving as an actual data source to describe the entire

population. This research selected a sample using the non-probability sampling technique. Sampling was carried out considering inclusion and exclusion criteria.

The inclusion criteria for this research were characteristics that population members must have to be selected for sampling, specifically: being willing to participate, having hemoglobin levels between 8-11 g/dL, and being pregnant women at 28-40 weeks gestation. Conversely, the exclusion criteria, which disqualified population members, included unwillingness to participate or dislike of red dragon fruit. To avoid biased data and account for potential dropouts, the sample size was determined as 24 respondents.

The research stages began with planning, which involved securing permits from UM-AD Palembang and the Palembang City Maternity Clinic, obtaining informed consent from subjects, and preparing instruments. During the implementation stage, respondents underwent a pretest (Hb level measurement), received a 250 mL healthy drink once daily for 7 days after breakfast, and then underwent a posttest on day 7. The final stage involved data analysis and report writing, where the researcher evaluated the effect of the healthy drink on hemoglobin levels by comparing the pretest and posttest results using statistical analysis.

RESULT AND DISCUSSION

The univariate analysis in this research showed that the majority of respondents were between 28 and 34 years old. The average hemoglobin (Hb) level of pregnant women in the third trimester before being given the healthy drink (soybean and dragon fruit) was 10.7, while the average Hb level after consuming the healthy drink increased slightly to 10.8.

Bivariate Analysis

Bivariate analysis was to see differences in hemoglobin levels before and after the administration of Healthy Drinks (Soy and Dragon Fruit) in pregnant women in the third trimester. Before bivariate analysis was performed, a data normality test was first performed with Shapiro-Wilk because the sample was <50 at the time before and after the intervention.

Normality Test

Table 1. Normality Test with Shapiro-Wilk

Variable	*Shapiro-Wilk*		
	Statistic	**df**	**Sig.**
Difference Pre and Post Test	0,89	24	0,013

Based on table 1, a data normality test has been carried out using the Shapiro-Wilk Test (due to a sample of <50 respondents) on the difference in hb levels pretest and posttest a sig value of 0.013, therefore it can be said that the data is not normally distributed due to a significant value of <0.05. For this reason, data transformation is carried out as an effort to normalize data.

Data Transformation

Table 2. Data Transformation Test

Variable	*Shapiro-Wilk*		
	Statistic	**df**	**Sig.**
Difference Pre and Post Test	0,954	24	0,333

Based on table 2 above, the results of the data transformation test are obtained which are used to change the measurement of the original data to another form so that the data can meet the assumptions to be analyzed. From the data transformation, normally distributed data was obtained, so the researcher used an alternative test, namely the Paired Samples T Test.

Paired Samples T-Test

Table 3. The Effect of Giving Healthy Drinks (Soybeans and Dragon Fruit) on Hemoglobin Levels in Pregnant Women in the Third Trimester (n=24)

Variable		Mean	Min	SD	t	P Value
Kadar Hb	Before	10,58	9,1	0,59	86,87	0,000
	After	10,87	10,0	0,63	84,27	

Based on table 3, it was found that the Paired Samples T-Test analysis test obtained an average value before being given Healthy Drinks (Soybeans and Dragon Fruit) which was 10.58 while the median value after being given Healthy Drinks (Soybeans and Dragon Fruit) was 10.87. When the Paired Samples T-Test was carried out, it was found that the p-value of 0.000 (p-value <0.05) where the hypothesis of zero (Ho) was rejected (Ha) was accepted, which means that there was an effect of giving healthy drinks (soybeans and dragon fruit) on hemoglobin levels in pregnant women in the third trimester.

Blood hemoglobin (Hb) is a parameter used to determine the prevalence of anemia. The increased volume of plasma causes the concentration of hemoglobin to decrease somewhat during pregnancy. As a result, the overall viscosity of the blood decreases. Normal Hb values at the end of pregnancy or third trimester pregnant women averaged 12.5 g/dL, and about 5% of pregnant women had Hb levels of less than 11.0 g/dL. Hb values below 11.0 g/dL, especially in pregnant women in the third trimester, need to be considered abnormal and are usually caused by iron deficiency and not due to pregnancy hypervolemia (Sikoway, 2020). Natural ingredients that can be used as an alternative to treat anemia in increasing hemoglobin levels and are easy to obtain and cultivate also contain protein, vitamin C, and iron. and increased hemoglobin, one of which is dragon fruit (27).

Anemia in pregnancy can have harmful effects on both mother and fetus. Anemia in pregnant women can result in the risk of postpartum bleeding. If anemia occurs from the beginning of pregnancy, it can cause premature labor. Anemia can be prevented by consuming a balanced nutritious diet with sufficient iron intake to meet the body's needs (28). Mothers with anemia will experience a decrease in physical work, fatigue easily, an increased risk of infection, and will interfere with the lactation process during breastfeeding. Meanwhile, the impact on the fetus is the occurrence of spontaneous abortion, premature delivery, fetal death in the womb, lower than normal infant weight at birth, and impaired growth and development of the baby both physically and neurologically (29).

Hemoglobin levels in the first trimester ranged on average from 11.6-13.9 g/dl, in the second trimester ranged from 9.7-14.8 g/dl and in the third trimester ranged from 9.5-15.0 g/dl (30). Hb values below 11.0 g/dL especially at the end of pregnancy need to be considered abnormal and are usually caused by iron deficiency and not by gestational hypervolemia. Blood hemoglobin (Hb) is a parameter used to determine the prevalence of anemia. The increased volume of plasma causes the concentration of hemoglobin to decrease somewhat during pregnancy. As a result, the overall blood viscosity is reduced (Sikoway, 2020). Pregnancy with anemia is a national problem and affects the quality of human resources. The incidence of anemia or blood deficiency in pregnant women in Indonesia is still relatively high, which is 48.9%. Anemia is a condition in which hemoglobin decreases, so that the capacity and carrying capacity of oxygen to vital organs in pregnant women and fetuses is reduced (31).

The risk posed if pregnant women have high hemoglobin levels is an increase in blood viscosity directly which can affect blood flow in the mother's body so that blood does not reach the placenta and will inhibit the development of a healthy fetus (32). Factors that cause anemia in pregnant women are: birth spacing, low iron supplementation, frequent consumption of coffee and tea during pregnancy, knowledge, maternal age, gestational age, and parity (33). Based on the results of this research, the average age of the respondents was 31.88 years old, with the youngest age being 24 years old and the oldest age being 38 years. The mother's age is one of the factors that can affect the occurrence of anemia. If the mother's age at the time of pregnancy is relatively young (<20 years), there will be a risk of anemia because at that age there is still growth that requires more nutrients. So that it will affect the adequacy of the fetus' nutritional status which ultimately causes a decrease in the nutritional status of the mother, causing anemia (34).

Based on the research (35), it was found that the hemoglobin levels of pregnant women with anemia in the third trimester before the administration of dragon fruit juice averaged = 10.215 gr/dl std.deviation = 0.1348 gr/dl maximum = 10.5 gr/dl and minimum = 10.0 gr/dl. Anemia during pregnancy can cause harm to both the fetus and the pregnant woman due to its effect on the quality of human life, Anemia in pregnancy is a national problem. Anemia can affect fetal development during pregnancy, having a negative impact on both mother and fetus. Anemia can also lead to premature birth, infectious diseases, and even death for the mother and fetus (36).

Putri (37) found that pregnant women with TM III who experienced anemia before being given dragon fruit obtained data on the average Hb level of 10.10 gr/dl, a minimum value of 9.6 gr/dl, and a maximum value of 10.8 gr/dl. Anemia can be classified into 3 criteria, namely mild (11g/dl-normal), moderate (8 g/dl-11 g/dl), and severe (less than 8 g/dl). In pregnant women, this condition is related to hemoglobin concentration and iron deficiency anemia is one of the causes. Anemia in pregnant women differs depending on the trimester, namely <11 g/dl in the first trimester, <10.5 g/dl in the second trimester, <11 g/dl in the third trimester (38).

The research (39) found that most of the respondents experienced mild anemia of 10-10.9 gr/dl as many as 14 people (87.5%) and a small number of respondents who experienced moderate anemia of 7-9.9 gr/dl amounted to 2 people (12.5%). Most pregnant women will experience some degree of anemia because iron is needed to produce red blood cells in the fetus. Anemia can appear during pregnancy due to a lack of folic acid. During pregnancy, anemia can be prevented and treated using iron and folic acid supplements (40).

Based on the results of the research and theory above, the researcher assumes that hemoglobin levels in pregnant women in the third trimester before being given dragon fruit juice still show an average below normal, this is because in pregnant women this condition is related to hemoglobin concentration and iron deficiency anemia is one of the causes. Anemia in pregnant women differs depending on the trimester, namely <11 g/dl in the first trimester, <10.5 g/dl in the second trimester, <11 g/dl in the third trimester. In addition, there are also factors that cause anemia in pregnant women, namely birth distance, lack of iron supplements, frequent consumption of coffee and tea during pregnancy, knowledge, maternal age, gestational age, and parity. The mother's age is one of the factors that can affect the occurrence of anemia. If the mother's age at the time of pregnancy is relatively young (<20 years), there will be a risk of anemia because at that age there is still growth that requires more nutrients.

Dragon fruit is one of the fruits cultivated in Indonesia, dragon fruit plants have many benefits, including for pregnant women, pregnant women need additional nutrients to facilitate the growth and development of their pregnancy as well as for the fulfillment of nutrition for their own pregnant women (Mellyani et al., 2022). Ripe dragon fruit contains a lot of organic acids, protein, minerals such as potassium, magnesium, calcium, iron, and vitamin C. Based on its chemical content, dragon fruit, which contains a lot of minerals, iron, and vitamin C, can be used for the treatment of anemia (42). The benefits of dragon fruit for pregnant women are certainly a contributor to complex nutrition that is good for the mother and fetus. Interestingly, dragon fruit also turns out to contain vitamin B1 which is excellent for fetal growth, stimulates protein absorption and helps burn into energy (35).

Honey's functions on health are as an antibiotic, wound healing, cure of gastrointestinal diseases (diarrhea and gastroenteritis), antifungal (dermatophytes and candidiasis), antiviral, antioxidant, and cure of cardiovascular diseases. According to Nisbet, there are 7 types of honey in circulation, including Manuka, Pasture, Jelly bush, Jungle, Chestnut, Rhododendron, and Blossom (11).

Vegetable soybeans (Glycine max L.Merill), are one type of legumes that are included in the category of vegetable crops (green soybean vegetable). This vegetable is rich in protein, calcium, iron, vitamins A, B1, and C. In addition to these nutritional content, it is also mentioned that vegetable soybeans are rich in potassium, ascorbic acid, and vitamin E with a percentage of nutritional content of 40% protein, 20% fat (without cholesterol), 33% carbohydrates, 6% fiber, and 5% ash (at dry weight). Soybeans are a local food ingredient that has the potential for nutrition for breastfeeding mothers(12)

Based on the research (35), the results of the paired simple t test were found to have a significance value of 0.000 < 0.05, so it can be concluded that Ho was rejected and Ha was accepted, thus it can be concluded that there is an effect of giving dragon fruit juice on the increase in hemoglobin levels of pregnant women with anemia in the third trimester at PMB Latibes Juliana Duren Sawit East Jakarta. One way to overcome anemia in pregnancy is to eat dragon fruit regularly. Dragon fruit contains vitamin C so it can help optimize the absorption of iron through the digestive tract. This, of course, can directly increase hemoglobin levels (16).

Research (Putri et al., 2024) found that the negative value of rank or Hb that decreased after the administration of dragon fruit was 0.000, then the value of Asymp.sign (2-tailed) was 0.000 (<0.05) so it can be concluded that there is an effect of giving dragon fruit on the increase

in Hb levels in pregnant women with TM III who experience mild anemia. Dragon fruit needs to be consumed by the public, especially pregnant women, as a medicine to increase the amount of hemoglobin and immunity, also good for the digestive system, blood circulation, reducing emotional stress and neutralizing toxins in the blood. The vitamin C content in dragon fruit can help in the process of iron absorption, increase blood formation, maintain endurance and immunity (44).

Research (39) obtained a statistical test obtained a p-value of 0.000 < 0.05 so that it can be concluded that H1 was accepted which shows that there is an influence of dragon fruit juice on the Hb level of pregnant women with anemia at TPMB Oka Putri, Probolingo City. Dragon fruit given in the form of juice is more effective in increasing hemoglobin levels in pregnant women who experience anemia. Interventions given in the form of juice or smoothed absorption processes carried out by digestion will be faster by about 20 minutes (45).

Based on the results of the research and theory above, the researcher assumes that there is an effect of the effect of giving healthy drinks (Soybeans and Dragon Fruit) on hemoglobin levels in pregnant women in the third trimester, this can be seen from changes in maternal hemoglobin levels before and after the intervention by consuming healthy drinks (Soybeans and Dragon Fruit). Dragon fruit contains vitamin C, and soybeans contain isoflavone compounds so that they can help optimize the absorption of iron through the gastrointestinal tract. This can of course directly increase hemoglobin levels, besides that the vitamin C content in dragon fruit can help in the iron absorption process, increase blood formation, maintain endurance and immunity.

CONCLUSION

This research successfully demonstrated the effectiveness of healthy drinks containing dragon fruit and soybean in improving hemoglobin levels among third-trimester pregnant women. The study achieved its primary objective by showing a statistically significant increase in hemoglobin levels from 10.58 g/dL to 10.87 g/dL (p-value = 0.000 < 0.05) after seven days of intervention. The combination of dragon fruit's vitamin C content and soybean's isoflavone compounds effectively enhanced iron absorption, contributing to hemoglobin improvement. This natural intervention approach offers a safe, cost-effective alternative for managing mild anemia in pregnancy, potentially reducing the risk of adverse maternal and fetal outcomes, including stunting in infants.

Future research should focus on: (1) conducting randomized controlled trials with larger sample sizes to validate these findings, (2) investigating the optimal dosage and duration of healthy drink interventions, (3) exploring the long-term effects on maternal and infant health outcomes, (4) evaluating the cost-effectiveness of this intervention compared to traditional iron supplementation, and (5) developing standardized protocols for implementing healthy drink interventions in community health programs. Additionally, research should examine the sustainability and acceptability of this intervention across diverse populations and geographic settings.

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