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High Protein Milk Affected the Increase of the Hb Levels of Third-trimester of Pregnancy with Anemia

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Abstract

Anemia is a risk factor that contributes to 50% of all maternal deaths. The main factors causing anemia are low iron intake and infection. Protein intake, especially animal protein intake, helps increase iron absorption. This study aims to determine the effect of providing high protein milk intake on increasing hemoglobin levels in pregnant women in the third trimester with iron deficiency. This type of research is Pre-Experimental with One Group Pretest-Posttest Design. The population in this study was all third-trimester of pregnant women with pale faces in the of the Gondanglegi Public Health Center Kabupaten Malang. The sample was 33 people taken by using the total sampling technique. The measuring test was the Wilcoxon Marked Rank Test. The examination results showed that the average hemoglobin level before treatment was 10.1 gr/dl, and after treatment was 11.1 gr/dl. The results showed that there was an effect of giving high-protein milk on increasing hemoglobin levels in third-trimester pregnant women with pale skin in Gondanglegi Health Center (p-value = 0.000). This study concludes that milk protein consumption basically affects the increase in hemoglobin levels in pregnant women. It is recommended for pregnant women who get anemia to focus on their food intake, especially protein consumption.

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INTRODUCTION

Among pregnant women, iron deficiency anaemia is also associated with adverse reproductive outcomes such as preterm delivery, low-birth-weight infants, and decreased iron stores for the baby, which may lead to impaired development. Failure to reduce anaemia may result in millions of women experiencing impaired health and quality of life, and may impair children's development and learning. Anaemia is an indicator of both poor nutrition and poor health. Prevalency of anemia in women 29.9% of women aged 15-49 years suffered from anemia in 2019 (World Health Organitasion, 2021) In Asia, anemia (irrespective of the severity) is the second leading cause of maternal death accounting 12.8% independent of deaths due to postpartum hemorrhage. A literature search further adds that about 20% of maternal deaths are caused by anemia and with this anemia is additional risk factor in contribution of 50% of all maternal deaths (Khaskheli et al., 2016).

Anemia is identified by hemoglobin levels less than 11.0g/dL and may be divided into three levels of severity: mild anemia (Hb levels 9 to 10.9g/dL), moderate anemia (Hb levels 7 to 8.9g/dL), and severe anemia (Hb levels less than 7g/dL) (Okia et al., 2019). Pregnancy causes an increase in plasma volume of about 30%, an increase in erythrocytes of 18% and an increase in hemoglobin of 19% (Daru et al., 2018). In addition to the physiological process during pregnancy, there are various factors that contribute to the occurrence of anemia. The main factors are low iron intake and infections such as malaria which play an important role in the occurrence of anemia (Samuel et al., 2020). Deficiencies in essential micronutrients such as iron, folate, protein, carbohydrates and vitamin B12 before and during pregnancy increase the risk of women experiencing anemia (Ayensu et al., 2020). Iron deficiency will increase the recurrence of complications of pregnancy and childbirth. Maternal mortality, rash rates, low birth weight babies, and perinatal mortality rates increase. In addition, dehydration during illness and post-pregnancy is more normal in iron-deficient women (Jwa et al., 2015).

Generally In Asia, anemia remains one of the most prevalent severe maternal morbidities In response to the high prevalence of maternal anemia, multiple countries, including Indonesia, have implemented interventions and preventive policies by providing iron supplements containing at least 60 mg of elemental iron to adolescent girls (Wirawan & Nurrika, 2022). Of all the local Public Health Centersin the Malang Regency, in 2021 the working area of the Gondanglegi Public Health Center Center was one of the areas with the highest incidence of pregnant women with iron deficiency, namely 28% of cases at the level of pregnant women get blood supplement tablets 100 percent.

Protein intake, especially animal protein intake helps increase iron absorption, therefore low protein intake can affect Hb levels to be less, which can lead to anemia (Erningtyas et al., 2023). The results of the study on the sample of food utilization of protein sources showed that 31.8% of pregnant women consumed vegetable protein in the form of tofu and tempeh with a food weight of 40 grams/day, while 95.5% - 100% of pregnant women never consumed animal protein in the form of offal. In addition, 95.5% - 100 percent of pregnant women never consumed animal protein in the form of offal, hamburger, shrimp, or crab. From this information, it can be seen that the protein intake of pregnant women who only consume vegetable protein such as tofu and tempeh is still below the target of the Nutrition Adequacy Rate, which is around ≥76 gr (Rahmi & Husna, 2020).

One of the ways to prevent anemia is by fulfill nutritional adequacy in two ways, namely consuming iron-rich foods and taking blood-added tablets. The government recommends that every pregnant woman should consume at least 90 Blood Supplement Tablets during pregnancy. Iron intake can be obtained from various sources of animal protein such as liver, fish and meat. As well as vegetable sources such as soybeans, green beans, red spinach, green vegetables and others. To increase the absorption of iron, especially those from vegetable sources, it is recommended to consume fruits that contain vitamin C, such as oranges, guava and others (Erningtyas et al., 2022). The general aim of this research is to find out the effect of providing high protein milk intake on the improvement of Hemoglobin Levels in the third trimester of pregnancy with anemia in the Gondanglegi Community Health Center.

METHODS

This type of research is Pre-Experimental with One Group Pretest-Posttest Design with a sampling technique, namely a total sampling of 33 pregnant women. The research stage involved collecting 33 anemic pregnant women whose Hemoglobin levels had been checked in the Laboratory Unit at the Gondanglegi Community Health Center, then the

researchers gave them high protein milk intake with a drinking schedule, 2 times a day, 1 glass (200 cc)/10 grams for 10 days, then the hemoglobin levels were checked again on the samples that had been given the high-protein milk. The instrument used in this research was an observation sheet. The factual test in this review utilized the Wilcoxon Marked Rank Test. Sample inclusion criteria 1) Mother is willing to be a respondent 2) third-trimester pregnant women pregnant 3) pregnant women with anemia. Exclusion criteria 1) pregnant women with disease complications 2) Pregnant women who are allergic to protein milk 3) pregnant women who do not drink milk according to schedule.

RESULTS

The following are the results of research on providing high protein milk intake to increase hemoglobin levels in third-trimester pregnant women with anemia in the Gondanglegi Community Health Center Working area:

Table 1. Hemoglobin Level Before and After Intake

	Average	Minimum level	Maximum level	p-value	Ranks
Before	10,1 gr/dl	9,1 gr/dl	10,6 gr/dl	0,000	*Positive Ranks* = 33
After	11,1 gr/dl	10,7 gr/dl	11,6 gr/dl		

The table above shows that the average Hemoglobin Level before being given high-protein milk intake was 10.1 gr/dl, with a baseline value of 9.1 gr/dl and the highest value of 10.6 gr/dl. The table above shows that the average hemoglobin level after high protein milk intake was 11.1 gr/dl, with a baseline value of 10.7 gr/dl and the highest value of 11.6 gr/dl.

The table above shows that the consequences of the Wilcoxon Marked Rank Test show a p-value = 0.000. These results are smaller than the level of importance used, namely $\alpha = 0.05$, so there is an effect of giving high protein milk intake on increasing Hb levels in third-trimester pregnant women with paleness in the Gondanglegi Health Center Working Area. Then the Position value shows that each of the 33 respondents is in the Positive Position category, meaning that all respondents experienced an increase in Hb levels after being given a high milk intake.

DISCUSSION

Hemoglobin Level Before High Protein Milk Intake

The Hemoglobin Level before high protein milk intake was 10.1 gr/dl, with a baseline value of 9.1 gr/dl and the highest value of 10.6 gr/dl. Pregnant women are said to be anemic if Hb<11 grams% in the first and third trimesters, Hb <10.5 grams% in the second trimester. These results show that all respondents experienced weakness. Blood volume in pregnant women increases by about 1500 ml consisting of 1000 ml of plasma and about 450 ml of Red Blood Cells (RBCs). The production of RBCs increases during pregnancy, the increase in RBCs depends on the amount of iron available. Although the production of RBCs increases, hemoglobin and hematocrit decrease, this is called physiological anemia. Pregnant women in the second trimester experience a rapid decrease in hemoglobin and hematocrit because at this time there is a rapid expansion of blood volume. The lowest decrease in Hb is at 20 weeks of pregnancy, then increases slightly until term pregnancy (Septiasari & Dian Mayasari, 2023).

The type of anemia that is often found is iron deficiency anemia. Iron deficiency anemia can be caused by low intake and lower than the Adequate Nutritional Intake, especially lack of consumption of foods high in iron (Salsabil & Nadhiroh, 2023). During pregnancy, the amount of iron required is much greater than in non-pregnant mothers. The iron available in the mother's body will be transferred to the baby according to the gestational age. In the first trimester, the iron consumed by the embryo is not much, but in the second and third the amount of iron needed by the body will increase. Therefore, pregnant women must be able to meet their health needs during pregnancy, both from food and from iron supplements. If the iron content in the mother's body is not sufficient, it can reduce the mother's hemoglobin level which can cause weakness during pregnancy. It is important to pay attention to health needs during pregnancy because weakness can occur, but it can also slow down the growth and development of the baby in the womb and cause other complications (Çakmak et al., 2018).

Pregnant women often experience weakness in the third trimester (45.7%), while in the second trimester only about 44.1%, and in the main trimester only about 40.5% (Jwa et al., 2015). The

results of other studies show that the older the gestational age, the greater the possibility of experiencing anemia, where of the 46 mothers who experienced anemia, 5 people (10.9%) were found in the first trimester of pregnancy, 21 people (45.7%) in the second trimester and 20 people (43.5%) were in the third trimester of pregnancy (Fitri et al., 2023). If the pregnant mother is pale, the metabolic capacity of her body will be reduced so that the development and growth of the baby in the womb will be disrupted (Daru et al., 2018).

The peculiarities that occur based on the above research and hypotheses indicate that the occurrence of weakness occurs due to many factors, for example, the internal factor is the gestational age and the external factor is the health needs of pregnant women who are still pregnant.

Hemoglobin Level after High Protein Milk Intake

The results showed that the average Hemoglobin Level after being given high protein milk intake was 11.1 gr/dl, with a baseline value of 10.7 gr/dl and the highest value of 11.6 gr/dl. These results show that after being given a high protein milk intake, almost all respondents did not experience pale. Protein is one of the nutritious components that must be considered during pregnancy. Pregnant women need more protein consumption than non-pregnant women, so it is useful to support the development of maternal and embryonic cells (Rahmi & Husna, 2020). Good protein consumption can reduce the occurrence of iron deficiency in pregnant women (Gedefaw et al., 2015).

Protein is a nutrient that plays an important role in life, namely functioning in the formation of essential bonds in the body, including the formation of hemoglobin, and has a very important role in the process and transportation of iron in the body (Erningtyas et al., 2023). Protein is known to play a role in the transport of iron in the form of transferrin (Harahap et al., 2021). Protein acts as a building and regulatory substance for the body. Insufficient protein intake can inhibit iron transport which will lead to iron deficiency (Salsabil & Nadhiroh, 2023). The facts and hypotheses above are reasons for experts to believe that the high-protein milk intake provided by respondents plays a role in meeting the hemoglobin levels of pregnant women.

Effect of Giving High Protein Milk Intake on Increasing Hb Levels in Third-trimester Pregnant Women with Anemia

The results of information research on the impact of giving high-protein milk consumption on increasing Hb levels in Third-trimester pregnant women with iron deficiency obtained p-value = 0.000. The next information is p-value = 0.000 < 0.05, meaning $p < \alpha$, then H 1 is recognized, meaning that there is an effect of giving high-protein milk on increasing Hb levels in Third-trimester pregnant women with weakness in the Gondanglegi Community Group Public Health Center Center Working Area. Then the Position value shows that each of the 33 respondents is in the Positive Position classification, meaning that all respondents experienced an increase in Hb levels after being given high protein milk intake.

The results of this study are in accordance with previous studies which showed that although giving milk to pregnant women was not able to increase hemoglobin levels significantly, it was able to reduce the proportion of anemia by 3%, from 70.4% to 67.4%. This means that giving milk to pregnant women can prevent a decrease in hemoglobin levels and prevent an increase in the proportion of anemia (Fikawati & Syafiq, 2023). Other research results also show that there is a relationship between protein consumption and the incidence of disease in pregnant women with (p-value = 0.032). In this study, data was obtained that pregnant women who were not anemic consumed animal protein more often with a frequency of 4-5 times a week, while pregnant women with anemia consumed it 3-4 times a week. Consumption of vegetable protein in pregnant women with anemia was higher with a frequency of 6-7 times a week compared to pregnant women who were not anemic with a frequency of 3-5 times a week (Setyawati & Syauqy, 2014).

Factors that influence the occurrence of anemia in pregnant women include iron deficiency, infection, folic acid deficiency, hemoglobin abnormalities. Other factors that influence the occurrence of anemia in pregnant women are age, education, pregnancy spacing, parity. Apart from the factors above, ANC frequency, Fe consumption, reproductive health knowledge and eating habits of pregnant women also influence the occurrence of anemia in pregnant women (Dyah Fitriyawardhani & Hermawati, 2024). The main cause of anemia in pregnant women is generally the amount of iron consumed that does not match what is needed. Lack

of iron intake is a result of the insufficient amount of iron consumed, as well as the influence of the ability to absorb iron (Khoirunisa et al., 2023).

Hemoglobin is made of heme (iron) and globin (protein). This protein plays a role in moving iron deep into the bone marrow to form new hemoglobin particles. Protein in red platelets weakens oxygen and allows red platelets to deliver oxygen throughout the body (Daru et al., 2018). Protein quality is determined by the type and proportion of amino acids it contains. Complete or high biological value protein is a protein that contains all types of essential amino acids in proportions appropriate for growth. Sources of complete protein are all animal proteins, except agar-agar. Incomplete protein or low-quality protein is a protein that does not contain or contains one or more essential amino acids in low amounts. Sources of low-quality protein are nuts except soybeans (Setyawati & Syauqy, 2014). In the Regulation of the Minister of Health Number 41 of 2014 concerning Balanced Nutrition Guidelines, it is stated that milk is included in the group of protein source side dishes along with fish, eggs, poultry, meat, and nuts and their processed products (tofu and tempeh) (Minister of Health of the Republic of Indonesia, 2014).

A systematic review on dietary interventions for anemia in pregnant women shows that increasing iron and protein intake, including through fortified milk, is effective in increasing hemoglobin levels and reducing anemia. These interventions often involve iron-fortified or multinutrient products, and can improve the overall health status of the mother and fetus. (Dyah Fitriyawardhani & Hermawati, 2024). Another study in Uganda found a complex relationship between iron and vitamin A levels and birth outcomes. Consuming protein milk fortified with iron and vitamins can help stabilize hemoglobin levels and prevent the risk of premature birth and low birth weight (LBW), which is often associated with anemia during pregnancy (Skolmowska et al., 2022). Research shows that pregnant women can effectively prevent anemia by consuming protein-rich milk. The appropriate method involves consistent intake of milk that meets protein and micronutrient requirements essential for pregnancy. For instance, the consumption of about 1-2 cups of milk daily provides not only protein but also iron and calcium, all of which contribute to preventing anemia and supporting the development of the fetus. Whole milk, or milk fortified with additional nutrients like iron, vitamin D, and DHA, is particularly recommended because it offers comprehensive nutritional support. (Huang et al., 2022).

Anemia prevention is also enhanced by combining milk with foods rich in vitamin C (e.g., citrus fruits) to improve iron absorption. Midwives and healthcare providers often advise pregnant women on the best ways to integrate these into their diet, emphasizing a balanced intake that meets the daily protein and micronutrient needs (Huang et al., 2022). To prevent anemia in pregnant women, choosing the right type of protein milk is essential. High-protein milk fortified with iron and other essential micronutrients like folic acid and vitamin B12 is particularly beneficial. These nutrients work synergistically to enhance iron absorption and support red blood cell production, which helps maintain healthy hemoglobin levels. Studies recommend milk that contains whey protein or soy protein, as these types are easily digestible and provide a high biological value protein source, which is crucial for pregnant women with anemia (Stevens et al., 2013). Additionally, incorporating protein-rich milk into a balanced diet that includes iron-rich foods (like lean meats and legumes) and vitamin C sources (such as citrus fruits) can further enhance the effectiveness of protein milk in managing anemia during pregnancy (Al-Bayyari et al., 2024).

Due to the current facts and speculations above, analysts assess that as the gestational age and other factors that influence it increase, the need for hemoglobin in the blood also increases, and its fulfillment must be balanced with good nutrition, including protein.

CONCLUSION

High Protein Milk Affected to Increase the Hb Levels of Third-trimester of Pregnancy with Anemia in the Gondanglegi Health Center Working Area (p-value = 0.000).

SUGGESTION

Medical personnel are expected to pay more attention to good nutritional intake such as high-protein milk given during pregnancy, both in terms of recurrence, type, and amount.

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CONFLICTS OF INTEREST

The Authors in this research have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

AUTHOR CONTRIBUTIONS

The first author is in charge of coordinating the course of research, participating in research, compiling research reports, and publishing journal articles. The second author participated in the preparation of research reports, and journal publications.

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