

Capturing The Effect of Iron Intake on The Incidence of Anemia in Pregnant Women

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Abstract: Iron is one of the important components of hemoglobin. Hemoglobin carries oxygen in red blood cells from the lungs to all body tissues. The concentration of hemoglobin indicates the level of iron sufficiency or deficiency. Iron deficiency can cause anemia, resulting in reduced oxygen capacity in red blood cells for organs. In pregnant women, anemia is still a frequent nutritional problem. Anemia in pregnant women can increase the risk of complications in pregnancy and childbirth. The method used in writing this article is a literature review of journals from 2019 to 2024. The purpose of this literature review is to analyze the effect of iron intake on the incidence of anemia in pregnant women. The results of the articles reviewed show that there is an effect of iron intake on the incidence of anemia in pregnant women. Iron intake can increase hemoglobin levels to reach normal values. In maximizing iron absorption, vitamin C intake is also good to consume to help the iron absorption process. So it can be concluded that consuming food intake containing iron can increase hemoglobin production in pregnant women, which can reduce the risk of childbirth such as premature birth and low birth weight (LBW) in infants.

1 INTRODUCTION

A condition in which red blood cells are reduced in blood circulation so that they are unable to carry oxygen to the entire tissue is an anemia. Pregnant mothers in Indonesia have anemia prevalence of 70% or 7 out of 10 pregnant women with cases of anemia. One of the most susceptible groups to nutritional problems is iron deficiency anemia (Fe). Pregnant women are at higher risk of developing anemia (Kadir, 2019). Anemia during pregnancy is defined when the mother's hemoglobin levels are below 11 g/dL in the first and third trimesters or hemoglobins are below 10.5% g/dl in the second trimester. The risk of anemia in the pregnant mother is premature birth, antepartum bleeding, postpartum hemorrhage that may result in the death of the mother and child, and infectious diseases (Sulung et al., 2022).

In Indonesia, the prevalence of anemia has increased as a result of a person's deteriorating nutritional status. Inadequate nutrition is caused by factors of

non-conformity of food intake with the required intake of the body. Based on the Nutritional Satisfaction Data. 2019, it shows that during pregnancy the pregnant mother requires an additional energy and protein. Where pregnant mothers in trimester I perform an additional calorie of 180 kcal and protein of 20 grams. In trimester II and III requires additional calories of 300 kkal and 20 gram of protein. The energy helps in the movement of the muscles of the gastrointestinal tract, thus facilitating the absorption of iron in the intestines. Pregnant mothers require about 800 mg of iron (Fe) where 300 mg is needed for the fetus and 500 mg is used for hemoglobin growth (Tarigan et al., 2021).

Pregnancy in the third trimester is the maturity of pregnancy, so high nutritional requirements, especially iron, are crucial to preventing anemia. Pregnant mother's anemia occurs in the third trimester, because at this time the fetus accumulates

iron reserves for its own supply as the supply of the first month after birth (Lestari et al., 2022). An effort can be made to prevent anemia is through increased intake of foods that have iron content. Just taking Fe tablets alone is less effective in meeting a person's iron needs, especially women and pregnant mothers. For that, we need other sources of food to meet our iron requirements. Consumption of vitamin C can also play a role in helping absorption of iron in the body. Thus, consuming a food source of iron along with a source of vitamin c is a good combination for increasing hemoglobin levels. One of the factors that a pregnant woman suffers from anemia is a lack of iron intake, therefore writing this article aims to find out a picture of the intake of iron with the incidence of anemia to the pregnant mother.

2 METHODS

This research is a literature review with literature sources from the Google Scholar database. In the literary process, the keywords used are iron intake, anemia and pregnant mothers. Literature is limited to research over the last five years, counting from 2019 to 2024. 20,800 studies were found through the Google Scholar database. These studies are analyzed to obtain research that meets the criteria of research, that is, the type of quantitative research, carried out over the last 5 years, less than equal to 100 people as a sample. According to this criterion, the number of studies obtained is 18 studies, conducted by Indonesian researchers. Most of his studies were articles in scientific journals. The filtering process of our article is presented in the following PRISMA diagram.

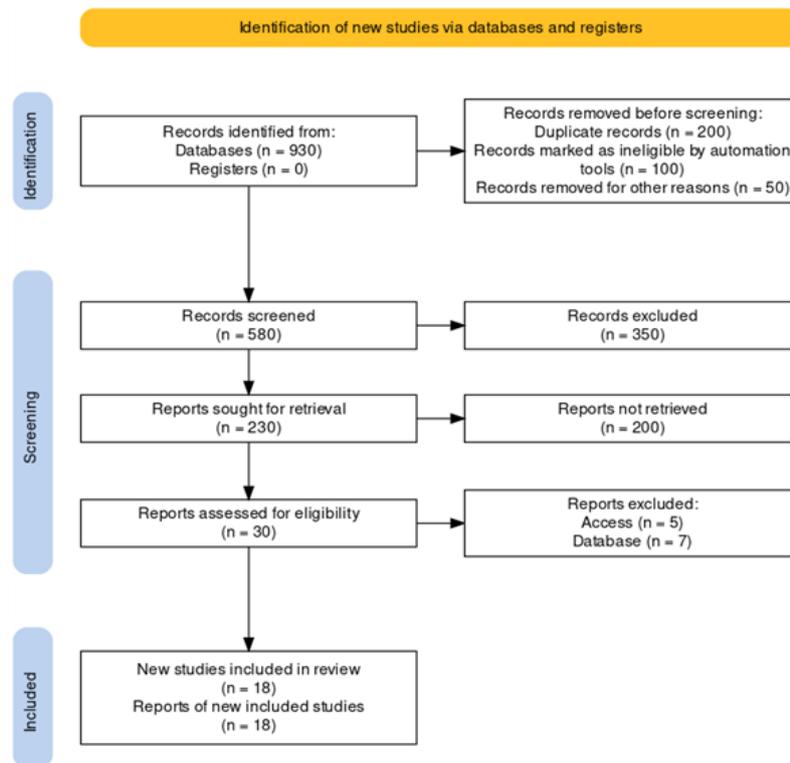


Figure 1: Literature Search

3 RESULTS

The literature search used the Google Scholar database with the keyword "Ineffects of iron intake on pregnant mothers". The first search resulted in

20,700 articles. The article was then given a special coverage for the last five years, namely 2019-2024, leaving 930 journal articles. Articles are then sorted by title, abstract, and keyword. The article must also meet the following inclusion criteria: (1) the article is not a literature review; (2) it is a non-paid article; (3) it is in full text form. Thus, 18 research journal articles have been obtained that can be re-examined.

Table 1: Overview of The Study on Nutrient Intake on The Incidence of Anemia in Pregnant Women

Researcher(s)	Year	Sample Quantity	Research Type and Desain	Instrument
Widowati et al., 2019	2019	11	<i>Quasi experimental</i>	Hemoglobin meter and observation sheet
Luthbis & Ratnasari, 2020	2020	30	<i>Quasi experimental</i>	Observation sheet and Hb meter (easy touch) GCHB
Lutfiasari et al., 2020	2020	15	<i>Pre experimental</i>	Observation sheet and Hb measuring stick
Sulaiman et al., 2022	2022	100	<i>Kuantitatif-Cross Sectional</i>	Interview, Hb measuring instrument
Lathifah & Susilawati, 2019	2019	40	<i>Pra experimental</i>	Questionnaire sheet and Hb meter
Lestari et al., 2022	2022	30	<i>Quasi experimental</i>	Easy Touch Hemoglobin
Agustina et al., 2022	2022	60	<i>Quasi experimental</i>	Hb measurement device
Choirunissa & Manurung, 2020	2020	30	<i>Quasi experimental</i>	Hemoglobin measurement tool
Olii, 2020	2020	60	<i>Pre experimental</i>	Hemoglobin measurement tool and food recall form
Marlina et al., 2022	2022	15	<i>Quasi experimental</i>	Digital hemoglobin meter
Harismayanti & Lihu, 2021	2021	34	<i>Quasi eksperimental</i>	Hb measurement questionnaire
Kundryanti et al., 2019	2019	13	<i>Quasi experimental</i>	Digital Hb set and observation sheet
Fajrin, 2020	2020	19	<i>Kuantitatif- cross sectional</i>	Questionnaire and lab result of Hb level
Ariecha et al., 2020	2020	32	Observasional - cross sectional	Questionnaire sheet
Monica et al., 2021	2021	60	<i>Pretest-posttest group desain</i>	control
Liananiar et al., 2020	2020	24	<i>Pretest-posttest Group desain</i>	control
Ulfiana et al., 2019	2019	44	<i>Quasi experimental</i>	Measurement of hemoglobin level by cyanmethemo globin method
Sugita & Kuswati, 2020	2020	30	<i>Quasi experimental</i>	Measurement of Hb levels with Hb sahli measuring instrument
				Mini screen digital Hb meter with Hospitex brand
				Hb level measuring instrument

Table 1 shows an overview of studies on the impact of iron intake on the incidence of anaemia in pregnant women from 2019 to 2024. The sample used in the study is less than the same as 100 people. The studies mostly use the type and design of Quasi Experimental research.

4 DISCUSSIONS

Iron in The Body

Iron is a component that the body needs to build blood cells, such as hemoglobin, myoglobin (a protein that carries oxygen to the muscles), and collagen (a cartilage-forming protein), which also serves as the body's defence system. You can get iron by eating

meat, eggs, grains, nuts, seeds, vegetables, and fruits. To meet your iron needs, the kind of iron that you often consume must also be taken into account. There are two types of iron in foods: the heme iron that is found in animal foods such as meat, and the non-heme iron found in vegetable foods like vegetables and grains. Research has shown that Heme iron is more easily absorbed into the lumen of the intestine than non-Heme iron, especially when combined with foods that contain vitamin A, vitamin C, and amino acids.

Iron Deficiency Anemia

Iron deficiency is a common anemia that interferes with the production of red blood cells, especially the synthesis of hemoglobin, and ultimately causes symptoms such as fatigue and growth disorders in

children. The main factor causing iron deficiency anemia is a lack of absorption of iron into the body. Other factors that are also relevant include family structure, nutritional consumption, menstrual patterns (for teenage girls), and the frequency of related infections. According to Nurbadiyah (2019), iron deficiency anemia can be influenced by various factors, including:

Increased Physiological Needs of Individuals

It is common in infants, where adaptation to the environment in the early stages of life increases red blood cells as a form of adaptation of the body to increased oxygen supply and growth causes changes in the reproductive system. Premature birth also means that babies are at higher risk of developing iron deficiency anemia. In addition, female teenagers are also prone to developing anemia due to the fact that adolescent girls have menstrual periods every month resulting in large amounts of blood loss, so the iron intake needs must be met in order to prevent anemia from occurring.

Lack of Iron Absorbed

The lack of absorption of iron from animal foods, the consumption of components that can produce iron, and the components which can inhibit its intake affect the risk of iron deficiency. This is due to a lack of gastric acid and the speed of food travel through the intestines.

Bleeding

Bleeding is a condition when blood comes out of a blood vessel and causes a person to lose blood in the body. Blood loss affects the iron balance. When you lose a lot of blood, you get severe iron deficiency and anemia.

Fetal-Mother Blood Transfusion

This condition is commonly referred to as fetomaternal transfusion, a condition in which blood from the fetus enters the mother's bloodstream through the placenta. Chronic blood leakage that occurs in the bloodstream of the mother can cause iron deficiency anemia at the end of the fetal life and early infancy.

Improvement of Health

Iron is needed to accelerate the growth process in infants, children, and adolescents, as well as with the

mother's pregnancy status, which requires the availability of large amounts of iron.

Iron deficiency anemia develops in three stages, the first phase begins with a decrease in the level of iron in the bone marrow, and a reduction in serum ferritin levels as a result of increased absorption of iron by the intestinal mucosa, which is accompanied by a decline in iron levels. The liver will synthesize transferins, producing an increase in TIBC. In the first stage, it shows no symptoms, and the status of red blood cells and red blood cell distribution is still normal. In addition, the second stage is a condition in which there is erythropoiesis deficiency of iron. This condition is manifested by a lack of hemoglobin (Hb) content within the reticulosis, although at this stage normal red blood cells are still present when the blood circulates, clinically without symptoms. In the third stage, levels of Hb and hematocrit decrease due to lack of iron storage and transportation, so the production of iron in the bone marrow also decreases. Therefore, at this stage the patient develops symptoms of anemia (Kurniati, 2020).

Anemia in Pregnancy

Anemia is when a mother's hemoglobin (Hb) levels in her blood are below 12 grams. Anemia during pregnancy is when her hemoglobins are below 11 grams per cent in the first and third trimesters, or less than 10.5% in the second trimester. Iron deficiency anemia is an anemia caused by a lack of iron in the body, so the need for iron (Fe) for erythropoiesis is not satisfied, which is marked by the image of hypochrome-micrositer red blood cells, serum iron levels (Serum Iron = SI) as well as transferin decreases, total iron binding capacity (TIBC) increases also the iron reserves in the bone marrow and elsewhere very little or no. There are many factors that can lead to iron deficiency anemia, including a lack of iron and protein intake from food, intestinal absorption disorders, acute and chronic bleeding, and increased iron requirements such as in pregnant women, growth periods, and recovery periods of various diseases.

Iron Deficiency Anemia in Pregnancy

The World Health Organization (WHO) has that pregnant women suffer from iron deficiency with a prevalence of 35-75% which, with the age of pregnancy, is increasing. According to the WHO, 40% of pregnant women in developing countries who die are related to pregnancy anemia, and most of the

causes of pregnancies are lack of iron intake and acute bleeding, and the two factors rarely interact. Preventive efforts are carried out with the administration of iron supplements during pregnancy. But the results are unsatisfactory. Iron absorption and iron requirements increased during pregnancy, with total iron requirements of about 1000 mg. As the body's iron reserves were exhausted, high iron requirements could not be met with a daily iron diet or iron supplementation. According to theory, iron supplements should be given in the pre-pregnancy period to prevent a lack of iron storage in the body. This disorder can occur due to low or empty iron storage in the body during pre-conception, especially in developing countries. Therefore, iron supplementation during pregnancy alone is not sufficient to prevent iron deficiency anemia. In one study it was found that giving iron supplements before pregnancies may reduce the prevalence of anemia compared to giving iron in the early stages (0% versus 38.46%, $p < 0.05$).

Impact of Iron Deficiency Anemia on Pregnant Mothers

Iron deficiency anemia can be fatal to pregnant mothers because it takes a lot of energy to give birth. Then during childbirth, there's usually heavy bleeding, and the condition of the pregnant mother gets worse due to anemia. Blood shortages and acute bleeding are the leading causes of pregnant mother death during childbirth. The main causes of maternal death include postpartum bleeding (associated with eclampsia and infection) and placenta previa, all caused by deficiency anemia. Pregnant mother suffering from iron deficiency anemia is unable to meet her nutritional needs and the fetus in her womb. Therefore, pregnant mothers suffering from iron deficiency anemia often experience miscarriages, dead births, low birth weight, or premature births.

Anemia in pregnant mothers is not without risk. Research has shown that high maternal mortality rates are closely linked to anemia. Anemia also causes a decrease in physical performance because the body cells do not receive enough oxygen. Anemia in pregnant mothers increases the incidence of complications during pregnancy and childbirth. Increased risk of maternal death, premature birth, low birth weight, and perinatal death. In addition, prenatal and postpartum bleeding is more common in women with anaemia, and women with anemia are more likely to die because they cannot tolerate blood loss. One consequence of iron deficiency anemia (ADB) is

premature birth, with additional problems such as low birth weight, inadequate immune response, and a tendency to experience psychological and growth problems. If this continues, it's linked to low IQ and decreased learning ability. All this leads to poor talent quality, reduced productivity, and economic impact. For treatment, one folate iron tablet containing 60 mg of iron and 250 µg of folic acid can be administered for 90 consecutive days during pregnancy.

The Effect of Iron Intake on Hemoglobin Levels of Pregnant Women with Anemia

An effort to control and prevent anemia is to supplement with Fe tablets and eliminate the cause. In addition, eating foods containing iron and changing dietary habits by eating fruits and vegetables can also prevent anemia. Non-pharmacological treatments can be done using simple and easily available vegetables and fruits. Some fruits that can increase the hemoglobin levels in pregnant women are chili, red seed rose, banana, red or green spinach vegetable beans, tomatoes, green nuts and others.

According to Widoyati et al., the year 2019 concerning the administration of turmeric syrup against the hemoglobin levels of pregnant women in the 2nd trimester with anemia. It is known that hemoglobin levels have increased by 1.0 gr/dl after consuming turmeric syrup. This is due to the content of iron 0.3 mg, vitamin C 3.6 mg per 100 grams. In the formation of red blood cells requires iron. Iron is an essential trace element for the body. The iron content in the spleen will later be absorbed by the intestine and then carried by the blood for blood formation (hematopoiesis). Iron is important for pregnant mothers to maintain and help the formation. Vitamin C inhibits the production of hepcidine (e.g., in HepG2 cells) that controls iron homeostasis, thus making vitamin C potentially helping reduce iron deficiency. The results are similar to the Sugita & Kuswati study (2020), which found that after eating turmeric, the hemoglobin level increased by 1.14 gr/dl.

According to a study by Lathifah & Susilawati, (2019) on the administration of red spinach juice mixed with honey against increased hemoglobin levels in pregnant women in the 3rd trimester. It is known that the overall increase in hemoglobin levels was the lowest of 0.4 points and the highest of 1.4 points. These differences are likely to be influenced by some factors such as the mother's age, or may also be that she consumes other foods that contain iron that

can't be controlled by the researchers. The increase in Hb levels after the administration of red spinach juice with honey is due to the fat content of 0.8 grams, 2.2 grams protein, 6.3 grams carbohydrates, 7 mg iron, 520 mg calcium, and Vit. C 62 mg per 100 grams. For that consumption of red spinach is perfectly suitable in everyday life and can prevent anemia. This research is similar to that conducted by Kurdayanti & Widowati (2019). With the kind of sponge that is green sponge. The administration of green spinach juice against increased hemoglobin levels has been shown to increase the Hb levels of pregnant women with anemia in the puskesmas work area of the southern Jakarta week market in 2018. The Hb level increased by 1.23 after giving green spinach juice. It is known that green spinach contains 3.9 mg of iron per 100 grams of spinach.

In addition to red and green spinach, iron is also found in other fruits such as beets and red seeds. In the study Harahap & Liesmayani, 2020 is an analysis of the influence of the consumption of strawberries on the increase in hemoglobin levels in pregnant women in trimester 3. Based on the results there was an increase in the levels of haemoglobin in the pregnant mothers by 11.5 mg/dl after consuming strawberry. A study by Agustina Dkk (2020) showed an increase in Hb levels after administering red seed juice. This administration is done by giving Fe tablets as well so that the improvement that occurs is more effective than just giving Fe Tablets alone. The chemical content of seed roses is amino acids (triptofan, lysine), phosphorus, iron, vitamin A, calcium, sulfur, vitamin B1, and vitamin C. Red seed rose contains minerals that can accelerate the process of synthesis of red blood cell hemoglobin so that it can help treat anemia or low red blood count. (Winarni et al., 2020).

Iron is one of the nutrients that cannot be obtained in adequate amounts from food consumed during pregnancy. For that, iron requires vitamin C to help maximize absorption. One of the fruits that has vitamin C and is good for health is orange. This is in line with a marlina study (2022) that states that giving Fe tablets with orange water can increase the Hb levels of pregnant women with mild category anemia. With an average increase of 0.77 gr/dl. Vitamin C helps in transferring iron from transferrin in plasma to ferritin in the liver, thus increasing non-heme iron absorption fourfold. Besides, tomatoes are a good source of vitamin C. Research by Lestari showed that pregnant women who consumed tomato juice showed higher hemoglobin levels. In this study, pregnant women with anemia in the third trimester in RSUD Ciawi were divided into two groups: one group

received tomato juice, while the other group received only tablets Fe. The findings of the study showed that the group given tomato Juice had an average hemoglobin increase of 3,800 g / dL, while a group receiving only tablet Fe had an increase of 0.7133 g / dl.

The dragon fruit is rich in iron and vitamin C. The iron that is found in the dragon's fruit is useful to increase the amount of iron in the blood. According to Olii's research, 2020 shows that consumption of dragon juice affects the hemoglobin levels of pregnant mothers. The respondents were pregnant women in the second and third trimesters who suffered from anaemia and only took Fe tablets. The results of the study indicated that after taking dragon juice there was an increase in hemoglobin levels with an average increase of 11.17 gr/dl. This suggests that the consumption of tablets of Fe combined with the intake of other nutrients of iron was more effective in increasing the level of haemoglobin of the pregnant woman than taking just Fe tablet.

The best strategy in dealing with iron deficiency in the body is to increase the intake of nutritious food sources and consume 60-120 milligrams daily. Consuming foods that are rich in iron such as liver, meat, milk, green vegetable fish, as well as green beans, one of which, like green nuts, can prevent anemia. As in pregnant mothers in the area of work puskesmas Dungaliyo showed an improvement after taking Fe tablets along with the consumption of green beans. The iron content of green beans is mainly found in embryonic plants and seed skins. One good way in presenting green beans is when the water and ampas are filtered and the nutrients are separated which produces green bean syrup and makes it a nutritious drink. The iron content in 100 grams of green beans is 6.7 mg. (Harismayanti & Lihu, 2021).

Pregnant mothers' iron requirements are increasing, requiring an additional 700-800 mg. Of this, 500 mg are used to boost hematopoiesis, 300 mg to support fetal needs in the hematopoiesis process during pregnancy, and 200 mg as a reserve for blood loss during childbirth. Therefore, pregnant mothers are advised to take an extra iron of about 30-60 mg per day. Previous research has shown that iron supplements can increase hemoglobin levels in pregnant women. Where when pregnant mothers consume iron (Fe) tablets every day for a month, hemoglobin levels can rise by 1 g/dl. The results of the study conducted by Choirunissa and Spruce (2020) showed that the intervention group had an increase in hemoglobin levels from 9,993 to 11,287. The iron content in green beans is 2.25 mg in every

half cup of green bean. The use of green beans as a non-pharmacological treatment in the prevention of anemia by increasing hemoglobin levels in pregnant women.

5 CONCLUSIONS

Iron deficiency anemia in pregnant mothers is a common health problem experienced by many women around the world. The World Health Organization (WHO) reports that the prevalence of iron deficiency in pregnant women ranges between 35-75% and increases with the age of pregnancy. Iron is essential for pregnant mothers to maintain and assist in the formation of red blood cells, as well as support the development and growth of the fetus. Iron sources can be found in foods such as liver, meat, milk, fish, green vegetables and nuts such as green beans. Therefore, pregnant mothers are advised to consume enough iron to avoid anaemia and complications during childbirth.

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