



## Effect of egg on hemoglobin level of pregnant women

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### ABSTRACT

Iron deficiency anemia is one of the most common disorders, especially during pregnancy. Pregnant women are categorized as having anemia if their hemoglobin level is  $<11\text{gr/dl}$ . The need for iron in pregnant women increases by 25% compared to non-pregnant women. Anemia can be prevented by consuming a balanced nutritious diet with sufficient iron intake to meet the body's needs. One food that is believed to have a high nutritional content is eggs. The aim of the study was to determine the effect of chicken eggs on hemoglobin in pregnant women with anemia in the third trimester. This type of quantitative research, with a pre-experimental research design. Respondents in this study were third-trimester pregnant women who experienced mild to moderate anemia. Bivariate data analysis using the Independent Sample T Test. The results of the analysis obtained  $p\text{-value} = 0.000$  ( $p\text{-value} < \alpha = 0.05$ ) which means that there is an effect of boiled chicken eggs on the increased level of hemoglobin in third-trimester pregnant women. Suggestions for pregnant women are to continue to eat balanced and varied nutritious foods and consume Fe tablets regularly

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### ABSTRAK

Salah satu gangguan yang paling sering terjadi terutama selama masa kehamilan adalah anemia defisiensi besi. Anemia pada kehamilan jika kadar hemoglobin dalam darah  $< 11\text{gr/dl}$ . Kebutuhan zat besi pada ibu hamil meningkat 25% dibandingkan ibu tidak hamil. Anemia dapat dicegah dengan mengkonsumsi makanan bergizi seimbang dengan asupan zat besi yang cukup untuk memenuhi kebutuhan tubuh. Telur merupakan salah satu makanan dengan zat gizi tinggi. Tujuan Penelitian Untuk Mengetahui Pengaruh Telur Ayam Terhadap Peningkatan Kadar Haemoglobin Pada Ibu Hamil Anemia Trimester III. Jenis Penelitian ini merupakan penelitian kuantitatif, dengan rancangan pra eksperimen. Responden dalam penelitian ini adalah ibu hamil trimester III yang mengalami anemia ringan hingga sedang. Analisis data bivariat menggunakan Uji Independent Sampel T Test. Hasil analisis didapatkan  $p\text{-value} = 0,000$  ( $p\text{-value} < \alpha = 0,05$ ) yang berarti ada pengaruh telur ayam rebus terhadap kadar haemoglobin pada ibu hamil. Disarankan bagi ibu hamil agar tetap mengonsumsi makanan yang bergizi seimbang serta beragam, dan rutin mengonsumsi tablet Fe.

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## INTRODUCTION

The most common health disorder especially during pregnancy is iron deficiency anemia (Mayasari et al., 2021). Anemia in pregnancy is a condition in which their hemoglobin concentration within them is <11gr/dl (Kemenkes RI, 2020). Age of the mother during pregnancy and the distance between pregnancies are known to be associated with the incidence of anemia in pregnant women (Akhirin et al., 2021). World health organization (WHO) data states that anemia is estimated to contribute up to 20% of maternal deaths, and during pregnancy increases the risk of premature birth, fetal death, low birth weight, postpartum hemorrhage, and infection during the puerperium (Anggraini et al., 2020; Sanjaya & Fara, 2021; WHO, 2017). Anemia can be caused by various things, including iron deficiency, deficiency of folic acid and vitamin B12, infectious diseases, congenital factors, and bleeding (Kemenkes RI, 2020). Nutritional status is related to hemoglobin levels (Sanjaya & Sari, 2020)

The need for iron in pregnant women increases by 25% compared to non-pregnant women. This is because iron is used for the formation of new cells and tissues including brain tissue in the fetus. To meet the need for iron during pregnancy, pregnant women take iron tablets. The Program for Giving Blood Supplement Tablets to pregnant women in Indonesia started in 1990 which aimed to prevent and treat iron deficiency anemia and to become one of the specific interventions in an effort to accelerate the reduction of stunting (Kemenkes RI, 2020). The need for iron during pregnancy is difficult to meet only from food alone, so pregnant women are advised to continue taking iron tablets while maintaining their diet, eat a variety of iron-rich foods every day

Maintaining a healthy diet during pregnancy will support normal fetal growth. Insufficient intake during pregnancy associated with increased iron requirements puts pregnant women at greater risk of experiencing iron deficiency, which can affect fetal growth and development (Sanjaya et al., 2021). Anemia in pregnancy can also increases risk of death during childbirth, the fetus and mother are susceptible to infection, and swelling (Mayasari et al., 2021).

Anemia can be prevented by consuming a balanced nutritious diet with adequate iron intake to meet the body's needs (Mayasari et al., 2021). Iron can be obtained by consuming red meat such as beef. (Mayasari et al., 2021). Iron can also be found in green vegetables such as Moringa leaves (Susanti et al., 2021), and nuts such as green beans (Mayasari et al., 2021), dates (Fauziah & Maulany, 2021).

A diet that is less diverse and nutritionally balanced is one of the causes of anemia in pregnant women. During pregnancy, mothers must consume foods that contain protein, carbohydrates, and micronutrients (vitamins and minerals) (Kemenkes RI, 2020), such as eggs. Eggs protein content is of high-quality. According United States

Department of Agriculture (USDA) 2018, one large egg contains 6.3g of protein distributed between the yolk and white portion. (3.6g in egg white and 2.7g in egg yolk) (Puglisi & Fernandez, 2022). Minerals such as iron, zinc and selenium are also contained in eggs. the iron in eggs is quite good, namely 1.04 mg in whole eggs, while in egg yolks it is 0.95 mg. The zinc content in a whole egg is 0.72 mg, and 0.58 mg in the egg yolk (Suheni et al., 2020).

Research conducted by Purba (2020) states that chicken eggs can increase hemoglobin during pregnancy. The results of the study stated that before consuming boiled chicken eggs the average was 8.08 and after consuming boiled chicken eggs was 9.39. By using the t-test, a value of 0.000 is obtained, which means <0.05 (Purba, 2020).

Until now the potential impact of eggs on iron status is still unclear (Werner et al., 2022), so further studies are needed

## METHOD

### Participant characteristics and research design

This study was quantitative using a pre-experimental research design with a one group pretest – posttest design approach. Respondents were pregnant women in their third trimester with mild to moderate anemia, had no history of allergy to chicken eggs, took daily iron tablets as recommended, had an upper arm circumference > 23.5 cm during the study.

### Sample size and sampling procedures

Respondents in this research were 17 anemic pregnant women who were selected based on purposive sampling technique.

### Methods and data analysis

The eggs used come from the same farm. Respondents were given 1 medium-sized boiled egg every day for 7 consecutive days.

The normality test using the Shapiro-Wilk obtained data normally distributed, so the bivariate analysis used the Independent Sample T-Test.

## RESULTS AND DISCUSSION

The average hemoglobin level before and after being given boiled chicken eggs.

**Table 1**  
**Average Hemoglobin Levels Before Giving Boiled Chicken Eggs**

Average hemoglobin	Mean	SD	Min	Max	n
Before intervention	10,1765	0,49185	9,00	10,90	17

**Table 2**  
**Average Hemoglobin Levels After Giving Boiled Chicken Eggs**

Average hemoglobin	Mean	SD	Min	Max	n
After Intervention	10,8765	0,46169	9,80	11,50	17

**Table 3**  
 The Effect of Giving Boiled Chicken Eggs on Hemoglobin Levels in Pregnant Women

Hemoglobin	Mean	SD	p-value
Before intervention	10,1765	0,49185	0,000
After Intervention	10,8765	0,46169	0,000

The average hemoglobin level before the intervention (table 1) was 10.1765 g/dl with a standard deviation (SD) of 0.49185, a minimum of 9.00 g/dl and a maximum of 10.90 g/dl, and the average hemoglobin level after the intervention (table 2) is 10.8765 g/dl with an SD value of 0.46169, a minimum of 11.50 g/dl and a maximum of 11.50 g/dl.

Eggs are a food ingredient that has a high nutritional value. The highest egg content is vitamin A, which is estimated at 98 micrograms per egg, followed by other vitamins such as D, E, C and B, where the high mineral in eggs is phosphorus followed by other minerals such as sodium, calcium, magnesium, iron, zinc (Pendet, 2016).

The protein content in eggs is of high quality. One large egg contains 6.3g of protein distributed between the yolk and white (3.6g in the egg white and 2.7g in the egg yolk) (Puglisi & Fernandez, 2022). Several types of important minerals are also contained in eggs, namely, zinc, iron, and selenium.

The iron contained in eggs is quite good, one whole egg contains 1.04 mg of iron and 0.72 mg of zinc. Meanwhile, egg yolk contains as much as 0.95 mg of iron and 0.58 zinc (Suheni et al., 2020). Iron has an important role for human life, because iron plays a role in many body functions, including immunity, oxygen transportation, cell division and differentiation, and energy metabolism. Iron homeostasis is controlled by intestinal absorption because iron does not have an active excretion mechanism for humans. Thus, efficient intestinal bioavailability of iron is essential for reducing anemia, the risk of iron deficiency (Piskin et al., 2022).

The results of bivariate analysis in table 3 using the Independent Sample T-Test obtained p-value = 0.000 (p-value <math>\alpha = 0.05</math>), which means that there is an effect of boiled chicken eggs on hemoglobin levels in third trimester pregnant women, with an increase of 0.7 g/dl.

Efforts to prevent anemia in pregnant women can be done by regularly consuming at least 90 tablets of iron tablets during pregnancy, eating a balanced variety of foods, using footwear to prevent hookworm infection, using mosquito nets on beds as a prevention of malaria for malaria endemic areas, and multiplying consume foods rich in iron and protein such as liver, meat, fish, eggs, green vegetables, and red or yellow fruits (Kemenkes RI, 2020).

Anemia is a condition where the hemoglobin concentration is lower than normal threshold. Pregnant women are categorized as anemia if their hemoglobin level in the blood is <math>< 11\text{gr/dl}</math> (Kemenkes RI, 2020). There are about 300 hemoglobin molecules in one red blood cell. An insufficient amount of hemoglobin will cause the body's tissues to lack oxygen, because hemoglobin functions to carry oxygen throughout the body (Katili et al., 2019)

In this study there were differences in hemoglobin levels before and after intervention, which means that eggs can increase hemoglobin concentration in pregnant women. Eggs are a cheap and easy source of protein. The content of essential amino acids is almost equivalent to that in breast milk. In addition to minerals such as iron, calcium, phosphorus, sodium and magnesium which can increase hemoglobin levels, eggs also contain various vitamins such

as vitamins A, D and B vitamins (Katili et al., 2019). The content of ovalbumin which is a component of egg white is believed to be useful for the recovery of iron deficiency anemia (Kobayashi et al., 2015). The surface of the ovalbumin molecule has a negative carboxylate site (-CO<sub>2</sub>-) which has a strong iron-binding effect, so egg white protein has also been shown to have strength in anemia recovery (Chai et al., 2019)

Protein is important in maintaining normal iron metabolism, and is one of the main nutrients involved in all aspects of iron metabolism in vivo, including iron absorption, hematopoiesis, transport, and storage. Protein also has the greatest influence on iron absorption compared to carbohydrates and lipids (Kobayashi et al., 2015). Although several studies have stated that giving eggs does not affect hemoglobin, even egg yolk reduce iron absorption (Chai et al., 2019; Kobayashi et al., 2015; Werner et al., 2022)

Previous studies have stated that protein intake from egg yolks reduces iron absorption because it can combine with phosvitin and form iron complexes that do not dissolve in the small intestine (Chai et al., 2019; Kobayashi et al., 2015). Previous studies have stated that protein intake from egg yolks reduces iron absorption because it can combine with phosvitin and form iron complexes that do not dissolve in the small intestine (Chai et al., 2019; Kobayashi et al., 2015). Phosvitin is a resistant protein so there is a possibility that insoluble iron complexes are excreted from the body without being used in vivo. Therefore, these findings suggest that iron from eggs is not readily usable in vivo, and ingredients from egg yolk reduce the bioavailability of dietary iron. The study also describes avoiding egg yolks as a source of protein and iron in cases of iron deficiency anemia, as well as the pressure that iron bioavailability varies with different cooking processes, especially egg yolks (Kobayashi et al., 2015). Further studies will be needed to confirm these findings.

In this study there was no control diet, the respondents continued to consume food as usual, only added 1 boiled chicken egg every day for 7 days, and continued to regularly consume iron tablets, so that respondents continued to consume a variety of foods which also had an impact on increasing hemoglobin in the blood.

#### LIMITATION OF THE STUDY

This research was conducted with a small number of respondents, and there was no diet control during the study, the respondents was free to eat food as usual, only adding 1 boiled chicken egg per day and ensuring that the respondents continued to take iron tablets. Checking hemoglobin before and after the intervention was carried out with a simple digital hemoglobin checker.

#### CONCLUSIONS AND SUGGESTIONS

The result of this study showed that eggs can increase hemoglobin concentration of pregnant women. Further research is needed with a larger number of respondents and control over the diversity of respondents' eating patterns during the study.

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