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Compliance of Iron Tablet Consumption and Anemia in Third Trimester of Pregnancy at Sleman Primary Health Care, Yogyakarta

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ABSTRACT

Background: Iron deficiency anemia in pregnant women is a global health problem with a prevalence of 36.8%, often occurring as mild anemia in the third trimester of pregnancy. In Indonesia, anemia in pregnant women reached 44.2% in 2019. In Sleman District, Yogyakarta Special Region, the prevalence of anemia in pregnant women increased to 10.46% in 2019 compared to 2015. Anemia in pregnancy causes serious complications on the maternal and the fetus. One method of preventing iron deficiency anemia in pregnancy is to take iron tablets orally. This study aims to investigate the frequency of anemia in the third trimester of pregnancy and its correlation with compliance with iron tablet consumption.
Methods: This type of research is quantitative research with a cross-sectional approach. The sample of this study was all third-trimester pregnant women at the Sleman Primary Health Care who met the inclusions and exclusions, with a total of 153 respondents, using the purposive sampling technique. All the data analysis using the Spearman correlation test.
Results: This study showed there was 22,22% of anemia in the third trimester of pregnancy. There was a weak negative correlation between compliance with iron tablet consumption and anemia incidence with a coefficient correlation of -0,224 with a p-value of 0,011 ($p<0,05$).
Conclusion: Anemia in the third trimester affected 22,22% of pregnant patients at Sleman Primary Health Care, and there was a negative correlation between anemia and iron tablet compliance.

Keywords: ***anemia, iron deficiency, pregnancy, incidence, third trimester***

INTRODUCTION

Pregnancy is an aspect that determines the quality of future generations of the nation because it includes the development of the child from the womb. Anemia is the most common nutritional deficiency experienced by pregnant women globally [(1)]. Nutrition needs play an important role during pregnancy because they affect the condition of the mother and fetus [(1,2)]. According to the World Health Organization (WHO), an aspect of the cause of anemia experienced in pregnant women, especially in developing countries, is iron deficiency [(3)].

Iron deficiency anemia in pregnant women has a global prevalence of 36.8%. The most common type of anemia globally is mild anemia during the third trimester [(4)]. Pregnant women's anemia is still a public health concern in Indonesia, according to SKI (Survei Kesehatan Indonesia) 2023, with a prevalence of anemia of 27.7%. Pregnant women's anemia proportion decreased from 48.9% to 27.7% (a 21.2% reduction) from Riskesdas 2018 [(5,6)].

Anemia is still a health problem in pregnant women located in Sleman district, Yogyakarta Special Region. The prevalence of anemia experienced by pregnant women in 2019 increased to 10.46% compared to 2015 data. The highest prevalence of anemia in pregnant women occurred in the Prambanan Health Center working area, which was 24.15% in 2019. In the past three years (2019 to 2021), the prevalence of pregnant anemia in DIY has increased. As a priority for health issues in DIY, efforts to lower the prevalence of anemia among pregnant mothers should be made more effectively in light of the objective of reducing the number of maternal deaths [(7,8)].

Anemia for pregnant women can cause increased risks such as placental abruption, postpartum hemorrhage, shock, prolonged labor due to weak contractions in the uterine muscles, infection (either during or after delivery), and can even cause maternal death [(1)]. According to the current study, pregnant women with anemia are at risk of low birth weight 7.47 times during pregnancy [(9)]. Other risks to the baby caused by anemia in pregnancy are premature birth, fetal malformation, not vigorous newborn, and neonatal mortality [(1,9,10)].

Iron is a mineral that plays a role in biological activities, including DNA synthesis, cell growth and differentiation, immunity, mitochondrial function, and the body's reaction to oxygen deprivation. Iron requirements during pregnancy increase about 10-fold [(11)]. Efforts to avoid anemia in pregnancy can be implemented by consuming iron tablets with a routine of 90 tablets during pregnancy. How to consume, the accuracy of the amount, and the time of taking iron tablets can be a benchmark to encourage the attitude of pregnant women to take iron tablets [(12)].

In a previous study, it was explained that compliance with the consumption of iron tablets did not affect the incidence of anemia that occurred in pregnant women [(13)]. However, others showed a correlation between adherence to iron tablet consumption and the chance of anemia in pregnant women [(14,15)]. The differences in the results of this study were caused by several factors, such as the number of samples, the location of the study, and the year of the study. This encourages researchers to prove again whether compliance to taking iron tablets in pregnant women at the Sleman Primary Health Care can significantly prevent anemia in pregnancy.

METHODS

The method used in this research is quantitative research with a cross-sectional approach. The sampling technique used was purposive sampling where the sample was taken by setting certain characteristics. This research was conducted from February 2024 to March 2024 at the Sleman Primary Health Care. The inclusion criteria were all pregnant women in the third trimester at Sleman Primary

Health Care when this study was conducted. The exclusion criteria were respondents who didn't give informed consent. The dependent variable was anemia. Anemia in this study is defined when respondents have hemoglobin below 11 g/dl. We got this data from medical records at Sleman Primary Health Care. Compliance with iron tablet consumption is the dependent variable. It is based on a validated questionnaire from a previous study [16]. Iron tablet consumption consists of the right dose, the right time, and the right method of administration. We used univariate and bivariate analyses to describe all variables. The chi-square statistical test and the Spearman correlation test are used in testing the association and correlation of all variables. The research received approval from the Ahmad Dahlan University Institutional Review Board, bearing the ethical approval number 012308199.

RESULT

This research was conducted from February to March 2024 to meet the number of respondents as many as 153 people at the Sleman Primary Health Care. Univariate analysis was conducted to know the frequency distribution (n) and percentage (%) of age, education, job, parity, dose compliance, duration, how to take iron tablets, and the incidence of anemia.

Table 1. Frequency of Anemia in Third Pregnancy at Sleman Primary Health Care

Hb Level	Frequency	%
Anemia (Hb<11 g/dl)	34	22.2%
Not Anemia Hb (> 11 g/dl)	119	77.8%
Total	153	100%

Based on Table 1, it can be seen that 34 respondents suffered from anemia in the third trimester of pregnancy with a percentage of 22.2%.

Based on Table 2 it can be seen that the majority of respondents aged 20-35 years, 44.4% of respondents have a high school education, half of respondents are not working, and 40.5% of respondents are experiencing their first pregnancy.

Table 2. Demographic data of the Respondents

Characteristics	Frequency	%
Age		
< 20 years	1	0.7%
20-35 years	128	83.37%
> 35 years	24	15.7%
Education		
Master	7	4.6%
Bachelor	58	37.2%
Diploma	11	7.2%
Senior High School	68	44.4%
Junior High School	8	5.2%
Elementary	1	0.7%
Occupation		
Employed	75	49%
Unemployed	78	51%
Parity		
1st	62	40.5%
2nd	54	35.3%
3rd or more	37	24.2%
Total	153	100%

Based on Table 3, it can be seen that 45.8% of respondents complied with the dose, 35.9% of respondents complied with the time, 84.3% of respondents complied with the method of taking iron tablets and 19.6% of respondents complied with all categories of compliance consisting of dose, time, and method of taking iron tablets. The right dose, the right time, and the right method, as well as a combination of the three of them, are correlated with anemia in third-trimester pregnancy at Sleman Primary Health Care.

The correlation between the right dose, the right time, and all categories of compliance to the incidence of anemia is low while the relationship between the

right method to the incidence of anemia is moderate (Coefficient Correlation -0.418). The negative sign indicates that if the level of iron tablet consumption increases, the incidence of anemia decreases, and vice versa.

Table 3. Correlation between compliance of the dose, time, method, and all categories of taking iron tablets with the incidence of anemia

Variable	Anemia	Not Anemic	Spearman's rho (p-value)
	n (%)	n (%)	
Right dose			
Compliance	7 (10%)	63 (90%)	- 0.270 (0,001)*
Not compliance	27 (32.5%)	56 (67.5%)	
Right time			
Compliance	3 (5.5%)	52 (94.5%)	- 0.302 (0,000)*
Not compliance	31 (31.6%)	67 (68.4%)	
Right method			
Compliance	19 (14.7%)	110 (85.3%)	- 0.418 (0,000)*
Not compliance	12 (62.5%)	9 (37.5%)	
Right dose, time, and method (Compliance with Iron Tablet Consumption)			
Compliance	1 (3.3%)	29 (96.7%)	- 0.224 (0,005)*
Not compliance	33 (26.8%)	90 73.2%)	

* Correlation is significant at $p<0.05$

DISCUSSION

Incidence of Anemia

Based on the results of the study, it can be seen that the proportion of anemia incidence in third-trimester pregnancy was 22.2% anemia. The previous study showed similar results with the incidence of anemia in third-trimester pregnant women at 24.5% [(17)]. The result of this study was lower when compared to other results at the Sleman Health Office in 2020. The percentage of anemia in pregnant women in Sleman Regency in 2019 was 10.46% [(18)].

In this study, anemia was found to occur mostly in respondents aged 20-35 years with a percentage of 91.2%, respondents with high school education with a percentage of 50.0%, respondents who were not working with a percentage of 70.6%, and respondents experiencing their first pregnancy with a percentage of 41.2%. This contradicts the results of a study conducted by others which states that age, not high school, unemployment, multiparity, and non-compliance with taking iron tablets can increase anemia in third-trimester pregnant women [(19)]. This difference may be caused by several factors such as differences in location and sample size that affect the distribution of the population.

Anemia is often referred to as lack of blood or low numbers of red blood cells. In pregnancy, anemia is usually caused by iron deficiency and is diagnosed by measuring the hemoglobin level in the pregnant woman's blood. During pregnancy, several hematological changes occur, such as an increase in blood plasma volume of up to 45%, an increase in erythrocyte mass of 25%, decreased platelet count, increased blood clotting activity, and increased erythropoiesis [(20)].

Anemia during pregnancy can have a serious impact on both maternal and fetal health. In the mother, anemia increases the risk of premature birth, low birth weight, placental abruption, and severe postpartum hemorrhage. In addition, anemia can lead to fetal malformations and stunted fetal development due to a lack of oxygen and nutrients. Severe anemia can also affect maternal health by increasing the risk of infection, fatigue, and even heart failure. Effective management through iron supplementation and regular monitoring is essential to reduce these risk [1,21].

Correlation between the Right Dose and Anemia

Based on the results of this study, it was found that there were 90% of respondents who complied with the dosage in taking iron tablets did not experience anemia in third-trimester pregnant women at Sleman Primary Health Care. The results of this study indicate that there is a low correlation between the right dose in taking iron tablets with the incidence of anemia with a p-value of 0.002 ($p < 0.05$). The results of this study are supported by previous research that pregnant women who are obedient to consume iron tablets do not suffer from anemia [22].

The mechanism of iron deficiency and the incidence of anemia in pregnant women involves several important factors. Iron is an essential component for the synthesis of hemoglobin, which is important for oxygen transportation in the body. Iron requirements increase during pregnancy to support fetal and placental growth. Iron deficiency can inhibit hemoglobin production and cause anemia [23,24]. The process of red blood cell formation (erythropoiesis) requires a sufficient amount of iron. Iron deficiency results in decreased production of hemoglobin and red blood cells, which can lead to tissue hypoxia and clinical symptoms of anemia such as fatigue and palpitations [24,25]. Inflammation can increase levels of hepcidin, a hormone that inhibits iron absorption in the gut and iron release from storage. This can exacerbate iron deficiency in pregnant women who already have high iron requirements [23].

Non-compliance with iron tablet consumption can cause iron to not be absorbed optimally, which will have an impact on the effectiveness of red blood cell production [11,26]. The more compliant the pregnant women are in taking iron tablets during pregnancy, the lower the possibility of the pregnant women experiencing anemia during pregnancy. On the contrary, the more non-compliant pregnant women consume iron tablets during pregnancy, the incidence of anemia in pregnancy will increase [27]. Thus, taking iron tablets is one of the important efforts in preventing and overcoming anemia, especially anemia caused by iron deficiency in pregnant women.

From the research that has been done, it is found that respondents who are not compliant in taking iron tablets are caused by memory factors (recall bias) where respondents often forget to take iron tablets. This also happened in several previous studies which state that recall bias can occur because mothers have to remember about iron tablet consumption from early pregnancy to the third trimester [28]. In addition, it was found that some respondents who were not compliant with consuming iron tablets were caused by they thought that their hemoglobin levels were normal so respondents felt no need to take iron tablets regularly.

Correlation between the Right Time and Anemia

Based on the results of this study, it was found that there were 94.5% of respondents who obeyed the time in taking iron tablets did not experience anemia in third-trimester pregnant women at the Sleman Primary Health Care. The results of this study indicate that there was a correlation between the right time with the incidence of anemia at the Sleman Primary Health Care with a p-value of 0.000 ($p < 0.05$).

The results of this study are in line with previous research where 29 pregnant women were classified as obedient in adherence to taking iron tablets with 19 of them (65.5%) pregnant women not suffering from anemia while 10 (34.5%) other pregnant women suffered from anemia [16].

Respondents who were not time-compliance in taking iron tablets were mostly due to the time interval used by respondents in taking iron tablets close to or almost the same time as eating. Other research supported this finding that the high chance of anemia in pregnant women was seen from the OR value of 11.4 (95% CI: 3.092-42.026). The possibility that causes the high OR is that most pregnant women take iron tablets at almost the same time as eating / the stomach is not empty while iron absorption is better in empty stomach conditions [14].

Correlation between the Right Method and Anemia

Based on the results of this study, it was found that there were 85.3% of respondents who were compliant in taking iron tablets did not experience anemia, and the remaining 14.7% experienced anemia in third-trimester pregnant women at the Sleman Primary Health Care. The results of this study indicate that there was a correlation between the right method of taking iron tablets with the incidence of anemia at the Sleman Primary Health Care with a p-value of 0.000 ($p < 0.05$). The results of this study are supported by previous research where 59 pregnant women were classified as the noncompliance category in how to consume iron tablets with 23 of them (39%) pregnant women not suffering from anemia and 36 (61%) pregnant women suffering from anemia [29].

Compliance with the method was obtained from the results of the interview guide where the respondents' answers did not include tea, coffee, milk, chocolate, and cheese. If there are these answers, the respondent is classified as non-compliant because it can interfere with the absorption and effect of the iron tablets themselves. This is supported by other research which states that good consumption of iron tablets can be by drinking them only with mineral water, not together with drinks containing caffeine such as tea and coffee which can interfere with iron absorption. In addition, it should not be combined with drinking milk because milk neutralizes iron so that the effect of iron will be reduced [30]. From this study, it was found that most of the respondents who did not comply with the method of taking iron tablets were caused by the way the respondents drank it using tea or milk.

Correlation between Compliance in Iron Tablet Consumption (Right Dose, Right Time, Right Method) and Anemia

Based on the results of this study, it was found that there were 96.7% of respondents who complied with the dose, time, and method of taking iron tablets did not experience anemia, and the remaining 3.3% experienced anemia in third-trimester pregnant women at the Sleman Primary Health Care. The results of this study indicate that there is a correlation relationship between compliance with taking iron tablets in third-trimester pregnant women with the incidence of anemia at the Sleman Primary Health Care with a p-value of 0.011 ($p < 0.05$). Other studies showed similar results that iron tablet consumption compliance is said to be compliant if the right number of tablets are consumed, the right way to consume iron tablets, and the frequency of consumption of iron tablets per day [16,26,27].

CONCLUSION

Based on the study, it can be concluded that anemia in the third trimester affected 22,22% of pregnant patients at Sleman Primary Health Care, and there was a low correlation between compliance with taking iron supplements and anemia.

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