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Original Research

Iron Supplement Tablet Consumption is Associated with Hemoglobin Levels in Pregnant Women

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ABSTRACT

Background: *Hemoglobin (Hb) levels in pregnant women are checked in the first trimester (Hb1) and third trimester (Hb2). Hemoglobin requires iron (Fe) and protein; consumption of at least 90 iron tablets during pregnancy is recommended to increase Hb and prevent anemia. The purpose of this study was to analyze TTD consumption, hemoglobin levels in the first and third trimesters, and the relationship between TTD consumption and Hb levels in pregnant women at the Bayat Community Health Center, Klaten Regency.*

Methods: ***This was*** *an associative quantitative study with a sample of 52 pregnant women in their third trimester who had their Hb checked at the Bayat Community Health Center in October 2022 (incidental sampling). Univariate and bivariate analyses were performed; the relationship between TTD consumption and Hb was tested using Spearman's correlation using IBM SPSS Statistics 23.*

Results: *A total of 59.6% of respondents regularly consumed ≥90 TTD tablets, but 65.4% did not experience an increase in Hb levels from Hb1 to Hb2. Spearman's test showed a significant relationship between TTD consumption and Hb levels (p = 0.000; r = 0.516) with a positive direction, indicating that regular TTD consumption is associated with an increase in Hb levels.*

Conclusion: *There is a moderate positive correlation between iron supplement consumption and hemoglobin levels in pregnant women at the Bayat Community Health Center. It is recommended to improve program interventions: strengthening counseling and education on iron supplement consumption compliance, monitoring compliance by health workers, providing adequate supplements, and conducting periodic Hb checks and follow-ups for mothers who do not show an increase in Hb.*

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INTRODUCTION

The Iron-Folic Acid Tablet (IFAT) program for pregnant women has been implemented since 1990 by the Indonesian government. This program aims to prevent and address iron-deficiency anemia, which remains a public health issue. The iron requirement for pregnant women increases by approximately 25% compared to non-

pregnant women ( ), so iron intake from food alone is often insufficient to support the physiological needs of pregnancy.

Anemia in pregnant women is a serious nutritional problem with widespread impacts on the health of both the mother and the fetus. Data from the 2018 Riskesdas shows that 48.9% of pregnant women in Indonesia suffer from anemia. This condition can hinder fetal growth, increase the risk of pregnancy and childbirth complications, and even cause maternal and infant mortality (Ministry of Health of the Republic of Indonesia, 2020). Therefore, early detection and prevention of anemia are an important part of health services for pregnant women.

The Indonesian Ministry of Health's Third Edition of the Integrated Antenatal Care Guidelines (2020) emphasizes that hemoglobin level checks should be conducted in the first and third trimesters. These checks aim to detect the risk of anemia early in pregnancy and evaluate the mother's condition prior to delivery. Hb checks also serve as the basis for determining follow-up actions and recommendations for safe delivery for pregnant women.

Several previous studies have shown that regular consumption of iron tablets can increase hemoglobin levels. Research by Keswara and Hastuti (2016) showed a significant increase in Hb levels after one month of iron tablet administration. Another study by Jufri, Asi, and Heyrani (2018) also found a significant relationship between iron tablet consumption and increased hemoglobin levels in pregnant women. However, variations in results in the field show that TTD consumption compliance and Hb increase are not always in line, so contextual studies in various regions are needed.

The Bayat Community Health Center in Klaten Regency has implemented integrated antenatal care guidelines, including the administration of a minimum of 90 TTD tablets and Hb checks in the first and third trimesters. Based on the September 2022 KIA report, of the 51 pregnant women who had their Hb levels checked in the third trimester, 11.8% were anemic. This condition indicates that there are still problems with TTD consumption compliance and suboptimal Hb levels. Therefore, this study aims to analyze the relationship between iron tablet consumption and hemoglobin levels in pregnant women at the Bayat Community Health Center in Klaten Regency as an effort to strengthen maternal nutrition interventions at the primary care level.

MATERIALS AND METHODS

This study uses a quantitative design with an associative approach. This design was chosen because it is in line with the research objective of determining the relationship between two variables, namely TTD consumption and hemoglobin levels in pregnant women. This approach allows researchers to describe the relationship between variables objectively using numerical data analyzed statistically. With an associative design, researchers can identify the strength and direction of the relationship without directly treating the respondents (Sugiyono, 2017; Jaya, 2021).

The research was conducted at the Bayat Community Health Center in Klaten Regency, which is a primary health facility with active integrated antenatal services. This location was chosen because it has complete and well-archived data on hemoglobin levels in pregnant women. The research lasted for six months, from July to December 2022, covering the stages of planning, licensing, data collection, analysis, and reporting of results.

The population in this study consisted of all third-trimester pregnant women who had their hemoglobin levels checked at the Bayat Community Health Center in October 2022, totaling 52 people. The sampling technique used incidental sampling, which is a technique of selecting samples based on chance during the study, as long as the respondents met the research criteria (Jaya, 2020). The sample size of 52 pregnant women was considered sufficient to represent the relationship between variables. Inclusion criteria included pregnant women in their third trimester who had complete Hb1 and Hb2 examination data in their maternal and child health (KIA) book, while exclusion criteria included pregnant women with chronic diseases or medical conditions that affected hemoglobin levels.

This study had two main variables, namely iron tablet consumption as the independent variable and hemoglobin levels as the dependent variable. The research instrument was a data recapitulation sheet, which was compiled based on the KIA report from the Bayat Community Health Center, village midwife reports, and the KIA book for pregnant women. The data collected included the characteristics of pregnant women, the amount of iron tablets consumed, and Hb levels in the first and third trimesters. The content validity of the instrument was tested through expert judgment by the supervising lecturer and health workers at the Bayat Community Health Center, while the reliability of the data was ensured through cross-verification between the report sources and medical records.

The data collection procedure was carried out after the researchers obtained official permission from the institution and the health center. The researchers traced the KIA reports and KIA books of pregnant women to record data related to TTD consumption and Hb examination results. The collected data were examined through a process of editing, coding, scoring, and tabulating before being analyzed. The analysis was performed univariately to describe the frequency distribution and bivariately using Spearman's correlation test to determine the relationship between TTD consumption and Hb levels. The entire data analysis process was performed using IBM SPSS Statistics version 23.

This study obtained health research permission from the Surakarta Health Polytechnic with permit number KH.03.01/12.2/1598/2022. The researchers conducted the study in accordance with health research ethics principles, including anonymity (without mentioning the respondents' names) and data confidentiality to protect the respondents' privacy. All data were used solely for scientific purposes and presented in aggregate form to prevent personal identification.

RESULTS

Univariate Analysis

Table 1 shows that most respondents were aged 20–35 years (82.7%) and had an upper arm circumference ≥23.5 cm (82.7%), indicating good nutritional status. Most respondents had a normal BMI (67.3%) and a high school education (61.5%). The majority of pregnant women were not working (59.6%) and regularly consumed ≥90 iron tablets (59.6%). However, 65.4% of respondents did not experience an increase in hemoglobin levels from the first trimester to the third trimester. The average Hb level in the first trimester was 11.8 g/dL, while the average in the third trimester decreased to 11.4 g/dL, indicating considerable variation between individuals.

Table 1. Characteristics of Pregnant Women at Bayat Health Center, Klaten District, 2022 (n = 52)

Variable	Category / Value	Frequency (n)	Percentage (%)
Age of pregnant women	< 20 years	2	3.8
	20–35 years	43	82.7
	> 35 years old	7	13.5
Upper Arm Circumference (UAC)	< 23.5 cm	9	17.3
	≥ 23.5 cm	43	82.7
Body Mass Index (BMI)	< 18.5 (malnutrition)	5	9.6
	18.5–24.9 (normal)	35	67.3
	≥ 25 (overweight/obese)	12	23.1
Highest level of education	Elementary	1	1.9
	Junior high school	11	21.2
	High School	32	61.5
	College	8	15.4
Employment	Not working	31	59.6
	Working	21	40.4
Iron Supplement Tablet Consumption (TTD)	Irregular (<90 tablets)	21	40.4
	Regular (≥90 tablets)	31	59.6
Hemoglobin (Hb) Level	No increase (Hb1 > Hb2)	34	65.4
	Increase (Hb1 < Hb2)	18	34.6
Variable		**Mean**	
Mean Hb in the First Trimester (Hb1)	—	11.8 g/dL	—
Average Hb in the third trimester (Hb2)	—	11.4 g/dL	—

Bivariate Analysis

Before conducting the correlation test, *the Shapiro–Wilk test* was used to test the normality of the data and showed that the data distribution was not normal ($p < 0.05$). Therefore, the correlation between variables was analyzed using Spearman's rho correlation test.

Table 2. Relationship between Iron Supplement Tablet Consumption and Hemoglobin Levels in Pregnant Women

Variable	Correlation Coefficient (r)	p-value (Sig. 2-tailed)	Interpretation
Relationship Between Iron Supplement Consumption and Hemoglobin Levels	0.516	<0.001	Moderate positive relationship, significant

The analysis results show a significant relationship between iron supplement consumption and hemoglobin levels in pregnant women (p = <0.001; r = 0.516). The positive direction of the relationship indicates that the more regular the consumption of iron tablets, the higher the hemoglobin levels of pregnant women. The strength of the relationship is in the moderate category, so adherence to iron tablet consumption contributes to increased hemoglobin levels, although there are still other factors that can influence the results.

DISCUSSION

The results of the study show that most pregnant women at the Bayat Community Health Center have consumed TTD regularly, but most did not experience an increase in hemoglobin levels from the first trimester to the third trimester. This condition indicates that regular consumption of TTD does not fully guarantee an increase in hemoglobin levels. This phenomenon indicates that the effectiveness of TTD is influenced by other factors such as nutritional intake, iron absorption, and the mother's health condition during pregnancy (Indonesian Ministry of Health, 2020).

The findings of this study are in line with the results of research by Umi Romayati Keswara and Yuni Hastuti, which showed a difference in hemoglobin levels after administering 60 mg/day of iron tablets for one month. Another study by Jufri, Asi, and Heyrani (2018) also found a positive relationship between iron tablet consumption and increased hemoglobin levels. However, in this study, some pregnant women who had regularly consumed TTD still did not experience an increase in Hb levels. This reinforces the opinion that TTD consumption compliance needs to be balanced with a nutritious diet and iron absorption factors for optimal effects (Kamaruddin et al., 2019).

The differences in results between individuals in this study may be due to variations in protein intake, vitamin C, or consumption of substances that inhibit iron absorption, such as tea and coffee. The initial nutritional status of pregnant women, as indicated by Body Mass Index (BMI) and Upper Arm Circumference (UAC), also plays an important role in the body's ability to form hemoglobin. According to research by Nugrahaeni (2020), mothers with chronic energy deficiency (CED) are at high risk of anemia because their bodies lack the basic ingredients for forming hemoglobin, namely iron and protein. Thus, increasing hemoglobin levels depends not only on TTD consumption but also on the nutritional quality and physiological condition of pregnant women.

This study has important implications for antenatal care at the community health center level. Health workers need to monitor not only the number of tablets consumed but also the quality of the pregnant woman's food intake. Comprehensive nutrition education can help improve iron absorption through the consumption of animal protein sources and vegetables and fruits rich in vitamin C. Intensive and personalized counseling programs can increase mothers' awareness of the importance of regular and proper consumption of

TTD, as recommended in the Third Edition of the Integrated Antenatal Care Guidelines (Indonesian Ministry of Health, 2020).

Methodologically, this study has several limitations. The research design used was cross-sectional with secondary data from KIA reports, so that cause-and-effect relationships could not be determined with certainty. In addition, this study did not measure other factors that could affect hemoglobin levels, such as eating habits, infections, and consumption of additional supplements. Limitations in the measurement of external variables may reduce the accuracy of statistical analysis results, so the findings need to be interpreted with caution.

The researchers recommend that future studies use a longitudinal design that allows monitoring of changes in hemoglobin levels during pregnancy with control of dietary patterns and other risk factors. Community health centers are advised to strengthen nutrition education programs and monitor TTD compliance directly through cadre visits. In addition, local governments need to ensure the availability of TTD with quality standards in accordance with Minister of Health Regulation No. 88 of 2014 so that its benefits are more optimal in preventing anemia in pregnant women (Ministry of Health of the Republic of Indonesia, 2020).

CONCLUSION

The results of the study show a significant relationship between iron tablet consumption and hemoglobin levels with a moderate strength and positive direction, which means that the more regular the consumption of iron tablets, the more hemoglobin levels tend to increase. This finding emphasizes the importance of consistent iron supplementation accompanied by nutrition education to improve the success of anemia prevention programs in pregnant women. Therefore, health workers need to strengthen the monitoring of iron tablet consumption through the KIA book and provide nutrition counseling based on local food sources of protein and iron.

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