Relationship Between Sociodemographic Characteristics and Laboratory Parameters of Iron Supplement Tablet Comsumption on Anemia In Pregnancy

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KEYWORDS

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ABSTRACT:

Introduction: Anemia is a condition that can occur during pregnancy and can adversely affect the health of both the mother and fetus. Iron or Fe is an essential micronutrient needed by the body for hemoglobin formation to prevent anemia. Sociodemographic factors can influence the occurrence of anemia during pregnancy and change of laboratory parameters.

Objective: The study aims to evaluate relationship between sociodemographic characteristics including age, education, family income and occupation, nutritional status, race/ethnicity, residency status, living environment, and laboratory parameters on the consumption of iron tablets for anemia in pregnancy

Methods: This study was an analytical observational study using a cohort study design. The sample consisted of 100 pregnant women, who were receiving iron supplement tablets from a health center. These women had uncomplicated pregnancies and did not have chronic illnesses. They were divided into two groups based on their consumption of iron supplement tablets: one group consumed fewer than 90 tablets, while the other group consumed 90 tablets.

Results: The study found significant results ($p<0.05$) in four out of fifteen sociodemographic characteristics: distance from residential house to the health center, complaints during the consumption of iron supplement tablets, changes in dietary habits during pregnancy, and changes in work routines. Significant results ($p<0.05$) were also found in laboratory parameters including HB, MCV, MCH, and MCHC after consuming the iron supplements during pregnancy.

Conclusions: Distance from home to the health center measured in kilometers, complaints during the consumption of iron supplement tablets, changes in dietary habits, and work routines showed statistically significant results. Laboratory parameters also showed statistically significant improvements with the consumption of iron supplement tablets during pregnancy.

1. Introduction

Anemia in pregnancy is a common condition and can cause various adverse effects on maternal health and fetal development. Anemia in pregnancy is reported to increase the risk of serious complications, such as premature birth, maternal and child mortality, and the risk of infection [1,2]. Medically, anemia in pregnancy is defined as a condition where the hemoglobin level of a pregnant woman is less than a certain limit depending on the trimester, namely <11 g/dL in the first or third trimester, and <10.5 g/dL in the second trimester [3].

The prevalence of anemia in pregnancy in Indonesia has shown a significant increase, from 37.1% in 2013 to 48.9% in 2018 [4]. This condition is exacerbated by the low coverage of iron supplementation (TTD) consumption during pregnancy, which although increasing, has not reached the target of the Ministry of Health's Strategic Plan (Renstra). Regular iron consumption plays an important role in preventing anemia, but various factors, including nausea, side effects, and boredom, often hinder pregnant women's compliance in taking iron tablets [4,5]

In addition to compliance factors, studies have shown that sociodemographic factors, such as age, education, employment status, and residential environment, have a significant influence on the risk of anemia in pregnancy [6]. Data from the Ministry of Health shows that young age groups and low education levels are more susceptible to anemia. This is an important reason to understand more deeply the relationship between sociodemographic characteristics and anemia in pregnancy. Therefore, this study aims to examine the relationship between sociodemographics and laboratory parameters on the consumption of iron tablets to overcome anemia in pregnancy, as an effort to improve maternal and child health in Indonesia.

Based on the explanation, the general objective of this study is to conduct a study of the relationship between sociodemographic characteristics and laboratory parameters on the consumption of iron tablets for anemia in pregnancy. The specific objectives are: 1) To determine the relationship between sociodemographic characteristics of age and iron tablet consumption. 2) To determine the relationship between sociodemographic characteristics of education and iron tablet consumption. 3) To determine the relationship between sociodemographic characteristics of employment status and iron tablet consumption. 4) To determine the relationship between sociodemographic characteristics of parity and iron tablet consumption. 5) To determine the relationship between sociodemographic characteristics of family economy and iron tablet consumption. 6) To determine the relationship between sociodemographic characteristics of residential status and iron tablet consumption. 7) To determine the relationship between sociodemographic characteristics of place of residence and iron tablet consumption. 7) To determine the relationship between sociodemographic characteristics of distance from home to health center (kilometers) and iron tablet consumption. 8) To determine the relationship between sociodemographic characteristics of race and ethnicity and iron tablet

consumption. 9) To determine the relationship between sociodemographic characteristics of nutritional status and iron tablet consumption. 10) To determine the relationship between sociodemographic characteristics of transportation to health center and iron tablet consumption.

2. Methods

This study was observational analytic using a cohort study design. Cohort study design is an analytical study of the relationship between risk factors and the effects of a disease or health problem. Data was taken from Kassi-Kassi Health Center and Tamamaung Health Center, Makassar City. The study was carried out in the period August 2023-February 2024.

The population in this study were pregnant women who came to the Kassi-Kassi Health Center and Tamamaung Health Center in Makassar City. The study sample is a population that meets the inclusion criteria and exclusion criteria of the population.Inclusion criteria for pregnant patients include: a) Primigravida and Multigravida; b) Patients receive a KIA book and have themselves checked at the Health Center since the first trimester of pregnancy; c) Patients consume iron tablets from the health center, have proof in the KIA Book; d) Patients without complications in pregnancy; e) Do not have chronic diseases (history of hypertension, diabetes, autoimmune, and chronic kidney disease); f) Willing to be study subjects. Exclusion criteria include: a) Complications in pregnancy, fetal anomalies, eclampsia, fetal distress; b) Pregnancy checked in the 3rd trimester; c) Don't have a KIA book during pregnancy. d) Do not agree to have study examinations on the patient. The study sample was obtained through the consecutive sampling method with a minimum sample calculated based on the minimum sample formula. The data taken was extracted into a study form and analyzed using a computer.

The sample size required for a two-sided test is obtained using the following formula:

$$= \frac{\left[Z_{1-\frac{\alpha}{2}}\sqrt{2P(1-P)} + Z_{1-\beta}\sqrt{P_1(1-P_1)+P_2(1-P_2)}\right]^2}{(P_1-P_2)^2}$$

$$n = \frac{\left[1.96\sqrt{2 \cdot 0.5465(1-0.5465)} + 1.28\sqrt{0.66(1-0.66)+0.433(1-0.433)}\right]^2}{(0.66-0.433)^2}$$

$$n = 99$$

α = Confidence level 5% (1.96)
β = Study power 90% (1.28)
P1 = Proportion of anemia samples who consumed Fe tablets with less frequency (66.0%)
P2 = Proportion of anemia samples who consume Fe tablets with sufficient frequency (43.3%)

The study stages consist of 4 phases. First, submit a letter to the hospital to carry out examinations on patients who meet the inclusion criteria at the study location. Second, randomly selecting patients by identifying pregnant women at community health centers from the 1st trimester of pregnancy and explaining the study and asking patients to fill out written informed consent. Third, carry out routine blood tests to assess Hb, RBC, MCH, MCHC levels, then administer iron supplement tablets and control them through the Mother and Child health book. Then, another examination was carried out in the 2-3 trimester after consuming 90 iron supplement tablets to assess whether physiological anemia occurred in pregnancy, and assess whether consumption of iron supplement tablets affected the reduction in Hb, RBC, MCV, MCH, MCHC levels. Fourth, fill out a questionnaire based on sociodemographic characteristics. Data from examination of the three variables above were collected, analyzed by multivariate data, and study results were reported. Sample testing will be carried out at the Hasanuddin University Hospital Study Laboratory Unit using the ELISA method

Frequency and percentage study results for mean, standard deviation, median, minimum and maximum values are displayed descriptively using counts and percentages for

categorical variables and mean and SD for numeric variables or median and interquartile range if an uneven distribution is obtained. Statistical analysis was carried out using the program of SPSS program (v26). Then a non-parametric Chi-Square test was carried out for sample characteristics and a non-parametric Mann-Whitney U test to assess sociodemographic characteristics and laboratory parameters of pregnancy anemia.

This study was approved by the Ethics Committee of Biomedical Study on Humans, Faculty of Medicine, Hasanuddin University, Makassar, South Sulawesi, Indonesia. Based on recommendation letter Number: 552/UN4.6.4.5.31/ PP36/ 2023with protocol number: UH23070496.

3. Results

The respondents of this study consisted of 100 subjects. Study subjects have met the inclusion and exclusion criteria for study subjects and have signed informed consent. Based on the results of the Kolmogorov-Smirnov Normality test in this study, it was found that the data distribution was not normal for all variables. Based on the results of the Levene Statistics Homogeneity test in this study, it was found that the data distribution was normal in the variables of parity, experiencing nausea and vomiting, regular control and MCHC levels after consuming iron supplement tablets. Data with a non-normal distribution and some that were homogeneous or non-homogeneous then carried out the non-parametric Chi-Square test for sample characteristics and the non-parametric Mann-Whitney U test to assess the sociodemographic characteristics and laboratory parameters of pregnancy anemia. Sample characteristics can be seen in table 1 below.

Table 1 Sample Characteristics

Sample Characteristics	Consumption of Iron Supplement Tablets (%)		*p-value*[a]
	<90 tablets (n=29)	90 tablets (n=71)	
Age (years)			0.688
Low Risk	24 (24)	61 (61)	
High Risk	5 (5)	10 (10)	
Education			0.373
≤12 years	20 (20)	55 (55)	
>12 years	9 (9)	16 (16)	
Job status			0.789
Working	9 (9)	24 (24)	
Not Working	20 (20)	47 (47)	
Parity			0.195
Primigravida	9 (9)	32 (32)	
Multigravida	20 (20)	39 (39)	
Family Economics			0.915
Low Economy	13 (13)	31 (31)	
High Economy	16 (16)	44 (44)	
Race and Ethnicity			0.469
Makassar	18 (18)	54 (54)	
Buginese	9 (9)	13 (13)	
Java	1 (1)	3 (3)	
Toraja	1 (1)	1 (1)	

Nutritional status			0.504
Underweight	0 (0)	4 (4)	
Normal Body Weight	8 (8)	24 (24)	
Overweight	10 (10)	21 (21)	
Obesity	11 (11)	22 (22)	

[a]Chi-Square Test

Based on Table 1 above, it explains that the majority of the subjects in this study were of low risk age, had an education of ≤12 years, were not working, were multigravida, had a high economic status, Makassar race and ethnicity, and had a nutritional status above normal body weight. Chi-Square test results show that all variables have a p-value > 0.05, so it can be said that there is no relationship between sample characteristics and consumption of iron supplement tablets. The relationship between sociodemographic characteristics and consumption of iron supplement tablets shows in table 2 below.

Table 2. Relationship between Sociodemographic Characteristics and Consumption of Iron Supplement Tablets

Characteristics	**Consumption of Iron Supplement Tablets (%)**		***p-value*[b]**	**RR (95% CI)[c]**
	<90 tablets (n=29)	**90 tablets (n=71)**		
Stay				
Residence Status				
Main family	16 (16)	33 (33)	0.432	1,008 (0.383-2.652)
Big family	13 (13)	38 (38)		
Residence				
Stay	26 (26)	62 (62)	0.746	0.489 (0.087-2.744)
Do not settle	3 (3)	9 (9)		
Distance from residential house to health center (kilometers)				
1	4 (4)	23 (23)		
2	10 (10)	21 (21)	**0.040**	1,454 (0.996-2.124)
3	6 (6)	16 (16)		
4	5 (5)	8 (8)		
5	4 (4)	3 (3)		
Transportation to the Community Health Center				
Motorcycle	21 (21)	55 (5)	0.593	1,688 (0.561-5.074)
Car	8 (8)	16 (16)		
Complaints During Consumption of Iron Supplement Tablets				
Experiencing Nausea and Vomiting	25 (25)	66 (66)	**0.037**	4,398 (0.756-25.589)
Changes in Habits During Pregnancy				
- Experiencing changes in eating patterns	27 (27)	63 (63)	**0.028**	0.5 (0.09-2.776)
- While pregnant, keep working			**0.027**	0.382
- Regular Pregnancy Control	26 (26)	62 (62)		(0.58-2.534)
			0.118	1,952 (0.000)
	29 (29)	71 (71)		

[b]Mann-Whitney U Test, [c]Logistic Regression Test

In table 2, the results of the Mann-Whitney test show that the factors that influenced the sample in consuming blood-added tablets were the distance from residential house to the health center, complaints of nausea and vomiting, changes in eating patterns experienced while taking blood-added

tablets and continuing to work during pregnancy which could This caused the sample to forget the schedule for taking iron supplement tablets, showing a p-value <0.05 or it could be said that this factor was related to the consumption of iron supplement tablets. The results of the Logistic Regression Test show that the factors influencing consumption of iron supplement tablets, the distance from residential house to a close health center (1 – 2 kilometers) has a greater chance of consuming 90 iron supplement tablets compared to the long distance from residential house to the health center and study subjects have the possibility to experience complaints of nausea and vomiting during pregnancy. The relationship between the laboratory parameters of anemia in pregnancy and the consumption of iron supplement tablets can be seen in the following table.

Table 3. Relationship between Laboratory Parameters of Anemia in pregnancy and Consumption of Iron supplement tablets

Characteristics	Consumption of Iron Supplement Tablets (%)		*p-value*[b]	RR (95% CI)[c]
	<90 tablets	90 tablets		
Before Consuming Iron Supplement Tablets				
Anemia in Pregnancy				
Not Anemic	34 (34)	15 (15)	0.729	0.858 (0.357-2.061)
Anemia	37 (37)	14 (14)		
Hb level				
Above normal	34 (34)	15 (15)	0.729	0.858 (0.357-2.061)
Below Normal	37 (37)	14 (14)		
MCV levels				
Below Normal	0 (0)	0 (0)	0.511	0.66 (0.031-13.826)
Normal	70 (70)	28 (28)		
Above normal	1 (1)	1 (1)		
MCH levels				
Below Normal	7 (7)	3 (3)	0.943	1,223 (0.475-3.147)
Normal	54 (54)	22 (22)		
Above normal	10 (10)	4 (4)		
MCHC levels				
Below Normal	1 (1)	0 (0)	0.192	0.335 (0.059-1.901)
Normal	67 (67)	26 (26)		
Above normal	3 (3)	3 (3)		
After Consuming Iron Supplement Tablets				
Anemia in Pregnancy				
Not Anemic	22 (22)	60 (60)	**0.042**	0.714 (0.241-2.122)
Anemia	7 (7)	11 (11)		
Hb level				0.714
Above normal	22 (22)	60 (60)	**0.042**	(0.241-
Below Normal	7 (7)	11 (11)		2.122)
MCV levels				
Below Normal	0 (0)	0 (0)	**0.030**	0.61 (0.021-12.826)
Normal	29 (29)	70 (70)		
Above normal	0 (0)	1 (1)		
MCH levels				
Below Normal	1 (1)	8 (8)	**0.048**	1,888 (0.676-5.274)
Normal	24 (24)	55 (55)		
Above normal	4 (4)	8 (8)		
MCHC levels			**0.022**	0.33

Below Normal	0 (0)	0 (0)	(0.043-1.871)
Normal	29 (29)	66 (66)	
Above normal	0 (0)	5 (5)	

[b]Mann-Whitney U Test, [c]Logistic Regression Test

In table 3, the results of the Mann-Whitney test which show the laboratory parameters of anemia in pregnancy before consuming the iron supplement tablets all have a p-value> 0.05 so it can be said that there is no relationship between the laboratory parameters of anemia in pregnancy and the consumption of iron supplement tablets. The laboratory parameters of anemia in pregnancy after consuming iron supplement tablets all have a p-value <0.05, so it can be said that there is a relationship between the laboratory parameters of anemia in pregnancy and the consumption of iron supplement tablets. The results of the Logistic Regression Test show that after consuming iron supplement tablets there is a great opportunity to reduce the risk of anemia and improve abnormal anemia parameter values.

4. Discussion

This study involved 100 pregnant women subjects who met the inclusion and exclusion criteria in two health centers in Makassar City. Given that the data were not normally distributed, non-parametric analysis was used to evaluate the relationship between sociodemographic characteristics and laboratory parameters on iron supplement tablet consumption in cases of pregnancy anemia.

The majority of respondents were aged between 20 and 35 years, an age group with a relatively low risk of pregnancy health. The results of the analysis showed that the age of pregnant women did not have a significant relationship with compliance with iron supplementation tablet consumption, in line with the theory that the ideal age for pregnancy is between 20-35 years, where the mother is in optimal reproductive condition [7]. However, study by Deori et al. (2021) shows that pregnancy at a very young age (<20 years) or old age (>35 years) still carries the risk of anemia due to the increased need for iron for fetal development and the physiological decline of the body in old age [8].

In addition, the level of education ≤12 years in the majority of subjects showed no significant difference in the consumption of iron tablets, although education is considered to influence knowledge and compliance. This study underlines that education alone does not always guarantee increased compliance with iron tablet consumption, influenced by other factors such as habits or forgetfulness [9]. Study by Pohan (2022) supports this finding, stating that although higher education provides better understanding, appropriate educational approaches need to be implemented to address knowledge and behavior gaps [10].

In the employment variable, most respondents were housewives, with employment status not showing a significant effect on the incidence of anemia. This shows that pregnant women get sufficient information about Fe tablets through health services, and this knowledge affects compliance with iron tablet consumption [11]. This study is in line with the findings of Mardiah (2021), which states that employment is not the only important factor because mothers still get information related to the consumption of nutrients and iron tablets during health checks [12].

Parity status, both primigravida and multigravida, also did not show a significant relationship with the consumption of iron tablets, with the majority of respondents being multigravida. The multigravida group tends to have more experience in dealing with pregnancy, which in theory reduces the risk of anemia. This study is supported by the Ambarsari study (2023), which states that mothers with high

parity experience less anemia due to frequent education and experience. However, findings by Pohan (2022) show that the risk of anemia increases in parity of more than three pregnancies or pregnancies that are too close together, which worsens the condition of anemia because the mother's body recovery time is shorter [10,13,14,15].

The majority of respondents were of Makassar ethnicity, indicating that culture and ethnicity may play a role in maternal health. For example, some pregnant women avoided certain foods or only took iron tablets when sick, influenced by local beliefs that iron can cause large babies and difficult deliveries. This is in line with study that suggests cultural factors may influence compliance with iron tablet consumption [16].

The majority of respondents in this study had fairly good family economic conditions. This study showed insignificant results, indicating that there are other factors that influence the incidence of anemia besides economic status.

Respondents' nutritional status also did not show a significant relationship with anemia. The majority had above normal body weight, which may be due to adequate diet and compliance with taking iron tablets [17]. Factors such as the family's ability to provide nutritious food and adequate iron intake can maintain nutritional status, although several other studies have found that low iron intake can increase the risk of anemia.[15]

Place of residence and distance to health facilities are associated with compliance in consuming iron supplement tablets (TTD). Respondents who live closer to the Health Center consume TTD more routinely, indicating that access to health facilities is important in the treatment of anemia in pregnancy. On the other hand, the results showed that obstacles such as nausea and vomiting were often experienced by pregnant women who consumed TTD, which resulted in non-compliance in the use of iron supplements [18,19]

The results of this study indicate that before consuming iron supplement tablets, there was no significant relationship between anemia profile during pregnancy and the level of iron supplement tablet consumption of 90 tablets for 3 months. The percentage of subjects who consumed iron supplement tablets <90 tablets and 90 tablets were relatively the same in the category of anemia in pregnancy levels and hemoglobin (Hb), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC). Although there were differences between the two groups, the differences were not statistically significant, with a large p value and a relative risk (RR) range that included a value of 1. The same thing happened in the analysis of MCV, MCH, and MCHC levels, where the differences between groups with levels below, normal, or above normal were not statistically significant.

After consuming iron supplement tablets for 3 months, there were changes in laboratory parameters of anemia. The majority of respondents did not experience anemia and had Hb levels above normal after consuming 90 iron supplement tablets. There was a difference in the number of subjects before consuming iron supplement tablets, the majority <90 tablets, in 3 months of evaluation, there was an increase in subjects consuming 90 iron supplement tablets. Based on the results of the study, most respondents had Hb, MCV, MCH and MCHC levels within the normal range. There is a relationship between laboratory parameters of anemia and consumption of 90 iron supplement tablets, because it has a p value of less than 0.05. This shows that the use of 90 iron supplement tablets in pregnant women can provide significant improvements in laboratory parameters of anemia in patients. This is also supported by various studies that prove the effectiveness of giving iron supplement tablets in increasing Hb levels and other laboratory levels of anemia [19].

This study also highlights the importance of iron consumption during pregnancy to meet the needs of the mother and fetus. Comparison of iron supplementation significantly increased Hb levels and other parameters related to anemia after 90 days of TTD consumption, supporting the effectiveness of iron supplementation in preventing anemia in pregnant women [20,21]. Other studies support that regular TTD consumption can increase Hb levels and other hematological parameters [22].

Several limitations need to be noted. First, there are limitations in carrying out follow-up, in the form of laboratory examination of anemia parameters not being carried out regularly after consuming iron supplement tablets. Apart from that, not carrying out re-examinations during delivery is also a limitation, because information relevant to changes in anemia status during delivery cannot be monitored directly.

The absence of detailed nutritional data hinders our ability to determine if pregnant women's diets meet their daily iron requirements. Addressing this gap in future study will enable us to produce more thorough and precise finding regarding the benefits and side effects of iron supplementation for anemia management during pregnancy.

5. Conclution

Distance from home to the health center measured in kilometers, complaints during the consumption of iron supplement tablets, changes in dietary habits, and work routines showed statistically significant results. Laboratory parameters also showed statistically significant improvements with the consumption of iron supplement tablets during pregnancy.

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