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The Risk Factors for Anemia in Women at Third Trimester of Pregnancy in the Primary Health Center of Tanjung Sekayam: A Case-Control Study

Faktor Risiko Anemia pada Ibu Hamil Trimester Ketiga di Puskesmas Tanjung Sekayam: Studi Kasus-Kontrol

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ABSTRACT

Background: The presence of anemia in pregnant women significantly affects the health of both mothers and their fetuses. Around 37% of pregnant women worldwide experience anemia. In the Community Health Center of Tanjung Sekayam, the prevalence of anemia in women at the third trimester of their pregnancy was notably high, at 50.4%.
Objectives: This study aims to identify the risk factors for anemia in women at third trimester of pregnancy in the working area of the Community Health Center of Tanjung Sekayam Subdistrict, Sanggau Regency.
Methods: This study was an observational research with a case-control design. The study population consisted of 153 women at third trimester of pregnancy, receiving antenatal care in the Community Health Center of Tanjung Sekayam. The samples included 62 respondents, selected through a simple random sampling, comprising of 31 cases and 31 controls. Data were collected using questionnaires and analyzed with the Chi-Square test to assess the factors associated with the occurrence of anemia.
Results: There was a relation among maternal age (p=0.000; OR=22.9), interpregnancy interval (p=0.024; OR=6.9), parity (p=0.011; OR=2.2), nutritional status (chronic energy deficiency) (p=0.000; OR=11.3), compliance (p=0.021; OR=3.9), and knowledge (p=0.001; OR=8.2) and the prevalence of anemia in the third trimester. However, the family support did not show any significant relation.
Conclusions: Maternal age, pregnancy interval, parity, nutritional status, compliance with iron tablet intake, and knowledge are related to the prevalence of anemia in third trimester of pregnancy. Family support did not show any significant relation with the incidence of anemia, possibly due to the limitations in measuring the family support itself and other factors, such as discomfort in consuming iron tablets and forgetfulness. More structured interventions and intensive education on the importance of iron and nutrition during the pregnancy are needed to reduce the risk of anemia.

INTRODUCTION

Anemia is a health condition marked by the number of red blood cells which are reduced or lower than the normal hemoglobin concentration, which is vital for transporting oxygen to the body's tissues. Its symptoms can include tiredness, weakness, dizziness, and the difficulty in breathing. Anemia can be caused by nutritional deficiencies, infections (e.g., malaria, tuberculosis, and HIV), chronic diseases, and the inherited red blood cell disorders. Iron deficiency is the most frequent cause, but other deficiencies in folate, vitamin B12, and vitamin A can also lead to anemia. The anemia commonly affects children, adolescent girls, the menstruating women, and pregnant and postpartum women in particular[1].

Anemia is a prominent public health concern at a global scale, particularly in the developing nations, in which the pregnant women are disproportionately affected. According to the World Health Organization (WHO), about 37% of pregnant women globally were affected by anemia[1]. Based on data from the 2023 Indonesian Health Survey, the prevalence of anemia among pregnant women in Indonesia was reported to be 27.7%[2].

Based on the information from the West Kalimantan Health Department on Family Health and

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Nutrition, the prevalence of anemia in pregnant women in 2019 reached 11,456 cases (12.25%), an increase from 10,800 cases (11.17%) in 2018[3,4]. In Sanggau Regency, the prevalence of anemia among pregnant women in 2019 reached 1,106 cases (10.13%). The highest occurrence was reported in the working área of Community Health Center of Tanjung Sekayam, in which 557 pregnant women (50.4%) were diagnosed with anemia[5]. Anemia during pregnancy is linked to several negative outcomes for both mothers and their fetuses, such as a higher risk of preterm labor, low birth weight, postpartum hemorrhage, infections, fetal abnormalities, and miscarriages. The third trimester is particularly crucial as nutritional needs are greater. Pregnant women with iron deficiency face an increased likelihood of the complications during pregnancy[6–8].

Anemia in pregnant women can be affected by a number of factors, such as mother's age, the stage of pregnancy, the number of previous pregnancies, and overall nutritional status. [9]. Other factors include maternal compliance with the iron tablet consumption, interpregnancy interval, maternal knowledge on the iron tablet consumption patterns, and family support, all of which have an effect on the occurrence of maternal anemia[9–11]. This study aims to determine the prevalence of anemia and its causing factors among women at third trimester of pregnancy in the Community Health Center of Tanjung Sekayam Subdistrict, Sanggau Regency.

METHODS

This research was an observational analytical study utilizing a case-control design. The population in this study consisted of a total 153 women at the third trimester of pregnancy, who received the Antenatal Care (ANC) services in the Primary Health Center of Tanjung Sekayam, based on the medical records from January to December 2020. The samples included 62 respondents (1:1 ratio), comprising 31 cases and 31 controls. The case and control samples were obtained using the simple random sampling, in which the case criteria were pregnant women with hemoglobin (Hb) level <11 g/dl and the control criteria were pregnant women with hemoglobin (Hb) level >11 g/dl. Data were collected through the ANC cohort visit book and a developed questionnaire that had been tested for its validity and reliability to capture several variables (e.g., maternal age, interpregnancy interval, parity, nutritional status, compliance, knowledge, and family support) in relation to the anemia status in cases and controls. The study variables included maternal age at risk (<20 years and >35 years) and not at risk (20–35 years), interpregnancy interval at risk (<2 years) and not at risk (≥2 years), parity at risk (>3 children) and not at risk (≤3 children), nutritional status (chronic energy deficiency) at risk (upper arm measurement <23.5 cm) and not at risk (upper arm measurement ≥23.5 cm). The compliance variable was categorized as non-compliant (Fe consumption <90 tablets) and compliant (consumption of 90 Fe tablets). The knowledge variable was assessed through 10 questions and categorized as poor (<7) and good (≥7), while family support was assessed through 4 questions and categorized as poor (<3) and good (≥3). The univariate (descriptive) analysis was used to observe frequency and percentage, while the bivariate analysis was used to test bivariate relation through the chi-square test. Decisions were made based on the p-value, in which a p-value <0.05 was statistically significant, indicating a strong evidence against the null hypothesis and suggesting a significant relation among the variables. All statistical analyses were carried out using Statistical Package for the Social Sciences (SPSS). This study was approved by the Ethics Committee of Muhammadiyah University of Pontianak with the number: 002a/KEPK-FIKES/UM PONTIANAK/2021.

RESULTS AND DISCUSSIONS

Univariate analysis in this study was applied to determine the frequency distribution of dependent and independent variables. In Table 1, it can be observed that most of the respondents from total 62 respondents were housewives in case group (93.5%) and control group (71.0%). In terms of education level, most of the respondents in case group had graduated from senior high school (38.7%), while most of the respondents in control group also had the same level of education (51.6%). In terms of age, 61.3% of respondents in the case group were at risk (<20 and >35 years), while respondents in the control group (93.5%) were not at risk (20-35 years). For the gestational interval, 32.3% of respondents in the case group were at risk (<2 years), while respondents in the control group (93.5%) were not at risk (≥2 years). In terms of parity, 22.6% of respondents in the case group were at risk (>3 children), whereas all respondents in the control group (100%) were not at risk (≤3 children). Concerning nutritional status, 54.8% of respondents in the case group had at-risk nutritional status, while 90.3% of respondents in the control group had non-at-risk nutritional status. Regarding the compliance factor, 69.2% of respondents in the case group were non-compliant in Fe tablet consumption, compared to 63.9% compliance in the control group.

Based on the knowledge category, the case group demonstrated insufficient knowledge (at 87.1%), whereas the control group had adequate knowledge (at 64.5%). Most mothers in both groups were unaware of the Fe tablet, with the percentages of 42% in the case group and 26% in the control group. Similarly, many mothers did not know the consequences of having iron deficiency, with the percentage of 45% in the case group and 29% in the control group. Regarding the family support, the case group (at 29.0%) received inadequate family support, while the control group (at 83.9%) received sufficient family support. Most of the mothers (26% in the case group and 39% in the control group) lacked motivation from their families to consume Fe tablets. The lack of family support in obtaining Fe tablets was also prevalent, with the percentage of 39% in the case group and 26% in the control group. The results of the univariate analysis are presented in Table 1 below.

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Table 1. Frequency Distribution and the Percentage of Respondents Based on Their Occupation, Education Level, Age, Gestational Interval, Parity, Nutritional Status, Compliance, Knowledge, and Family Support for Women at Third Trimester of Pregnancy at Health Center of Tanjung Sekayam Subdistrict, Sanggau Regency, Indonesia through a Questionnaire (n=62)

Variable	Case		Control	
	n	%	n	%
Respondents' Occupations				
Teacher	1	3.2	2	6.5
Housewife	29	93.5	22	71.0
Entrepreneur	0	0.0	1	3.2
Trader	1	3.2	1	3.2
Farmer	0	0.0	2	6.5
Civil Servant	0	0.0	2	6.5
Private Sector Employee	0	0.0	1	3.2
Education Level				
Elementary School	9	29.0	5	16.1
Junior High School	9	29.0	5	16.1
Senior High School	12	38.7	16	51.6
Diploma / Bachelor's Degree	1	3.2	5	16.1
Age				
At Risk (<20 and >35 Years)	19	61.3	2	6.5
Not at Risk (20-35 Years)	12	38.7	29	93.5
Gestational Interval				
At Risk (<2 Years)	10	32.3	2	6.5
Not at Risk (≥2 Years)	21	67.7	29	93.5
Parity:				
At Risk (>3 Children)	7	22.6	0	0
Not at Risk (≤3 Children)	24	77.4	31	100
Nutritional Status				
At Risk (Upper Arm Measurement <23.5 cm)	17	54.8	3	9.7
Not at Risk (Upper Arm Measurement ≥23.5 cm)	14	45.2	28	90.3
Compliance				
Non-Compliant (Consumption of <90 Fe Tablets)	18	69.2	8	30.8
Compliant (Consumption of 90 Fe tablets)	13	36.1	23	63.9
Knowledge				
Insufficient (Score <7)	27	87.1	11	35.5
Adequate (Score ≥7)	4	12.9	20	64.5
Family Support				
Insufficient (Score <3)	9	29.0	5	16.1
Adequate (Score ≥3)	22	71.0	26	83.9

The bivariate analysis in this study was conducted to identify the risk factors associated with anemia among women at third-trimester of pregnancy in the Community Health Center of Tanjung Sekayam Subdistrict, Sanggau Regency. The chi-square test results revealed the significant relation between anemia and several factors, namely age (p=0.000; OR=22.95), gestational interval (p=0.024; OR=6.905), parity (p=0.011; OR=2.292), nutritional status (p=0.000; OR=11.333), maternal compliance (p=0.021; OR=3.981), and knowledge (p=0.001; OR=8.233). However, no significant relation was found between family support (p=0.362; OR=2.127) and anemia in third trimester of pregnancy. The details of bivariate analysis results are presented in Table 2 below.

Table 2. Analysis on the Risk Factors for Anemia in Women at Third-Trimester of Pregnancy at Health Center of Tanjung Sekayam Subdistrict, Sanggau Regency, Indonesia through a Questionnaire (n=62)

Variable	Hb Level		p	OR	95% CI	
	Anemia	Non Anemia			Lower	Upper
Age						
At Risk (<20 and >35)	19 (30.6%)	2 (3.2%)	0.000	22.95	4.613	114.265
Not at Risk (20-35)	12 (19.4%)	29 (46.8%)				
Gestational Interval						
At Risk (<2)	10 (16.1%)	2 (3.2%)	0.024	6.905	1.368	34.846
Not at Risk (≥2)	21 (33.9%)	29 (46.8%)				
Parity						
At Risk (>3)	7 (11.3%)	0 (0.0%)	0.011	2.292	1.697	3.095
Not at Risk (≤3)	24 (38.7%)	31 (50%)				
Nutritional Status						
At Risk (<23.5)	17 (27.4%)	3 (4.8%)	0.000	11.333	2.837	45.272

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Variable	Hb Level		p	OR	95% CI	
	Anemia	Non Anemia			Lower	Upper
Not at Risk (≥23.5)	14 (22.6%)	28 (45.2%)				
Compliance						
Non-Compliant	18 (29.0%)	8 (12.9%)	0.021	3.981	1.358	11.666
Compliant	13 (21.0%)	23 (37.1%)				
Knowledge						
Insufficient (<7)	26 (41.9%)	12 (19.4%)	0.001	8.233	2.482	27.317
Adequate (≥7)	5 (8.1%)	19 (30.6%)				
Family Support						
Insufficient (<3)	9 (14.5%)	5 (8.1%)	0.362	2.127	0.621	7.291
Adequate (≥3)	22 (35.5%)	26 (41.9%)				

Based on the research findings, pregnant women at an at-risk age tended to having anemia (30.6%), contrary to the pregnant women at a non-at-risk age (46.8%). Further analysis revealed a significant relation between maternal age and the anemia occurrence during pregnancy. Age is one of the factors contributing to anemia in pregnant women. Mothers under the age of 20 years have a higher risk of having anemia during pregnancy[12]. Pregnancies at the age below 20 years and above 35 years are associated with an increased risk of anemia[13,14]. In women under the age of 20 years, various bodily organs, including reproductive development, are still in the maturing process, thus requiring a significant supply of nutrients. Consequently, if pregnancy occurs during this age, iron consumed is distributed to the fetus as well as mother's own biological growth, both of which demand substantial iron intake. Insufficient nutrient intake can lead to anemia[15]. Conversely, mothers above the age of 35 years often have the decreased bodily functions and are more susceptible to chronic illnesses, all of which can hinder iron absorption[16]. The ideal maternal age range for pregnancy is between 20 and 35 years, as this group has a lower risk of pregnancy complications and healthier reproductive systems[17]. Recommendations are directed towards mothers under the age of 20 years, encouraging them to delay pregnancy through the use of contraception. Similarly, mothers above the age of 35 years are advised not to get pregnant again.

According to the research findings, there was a significant correlation between how long the pregnancy interval and the incidence of anemia in pregnant women. Maternal pregnancy interval has been identified as a factor affecting the occurrence of anemia. Mothers with a shorter pregnancy interval (≤2 years) are exposed to a higher risk of having anemia, which can affect the well-being of the fetus growth[18–20]. One of the causes of anemia is the repeated pregnancies with a short interval. The reason is that the subsequent pregnancies occurring in a short interval take the mother's iron reserves, which may not have been fully replenished since previous pregnancy[15]. Each pregnancy depletes the body's iron reserves, while it takes time to recover iron reserves. Having pregnancies with too short interval increases the risk of anemia in subsequent pregnancies, as the body does not have sufficient time to replenish the depleted iron reserves. On the other hand, with an optimal pregnancy interval (>2 years), mother's uterus and physical condition have been fully recovered and prepared for another pregnancy[18]. Based on the recommendations, pregnant women are advised to plan their next pregnancy with an interval of longer than 2 years.

The research results indicated a significant association between the number of pregnancies (parity) and the occurrence of anemia in pregnant women. Other research findings also indicated that anemia tended to occur more frequently in multiparous mothers[11,13]. More frequent pregnancies and childbirth in women mean a greater loss of iron. During the pregnancy, there is an increased need for the iron to boost red blood cell production in mother's body and to support the development of red blood cells in her fetus. Mothers with some children must meet nutritional needs, not only for themselves but also for breastfeeding and caring for their children. This heightened nutritional demand can lead to an increased consumption of iron required for red blood cell production. If a mother does not receive sufficient iron intake through her diet, the risk of anemia will rise[21]. Mothers with three or more pregnancies have a higher risk of maternal mortality. The parity increases, so does the maternal mortality rate. In the cases of high parity, mothers have undergone multiple childbirths which can lead to the deterioration of reproductive organ functions. If they fail to maintain a balanced diet and neglect to take iron supplements, it can lead to the anemia during pregnancy. This situation presents dangers for mothers and their fetuses, while affecting the childbirth process. The risk can be minimized or avoided by applying the family planning programs[8]. It is recommended for the pregnant mothers to have children up to 3 (three).

Based on research findings, there was a significant correlation between nutritional status (upper arm measurement) and the occurrence of anemia in pregnant mothers. Mothers with a poor nutritional status (upper arm measurement <23 cm) are at a higher risk of having anemia, compared to mothers with a good nutritional status[22]. Anemia is more prevalent among pregnant mothers with the Chronic Energy Deficiency (CED) / upper arm measurement <23.5 cm, compared to the well-nourished pregnant mothers. This condition may be attributed to the adverse effects of protein-energy malnutrition and deficiency of other micronutrients on iron bioavailability and the storage of other hematopoietic nutrients (e.g., folic acid and vitamin B12). If MUAC measurement in pregnant women shows the result of less than 23.5 cm or falls within the middle portion of the MUAC tape, it indicates the risk of CED. Pregnant women having CED are at risk of developing anemia because CED reflects the inadequate nutritional

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status in pregnant mothers. Insufficient nutritional intake during pregnancy leads to an increased risk of anemia in pregnant mothers with CED[16]. Nutritional deficiency in pregnant mothers can have consequences, such as low birth weight in infants, an increased risk of neonatal mortality, an elevated risk of long-term morbidity including stunting, as well as to higher maternal morbidity and mortality rates[23]. Nutritional requirements during pregnancy vary significantly across trimesters. The nutritional needs increase, along with the pregnancy progress, thus underscoring the importance of interventions targeting women before and during pregnancy. These interventions aim to ensure the controlled nutritional intake and to reduce the incidence of malnutrition throughout the critical 1000-day period[24]. Pregnant mothers are recommended to fulfill their nutritional requirements in order to minimize the risk factors during pregnancy and provide adequate nutrition for their unborn babies.

Based on research findings, there was a significant correlation between the compliance in iron tablet consumption and the occurrence of anemia in pregnant mothers. Similar results also indicated a connection between a mother's compliance in taking iron tablets and anemia during pregnancy. The level of compliance in consuming iron tablets affects the occurrence of anemia in pregnant mothers in the third trimester, with an Odds Ratio (OR) value at 4.154. This indicated the risk of anemia in women at third trimester of pregnancy which was 4.154 times higher for not being compliant in taking iron tablets, compared to mothers compliant in iron consumption[25]. Women need more iron than men because they lose approximately 50 to 80 cc of blood during their monthly menstrual cycle, leading to a loss of 30 to 40 mg of iron. Additionally, pregnancy demands additional iron to increase red blood cells in the fetus and placenta. As an illustration, the iron requirement during pregnancy is approximately 900 mg of iron, including500 mg of iron used to elevate the mother's blood cells, with an additional 300 mg of iron for the placenta and 100 mg of iron for the fetal blood. If iron reserves are already low, each pregnancy will further deplete the body's iron levels, resulting in anemia during the next pregnancies[16]. Compliance in iron tablet consumption can be influenced by several factors, such as inadequate antenatal care, pregnancy examinations conducted by the non-healthcare personnel, rural residence, low socio-economic status, the lack of support from the spouse, the limited awareness on the importance of iron tablets, and the presence of side effects when consuming iron tablets[26–28]. To address these issues, healthcare professionals need to intervene to improve compliance in iron tablet consumption. The current strategy to cure iron-deficiency anemia primarily involves iron supplementation, through iron tablets, to women in their third trimester of pregnancy. It is prescribed that pregnant mothers in the third trimester take 90 iron tablets throughout their pregnancy. Higher compliance in pregnant mothers in consuming iron tablets means more effective prevention of anemia, thus reducing the risk of anemia. Conversely, pregnant mothers, who are less compliant in taking iron tablets, may have insufficient iron intake, leading to an increased risk of anemia[16]. It is recommended for pregnant mothers to regularly consume iron tablets in order to elevate their hemoglobin levels during pregnancy.

The results of this research prove a significant relation between maternal knowledge and the occurrence of anemia in pregnant mothers. Low knowledge levels among pregnant mothers increase the risk of anemia by three times, compared to mothers with sufficient knowledge[29]. In line with this, knowledge is also identified as a factor related to the occurrence of anemia, for being related to a mother's understanding in consuming iron supplements and her adherence to doing so[30–33]. Knowledge is the result of recalling events or incidents that have been experienced, either intentionally or unintentionally, after observing or sensing a specific object, thus being a crucial aspect in taking actions[34]. The analysis of individual questionnaire items reveals that the majority of respondents were not aware that iron deficiency during pregnancy can lead to anemia. The limited information received by respondents with moderate and low levels of knowledge could likely be attributed to internal factors, such as their lack of concern for their pregnancy condition and their limited ability to access information through both mass and electronic media[35]. Knowledge is a crucial domain for shaping an individual's behavior. In general, positive behaviors tend to reduce the risk of health problems or alleviate the suffering that has been experienced. A high level of behavior among pregnant mothers in meeting their needs for iron during pregnancy reflects a low likelihood of anemia occurrence. Providing information about anemia can further enhance the knowledge of pregnant mothers in understanding the anemia itself during pregnancy because knowledge plays a pivotal role, ultimately in leading pregnant mothers to adopt positive behaviors to meet their needs for iron[35,36]. Having nutrition professionals available during antenatal care (ANC) sessions is also crucial to educate pregnant women about benefits, potential side effects, and correct usage of the iron tablets. Furthermore, it is crucial to reactivate the monitoring of iron tablet consumption. This approach ensures that pregnant mothers receive proper information, comprehend the significance of iron supplementation, and correctly adhere to tablet consumption. This, in turn, reduces the risk of anemia and its associated complications[26]. Pregnant mothers are encouraged to continuously expand their knowledge about pregnancy and its care, including measures to prevent anemia. This will allow them to take preventive actions against occurrences that could pose risks to mothers and their expected babies.

The research found no significant correlation between family support and the occurrence of anemia in pregnant mothers. However, another perspective from different research states that family support in the form of attention, emotional support, information, advice, motivation, and understanding provided by family members is crucial in preventing anemia and enhancing compliance with iron tablet consumption[10]. Pregnant mothers who receive family support tend to be more compliant in consuming iron supplements[37]. Family support entails the attitude, actions, and acceptance of family members towards one another. Family members

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view supportive individuals as always ready to provide help and assistance when needed. Essentially, a pregnant mother desires a healthy pregnancy and a healthy child. In order for realizing mother's aspirations, family support is necessary since the family itself is a close and trusted unit where pregnant mothers seek support. This support can be encouragement, motivation, attention, or assistance, which can create a sense of happiness, safety, and comfort for the pregnant mother. Consequently, the pregnant mother is motivated to prioritize her health by consistently consuming iron tablets provided by healthcare professionals as a preventive measure against anemia during pregnancy[38,39]. Several factors indicate why family support in this study was not related to the occurrence of anemia. Firstly, the questionnaire used to measure family support had only four questions, which may not be sufficient to capture the full spectrum of family support. Family support is a multifaceted concept that includes emotional, informational, instrumental, and evaluative support, while the limited number of questions may fail to adequately reflect this complexity. Additionally, a short questionnaire may be less sensitive in detecting variations in the level of family support, thus reducing its ability to identify potential relation. Furthermore, other factors (e.g.,discomfort from consuming iron tablets and forgetfulness) may play a more significant role in influencing adherence to iron supplementation. Discomfort and side effects, such as nausea, can deter pregnant women from consistently taking iron tablets, regardless of the level of family support they receive. Finally, forgetfulness can also lead to non-compliance, which may not be effectively addressed by family support if reminders and support are not consistent or structured. Research results suggest that pregnant mothers' non-compliance in taking iron tablets is due to various reasons, including the uncomfortable side effects, such as nausea, from the iron tablets. Some pregnant mothers also fail to take the tablets regularly due to forgetfulness[40].

CONCLUSIONS

The findings of this study indicate a significant association among maternal age, the interval between pregnancies, parity, nutritional status, adherence to iron tablet intake, and knowledge, with the occurrence of anemia in women at the third trimester of pregnancy. Mothers'sage under 20 years or over 35 years, short pregnancy intervals (≤2 years), high parity (≥3 children), poor nutritional status (upper arm measurement <23.5 cm), non-compliance in consuming iron tablets, and low knowledge about the importance of iron are the main risk factors that increase the occurrence of anemia. On the other hand, family support did not show a significant relation with the occurrence of anemia, which may be due to limitations in measuring family support, discomfort when consuming iron tablets, and forgetfulness.

The recommendations from this study highlight the importance of more comprehensive and structured interventions to enhance pregnant women's understanding of the importance of iron and how to manage its side effects. More intensive education on nutrition during pregnancy, as well as health promotion emphasizing optimal pregnancy intervals, can help reduce the risk of anemia. Additionally, consistent monitoring and support from family and healthcare providers are necessary to ensure compliance with iron tablet consumption. Finally, the use of more detailed and valid questionnaires to measure family support is recommended for future research.

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CONFLICT OF INTEREST AND FUNDING DISCLOSURE

All authors have no conflict of interest in this article. This research is independent research from the researchers.

AUTHOR CONTRIBUTIONS

IA: conceptualized and designed the study; MM: analyzed data; IS: reviewing the article before submission; AR: taking responsibility in the construction of the whole or body of the manuscript; MM: collected data.

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