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Research Article

Risk Factors for Anaemia in Pregnant Women who Take Iron Folic Acid Tablets in Locus Stunting Districts in Indonesia

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Abstract.
Controlling anaemia in pregnant women is carried out through iron folic acid tablets (IFA) supplementation. The IFA supplementation for pregnant women in Indonesia has been carried out for a long time, but the prevalence of anaemia among pregnant women is still high. The results from the evaluation of anaemia management of pregnant women in Locus Stunting in 2021, showed that the proportion of anaemic pregnant women is higher in pregnant women who have taken IFA. Therefore, analysis was carried out to identify risk factors for anaemia in pregnant women who had taken IFA. Data analysis was carried out descriptively, along $\chi 2$ tests and logistic regression. The proportion of anaemic pregnant women who have taken IFA was 39.8% while the proportion of pregnant women who have never consumed IFA was 33.7% ($p<0.05$). The results of the bi-variate analysis of risk factors for anaemia in pregnant women who consume IFA were poor families, chronic energy malnutrition, and low consumption of meat, poultry, or fish. The results of the multivariate analysis showed that the risk factors for anaemia in pregnant women were those who have low family well-being, chronic energy malnutrition, second and third trimesters gestational age and low consumption of meat, poultry and fish.

Keywords: anemia, pregnant women, iron folic acid

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1. Background

Anemia in women is a global health problem as it affects about 500 million women of reproductive age (1). The consequences of anemia during pregnancy, long known are an increased risk of low birth weight, premature birth, perinatal death, and neonatal death (2). Anemia of pregnant women also puts the mother at increased risk of death during and after childbirth (3). Severe anemia can lead to circulatory decompensation, increased cardiac output, increased risk of bleeding, and decreased ability to avoid blood loss, which can lead to circulatory shock and death (4,5).

The most common causes of anemia of pregnant women are chronic iron deficiency, due to inadequate iron intake or absorption, increased need for iron during the period

of pregnancy, excretion of iron during menstruation and worm infestation in the intestine. Other important causes of anemia are infections, deficiencies in other nutrients especially folic acid, vitamin B_{12}, vitamin A and vitamin C, and genetic factors such as thalassemia or inherited blood disorders, as well as chronic inflammation (6). The most common anemia in pregnant women is Iron Deficiency Anemia (IDA).

In developing countries, iron deficiency anemia during pregnancy is very common with a prevalence of about 52 percent (7). *The World Health Organization* (WHO) estimates that the number of anemic pregnant women in the world in 2005 was approximately 56 million, with a distribution of 49 million in developing countries and 7 million in developed countries, and the majority (75-80%) had iron deficiency anemia (7). WHO data in 2017 showed that globally the prevalence of anemia of pregnant women in 1990 was 43.4 percent and in 2016 it was 40.1 percent. The WHO report stated that the prevalence of anemia of pregnant women in Indonesia in 1990 was 45.4 percent and in 2016 it was 42.0 percent (8). Basic Health Research Results show the prevalence of anemia in pregnant women in Indonesia in 2013 was 37.1 percent and in 2018 it was 48.9 percent (9,10).

The results of the evaluation study on the implementation of the anemia prevention program for pregnant women in the stunting locus district and the locus of Maternal Mortality Rate-Infant Mortality Rate (MMR-IMR) reduction in 2021 showed that 39.1 percent of pregnant women were anemic. The proportion is still a public health problem with a moderate category (20-39.9%). Pregnant women who never took Iron Folic Acid (IFA) during pregnancy were 6.9 percent. Compliance of pregnant women consuming IFA $\geq$ 90 grains reached 47.6 percent and 52.4 pregnant women consumed IFA $<$ 90 grains during pregnancy.

Efforts to combat iron deficiency and iron deficiency anemia in pregnant women, globally recommend iron supplementation during pregnancy, to help prevent iron deficiency. The program to overcome anemia of pregnant women through the administration of IFA has long been carried out, but the prevalence of anemia of pregnant women in Indonesia is still high, even in more than 30 years there has not been a significant decrease in the prevalence of anemia in pregnant women. The condition raises the question of whether there is a difference in the proportion of anemic status of pregnant women who consume IFA and who do not consume IFA. Therefore, a further analysis of research data was carried out to evaluate the implementation of the anemia prevention program for pregnant women in the stunting locus district and the locus of the decline in MMR-IMR in 2021. Further analysis aims to identify the risks and determinants of

food consumption patterns for anemia of pregnant women who do not consume and consume IFA.

2. Method

The research design is *cross-sectional* to obtain a description of *the outcome* at the time of the study. Data collection was carried out in the period from October to December 2021 in the area of 21 stunting locus districts as well as the locus of decreasing the MMR-IMR, and 9 districts only as stunting locus. The determination of districts was carried out in a systematic random manner, based on the compliance coverage of pregnant women taking IFA from the 2018 Basic Health Research. In each district, 1 stunting locus puskesmas was selected with the highest population of pregnant women. Overall, this study covered 19 provinces, 30 districts, and 30 puskesmas locus *stunting*.

The sample of this study was selected pregnant women and registered on the sample framework of pregnant women updated in the selected Puskesmas work area. The selection of pregnant women was carried out randomly systematically based on the sample framework of pregnant women updated. The inclusion criteria for the research sample were pregnant women and residing in selected Puskesmas areas, and stated that they agreed to be respondents to the study and signed informed consent. The exclusion criterion as a sample is to refuse, and the expectant mother is in a sick condition. The number of samples of pregnant women who were successfully interviewed and checked for hemoglobin levels was 3,658 pregnant women.

The study was conducted after obtaining an ethical approval No. LB.02.01/2/KE.476/2021 from the Health Research Ethics Commission of the Health Research and Development Agency, Ministry of Health R.I. Data collected through interviews using a structured questionnaire. The data collected includes socio-demographic characteristics, pregnancy history, consumption of IFA, and food diversity of pregnant women. Anthropometric data on the Upper Arm Circumference of pregnant women are collected through direct measurements according to standard procedures. Measurement of Upper Arm Circumference is carried out by trained Puskesmas Nutrition Staff. The anemic status of pregnant women is determined through an examination of hemoglobin levels by trained Puskesmas laboratory officers.

The dependent variable of this study was the anemic status of pregnant women, namely the condition of hemoglobin (Hb) levels in the blood less than 11 mg / dl. Independent research variables include sociodemographic characteristics, pregnancy history, consumption of IFA, food diversity of pregnant women, and risk of Chronic

Energy Malnutrition. The research data is processed descriptively and analytically with the principle of anonymous. Data analysis was carried out by correlation and regression tests to determine the factors associated with anemia in pregnant women.

3. Results and Discussion

An overview of the study subjects according characteristic and anemia status is presented in Table 1. Table 1 data shows that the proportion of anemia pregnant women is relatively higher in the high-risk age group, which is less than < 20 years and more than 35 years. The risk of anemia in high-risk age groups is no different. Most of the subjects lived in rural areas and there was no difference in the risk of anemia of pregnant women in rural and urban areas. Pregnant women from poor households i.e. quintiles 1, 2, and 3 have a higher risk of anemia than pregnant women from rich households (OR = 1,247 CI 1,088-1,428). The proportion of anemia is relatively higher in pregnant women who only graduated from nine years of primary education. The proportion of anemia is relatively higher in pregnant women who are not working or only as housewives.

Pregnant women from poor families are among the groups prone to malnutrition, including anemia. Most pregnant women are unable to consume iron-rich foods as recommended from the daily diet. Foods rich in iron are mostly foods sourced from animal foods. Animal food is an expensive source of food so in poor families, iron-rich foods include foods that are rarely consumed. Indonesia is a country with low consumption of animal food. Because many families are unable to consume iron-rich foods in their daily diet, iron supplementation is still needed to help overcome iron deficiency anemia (11,12).

Table 1 data shows that gestational age is one of the variables that correlates significantly with anemia of pregnant women. The proportion of anemic pregnant women in the first trimester gestational age is lower than the gestational age of the second and third trimesters. This can happen because the need for iron-related nutrients in the first trimester of pregnancy is not as much as in the second and third trimesters. The frequency of frequent pregnancies and the distance of pregnancy too close to the increase the risk of anemia of pregnant women. The data of this study shows that the proportion of anemic pregnant women is relatively higher in pregnant women with a frequency of more than 4 times and a distance of less than 3 years.

Chronic lack of energy is a condition of prolonged malnutrition and can be used as an indicator of protein and mineral deficiencies including iron. The results of this study show that a greater proportion of anemic pregnant women occur in pregnant women

Table 1: Proportion of subjects according to characteristics and risk of anemia of pregnant women.

Characteristic	Anemic status of pregnant women				OR	95% CI	
	Anemia		Normal				
	n	%	n	%		Lower	Upper
Maternal age group							
High risk (<20 years and > 35 years)	337	39,6	514	60,4	1,028	0,879	1,203
Not high risk (20-35 years)	1093	38,9	1714	61,1			
Region							
Urban	498	39,0	778	61,0	0,996	0,866	1,145
Rural	932	39,1	1450	60,9			
Level of family well-being							
Poor families (quintiles 1, 2, and 3)	891	41,2	1270	58,8	**1,247****	**1,088**	**1,428**
Wealthy families (quintiles 4 and 5)	539	36,0	958	64,0			
Mother's level of education							
Completed primary education (9 years)	758	40,2	1126	59,8	1,104	0,966	1,261
Graduated from secondary and university	672	37,9	1102	62,1			
Types of work of the mother							
Housewife/non-working	1023	39,7	1552	60,3	1,095	0,946	1,267
Work	407	37,6	676	62,4			
Gestational age							
1st trimester	129	24,5	398	75,5	**0,456****	**0,369**	**0,563**
2nd and 3rd trimester	1301	41,6	1830	58,4			
Frequency of pregnancy							
1 - 4 times	1342	38,8	2119	61,2	0,784	0,588	1,047
>4 times	88	44,7	109	55,3			
Pregnancy distance							
1-3 years	27	47,4	30	52,6	1,410	0,835	2,382
>3 years	1403	39,0	2198	61,0			
Risk of Chronic Energy Malnutrition							
Chronic Energy Malnutrition	279	51,1	267	48,9	**1,780****	**1,483**	**2,138**
Normal	1151	37,0	1961	63,0			
IFA consumption							
Not taking IFA	141	33,7	277	66,3	**0,770***	**0,622**	**0,955**
Taking IFA	1289	39,8	1951	60,2			

who lack chronic energy. The risk of anemia is 1.8 times greater in chronically energy-deficient pregnant women than in pregnant women with normal conditions. The results of this study showed that the proportion of anemic pregnant women was higher in

pregnant women who took IFA. This means that pregnant women who do not consume IFA are actually more protected from anemia. This is different from the results of previous studies, that IFA interventions can reduce the risk of anemia of pregnant women and have been used as the most common intervention to overcome anemia of pregnant women. Therefore, the results of this study must be carefully interpreted and critically analyzed.

In addition to the sociodemographic and pregnancy characteristics of anemia, pregnant women can also be associated with a diversity of food consumption. Diversity of food consumption can be done using the Minimum Dietary Diversity Women (MDD-W) indicator score. The MDD-W indicator includes 10 types of food groups. MDD-W is declared adequate if in the last 24 hours pregnant women consume at least 5 types of food groups (13). The results of research related to the MDD-W indicator are presented in Table 2.

Table 2 shows that the proportion of anemic pregnant women is relatively more in pregnant women who in the last 24 hours have not consumed food sourced from animal food, especially meat, poultry, fish, as well as milk and dairy products. The risk of anemia in pregnant women who in 24 hours do not consume animal food meat, poultry, and fish is 1.3 times higher than that of pregnant women who consume animal food.

The results showed that the risk factors and determinants of anemia for pregnant women include family welfare level, gestational age, risk of chronic lack of energy, IFA consumption, consumption of animal food in the form of meat, poultry, and fish, as well as an MDD-W score. Bivariate analysis one of the determinants associated with the risk of anemia of pregnant women is the consumption of IFA. Therefore, further analysis was carried out to ascertain whether there were any factors that resulted in a relationship between all pregnant women who took IFA were more at risk of anemia. The results of the analysis according to the characteristics and status of anemia in pregnant women who have never taken IFA are presented in table 3.

Table 3 shows that the risk of anemia of pregnant women who do not consume IFA is greater in poor or underprivileged families, chronically under-energized pregnant women, in the last 24 hours not consuming meat, poultry, or fish, and a minimum dietary diversity score of less than 5 types of foodstuffs or an inadequate MDD-W score. factors of gestational age. The highest risk of anemia in pregnant women who do not consume is in pregnant women with chronic lack of energy. Gestational age at the time of the first trimester is protective of the risk of anemia of pregnant women who do not take IFA, meaning that the risk of anemia is greater in the second and third trimester of

Table 2: Proportion of subjects according to MDD-W indicators and the risk of anemia of pregnant women.

Minimum Dietary Diversity-Women		Anemic pregnant women		Normal pregnant women		OR	95% CI	
		n	%	n	%		Lower	Upper
Food Group								
Cereals and tubers	No	36	35,3	66	64,7	0,846	0,561	1,277
	Yes	1394	39,2	2162	60,8			
Legumes	No	547	38,8	863	61,2	0,980	0,855	1,123
	Yes	883	39,3	1365	60,7			
Grains	No	-	-	-	-			
	Yes	-	-	-	-			
Milk and dairy products	No	942	39,8	1424	60,2	1,090	0,948	1,253
	Yes	488	37,8	804	62,2			
Meat, poultry, fish	No	246	44,2	310	55,8	**1,285****	**1,071**	**1,543**
	Yes	1184	38,2	1918	61,8			
Egg	No	635	38,0	1036	62,0	0,919	0,804	1,050
	Yes	795	40,0	1192	60,0			
Vegetables of dark green leaf	No	356	37,2	601	62,8	0,897	0,771	1,045
	Yes	1074	39,8	1627	60,2			
Vegetables and fruits rich in vitamin A	No	574	40,9	831	59,1	1,127	0,984	1,292
	Yes	856	38,0	1397	62,0			
Other vegetables	No	838	38,5	1337	61,5	0,943	0,824	1,080
	Yes	592	39,9	891	60,1			
Other fruits	No	680	39,6	1039	60,4	1,038	0,908	1,185
	Yes	750	38,7	1189	61,3			
Score Minimum Dietary Diversity-Women								
Inadequate		427	41,8	594	58,2	**1,171***	**1,011**	**1,357**
Adequate		1003	38,0	1634	62,0			

pregnancy. The results of the analysis and correlation test of determinants and risk of anemia of pregnant women in pregnant women who take IFA are presented in table 4.

Table 4 shows that the risk of anemia of pregnant women who consume IFA is also greater in poor or underprivileged families, chronically under-energized pregnant women, and pregnant women who in the last 24 hours have not consumed meat, poultry, or fish. The highest risk of anemia in pregnant women who take IFA is in pregnant women with chronic lack of energy. The first trimester gestational age is protective of the risk of anemia of pregnant women who take IFA, meaning that the risk of anemia is greater

Table 3: Proportion of Subjects according to characteristics and risk of anemia in pregnant women who do not consume IFA.

Characteristic	Pregnant Women Never Take IFA				OR	95% CI	
	Anemia		Normal				
	n	%	n	%		Lower	Upper
Level of family well-being							
Poor families (quintiles 1, 2, and 3)	96	37,9	157	62,1	**1,631**	**1,064**	**2,498**
Wealthy families (quintiles 4 and 5)	45	27,3	120	72,7			
Risk of Chronic Energy Malnutrition							
Chronic Energy Malnutrition	35	47,9	38	52,1	**2,077**	**1,243**	**3,469**
Normal	106	30,7	239	69,3			
Gestational age							
1st trimester	25	16,6	126	83,4	**0,258**	**0,158**	**0,423**
2nd and 3rd trimester	116	43,4	151	56,6			
Consumption of meat, poultry, fish							
No	34	44,7	42	55,3	**1,778**	**1,071**	**2,951**
Yes	107	31,3	235	68,7			
Score Minimum Dietary Diversity-Women							
Inadequate	60	40,5	88	59,5	**1,591**	**1,047**	**2,418**
Adequate	81	30,0	189	70,0			

in the second and third trimester gestational age. The results of logistic regression analysis to determine the determinants of anemia in pregnant women are presented in table 5.

The results of the logistic regression analysis in table 5 show that anemia of pregnant women can be estimated based on low levels of family well-being, the condition of pregnant women experiencing chronic lack of energy, the gestational age of the second and third trimesters, and not consuming meat, poultry, and fish. As in the analysis and description before the determinants of poverty, chronic lack of energy, and consumption of animal food, it consistently contributes to the risk of anemia of pregnant women. The results of the analysis also proved that IFA consumption was not correlated with the risk of anemia of pregnant women. The existence of a pseudo-correlation at the beginning of the analysis and presentation of bivariate data indicates the presence of a role factor that causes there to be a negative correlation between IFA consumption and the risk of anemia.

Table 4: Proportion of subject according to the characteristics and risk of anemia in pregnant women who consume IFA.

Characteristic	Pregnant Women Take IFA				OR	95% CI	
	Anemia		Normal				
	n	%	n	%		Lower	Upper
Level of family well-being							
Poor families (quintiles 1, 2, and 3)	795	41,7	1113	58,3	**1,212**	**1,050**	**1,399**
Wealthy families (quintiles 4 and 5)	494	37,1	838	62,9			
Risk of Chronic Energy Malnutrition							
Chronic Energy Malnutrition	244	51,6	229	48,4	**1,756**	**1,443**	**2,136**
Normal	1045	37,8	1722	62,2			
Gestational age							
1st trimester	104	27,7	272	72,3	**0,542**	**0,427**	**0,687**
2nd and 3rd trimester	1185	41,4	1679	58,6			
Consumption of meat, poultry, fish							
No	212	44,2	268	55,8	**1,236**	**1,016**	**1,503**
Yes	1077	39,0	1683	61,0			
Score Minimum Dietary Diversity-Women							
Inadequate	367	42,0	506	58,0	1,137	0,971	1,331
Adequate	922	39,0	1445	61,0			

Table 5: Determinants that correlate significantly with anemia of pregnant women.

Determinants of anemia of pregnant women	B	p-value	Exp (B)	95% (CI)	
				Lower	Upper
Level of family well-being	0,167	0,019	1,182	1,028	1,358
Chronic Energy Manutrition	0,579	0,000	1,783	1,482	2,147
Gestational age	-0,813	0,000	0,444	0,359	0,549
Consumption of meat, poultry and fish	0,272	0,004	1,313	1,089	1,583
Constant	0,431	0,133	1,539		

4. Conclusion

The risk of anemia of pregnant women is higher in the group of pregnant women with poor conditions, chronic lack of energy, not consuming meat, poultry, and fish, gestational age of 2^{nd} and 3^{rd} trimester. Determinants that correlate significantly with anemia of pregnant women include the level of family well-being, the gestational age of the 2nd and 3rd trimesters, the risk of chronic lack of energy, and the non-consumption

of meat, poultry, fish. The results of the analysis that showed as if there was a correlation that the risk of anemia of pregnant women was greater in pregnant women who took IFA were not proven. This means that the correlation is pseudo because there is a confounding factor.

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