RISK FACTORS AND PREVENTION STRATEGIES FOR ANEMIA IN PREGNANT WOMEN: A RETROSPECTIVE ANALYSIS IN PONOROGO REGENCY

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ABSTRACT Anemia is a condition in which the percentage of erythrocytes and hemoglobin (Hb) levels of pregnant women fall below normal. Ponorogo Regency Health Profile Data in 2022, there were 1,746 anemic pregnant women out of 10,878 (16.50%). This study aims to provide an overview of risk variables and initiatives aiming to decrease the proportion of anemia cases among pregnant women. The implications of this study may help to prevent the risk of Hb decline in women with late trimester gravida. Analytical observational research was used to conduct the study, which was conducted retrospectively from quantitative data. All 62 pregnant women with anemia in the third trimester formed the study sample for the case population. Two independent (free) factors were used in this study: parity, education, nutritional status, maternal age, and gestational age. The prevalence of anemia in third trimester pregnant women is the dependent variable. The instrument used by researchers is an observation sheet. Data analysis to determine the influence or factual use the chisquare test and to test the truth of the hypothesis uses Regression Logistic Analysis. The findings of the study revealed that maternal age (p-value 0.009) and gestational age (p-value 0.027) were risk factors that had an impact on the incidence of anemia at the North Ponorogo Health Center, indicating that gestational age affects the incidence of anemia. Maternal age has a significant risk impact on the occurrence of anemia. The data showed that the incidence of anemia with a risk of 0.884 times was not affected by nutritional status (p-value = 0.727), parity (p-value = 0.043), education (p-value = 0.043), while the incidence of anemia with a risk of 8.483 times was influenced by parity. The findings of this study lead to the conclusion that influencing risk factors were gestational age, maternal age and parity, while nutritional status and education were risk factors that had no effect on anemia in pregnant women. It is expected to provide advice or reference to health centers in order to conduct early detection or further improve comprehensive examinations in order to reduce the prevalence of anemia in the third trimester of pregnancy among several parameters that have been examined by researchers.

INDEX TERMS Anemia, Pregnancy, Risk Factors

I. INTRODUCTION

Iron deficiency anemia, or anemia during pregnancy, is a fairly simple type of anemia that is inexpensive to cure. Pregnancy-related anemia usually manifests in the second and third trimesters. It is recommended that pregnant women continue to take iron supplements and eat foods high in iron-rich foods, especially as they approach the second and third trimesters[1].

The third trimester of pregnancy is a crucial time when the body needs more nutrients than usual. Hemoglobin levels will drop if there is less iron in the blood, which will affect fetal growth. According to some studies, high levels of anemia in the third trimester and Hb levels in late pregnant women may have an impact on birth weight[2].

According to WHO in 2019 in a study[3], anemia in pregnant women is still a major global public health issue, especially in Indonesia. Worldwide, 36.5% of pregnant women suffered from anemia in 2019. According to the Riskesdas study, 48.9% of Indonesian pregnant women, or five out of ten, suffer from anemia. According to data from the Ponorogo Regency Health Profile for the Ponorogo Regency Region in 2022, there were 1,746 anemia pregnant women out of 10,878 pregnant women, or 16.50% of all pregnant

women[4]. Data from the North Ponorogo Health Center shows that there has been a significant increase in the rate of third-trimester anemia among pregnant women between 2021 and 2023. The percentage of anemia was 7.22% in 2021 and increased to 7.89% in 2022. However, the anemia rate increased to 19.2% in 2023, a more pronounced increase. This indicates that there is a problem that needs attention[5].

Reduced immune function, increased risk of infection, lower quality of life leading to miscarriage or abortion, bleeding resulting in death, babies born before the specified date or with as little as 2500 grams of birth weight and a gestational age of less than 37 weeks are just some of the negative effects of anemia in pregnant women. Anemia during pregnancy increases the risk of developing fetal or intrauterine growth retardation (IUGR)[6]. Prematurity rate, BBLR, frequency of pregnancy and delivery problems, maternal mortality risk, and perinatal mortality rate all rise when anemia is present during pregnancy[7] Teaching pregnant women and their families to consume high-iron foods, take the right iron supplements, and take vitamin C to increase the body's absorption of iron supplements is one strategy to do this[2] The Indonesian government mandates that all pregnant women take at least 90 iron pills (also known as Blood Supplement Tablets or TTD) during their pregnancy as part of their efforts to combat anemia. To increase iron levels pregnant women to lower the risk of anemia, which can be harmful to the mother and fetus[8].

The researchers intend to conduct a study entitled "Risk Factors for Anemia in Pregnant Women in the Third Trimester" in view of the previously stated circumstances, where many pregnant women still experience anemia.

The purpose of this study is to evaluate the risk factors that affect the prevalence of anemia in the last trimester of pregnancy in women. The main goal was to identify the variables that affect the third trimester of pregnancy and female anemia. Among the specific objectives are the following: assess the impact and risk level associated with gestational age on the incidence of anemia in the third trimester of pregnancy, Examine the impact and risk level associated with maternal age on the prevalence of anemia in the third trimester of pregnancy, Examining the impact and risk level associated with nutritional status on the prevalence of anemia in the third trimester of pregnancy, Examining the impact and risk level associated with parity on the prevalence of anemia in the third trimester of pregnancy, Examining the impact and risk level associated with education on the

prevalence of anemia in the third trimester of pregnancy, Thus, research can provide a deeper understanding of the factors that play a role in the incidence of anemia in pregnant women in the third trimester.

II. METHODS

Analytical observational research or analytical surveys based on quantitative data were used to conduct this study, with a Case Control design. From October 2023 to January 2024, the working area of the North Ponorogo Health Center in Ponorogo Regency will be the location of this research. The 62 pregnant women who experienced anemia during the third trimester were the case population analyzed. In the control sample, there were 124 randomly taken using a lottery method from a total of 260 pregnant women without anemia. The research sample for the control population is using probability sampling techniques. This study used a number of independent variables such as parity, education, nutritional status, gestational age, and maternal age. The incidence of anemia in the third trimester of pregnancy is a dependent variable. To assess whether these risk factors have an effect or not, in this study, the Chi-Square test was used, this test helps in determining whether independent and dependent variables are related. How to find out the risk level or odd ratio of existing risk factors for the incidence of anemia using Logistic Regression Analysis. It has a significant effect if the p-value <0.05.

III. RESULTS

This research was carried out at the North Ponorogo Health Center, a community health center (Puskesmas) Bangunsari. Jl. Pahlawan No.30, Ponorogo District. This health center is a public health service facility that provides outpatient care, the area is 11.00 Km2. The boundaries of the North Ponorogo Health Center are Bangunsari, Keniten, Banyudono, Jingglong, Beduri, Mangkujayan, Pinggirsari, Cokromengggalan, Tamanarum, Nologaten.

A. ANALYSIS OF THE INFLUENCE AND MAGNITUDE OF GESTATIONAL AGE RISK ON THE INCIDENCE OF ANEMIA IN PREGNANT WOMEN IN THE THIRD TRIMESTER

The findings showed that pregnant women who had a longer gestational age in the third trimester were more likely to experience anemia (69.4%) compared to those who were not anaemic (52.4%). The Chi-Square test showed that H0 (null hypothesis) was rejected due to a p-value of 0.027, which is less than the significance threshold of 0.05. This shows that the incidence of anemia in pregnant women

TABLE 1
Analysis of the influence and magnitude of gestational age risk on the incidence of anemia in pregnant women in the third trimester

Usia Kehamilan	Status Anemia			X^2	P Value	OR	95% CI
	Case	Control	Total				
Beresiko	43 (69,4)	65 (52,4)	108 (58)	4,869	0,027	2,054	1,078- 3,914
Tidak Beresiko	19 (30,6)	59 (47,6)	78 (42)				
Total	62 (100)	124 (100)	186 (100)				

during the third trimester is significantly influenced by gestational age. Furthermore, the results of the Logistics Regression Analysis test with OR 2.054 (95% CI 1.078 – 3.914) did not pass 1 were decided to be significant. The status of risky gestational age has a risk of 2.054 times compared to the status of non-risky gestational age. as shown in **TABLE 1**.

B. ANALYSIS OF THE INFLUENCE AND RISK OF MATERNAL AGE ON THE INCIDENCE OF ANEMIA IN PREGNANT WOMEN IN THE THIRD TRIMESTER

In the results of this study, it was found that third-trimester women whose mothers were older had a higher risk of developing anemia, with a prevalence of 30.5%. In contrast to individuals who do not suffer from anemia by 14.5%. A p-value of 0.009 was found in the findings of the Chi-Square test, which is less than a significance level of

in the third trimester of pregnancy and nutritional status. based on the data analyzed in this study. The influence between a woman's nutritional status and the likelihood of anemia during the third trimester of pregnancy. In addition, the results of the Logistic Regression Analysis test showed that the OR of 0.884 (95% CI: 0.443 – 1.764) passing 1 was decided to be insignificant. Nutritional status at risk has a risk of 0.884 times compared to nutritional status at risk, shown in **TABLE 3**.

D. ANALYSIS OF THE EFFECT AND AMOUNT OF PARITY RISK ON THE INCIDENCE OF ANEMIA IN PREGNANT WOMEN IN THE THIRD TRIMESTER

There was a difference in parity between the pregnant women in this study who had anemia in the third trimester and those who did not. Anemia was more common in pregnant women with higher parity, so the percentage of 6.5%

TABLE 2
Analysis of the Influence and Risk of Maternal Age on the Incidence of Anemia in Pregnant Women in the Third Trimester

Gestational Age	Status Anemia			X^2	p-value	OR	95% CI
	Case	Control	Total				
Risk	43 (69,4)	65 (52,4)	108 (58)	4,869	0,027	2,054	1,078- 3,914
No Risk	19 (30,6)	59 (47,6)	78 (42)				
Total	62 (100)	124 (100)	186 (100)				

TABLE 3
Analysis of the Influence and Risk of Nutritional Status on the Incidence of Anemia in Pregnant Women in the Third Trimester

Nutritional Status	Kejadian Anemia			x^2	p-value	OR	95% CI
	Case	Control	Total				
Risk	16 (25,8)	35 (28,2)	51 (27,4)	0,122	0,727	0,884	0,443-1,764
No Risk	46 (74,2)	89 (71,8)	135 (72,6)				
Total	62 (100)	124 (100)	186 (100)				

0.05. As a result, H0 (null hypothesis) was rejected, suggesting a substantial relationship between maternal age and the prevalence of anemia in the third trimester of pregnancy. And the results of the Logistic Regression Analysis test showed that the OR of 2.602 (95% CI 1.247 – 5.430) did not pass 1 was decided significantly. Age status Mothers at risk have a risk of 2,602 times compared to the age status of mothers who are not at risk. as shown in **TABLE 2**.

C. ANALYSIS OF THE INFLUENCE AND RISK OF NUTRITIONAL STATUS ON THE INCIDENCE OF ANEMIA IN PREGNANT WOMEN IN THE THIRD TRIMESTER

In this study, there was a difference in the nutritional status of anemia and non-anemia pregnant women in the third trimester. Compared to the anemia group (25.8%), pregnant women with superior nutritional conditions (not anemia) had a greater risk percentage (28.2%). However, a p-value of 0.727 was found in the findings of the Chi-Square test, exceeding the significance level of 0.05. This suggests that there is no clear link between the occurrence of anemia

compared to 0.8% in the group that did not suffer from anemia a p value of 0.043 was found in the findings of the Chi-Square test, which was less than a significance level of 0.05. As a result, H0 (null hypothesis) was rejected, suggesting a substantial relationship between parity and prevalence of anemia in the third trimester of pregnancy. And the results of the Regression Analysis Logistics test showed that the OR of 8.483 (95% CI 0.927 – 77.592) passed 1 was decided to be insignificant. The at-risk parity status has a risk of 8.483 times compared to the non-at-risk parity status, as shown in **TABLE 4.**

E. ANALYSIS OF THE INFLUENCE AND MAGNITUDE OF EDUCATIONAL RISKS ON THE INCIDENCE OF ANEMIA IN PREGNANT WOMEN IN THE THIRD TRIMESTER

There was variation in educational attainment in the third trimester of pregnancy in this study. who had a higher risk of developing anemia compared to individuals who were not at risk. Pregnant women with primary education had a higher risk (1.6%) compared to those with higher education (0.8%).

In secondary education, the risk is greater than that of no risk, namely (69.4%) and (63.7%).

The results of the Chi-Square test showed that there was a difference between a significance value of 0.05 and a p value of 0.617. As a result, it was decided to accept the null hypothesis (H0), which argued that there was no clear relationship between education level and the prevalence of

impact on gestational anemia, which is defined by low blood hemoglobin (Hb) levels. This shows the importance of paying attention to and managing pregnancy conditions in an effort to protect pregnant women from and treat anemia. Premature birth, low birth weight, abortion or miscarriage, as well as postpartum bleeding, may arise from this. Complications can also arise during pregnancy, childbirth,

TABLE 4.
Analysis of the Effect and Amount of Parity Risk on the Incidence of Anemia in Pregnant Women in the Third Trimester

Parity	Kejadian Anemia			x^2	p-value	OR	95% CI
	Case	Control	Total				
Risk	4 (6,5)	1 (0,8)	5 (2,7)	5,035	0,043	8,483	0,927-77,592
No Risk	58 (93,5)	123 (99,2)	181 (97,3)				
Total	62 (100)	124 (100)	186 (100)				

anemia in the third trimester of pregnancy. Based on the data analyzed in this study. And the results of the Logistic Regression Analysis test showed that the OR of 0.735 (95% CI 0.390 – 1.386) passed 1 was decided to be insignificant. The risk of education status has a risk of 0.735 times compared to the status of education without risk as shown in **TABLE 5.**

and the postpartum period. Women who are pregnant are susceptible to shock and infection. Which can increase the risk of complications during childbirth and afterwards. Because many third-trimester pregnant women still experience anemia when their pregnancy is nearing delivery or the last trimester, the authors state that gestational age has an indirect influence on the incidence of anemia in third-

TABLE 5.
Analysis of the Influence and Magnitude of Educational Risks on the Incidence of Anemia in Pregnant Women in the Third Trimester

Education	Incidence of Anemia			x^2	p-value	OR	95% CI
	Case	Control	Total				
Basic	1 (1,6)	1 (0,8)	2 (1,1)	0,967	0,617	0,735	0,390 – 1,386
Intermediate	43 (69,4)	79 (63,7)	122 (65,6)				
High	18 (29)	44 (35,5)	62 (33,3)				
Total	62 (100)	124 (100)	186 (100)				

IV. DISCUSSION

Finding risk factors for anemia in pregnant women in the third trimester at the Health Center is the goal of this study North Ponorogo in 2023. The benefit for the community itself is that it can help to prevent the risk of female descent of late trimester gravida women. The research that has been done to achieve this goal will be reviewed in this section.

1. The Influence and Size of Gestational Age Risk on the Incidence of Anemia

Chi-Square test to show a significant correlation between gestational age risk variables and anemia cases in North Ponorogo Health Center. Since the p-value is less than a significance level of 0.05 (0.027), the null hypothesis (Ho) is not supported. This suggests that gestational age has a significant impact on the incidence of anemia in the area studied. The results of the Logistic Regression Analysis Test in this study obtained an odd ratio of 2.054 with a 95%CI of 1.078 – 3.194 not passing 1 so it can be said to be significant. This corresponds to[9]. The risk of pregnant women developing anemia has been shown to be significantly influenced by their gestational age. Gestational age has an

trimester pregnant women. This suggests that factors related to gestational age, such as physiological changes in the body of pregnant women, can contribute to the risk of developing anemia. This emphasizes the importance of considering gestational age factors with the aim of managing and preventing anemia during the third trimester of pregnancy. In addition, according to research[1], the adjustment of the nutritional needs of pregnant women, especially those related to iron, because the gestational age changes. It was found through investigation that the risk of anemia increases with gestational age. This suggests that a woman's chances of developing anemia during pregnancy can be affected by physiological changes that occur throughout the third trimester. Anemia or low hemoglobin makes oxygen not optimal for mothers and babies. Maternal, BBLR, and Perintal deaths can be caused by anemia in pregnancy[10]. There is evidence that gestational age affects the risk of anemia in cases where maternal anemia can occur during the second trimester of pregnancy. 1.6 times more of Anemia is

.45 times more common in the first and third trimesters than in the first trimeste [1].

2. The Influence and Risk of Mother's Age on the Incidence of Anemia

Ho was rejected because the results of the Chi-Square test in this study showed that the risk factor of maternal age had a significant effect on the incidence of anemia in the North Ponorogo Health Center, with a value of P 0.009 < 0.05.The results of the Logistic Regression Analysis Test in this study obtained an odd ratio of 2.602 with a 95%CI of 1.247 – 5.430 not exceeding 1 so it can be said to be significant. This is in accordance with the theory Anemia is more common in mothers under the age of twenty and over the age of thirty-five. Physical and psychological factors contribute to this. Because malnutrition is common at this age, women who become pregnant before the age of 20 are at risk of developing anemia. The ideal age range to get pregnant is between 20 and 35. Iron consumption will be shared between the biological growth of the pregnant woman and the fetus if she becomes pregnant before the age of 20[11]. Pregnant mothers are usually between 20 and 35 years old. Due to their young biological age, they are more susceptible to emotional instability and shocks, which can result in a number of common diseases such as malnutrition and decreased immunity[12].

Due to age, it was discovered that the ideal age range for a woman to become pregnant is between 20 and 35. This is the age at which getting pregnant, carrying a kid, and going through the postpartum phase are all deemed safe[13]. The risk of anaemia is 3,921 times more likely to affect pregnant women over 35 and under 20 than for those between the ages of 20 and 35. Because more iron is needed during pregnancy, especially to increase the mass of maternal red blood cells and to aid fetal and placental growth, there is an increased risk of iron deficiency[6]. According to[14] the likelihood of anemia is 1,345 times higher in the second trimester compared to the gestational age of the first trimester. Meanwhile, there is a possibility of 2,590 percent anemia among pregnant women who are in the third trimester.

3. The Influence and Risk of Nutritional Status on the Incidence of Anemia

The results of the Chi-Square test in this study showed that, with a P value of 0.727 > 0.05, there was no significant relationship between the nutritional status risk variable and the incidence of anemia at the North Ponorogo Health Center. Therefore, Ho is trima. The results of the Logistic Regression Analysis Test in this study obtained an odd ratio of 0.884 with a 95%CI of 0.443 – 1.764. This is in accordance with Sarah's theory in the journal[15]. Based on the results of multiple logistic regression analysis, there was no effect between anemia and nutritional status based on LILA with an insignificant result of 0.299. This will probably happen because anemia is caused by a variety of variables in addition to a constant lack of energy. highlighting the impact of vitamin C and iron supplementation on related hematocrit in pregnant women.

In addition, research shows that a variety of other factors influence or amplify the occurrence of anemia, making dietary status not the only factor contributing to the condition. In addition, studies have shown that there are many other factors that support or influence the incidence of anemia, making nutritional conditions not the main factor that causes it[16].

however, according to the findings of other studies that have been carried out, show that there is a significant correlation between the incidence of anemia in pregnant women and their nutritional status, as the theories and findings of eating researchers support the idea that nutritional status affects anemia in pregnant women, as malnourished pregnant women are more likely to need a high nutritional intake for fetal and maternal growth [17].

Complications and risks of corneal energy deficiency in pregnant women are bleeding during pregnancy, IUGR, anemia, and infectious diseases. The risk of pregnant women who experience chronic energy deficiency is 2.96 than that of pregnant women who are not chronically deficient in energy[18]. Anemia and chronic energy deficits in the last trimester of pregnancy increase the likelihood of pain significantly compared to healthy pregnant women. One of the risks associated with KEK disorders is the potential for complications for the mother and fetus[19].

4. The Effect and Risk of Parity on the Incidence of Anemia

Ho was rejected because the results of the Chi-Square test in this study showed that the incidence of anemia in the North Ponorogo Health Center was significantly influenced by the Parity risk factor, with a P value of 0.043 < 0.05. The results of the Logistic Regression Analysis Test in this study obtained an odd ratio of 8.483 with a 95%CI of 0.927 – 77.592. According to research Compared to primigravida, the parity of grandemultigravida and multigravida on the risk of anemia, both mild and moderate, is consistent with studies conducted in pregnant women. This supports the hypothesis that having twins, two pregnancies that are close to each other, and a history of bleeding in the past can all contribute to iron deficiency anemia[1]. The risk of anemia increases with the third trimester. This is so that disorders such as anemia, which can develop during pregnancy and after childbirth, can be prevented. A woman's chances of developing anemia increase with the frequency of her pregnancy and childbirth[20].

A mother's health may be negatively affected by her parity, which increases her susceptibility to anemia. As a result, a four-fold increase in parity increases the likelihood of anemia. At high parity, the risk of anemia was 1,454 times higher[21]. A woman who has had three or more pregnancies (too many children) is at greater risk of parity because the presence of the fetus puts a strain on the uterus. Parity can be classified as high risk (giving birth to more than three children) or low risk (giving birth to fewer than three children)[22].

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5. The Influence and Risk of Nutritional Status on the Incidence of Anemia

Hasil The results of the Chi-Square test showed that, with a P-value of $0.617 > 0.05$, there was no significant influence between educational risk factors and the prevalence of anemia in the North Ponorogo Health Center. As a result, Ho was accepted. The results of the Logistic Regression Analysis Test in this study obtained an odd ratio of 0.735 with a 95%CI lower $0.390 – 1.386$. This is consistent with the theory The findings suggest that having more education does not ensure that mothers will not develop anemia. Pregnant women with a higher level of education have greater access to health information, especially in the field of nutrition, but knowledge alone cannot improve one's health if not used correctly in daily life. The findings of this study support Purwandari's 2016 study, which found no evidence of a significant correlation between the incidence of anemia in pregnant women and their education level (p value 0.360) (Purwaningtyas and Prameswari, 2017). In the research[23] which states that the findings of the study show that having more education does not ensure that pregnant women will not get anemia. Pregnant women have a high level of education, which makes it easier for them to absorb health information, especially in the field of nutrition. However, information cannot improve a person's health if it is not properly applied in daily life.

Poor levels of maternal education also have an impact on the lack of information, which affects their awareness of the need to receive health care to prevent anemia. Anemia is three times more common in pregnant women with lower levels of education than in mothers with higher education levels[24]. This is due to the fact that higher education does not expressly provide information about anemia, except for the health sector. Lack of education during pregnancy increases the risk of anemia 3,311 times higher than that of an educated mother[24].

V. CONCLUSION

This study's main goal is to identify the risk factors for anemia in the third trimester of pregnancy in women. An important finding was that there was an effect between gestational age and the incidence of anemia in pregnant women in the third trimester, with a risk of anemia 2,054 times., An important finding was that there was an effect between maternal age and the incidence of anemia in pregnant women in the third trimester, with a risk of 2,602 times. With a risk of 8,483 times, there was an association between parity and the incidence of anemia in the third trimester of pregnancy. The conclusion is not significant. There was no effect between education and the incidence of anemia in pregnant women in the third trimester, with a risk of 0.735 times, nor between nutritional status and the incidence of anemia in the third trimester, with a risk of 0.884 times.

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