

Original Research

Risk Factors of Pregnant Women with Anemia for LBW Incidence in Maospati, Indonesia

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Background: The prevalence of low birth weight (LBW), according to the World Health Organization (WHO), is estimated to be 15%–20% of all births worldwide. Babies with LBW face a challenging and risky life trajectory, often experiencing growth and development disorders. Pregnant women with a history of anemia are considered a risk factor for LBW cases. This study aims to determine the risk factors for anemia in pregnant women and the incidence of LBW in the Maospati Community Health Center area. **Methods:** This observational analytic study employed a case-control design. The case population consisted of LBW infants, while the control population included non-LBW infants. The case sample comprised 25 LBW infants, and the control sample included 50 infants who were not LBW. The independent variable was the history of anemia in pregnant women, and the dependent variable was the incidence of LBW. Data were collected from medical records and labor recapitulation records from February 2023 to February 2024, using an observation sheet as the research instrument. Data analysis involved calculating the proportion of cases to exposure and determining the odds ratio. **Results:** The study found a significant association between a history of anemia in pregnant women and the incidence of LBW in their babies, with a p-value of 0.003. Pregnant women with anemia had a 4.571 times greater risk of giving birth to an LBW baby compared to those without anemia. **Conclusions:** The findings indicate that a history of anemia in pregnant women is a significant risk factor for LBW in newborns. Monitoring pregnancy and hemoglobin levels is essential to reduce the incidence of LBW in infants.

Keywords: LBW; anemia; mother; pregnant

1. INTRODUCTION

Low birth weight (LBW) babies are babies weighing less than 2500 grams at birth, regardless of gestational age. The baby's birth weight is determined by weighing him within the first hour of birth.⁽¹⁾ The World Health Organization (WHO) estimates that 15%–20% of all babies born worldwide are LBW, which is equivalent to more than 20 million births every year.⁽²⁾ According to additional research by SDKI, the percentage of LBW nationally is around 7.5%. In East Java Province, the number of LBW incidents is 36%.⁽³⁾ For the Magetan Regency area, the number of LBW incidents from the Magetan Regency Health Profile data in 2020 was 4.80%, in 2021 it was 3.77%, and in 2022 it was 4.33%.⁽⁴⁾ For the sub-district area, especially the Maospati Community Health Center, the incidence of LBW in 2019 was 8.11%, in 2020 it was 13.9%, in 2021 it was 6.04%, in 2022 it was 6.66%, and in 2023 it was 8.08%. From this data, there is an increase in

the percentage of LBW births every year, although there is a significant decline.

According to Sembiring JB, the impact of babies with LBW is hypothermia, hypoglycemia, fluid and electrolyte imbalance, hyperbilirubinemia, respiratory distress syndrome, infection, and anemia, while long-term problems that may arise in LBW newborns include developmental disorders, hearing problems, growth disorders, chronic lung disease, visual impairment (retinopathy), increased pain and frequent hospitalizations, and an and an increased frequency of congenital abnormalities.⁽¹⁾

Factors causing the incidence of LBW include maternal factors, including maternal age, parity, and diseases suffered by the mother, for example, malaria, anemia, syphilis, TORCH infection, etc. pregnancy complications such as antepartum hemorrhage, severe pre-eclampsia, and preterm birth. Mothers who are alcoholics, mothers who smoke, and mothers who use narcotics are factors in a mother's habits. Fetal factors include prematurity, hydramnios, twin or multiple pregnancies, and chromosomal abnormalities. Living in the highlands, radiation, exposure to toxic substances, and socio-economic status are factors that can influence the incidence of LBW.⁽¹⁾ From several risk factors for LBW, researchers examined various research reports and emerged that LBW is associated with the condition of pregnant women who have low hemoglobin levels, CED pregnant women, and pregnancy comorbidities. These three variables constitute the concept of anemia in pregnant women. Thus, the incidence of LBW can be influenced by anemia in pregnant women. This research aims to determine the factors that cause LBW in mothers during pregnancy, so it is very important to do early prevention, especially anemia during pregnancy. The latest in this research focuses on the factors that cause LBW, namely anemia in mothers during pregnancy in the Maospati Community Health Center area. Researchers examined various research reports to conclude that LBW is related to the condition of pregnant women who have low hemoglobin levels, pregnant women with chronic energy deficiency, and pregnancy comorbidities. These three variables constitute the concept of anemia in pregnant women. Thus, the incidence of LBW can be influenced by anemia in pregnant women. Furthermore, 62% of pregnant women had anemia, with a median hemoglobin level of 10.6 g/dL. Nearly half of pregnant women with anemia (mild, moderate, and severe) were in their second

trimester based on gestational age. These circumstances met the criteria set forth by the World Health Organization (WHO) for major public health problems.⁽⁵⁾

There are several strategies to prevent the occurrence of LBW, one of which is improving the nutrition of pregnant women. An effort that can be made is by providing additional food. According to Minister of Health Regulation Number 51 of 2016 about Nutritional Supplementation Product Standards, pregnant women are given biscuits that are boosted with 11 vitamins and 7 minerals and contain protein, linoleic acid, and carbs, quality ANC services according to 10 T, checking pregnancy with ultrasound (USG), early detection, an integrated referral system, high-quality ANC and PNC, pregnant women, and delivery in health facilities.⁽⁶⁾ Pregnant women need to take one blood supplement tablet per day for a minimum of 90 days during pregnancy as an effort to prevent the risk of anemia during pregnancy.⁽⁷⁾

This research aims to determine the factors that cause LBW in mothers during pregnancy, so it is very important to do early prevention, especially anemia during pregnancy. The latest in this research focuses on the factors that cause LBW, namely anemia in mothers during pregnancy in the Maospati Community Health Center area. Researchers examined various research reports to conclude that LBW is related to the condition of pregnant women who have low hemoglobin levels, pregnant women with chronic energy deficiency, and pregnancy comorbidities. These three variables constitute the concept of anemia in pregnant women. Thus, the incidence of LBW can be influenced by anemia in pregnant women.

2. METHODS

The research method used was observational analytics with a case-control design. Taking measurements on the dependent variable (LBW) while the independent variable (anemia) is traced retrospectively to determine whether there is an influence of exposure to the independent variable (anemia) on the dependent variable (LBW). The research location is at the Masopati Health Center, Magetan Regency. The research was conducted from October 2023 to May 2024. The independent variable was the history of anemia in pregnant women. The dependent variable is the incidence of LBW. Case and

control data were obtained from medical records and birth recapitulation records from February 2023 to February 2024. The research instrument used was an observation sheet.

The case population is babies with LBW, and the control population is babies who are not LBW. Case sampling used a total population technique, namely 25 babies who were LBW. To take the control sample using a simple random sampling technique that meets the characteristics of babies with a term gestational age, is not restless, and is limited by the time and place of research that has been determined, namely 50 babies who are not LBW.

The data collection technique involves observing secondary data from birth recap books, pregnancy recap books, maternal registers, and medical records. Data obtained on the total number of newborns was 277; from this number, 25 babies experiencing LBW were taken as case samples. After reducing the number of LBW babies to 252 normal or non-LBW babies, the control sample was taken using a simple random sampling technique that met the characteristics of babies at term gestational age, was not restless, and was limited by the time and place of research that had been determined, namely 238 babies. After that, make a list of respondent numbers in order starting from February 2023 – February 2024, namely numbers 1-238. Paper numbered 1-238 was rolled up and drawn to determine a control sample of 50 samples. When one number is drawn, it is recorded and entered again for the draw so that all samples have the same chance. After determining the number of case and control samples, the mother's Hb status was checked to determine whether she experienced anemia during pregnancy or not.

Data analysis to calculate the proportion of cases to exposure using the chi-square test and calculating the odds ratio using the logistic regression test.

To collect data, obtain a research permit from the Master of Applied Midwifery Transfer Study Program, Magetan Campus, addressed to Litbankesbangpol. Litbankesbangpol was given a copy of the letter to the Head of the Magetan District Health Service and the Head of the Maospati Community Health Center. Then an ethical review was carried out through the Surabaya Ministry of Health Polytechnic for research licensing. The implementation of this research has received ethical permission number No.EA/2175/KEPK-Poltekkes-Sby/V/2024.

3. RESULTS

3.1 Frequency Distribution of Anemia Risk Factors Among Newborns

From the research results, it was found that a total of 18 mothers experienced anemia with a percentage of 72% giving birth to babies with LBW, and a total of 7 mothers with a percentage of 28% who were not anemic gave birth to babies with LBW as in Table 1.

Table 1. Frequency distribution of LBW cases

LBW	F	%
Anemia (< 11 g/dl)	18	72
No anemia (≥ 11 g/dl)	7	28
LBW	F	%

Source: Secondary data during February 2023 – February 2024

The research results showed that 50 babies who were not LBW from February 2023-February 2024 were taken randomly from all births in that period. A total of 18 mothers who experienced anemia with a percentage of 36% gave birth to babies who were not LBW, and a number of 32 mothers who were not anemia with a percentage of 64% gave birth to babies who were not LBW as in Table 2.

Table 2. Frequency distribution of non-LBW controls

Not LBW	F	%
Anemia (< 11 g/dl)	18	36
No anemia (≥ 11 g/dl)	32	64
Total	50	100

Source: Secondary data during February 2023 – February 2024

3.2 Analysis of the Influence of Anemia on the Incidence of LBW and Non-LBW

The results of research conducted using the Chi-Square Test (X^2) on the anemia variable on the incidence of LBW in the Maospati Health Center Working Area showed that there were more respondents with anemia in the LBW group (72%) compared to those who were not LBW (36%). The result (X^2), namely Pearson Chi-Square of 8.654 with a footnote of 0 cells (0.0%) has an expected number of less than 5. The minimum expected number is 12.00 and is calculated only for 2x2 tables so for Chi-Square test results who meet the criteria with a p-value of $0.003 < 0.05$, it is decided that H_0 is rejected, as shown in Table 3, it is determined that the incidence of LBW is influenced by anemic status.

Table 3. The Influence of Anemia on the incidence of LBW in the Maospati Community Health Center Work Area

			BBL status			X ²	p
			LBW (Case)	Not LBW (Control)	Total		
Anemic Status	Anemia (< 11 g/dl)	F	18	18	36	8.654	0.003
		%	72	36	48		
	No anemia (≥ 11 g/dl)	F	7	32	39		
		%	28	64	52		
	Total	F	25	50	75		
		%	100	100	100		

Source: Secondary Data for February 2023 – February 2024

3.3 Analysis of the Risk of Anemia in the Event of LBW

Odds Ratio (OR) is significant or not, seen from the confidence interval which takes into account the lower and upper values. In Table 4, the OR calculation results using the logistic regression test show a result of

4.571, a significance of 0.004 < 0.005 and the 95% Confidence Interval 1.605 - 13.021 does not exceed the number 1 so it is decided significant/meaningful where anemia status is a risk factor for LBW. This means that anemia status has a risk 4.571 times greater than that of non-anemia for LBW as in Table 4.

Table 4. There is a big risk of anemia in LBW events

	B	S.E.	Wald	Df	Sig.	Exp (B)	95% CI for EXP (B)	
							Lower	Upper
Anemia	1.520	0.534	8.099	1	0.004	4.571	1.605	13.021

Source: Secondary Data for February 2023 – February 2024

4. DISCUSSION

During pregnancy, the mother's blood volume increases to provide oxygen and nutrients to the fetus, causing a decrease in hemoglobin concentration in the blood. Lack of iron intake in food, impaired absorption of iron in the body, or excessive blood loss during pregnancy (such as bleeding in the first trimester or blood loss during childbirth) can also cause anemia in pregnant women. Anemia in pregnant women is generally caused by iron deficiency, which increases due to physiological needs during pregnancy, which are often not met by daily food intake.⁽⁸⁾

Parameters related to monitoring anemia in pregnant women, namely routine blood tests every trimester to detect anemia early and arrange appropriate treatment, Researchers recommend regular iron and folic acid supplementation because it is effective in preventing anemia, with a dose of around 30–60 mg iron and 400 µg folic acid per day.⁽⁹⁾

A sufficient supply of oxygen and nutrients from the mother through the placenta is essential for the fetus's growth and development. Hypoxia, or lack of oxygen, brought on by maternal anemia or placental issues can stunt fetal development, result in low birth weight, and raise the possibility of long-term health issues. Deficiencies in micronutrients such as iron, folate, and vitamin B12 can also interfere with blood formation and the fetal nervous system's development.⁽¹⁰⁾ In accordance with research, there is an influence of anemia risk factors on the incidence of LBW. Compared to pregnant women without anemia, those with anemia have a 4.571 times higher risk (OR) of giving birth to babies who have LBW. In accordance with research by Khairun Nisa et al., they reported that the risk (OR) of pregnant women with anemia was three times greater in giving birth to LBW babies than mothers who did not have anemia.⁽¹¹⁾ The comparative OR value is higher compared to the research of Khairun Nisa et al. due to the relatively small number of samples used.

The role of cardiac output, decreased hemoglobin (Hb) levels, and cell oxygenation in fetal growth has a significant relationship, as revealed in medical research. Increased cardiac output during pregnancy is key to ensuring adequate blood supply to the placenta. A decrease in Hb levels in pregnant women, especially in the second and third trimesters, can reduce the capacity of the blood to carry oxygen, triggering increased heart work to maintain adequate oxygenation for the fetus. Adequate oxygenation of fetal cells depends on adequate oxygen supply via the maternal bloodstream, which is an important factor in supporting healthy fetal growth and development.⁽¹²⁾ The pooled odds ratio analysis results demonstrated that pregnant women who experienced anemia during their pregnancy had 3.42 odds of being more likely to give birth to LBW babies than mothers who did not experience anemia; this result was statistically significant ($p < 0.0001$). Since the heterogeneity value was 62% ($p = 0.006$), random effects were considered in the meta-analysis's findings.⁽¹³⁾

Intrauterine hypoxia, or a lack of oxygen for the fetus, can significantly affect the fetus's development and health. Intrauterine hypoxia can cause various problems, including restricted fetal growth (IUGR), low birth weight, and an increased risk of premature birth.⁽¹⁴⁾ Monitoring pregnant women so that they do not experience anemia during pregnancy is an important step in preventing LBW. Anemia in pregnant women can result in a lack of oxygen supply and nutrients needed by the fetus, potentially causing stunted fetal growth and low birth weight. Maintaining adequate iron intake through food or supplements, carrying out regular pregnancy checks to monitor hemoglobin levels, and consuming foods rich in iron, such as meat, fish, green vegetables, and whole grains, are steps that can be taken. The results of the study indicate that there is a connection between anemia and the incidence of LBW because anemia during pregnancy might affect the growth and development of the fetus, leading mothers to give birth to babies who have LBW.⁽¹⁵⁾

5. CONCLUSION

It is determined from the data and discussion that anemia risk factors have an impact on the prevalence of low-birth-weight babies. Pregnant women who have anemia run a 4.571-fold higher risk of giving birth to

low birth weight (LBW) babies than mothers who do not have anemia. The limitation of this research is the research time, so it only examines the period February 2023–February 2024, which resulted in a small sample being studied. Because it uses secondary data in the form of birth recap books, pregnancy recap books, maternal registers, and medical records, there is some incomplete data. During the research, researchers were also unable to ask directly about the mother's routine for consuming Fe tablets.

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No funds received for this study.

Conflict of Interest

The authors declare no conflict of interest.

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