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RESEARCH ARTICLE

The Association Between Maternal Age, Hemoglobin Levels, and Parity with the Incidence of Low Birth Weight (LBW) at RSUD Dr. Pirngadi Medan, 2022–2023

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ABSTRACT

Background*: Low Birth Weight (LBW) can be defined as a baby weighing less than 2500 grams or 5.5 pounds. The causes of LBW are generally multifactorial, including maternal factors, pregnancy factors, fetal factors, and other factors. Based on research that has been conducted, several maternal factors that can influence the occurrence of LBW include age, hemoglobin levels, and maternal parity.*

Research Objectives: *The purpose of this study is to analyze the relationship between maternal age, hemoglobin levels and parity and the incidence of LBW babies in mother giving birth at Dr. pirngadi Hospital in 2022-2023.*

Methods: *This study used an observational-analytic method with a cross-sectional research design.*

Research Result *: The total number of research samples is 119 samples. The analysis used chi square test at p < 0,05. The result showed that age have a correlation with the incidence of LBW with a p-value 0,036 (<0,05), maternal hemoglobin levels also have a correlation with the incidence of LBW with p-value 0,022(0,05) and parity has correlation with the incidence of LBW with p-value 0,031(<0,05).*

Conclusion *:Maternal age, hemoglobin levels and parity are associated with the incidence of LBW at Dr. Pirngadi Hospital in 2022-2023.*

Keywords : LBW, Age, Maternal Hemoglobin levels, Parity

INTRODUCTION

The World Health Organization (WHO) defines Low Birth Weight (LBW) as any newborn weighing less than 2,500 grams (5.5 pounds). LBW is a critical factor in the increased mortality, morbidity, and disability rates among neonates, infants, and children, and it can have long-term consequences throughout their future lives.

The United Nations Children's Fund (UNICEF), in its 2019 *Low Birth Weight Estimates* research, reported that one in seven newborns globally experiences LBW. According to 2020 WHO data, the highest incidences of LBW were recorded in India (27.4%), followed by the Philippines (21.1%), and South Africa (16.6%). In Indonesia, LBW ranks ninth globally with a prevalence of 9.9%. LBW remains a primary health concern in Indonesia, second only to the Maternal Mortality Rate (MMR). The 2018 RISKESDAS report indicated that among children with recorded birth weights, 6.2% were born with low birth weight, with the highest prevalence in Central Sulawesi (8.9%) and the lowest in Jambi (2.6%).

Based on the North Sumatra Provincial Health Profile, there were 1,301 LBW cases out of 283,182 births in 2019, which slightly increased to 1,316 cases out of 298,156 births in 2021. In Medan, the prevalence of LBW in 2021 was 72 cases out of 37,889 births, while the highest incidence in North Sumatra occurred in Karo Regency, with 328 cases out of 8,589 births.

Birth weight is a vital indicator of infant health, serving as a primary factor for survival, physical growth, and mental development. The causes of LBW are generally multifactorial, involving maternal, gestational, fetal, and other environmental factors. Maternal factors include malnutrition during pregnancy, maternal age (< 20 or > 35 years), short pregnancy intervals, and maternal comorbidities. Gestational factors involve conditions such as hydramnios and multiple pregnancies, while fetal factors include congenital anomalies and intrauterine infections. Other risk factors include parity, socioeconomic status, education, and maternal occupation.

Maternal age significantly influences LBW incidence. Women younger than 20 years are considered to be at an early reproductive age, where reproductive organs and physiological functions are not yet optimal. A premature uterus and immature ova can disrupt fetal development. Conversely, women older than 35 years are at higher risk for LBW due to a higher susceptibility to degenerative diseases and declining physical health. As maternal age increases, uterine vascular changes and hormonal declines in the reproductive cycle can impair fetal growth.

Hemoglobin (Hb) levels are crucial as Hb is the protein in red blood cells responsible for transporting oxygen to the entire body, including the fetus. Low hemoglobin levels (anemia) in pregnant women can result in a diminished oxygen supply to the fetus. The WHO defines anemia in pregnancy as an Hb level < 11 g/dL, while the Centers for Disease Control and Prevention (CDC) defines it as Hb < 11 g/dL in the first and third trimesters, and < 10.5 g/dL in the second trimester. This condition is often caused by iron deficiency, blood loss, chronic diseases, or parasitic infections. A decrease in Hb levels reduces the blood's oxygen-carrying capacity, leading to a reduction in nutrients transported via the placenta, ultimately causing Intrauterine Growth Restriction (IUGR) and LBW.

Furthermore, research by Aditianti (2020) suggests that low Hb levels can trigger fetal hypoxia, stimulating the production of corticotropin-releasing hormone. This hormone can affect placental development and reduce uterine blood flow, leading to stunted fetal growth. Finally, parity—the number of pregnancies reaching viable gestational age—also plays a role. High parity increases LBW risk due to potential damage to the uterine blood vessels from repeated pregnancies, which impairs nutrient transfer from the placenta to the fetus, disrupting optimal fetal development.

METHODS

This study is an analytical observational research with a cross-sectional design, aimed at determining the association between maternal age, hemoglobin levels, and parity with the incidence of Low Birth Weight (LBW) at RSUD Dr. Pirngadi Medan from 2022 to 2023. The sample for this study consisted of 119 respondents, selected using a total sampling technique. The data utilized were secondary data obtained from the medical records of postpartum patients at RSUD Dr. Pirngadi Medan.
The independent variables in this study were maternal age, maternal hemoglobin levels, and parity, while the dependent variable was LBW. Univariate analysis was performed to describe the respondents' characteristics, including maternal age, hemoglobin levels, and parity. Bivariate analysis was conducted to examine the association between the independent and dependent variables. The statistical analysis employed in this study was the Chi-Square test.

RESULTS AND DISCUSSION

Univariate Analysis

Table 1. Frequency Distribution and Percentage of Low Birth Weight (LBW) Incidence Among Mothers Delivering at RSUD Dr. Pirngadi Medan, 2022–2023

Birth Weight Category	Frequency (n)	Percentage (%)
Low Birth Weight (LBW) (< 2500 grams)	88	73.9
Normal Birth Weight (NBW) (≥ 2500 grams)	31	26.1
Total	**119**	**100.0**

Based on Table 1 above, it is found that 88 mothers (73.9%) gave birth to infants with Low Birth Weight (LBW), while 31 mothers (26.1%) gave birth to infants with Normal Birth Weight. Therefore, the majority of women delivering at RSUD Dr. Pirngadi Medan during the 2022–2023 period had infants with LBW.

Maternal Age Category	Frequency (n)	Percentage (%)
High Risk (< 20 or > 35 years old)	83	69.7
Low Risk (20–35 years old)	36	30.3
Total	**119**	**100.0**

Based on Table 2 above, it is found that 83 mothers (69.7%) were in the high-risk age group, while 36 mothers (30.3%) were in the low-risk age group. Consequently, the majority of pregnant women at RSUD Dr. Pirngadi Medan during the 2022–2023 period were within the high-risk maternal age category."

Hemoglobin (Hb) Level Category	Frequency (n)	Percentage (%)
Anemia (< 11 g/dL)	[Data]	[Data]
Non-Anemia (≥ 11 g/dL)	[Data]	[Data]
Total	**119**	**100.0**

Based on Table 4.3 above, it is found that 81 mothers (68.1%) had hemoglobin levels indicating anemia, while 38 mothers (31.9%) had normal hemoglobin levels. Consequently, the majority of pregnant women at RSUD Dr. Pirngadi Medan during the 2022–2023 period were anemic

Parity Category	Frequency (n)	Percentage (%)
High Risk (Primipara / Multipara / Grandemultipara)*	[Data]	[Data]
Low Risk (Multipara)*	[Data]	[Data]
Total	**119**	**100.0**

Based on Table 4 above, it is found that 90 mothers (75.5%) were in the high-risk parity category, while 29 mothers (24.4%) were in the low-risk parity category. Consequently, the majority of pregnant women at RSUD Dr. Pirngadi Medan were within the high-risk parity group."

Bivariate Analysis

Table 5. Association Between Maternal Age and the Incidence of Low Birth Weight (LBW) at RSUD Dr. Pirngadi Medan, 2022–2023

Maternal	LBW	LBW	Total	p-

Age	**(Yes)**	**(No/Normal)**		**value**
	n (%)	**n (%)**	**n (%)**	
High Risk (<20 or >35 years)	66 (55.4%)	17 (14.3%)	83 (69.7%)	
Low Risk (20–35 years)	22 (18.5%)	14 (11.8%)	36 (30.3%)	**0.036**
Total	**88 (73.9%)**	**31 (26.1%)**	**119 (100.0%)**	

Based on Table 5, it is observed that among the 88 mothers (73.9%) who gave birth to infants with LBW, 66 mothers (55.4%) were in the high-risk age group, while 22 mothers (18.5%) were in the low-risk age group. Furthermore, among the 31 mothers (26.1%) whose infants did not have LBW, 17 mothers (14.3%) were in the high-risk age group, and 14 mothers (11.8%) were in the low-risk age group. The results of the Chi-Square statistical test yielded a p-value of 0.036. Since the p-value is less than 0.05, it indicates that there is a statistically significant association between maternal age and the incidence of Low Birth Weight (LBW) at RSUD Dr. Pirngadi Medan for the period of 2022–2023."

Table 6. Association Between Maternal Hemoglobin (Hb) Levels and the Incidence of Low Birth Weight (LBW) at RSUD Dr. Pirngadi Medan, 2022–2023

Hemoglobin Level	LBW (Yes)	LBW (No/Normal)	Total	p-value
	n (%)	n (%)	n (%)	
Anemia (< 11 g/dL)	65 (54.6%)	16 (13.5%)	81 (68.1%)	
Normal (≥ 11 g/dL)	23 (19.3%)	15 (12.6%)	38 (31.9%)	0.022
Total	88 (73.9%)	31 (26.1%)	119 (100.0%)	

Based on Table 4.6, it is observed that among the 88 mothers (73.9%) who gave birth to infants with LBW, 65 mothers (54.6%) were anemic, while 23 mothers (19.3%) had normal hemoglobin levels. Furthermore, among the 31 mothers (26.1%) whose infants did not have LBW, 16 mothers (13.5%) were anemic, and 15 mothers (12.6%) had normal hemoglobin levels. The Chi-Square statistical test yielded a p-value of 0.022. Since the p-value is less than 0.05, it indicates that there is a statistically significant association between maternal hemoglobin levels and the incidence of Low Birth Weight (LBW) at RSUD Dr. Pirngadi Medan for the period of 2022–2023.

DISCUSSION

Association Between Maternal Age and Low Birth Weight (LBW)

The results of this study, as shown in Table 5, indicate a significant association between maternal age and the incidence of LBW, with a p-value of 0.036. Data revealed that of the 88 mothers who gave birth to LBW infants, 66 (55.4%) were in the high-risk age category, while 22 (18.5%) were in the low-risk category. Conversely, among the 31 mothers with normal-weight infants, 17 (14.3%) were high-risk and 14 (11.8%) were low-risk.

These findings align with research by Annisa Khoiriah, which reported a p-value of 0.003, showing that 52.4% of high-risk age respondents experienced LBW compared to 20.4% in the low-risk group. Khoiriah suggests that maternal age is a critical risk factor; women pregnant under 20 years old often have suboptimal reproductive organ development and physiological functions. Furthermore, psychological immaturity at this age may hinder the ability to manage pregnancy, often leading to complications. Conversely, pregnancy over 35 years old is discouraged due to the increased prevalence of degenerative diseases such as hypertension and benign tumors. During labor, women over 35 may face difficulties due to weakened uterine contractions and pelvic floor abnormalities.

This study is further supported by Nunung Nurbaiti et al., who found that 37.2% of high-risk age mothers had LBW infants compared to 13% in the low-risk group (p = 0.000). The theory suggests that biologically and mentally, mothers under 20 are often unstable, which may

lead to neglect of nutritional needs and decreased immunity. Similarly, Windah Wahyuni et al. found a significant association (p = 0.006), noting the highest percentage of LBW in mothers < 20 and > 35 years old due to immature reproductive organs in the former and degenerative risks and impaired uterine contractions in the latter.

Association Between Hemoglobin (Hb) Levels and LBW

The bivariate analysis in Table 6 demonstrates a significant association between maternal Hb levels and LBW (p = 0.022). Among mothers with LBW infants, 65 (54.6%) were anemic, while 23 (19.3%) had normal Hb levels. Among mothers with normal-weight infants, 16 (13.5%) were anemic and 15 (12.6%) were normal.

This is consistent with research by Albert Luis et al. (p = 0.005), which posits that anemia causes impaired uteroplacental oxygenation, hindering optimal intrauterine fetal growth. Reduced blood oxygen leads to fetal hypoxia, directly impacting birth weight. Pregnancy requires adequate blood flow to support placental and fetal nutrition. Hypoxia induces oxidative stress—an imbalance between free radicals and antioxidants. In cases of intrauterine malnutrition, antioxidant levels drop due to a lack of essential micronutrients, further disrupting growth. As pregnancy progresses, declining Hb levels can lead to anemia-induced hypoxia and reduced uterine blood flow, resulting in fetal asphyxia and LBW.

Association Between Parity and LBW

As shown in Table 7, there is a significant association between parity and LBW (p = 0.031). Among 88 mothers with LBW infants, 71 (59.6%) were in the high-risk parity group, while 17 (14.3%) were in the low-risk group.

These results mirror findings by Windah Wahyuni et al. (p = 0.005), where 60.5% of high-risk parity mothers experienced LBW. Generally, a parity of 2 or 3 is considered the safest regarding maternal mortality and LBW risk. Health risks for both mother and child increase during the first, fourth, and subsequent deliveries. Primiparity (first delivery) increases the risk of preterm labor and LBW because the reproductive system has not previously accommodated a pregnancy.

The researcher assumes that parity is a key determinant of LBW, consistent with Juliana Sembiring et al., who state that while the second and third children are safest, the first or more than three deliveries have adverse impacts. High parity (> 3) is associated with higher maternal mortality and a higher risk of LBW or congenital disabilities. Additionally, the researcher notes that primiparous mothers often experience high anxiety regarding their first pregnancy and delivery process, which can lead to inadequate nutritional intake, thereby increasing the risk of LBW. This is also supported by Elisa Situmorang et al. (p = 0.001) and WHO guidelines, which state that primiparous infants often weigh less due to the initial "trial" of the reproductive organs and the mother's potential lack of knowledge regarding prenatal nutrition and care.

CONCLUSION

1. Based on the frequency distribution of maternal age, 83 mothers (69.7%) were in the high-risk age category, while 36 mothers (30.3%) were in the low-risk age category at RSUD Dr. Pirngadi Medan during 2022–2023.
2. Based on the frequency distribution of hemoglobin levels, 81 mothers (68.1%) were categorized as anemic, while 38 mothers (31.9%) had normal hemoglobin levels at RSUD Dr. Pirngadi Medan during 2022–2023.
3. Based on the frequency distribution of maternal parity, 90 mothers (75.5%) were in the high-risk parity category, while 29 mothers (24.4%) were in the low-risk parity category at RSUD Dr. Pirngadi Medan during 2022–2023.
4. Based on the frequency distribution of Low Birth Weight (LBW), 88 infants (73.9%) were born with LBW, while 31 infants (26.1%) had a normal birth

weight at RSUD Dr. Pirngadi Medan during 2022–2023.

5. Bivariate analysis between maternal age and LBW showed that among the 88 infants with LBW, 66 (55.4%) were born to mothers in the high-risk age group and 22 (18.5%) to mothers in the low-risk age group. The Chi-Square test yielded a p-value of 0.036, indicating a significant association between maternal age and the incidence of LBW.
6. Bivariate analysis between hemoglobin levels and LBW showed that among the 88 infants with LBW, 65 (54.6%) were born to anemic mothers and 23 (19.3%) to mothers with normal hemoglobin levels. The Chi-Square test yielded a p-value of 0.022, indicating a significant association between maternal hemoglobin levels and the incidence of LBW.
7. Bivariate analysis between maternal parity and LBW showed that among the 88 infants with LBW, 71 (59.6%) were born to mothers in the high-risk parity group and 17 (14.3%) to mothers in the low-risk parity group. The Chi-Square test yielded a p-value of 0.031, indicating a significant association between maternal parity and the incidence of LBW.

SUGGESTIONS

1. For the Healthcare Institution: The findings should serve as an evaluation tool to better identify risk factors associated with LBW. It is recommended that the institution enhances its management protocols to ensure prompt, precise, and responsive care, thereby preventing complications for both the mother and the fetus.
2. For Future Researchers: It is expected that future studies will investigate other potential risk variables that contribute to the incidence of LBW to provide a more comprehensive understanding of the condition.
3. For Pregnant Women: Expectant mothers are encouraged to maintain optimal nutritional intake throughout their pregnancy to mitigate risks and prevent adverse health outcomes for both themselves and their fetuses.

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