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Preeclampsia severity and low birth weight among newborns

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Abstract

Background: Severe preeclampsia remains a major obstetric complication contributing to maternal and neonatal morbidity and mortality. Impaired uteroplacental perfusion associated with severe preeclampsia may restrict fetal growth and increase the risk of low birth weight (LBW). However, previous studies have reported inconsistent findings regarding this association.

Purpose: To examine the relationship between severe preeclampsia and low birth weight (LBW) incidents.

Method: A quantitative correlational study with a retrospective analytical study design was conducted. A total of 97 respondents were selected through purposive sampling from 544 eligible delivery cases. Secondary data were obtained from maternal and neonatal medical records. Univariate analysis was used to describe respondent characteristics, while the Chi-square test was employed for bivariate analysis with a significance level of $p < 0.05$.

Results: The majority of mothers experienced severe preeclampsia (60.8%), and most infants were born with LBW (61.9%). Statistical analysis revealed a significant association between severe preeclampsia and LBW incidence ($p = 0.018$). Mothers with severe preeclampsia were more likely to deliver LBW infants (43.3%) compared with those without severe preeclampsia (18.6%).

Conclusion: Severe preeclampsia is significantly associated with the occurrence of LBW. These findings highlight the importance of early detection, close monitoring, and effective management of preeclampsia during pregnancy to reduce the risk of LBW and improve maternal and neonatal health outcomes.

Keywords: High-Risk Pregnancy; Low Birth Weight; Maternal Health; Neonatal Outcomes; Severe Preeclampsia.

INTRODUCTION

Preeclampsia is a pregnancy-specific syndrome characterized by hypertension and proteinuria, generally occurring at a gestational age of 20 weeks or older (Fendiputra, Lalenoh, & Posangi, 2025). Preeclampsia is defined as an increase in systolic and diastolic blood pressure exceeding 140/90 mmHg in pregnant women who previously had normal blood pressure, accompanied by proteinuria (+1 to +4) after 20 weeks of pregnancy (Odang, Sir, & Hinga, 2023).

To date, preeclampsia remains a threatening problem in pregnancy, closely related to the maternal mortality rate (MMR), especially in developing countries. The World Health Organization (WHO)

states that approximately 585,000 mothers die each year during pregnancy or childbirth, of whom 58.1% die from preeclampsia (Akib & Limbong, 2024). According to Indonesia's health profile in 2021, the incidence rate of preeclampsia in Indonesia is 128,273 per year, which is approximately 5.3%. Hypertension in pregnancy is responsible for 1,077 maternal deaths (World Health Organization, 2025).

The cause of the high maternal mortality rate (MMR) is hypertension in pregnancy, which includes severe preeclampsia, also known as severe preeclampsia (Lestari, Hanifah, & Putri, 2024). Preeclampsia occurs due to placental abnormalities,

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which result in a decreased supply of nutrients and oxygen to the fetus, causing intrauterine growth restriction (IUGR), which is one manifestation of low birth weight (LBW) (Akib & Limbong, 2024).

The World Health Organization (WHO) notes that around 96% of LBW incidents worldwide occur in developing countries (World Health Organization, 2023). Indonesia, as one of the developing countries, ranks third for the highest prevalence of LBW (11.1%), after India (27.6%) and South Africa (13.2%). In 2021, 111,719 (2.5%) of weighed babies were found to have LBW out of 4,443,095 live births. Neonatal deaths in Indonesia are also most often caused by LBW, with a percentage reaching 34.5% (Ministry of Health of the Republic of Indonesia, 2022). The trend in the infant mortality rate (IMR) in Indonesia has shown a decrease; however, efforts are still needed to accelerate and maintain this momentum so that the IMR target of 16 per 1,000 live births can be achieved by the end of 2024 (Setiyaningsih, Zakiah, Prihatanti, & Hapisah, 2025). The incidence of LBW in West Java in 2022 was 19,971 (Central Statistics Agency, 2023).

LBW is the main cause of increased mortality, morbidity, and disability among neonates, infants, and children, and experiencing LBW can have long-term effects throughout life. LBW has become a complex problem due to its relatively high risk of malformations compared to the general infant population (UNICEF, 2023). Due to incomplete maturation and weak organ systems, LBW infants are at risk for growth and developmental disorders, and even death (Syafira, Wirniaty, & Zachreini, 2026).

LBW is caused by several factors, namely maternal, fetal, and placental factors. One maternal factor that can cause LBW is the presence of maternal disease during pregnancy. One maternal disease that can affect the baby's birth weight is preeclampsia. Pregnant women with preeclampsia may develop intrauterine growth restriction, resulting in babies that are much smaller and weaker than expected. This condition may result in infants being born with low birth weight (Lempow, Sari, & Darsono, 2023).

Mothers with preeclampsia have a fourfold higher risk of delivering LBW infants than those without preeclampsia (Pradnyaningrum, 2018). This demonstrates the importance of careful monitoring

and management of pregnancies with preeclampsia to reduce the risk of complications in newborns (Srimulyawati, Septina, Heriyanto, & Kartina, 2024). However, a study by Nur'aisyah (2019) showed different results, indicating no association between preeclampsia and LBW (Setiyaningsih et al., 2025).

Although some studies have not found a relationship between severe preeclampsia and LBW, others have shown a relationship between severe preeclampsia and LBW. Therefore, this study aimed to determine whether there was a relationship between severe preeclampsia and LBW at dr. Slamet Garut Hospital. The Garut Regency is one of the regions with a LBW cases, accompanied by an increasing trend each year. According to the Garut health office, in 2022 there were 1.494 LBW cases (3.19%), in 2023 there were 1.762 cases (4.42%), and in 2024 there were 1.835 cases (Garut City and District Health Office, 2024).

RESEARCH METHOD

This study employed a quantitative correlational design with a retrospective analytical study approach to examine the relationship between severe preeclampsia and low birth weight (LBW) incidence. The a retrospective analytical study design was selected because it allows for the assessment of the relationship between independent and dependent variables simultaneously at a single point in time without manipulating any study variables.

This study was conducted at Dr. Slamet Regional General Hospital, Garut, West Java, Indonesia. The target population consisted of the target population consisted of all women diagnosed with preeclampsia who delivered at Dr. Slamet Regional General Hospital during the study period who delivered at the hospital during the study period, totaling 544 cases. The sample size was determined using the Cochran formula, with a 95% confidence level and a 10% margin of error. Based on the calculation, the minimum required sample size was 97. Sampling was conducted using a purposive sampling technique by selecting medical records that met predetermined eligibility criteria.

The inclusion criteria were as follows: (1) Mothers diagnosed with preeclampsia, (2) infants born to mothers with preeclampsia, (3) mothers who experienced preeclampsia during the second or third

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trimester of pregnancy, (4) availability of neonatal birth weight data, and (5) complete maternal and neonatal medical records. The exclusion criteria were as follows: (1) mothers with chronic hypertension, (2) mothers with comorbid conditions that could affect birth weight, such as diabetes mellitus, cardiovascular disease, or other related disorders, (3) multiple pregnancies, (4) incomplete medical records, and (5) intrauterine fetal death before delivery.

Data were collected using secondary data obtained from maternal and neonatal medical records. The independent variable was severe preeclampsia, defined as blood pressure $\geq 160/110$ mmHg accompanied by proteinuria. The dependent variable was low birth weight (LBW), defined as a birth weight of less than 2,500 grams. Data regarding maternal diagnosis and neonatal birth weight were

extracted from hospital medical records using a structured data collection form.

The study utilized secondary data; therefore, validity and reliability testing of the research instruments were not performed. The data collection process included editing, coding, data entry, and data cleaning to ensure data completeness and accuracy prior to analysis. Data analysis consisted of univariate and bivariate analyses. Univariate analysis was used to describe the characteristics of the study variables and was presented as frequencies and percentages. Bivariate analysis was performed using the chi-square test to examine the relationship between severe preeclampsia and the incidence of LBW. Statistical significance was determined at a p-value of < 0.05 .

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RESEARCH RESULTS

Table Characteristics of Respondent (N=97)

Variable	Results	P-value
Age (Mean±SD) (Years) (Range)	(31.92 ± 7.15) (18-45)	
High Risk (<20)	5/5.2	
No Risk (20-35)	55/56.7	
High Risk (>35)	37/37.0	
Parity (n/%)		
Primiparous: Parity 1	19/19.6	
Multiparous: Parity ≥2	78/80.4	
Gestational Age (n/%)		
Preterm: <37 weeks	56/57.7	
Term: ≥37 weeks	41/42.3	
Education (n/%)		
No School	3/3.1	
Elementary School	35/36.1	
Junior High School	17/15.5	
Senior High School	40/41.1	
Bachelor	2/3.1	
Preeclampsia (n/%)		0.018
Severe	59/61.0	
Non-Severe	38/40.0	
Birth Weight (n/%)		
Low Birth Weight (LBW)	60/62.0	
Non-Low Birth Weight (LBW)	37/38.0	

Based on Table, it shows that the majority of respondents are aged 20–35 years, totaling 55 respondents (26.7%). Most respondents were multiparous, totaling 78 respondents (80.4%). Most pregnancies were at gestational age <37 weeks, with 56 respondents (57.7%). The majority of respondents' last education level was senior high school, with 40 respondents (41.1%). the majority had severe preeclampsia, totaling 59 respondents (60.8%), the majority of respondents gave birth to babies with low birth weight (LBW), totaling 60 babies (61.9%). the percentage of LBW with severe preeclampsia was higher, totaling 24 respondents (43.3%), compared to the percentage of babies

without LBW and without severe preeclampsia, totaling 20 respondents (20.6%). The results of the statistical test using the chi-square test yielded a significant p-value of $p = 0.018$ ($p < 0.05$), indicating a significant association between severe preeclampsia and the incidence of LBW.

DISCUSSION

Based on the results of a study conducted with 97 respondents, it was found that most pregnant women experienced severe preeclampsia (59 respondents, 60.8%). Preeclampsia is a pregnancy disorder characterized by elevated blood pressure and proteinuria due to failure of spiral artery remodeling,

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causing placental ischemia; this condition triggers an increase in antiangiogenic and proinflammatory factors that can disrupt uteroplacental perfusion (Srimulyawati et al., 2024).

The high rate of severe preeclampsia in this study may be associated with respondent characteristics, the majority of whom were in the high-risk age group (>35 years), multiparous, and had a gestational age of less than 37 weeks. These factors are known to play a role in increasing the risk of pregnancy complications, including preeclampsia. This finding is consistent with the previous research of who stated that severe preeclampsia is a pregnancy complication associated with an increased risk of maternal and neonatal disorders (Wang, Zeng, Liu, & Zhang, 2022).

Studies have shown that preeclampsia is associated with an increased risk of chronic hypertension, ischemic heart disease, and stroke in mothers later in life. The results of this study indicate that early detection of risk factors and monitoring blood pressure during pregnancy through antenatal care (ANC) services needs to be continually enhanced (Jamilah & Sari, 2024).

This study also showed that most babies were born with low birth weight (LBW), totaling 60 babies (61.9%). LBW refers to infants born weighing less than 2,500 g and is an important indicator of neonatal health. Babies with LBW are at a higher risk of growth disorders, infections, developmental problems, and increased morbidity and mortality in both neonatal and long-term periods (Cahyani, Dahliah, Makmun, Kamaluddin, & Darma, 2024). The high incidence of LBW in this study indicates that there are still risk factors during pregnancy that affect fetal growth.

One of the factors contributing to LBW is impaired blood flow to the placenta, which results in the fetus not receiving optimal oxygen and nutrients (Gaccioli & Lager, 2016). This condition is often found in mothers with severe preeclampsia. This is supported another research, which states that severe preeclampsia can cause vasospasm of the placental blood vessels, thereby inhibiting fetal growth in utero (intrauterine growth restriction / IUGR) and increasing the risk of delivering a baby with LBW. Most respondents in this study had a gestational age of less than 37 weeks, which is also a risk factor for LBW (Muhasidah & Sumira, 2020).

Bivariate analysis results show that the Chi-square test yielded a p-value of 0.018 ($p < 0.05$), indicating a significant association between severe preeclampsia and incidence of LBW. Mothers with severe preeclampsia delivered more LBW babies (43.3%) than mothers without severe preeclampsia (18.6%). These results indicate that severe preeclampsia is a risk factor contributing to LBW.

This association may be influenced by several maternal characteristics also observed in this study. Most respondents were in the high-risk age group (>35 years), multiparous, and had a gestational age of < 37 weeks. Age outside the healthy reproductive range (20–35 years) is known to increase the risk of pregnancy complications, including preeclampsia and LBW (Karlina, 2016).

Another study also reported that mothers aged >35 years had a 1.8-fold higher risk of delivering LBW babies compared to mothers of healthy reproductive age (Putri & Sari, 2021). In addition, high parity can increase the risk of vascular disorders that impact placental perfusion, while gestational age of < 37 weeks is one of the factors closely associated with LBW (Handayani & Kartini, 2025).

The findings of this study are consistent who reported that severe preeclampsia increases the risk of LBW by 2–3 times ($OR = 2.52$) (Wang et al., 2022). Similar findings were also reported by Maria (2021), who found that mothers with severe preeclampsia have a 3.1-fold greater risk of delivering LBW babies compared to mothers without preeclampsia. Furthermore, another research found a significant association between hypertension in pregnancy and LBW (Pratiwi & Suciawati, 2022).

Physiologically, preeclampsia causes uteroplacental perfusion disorders due to ischemia and vasospasm of the placental blood vessels, resulting in a reduced supply of oxygen and nutrients to the fetus (Hu & Zhang, 2021). This condition can inhibit fetal growth and increase the risk of babies being born with low birth weight (Srimulyawati et al., 2024). These findings highlight the importance of early detection and management of preeclampsia during pregnancy to reduce the incidence of LBW.

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CONCLUSION

Based on the research results, most respondents experienced severe preeclampsia (60.8%), and the majority of infants were born with LBW (61.9%). The Chi-square test results showed a significant association between severe preeclampsia and the incidence of LBW ($p=0.018$). These findings indicate that mothers with severe preeclampsia have a higher risk of delivering infants with LBW compared to mothers without severe preeclampsia. Therefore, early detection and management of preeclampsia during pregnancy need to be improved to reduce the incidence of LBW.

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