

Preeclampsia as a Risk Factor for Low Birth Weight: A Case-Control Study at Drs. H. Amri Tambunan Hospital

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Abstract: Preeclampsia is one of the complications of pregnancy that can disrupt blood flow to the placenta so that the intake of nutrients to the fetus is disrupted and at risk of causing low birth weight (LBW). This study aims to determine the relationship between preeclampsia and the incidence of LBW at Drs. H. Amri Tambunan Hospital. Observational analytical research type with a case-control design. The sample totalled 176 postpartum patients for the period July 2021-August 2024, which were taken using consecutive sampling. Data analysis used the Chi-Square test with SPSS. The results of this study were 88 cases of preeclampsia and 88 cases of non-preeclampsia. In the preeclampsia group, 72 infants (81.8%) had LBW and 16 infants (18.2%) did not have LBW. In the non-preeclampsia group, 11 infants (12.5%) experienced LBW, and 77 infants (87.5%) did not have LBW. The results of the chi-square test showed a value of $p=0.000$ ($p<0.05$). There is a significant relationship between preeclampsia and the incidence of LBW at Drs. H. Amri Tambunan Hospital.

Keywords: Low birth weight; case-control; preeclampsia

INTRODUCTION

Pregnancy is a biologically normal special condition in a woman's life. In general, gestational age lasts for 280 days (40 weeks).¹⁻⁵ During pregnancy, it is very susceptible to complications that can harm the fetus and mother and even cause death. Indonesia is one of the countries with the highest maternal mortality rate (MMR) in Southeast Asia, with a total of 4,627

maternal deaths. The three main causes of maternal death in Indonesia are bleeding, infection, and preeclampsia.^{2,3,6}

Preeclampsia is a pregnancy complication characterised by high blood pressure, proteinuria, and oedema that can lead to seizures and even coma. In mothers with preeclampsia, the risk of Intrauterine Growth Restriction (IGR) and preterm birth increases, thus increasing the risk of low

birth weight (LBW) babies.^{3,7,8} Preeclampsia cases in Indonesia reached 128,273 per year. Maternal endothelial dysfunction that occurs in preeclampsia will cause placental ischemia so that the baby does not get enough nutrition and oxygen, which eventually leads to the occurrence of LBW.^{4,6,9}

By definition, LBW is a baby born weighing less than 2,500 grams. LBW babies are at high risk of death early in life as well as long-term growth and health problems. In 2020, LBW was the largest cause of neonatal deaths in Indonesia at 35.2%.^{5,10,11} Based on this background, this study aims to determine the relationship between preeclampsia and the incidence of LBW at Drs. H. Amri Tambunan Hospital.

METHODS

This study is an observational analytical research with a case-control design which was carried out in August–October 2024 at Drs. H. Amri Tambunan Hospital, Lubuk Pakam, Deli Serdang Regency, North Sumatra. The research population is all postpartum patients at Drs. H. Amri Tambunan Hospital for the period of July 2021-August 2024, with a total of 176 people.

Sampling was carried out using a non-probability sampling technique of the consecutive sampling type. The inclusion criteria are all postpartum patients with complete medical record data. The sample consisted of 88 cases of preeclampsia and 88 cases of non-preeclampsia. The data used are secondary data from the patient's medical records.

The data analysis carried out was univariate analysis to describe each variable based on number and percentage, as well as bivariate analysis to see the relationship

between preeclampsia and LBW using the Chi-Square test through SPSS with a Phi value of $p < 0.05$ as the significance limit.

RESULTS

The research was carried out at Drs. H. Amri Tambunan Hospital. The incidence of preeclampsia from 2021–2024 was 176 patients. Samples were taken from 88 preeclampsia patients and 88 non-preeclampsia patients. Data collection took place from October 1, 2024, to October 11, 2024, through medical record data.

Table 1. Distribution of Frequency of Low Birth Weight Incidence (LBW) at Drs. H. Amri Tambunan Hospital

LBW	Preeclampsia		Total N (%)
	Preeclampsia N (%)	Non Preeclampsia N (%)	
LBW (< 2500 gram)	72 (81.8)	11 (12.5)	83 (47.2)
Non LBW (≥ 2500 gram)	16 (18.2)	77 (87.5)	93 (52.8)
Total	88 (100)	88 (100)	176 (100)
P value	0,000		

Based on Table 1, in the preeclampsia group there were 72 (81.8%) cases of LBW and 16 (18.2%) cases of non-LBW. In the non-preeclampsia group, there were 11 (12.5%) cases of LBW and 77 (87.5%) cases of non-LBW. The results of the chi-square test showed a value of $p = 0.000$ ($p < 0.05$) which means that there is a significant relationship between preeclampsia and the incidence of LBW at Drs. H. Amri Tambunan Hospital.

DISCUSSION

The results of this study showed that out of 88 mothers with preeclampsia, as many as 72 (81.8%) gave birth to babies with

low birth weight (LBW). These findings reinforce the evidence that preeclampsia is a significant risk factor for the occurrence of LBW. These results are in line with previous studies that reported that the proportion of LBW babies in mothers with preeclampsia reached 77.0%, much higher than in mothers without preeclampsia, with a statistically significant difference ($p < 0.001$).^{6,11-13} The consistency of these findings suggests that the association between preeclampsia and LBW is strong and has been confirmed in a wide range of populations.

Pathophysiologically, preeclampsia is characterised by the presence of systemic endothelial dysfunction that leads to uteroplacental perfusion disorders. This process begins with a failure of the spiral artery remodelling in early pregnancy, which causes the blood vessels to remain in a state of high resistance. As a result, blood flow to the placenta becomes suboptimal and causes hypoxia and placental ischemia.^{4,14,15} This condition interferes with the function of the placenta as the main organ in the exchange of oxygen and nutrition between mother and fetus. In addition, the release of antiangiogenic factors such as sFlt-1 and endoglin also exacerbates endothelial dysfunction and causes an imbalance of angiogenesis. The final impact is inhibition of intrauterine growth *restriction* (IUGR), which is clinically manifested as LBW.^{16,17}

The findings of this study are also strengthened by the results of a study at Embung Fatimah Hospital, Batam City, which shows a meaningful relationship between preeclampsia and the incidence of LBW, with an Odds Ratio value of 13,500 (95% CI).^{7,18} This high OR value indicates that preeclampsia is not only a risk factor, but is a strong determinant of the occurrence of LBW. Epidemiologically, this indicates that mothers with preeclampsia are up to 13

times more likely to give birth to babies with LBW compared to mothers without preeclampsia. The magnitude of this risk also reflects the importance of early detection and management of preeclampsia as the main strategy in reducing the incidence of LBW.^{19,20}

However, in this study, several cases of babies with normal birth weight were also found to be born to mothers with preeclampsia. This shows that preeclampsia does not always lead to LBW, as there are protective factors that can modify its impact. These factors include the mother's good nutritional status, adherence to antenatal care (ANC) visits, optimal blood pressure control, and appropriate medical interventions. In addition, the severity of preeclampsia and gestational age at onset also play an important role; Mild preeclampsia or those that occur at gestational age near term tend to have a smaller impact on fetal growth.

Thus, it can be concluded that preeclampsia has a strong and significant relationship with the occurrence of LBW through the mechanism of placental perfusion disorders and fetal growth inhibition. However, pregnancy outcomes are still influenced by a variety of other factors that are multifactorial, so a comprehensive approach in pregnancy care is needed to minimise these risks.

CONCLUSION

There was a significant relationship between preeclampsia and the incidence of low birth weight (LBW) at Drs. H. Amri Tambunan Hospital for the period July 2021–June 2024 ($p = 0.000$). Mothers with preeclampsia are at a higher risk of giving birth to babies with LBW than mothers without preeclampsia.

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