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Frequency and risk factors associated with Low Birth Weight (LBW) at Bandung Regional General Hospital Indonesia

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Abstract

Low birth weight (LBW) was the highest contributor to the infant mortality rate at 52.4% in Bandung, Indonesia. The purpose of this study was to examine the incidence of LBW and associated risk factors. This study used a retrospective cross-sectional approach to identify 233 newborns with low birth weight from January to December 2022. The dependent (LBW) and independent variables (risk factors) were analyzed with a chi-square and Multivariate logistic regression test. The results in the bivariate analysis of this study were LBW was associated with preeclampsia (p = 0.001), gestational age (p = 0.000), premature rupture of the membranes (PROM) (p = 0.000), oligohydramnios (p = 0.019), multiple pregnancy (p = 0.000), and intrauterine growth restriction (IUGR) (p = 0.000). In multivariate analysis, LBW was associated with preeclampsia (p = 0.040 OR 1.806 CI 95% 1.028-3.173), gestational age (p = 0.000 OR 18.365 CI 95% 12.272-27.484), PROM (p = 0.007 OR 0.514 CI 95% 0.317-0.832), multiple pregnancy (p = 0.000 OR 4.934 CI 95% 2.246-10.841), and IUGR (p = 0.000 OR 0.043 CI 95% 0.018-0.107). Meanwhile, oligohydramnios was not associated with LBW (p = 0.099 OR 2.004 CI 95% 0.018-0.107).

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Contents

1 Introduction

Low birth weight (LBW) remains an important global public health problem, and it plays a vital role in determining the survival of newborns in vulnerable conditions (Faadhillah, 2020). Low birth weight is associated with fetal and neonatal morbidity and mortality, impairment of growth, and higher risk of stunted growth, lower IQ, and adult-onset chronic conditions (Lake & Fite, 2019; K'Oloo et al., 2023). According to the World Health Organization (WHO) definition, newborns with a birth weight of less than 2500g regardless of their gestational age are considered low birth weight newborns (World Health Organization, 2023).
Fetal exposure to risk factors such as maternal unfavorable, socioeconomic conditions, smoking habits, malnutrition, diseases, and lack of attention to prenatal care and delivery can contribute to LBW incidence (Lake & Fite, 2019). There is wide variation in the prevalence of low birth weight across regions. However, evidence shows that nearly half of low birth weight occurs in low and middle-income countries, especially in the most vulnerable populations (Thapa et al., 2022). It also predicts neonatal mortality, child malnutrition, and cardiovascular disease risks in adulthood.

The prevalence of low birth weight across the globe accounts for 15.5%, which means each year from 130 million annual births, 20 million are low birth weight (Lake & Fite, 2019). In South Asia, the neonatal mortality rate is estimated to be between 23 and 27 per 1,000 live births. In 2021, a child born in South Asia was nine times more likely to die. Low birth weight affects 1 in 7 newborns worldwide. According to Basic Health Research (RISKESDAS) in 2018, the mean proportion of LBW in Indonesia was 6.2%, while West Java showed 6.3% (Dinas Kesehatan Jawa Barat, 2019). LBW was the highest contributor to the infant mortality rate in Bandung Regency at 52.4% (World Health Organization, 2023).

Understanding the incidence and influencing risk factors of LBW is important for health workers, hospital administrators, and policymakers because it can be used to implement the right strategies for LBW prevention. Therefore, this study aimed to examine the incidence of LBW and associated risk factors during pregnancy or delivery (Singh et al., 2009; De Bernabé et al., 2004).

2 Materials and Methods

This research is analytic survey research with a cross-sectional approach where all the objects studied will be observed simultaneously. The study was conducted from January to December 2022 at Bandung Regional General Hospital, Indonesia. All data collected from secondary medical record data at the Bandung Regional General Hospital in 2022, accessed directly from the medical record data with permission from the Bandung Regional General Hospital, will be kept confidential. The data contained in the medical record is not all available as needed by the researcher, so the researcher adjusts to the availability of existing data.

The population in this study were all babies born alive from January to December 2022 at Bandung Regional General Hospital, with a total sample of 1336 newborns. The sample size is determined using total sampling technique. The source of data in this study is secondary data from medical record. The variables taken are LBW as a dependent variable, and independent variable risk factors consist of gestational age,

preeclampsia, PROM, oligohydramnios, multiple pregnancy, and IUGR (Jung et al., 2022; Conde-Agudelo et al., 2008).

The results of this study were analyzed by univariate and bivariate analysis using the chi-square test with a significant level of p-value = 0.05. The relationship between LBW and risk factors was analyzed using logistic regression. Logistic regression results were reported as odds ratio 95% confidence interval and p-value.

3 Results and Discussions

3.1 Result

From January to December 2022, there were 1336 who were born in Bandung Regional General Hospital, Indonesia. Among these, 233 (17.4%) were LBW and 1103 (82.6%) were normal birth weight. The results of this study are divided into univariable, bivariable, and multivariate analyses to assess the relationship between dependent (LBW) and independent variables (preeclampsia, gestational age, PROM, oligohydramnios, multiple pregnancy, and IUGR) at Bandung Regional General Hospital. The following table shows the univariate analysis results of low birth weight, preeclampsia, gestational age, PROM, oligohydramnios, multiple pregnancy, and IUGR at Bandung Regional General Hospital.

Table 1
Frequency Distribution

Variable	Category	N	%
Low Birth Weight	≥ 2500 gr	1103	82.6%
	<2500 gr	233	17.4%
Preeclampsia	Normal	1239	92.7%
	PEB	97	7.3%
Gestational Age	≥ 37 weeks	1183	88.5%
	<37 weeks	153	11.5%
PROM	Non	1044	78.1%
	PROM	292	21.9%
Oligohydramnios	Non	1294	96.9%
	Oligohydramnios	42	3.1%
multiple Pregnancy	Single	1299	97.2%
	multiple	37	2.8%
IUGR	Non	1304	97.6%
	IUGR	32	2.4%

Table 2
Bivariate Analysis Between Low Birth Weight And Risk Factor

Variable	Category	>2500 gr	%	<2500 gr	%	P Value	CI 95%
Preeclampsia	Normal	1239	92.7%	203	87.1%	0.001	1.448-3.606
	PEB	97	7.3%	30	12.9%		
Gestational Age	≥ 37 weeks	1183	88.5%	130	55.8%	0.000	11.367-
	<37 weeks	153	11.5%	103	44.2%		24.493
PROM	Non	1044	78.1%	205	87.9%	0.000	0.286-0.660
	PROM	292	21.9%	28	12.1%		
Oligohydramnios	Non	1294	96.9%	220	94.4%	0.019	1.120-4.277
	Oligohydramnios	42	3.1%	13	5.6%		
Multiple	Single	1299	97.2%	213	91.4%	0.000	3.091-11.641
Pregnancy	Multiple	37	2.8%	20	8.6%		
IUGR	Non	1304	97.6%	208	89.3%	0.000	8.034-44.079
	IUGR	32	2.4%	25	10.7%		

The bivariate test determines the correlation between the dependent and each independent variable (preeclampsia, gestational age, PROM, oligohydramnios, multiple pregnancy, and IUGR). Table 2 shows the result of the bivariate test between LBW and preeclampsia (p-value = 0.001), gestational age (p-value = 0.000), PROM (p-value = 0.000), oligohydramnios (p-value = 0.019), multiple pregnancy (p-value = 0.000), and IUGR (p-value = 0.000). That result indicated a correlation between LBW and each independent variable.

Table 3
Multivariate Analysis

Variable	P Value	OR	CI 95%
Preeclampsia	0.040	1.806	1.028-3.173
Gestational Age (<37 weeks)	0.000	18.365	12.272-27.484
PROM	0.007	0.514	0.317-0.832
Oligohydramnios	0.099	2.004	0.878-4.575
Multiple Pregnancy	0.000	4.934	2.246-10.841
IUGR	0.000	0.043	0.018-0.107

The multivariate test using multiple logistic regression determines the correlation between dependent with overall independent significant variables from bivariate analysis. Table 3 shows that LBW was correlated with preeclampsia (p-value = 0.040 OR 1.806 and CI 95% 1.028-3.173), gestational age <37 weeks (p-value = 0.000 OR 0.514 CI 95% 12.272-27.484), PROM (p-value = 0.007 OR 0.514 CI 95% 0.317-0.832), multiple pregnancy (p-value = 0.000 OR 4.934 CI 95% 2.246-10.841), and IUGR (p-value = 0.000 OR 0.043 CI 95% 0.018-0.107). Meanwhile, there is no correlation between LBW and oligohydramnios (p-value = 0.099 OR 4.934 CI 95% 0.878-4.575). The data analyzed showed that the factors that caused low birth weight were preeclampsia, gestational age (<37 weeks), PROM, multiple pregnancies, and IUGR.

3.2 Discussions

The characteristics variables in this study were grouped based on LBW and risk factors consisting of preeclampsia, gestational age, PROM, oligohydramnios, multiple pregnancy, and IUGR (Armengaud et al., 2021; Lausman et al., 2012). Low birth weight is critical for neonatal survival, physical health, and development, so it is recommended to healthcare workers and policymakers to make an appropriate interventions to improve women's health before, during, and after pregnancy. A total of 1.336 mother-infant pairs were included in this study, and the incidence of neonatal LBW was 17.4%. The difference in prevalence in other regions may be due to different living habits, environment, and economic factors (Shaohua et al., 2022).

According to the results above preeclampsia can be one of the factors affecting LBW with p-value = 0.040 OR 1.806 and CI 95% 1.028-3.173, which is similar to a previous study that showed preeclampsia can be one of the factors affecting low birth weight, indicating that there was a relationship between preeclampsia and LBW. This means that women with preeclampsia increase the risk of their babies with LBW (Nakimuli et al., 2020), and also supported by previous study that showed that preeclampsia could increase the risk of low birth weight due to decreased uteroplacental blood flow, which will cause the outcome of low birth babies (Liu et al., 2021).

The results of previous studies similar to this study showed that prematurity of gestational age <37 weeks were more at risk of having LBW (Anil et al., 2020). This is consistent with the theory that babies born under 37 weeks of gestational age are more at risk for LBW because of the imbalances of placental circulation and chronic nutritional deficiencies. Prematurity was the single most predictive of LBW in the world. A systematic review and meta-analysis study in Ethiopia reported that gestational age <37 weeks was significantly associated with the increased odds of LBW (Alemu & Aynalem, 2022). When the neonates were delivered before reaching 37–42 weeks of gestational age, they were likely to be small and to have decreased skeletal muscle mass and subcutaneous fat tissue (Desta, 2019).

This study shows there was a relationship between PROM and LBW. This was consistent with the theory that PROM was the leading cause of preterm birth in the United States. Based on gestational age, babies born

premature can be small or large during gestation, but in most cases preterm or premature babies will be born with low birth (Wijaya & Darussalam, 2022). PROM causes the loss of amniotic fluid, restricts fetal growth, and results in the birth of a prematurely born LBW infant (Tshotetsi et al., 2019; Romero et al., 2011; Padayachee et al., 2020).

There were statistically significant results between LBW and multiple pregnancies in this study ($p<0.05$). Intrauterine growth restriction is three times more common in twin pregnancies than in single pregnancies. The relative immaturity of the placenta and nutrient competition between twins are the most probable causes of LBW (Sharma et al., 2015). The results of this study show that twin pregnancies increase the chance of LBW. These results are consistent with other studies. It has been shown that a twin pregnancy is somewhat related to LBW for newborns (Moradi et al., 2021; Fatimah et al., 2021).

Infants with a birth weight and/or birth length below the 10th percentile for gestational age are diagnosed with IUGR (Sharma et al., 2016). Intrauterine growth restriction is a multifactorial symptom caused by fetal, placental, and maternal diseases. It occurs in 10% of all term pregnancies (Albu et al., 2014). Most IUGR pregnancies are characterized by restricting blood flow to the fetus, resulting in an inadequate supply of oxygen and nutrients (Zhang et al., 2015). The maternal and fetal components of the placenta must be perfused adequately. Placental insufficiency is primarily caused by inadequate vascular adaptation at the uteroplacental interface, resulting in fetal hypoxia, hypoglycemia, and growth restriction (Zohdi et al., 2012).

In a previous study, pregnancies complicated by isolated oligohydramnios were not associated with significant adverse perinatal outcomes (Spinillo et al., 2015; Pitt et al., 2000). This study showed that low birth weight with oligohydramnios was not associated (p-value > 0.05). Oligohydramnios in complicated pregnancy is associated with an increased risk of delivery of an infant with low birth weight, but other comorbid conditions may confound this (Taneja et al., 2017). Although oligohydramnios in low-risk pregnancies is an aberrant finding, there is not enough data to determine the optimal delivery timing to reduce the risk of adverse outcomes. Oligohydramnios in complicated pregnancies should be managed based on comorbid conditions (Rabie et al., 2017).

4 Conclusion

This study concluded that several interplaying factors led to LBW incidence at Bandung Regional General Hospital, Indonesia. Low birth weight was associated with preeclampsia, gestational age, PROM, multiple pregnancy, and IUGR. Meanwhile, there was no correlation between LBW and oligohydramnios at Bandung Regional General Hospital. Early risk factor prevention can begin with continuous monitoring during early pregnancy until delivery. These particular risk factors may be modified to reduce low birth weight incidence, considering the short-term and long-term effects. The findings of this study provide insights and improved awareness for health workers, hospital administrators, and policymakers on strategies and interventions to improve women's health before, during, and after pregnancy to reduce the prevalence of LBW in the future since low birth weight has an important role in neonatal mortality

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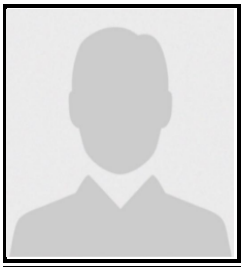
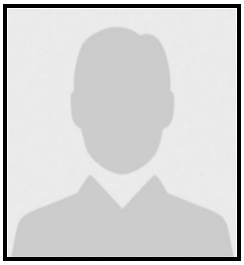
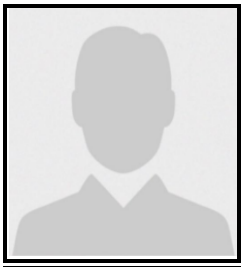
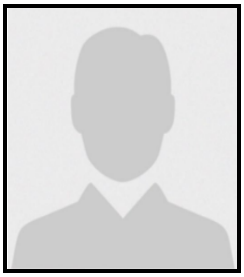
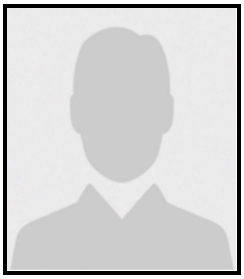
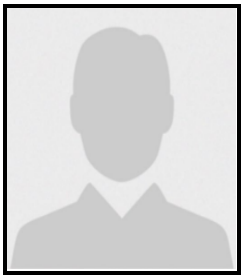
	**Aghnia Purnama Putri** Pediatric Intern, Bandung Regional General Hospital, Bandung, Indonesia *Email: aghniapp@gmail.com*
	**Ayu Alia** Department of Pediatric, Bandung Regional General Hospital, Bandung, Indonesia
	**Junita Sinaga** Department of Pediatric, Bandung Regional General Hospital, Bandung, Indonesia
	**Amelia Harsanti** Department of Pediatric, Bandung Regional General Hospital, Bandung, Indonesia
	**Rissa Puspitari Sabur** Department of Pediatric, Bandung Regional General Hospital, Bandung, Indonesia



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