THE EFFECT OF LOW BIRTH WEIGHT (LBW) ON NEONATAL DEATH IN GORONTALO CITY

Ahmad I. Mohune [1], Sunarto Kadir [2], Lintje Boekoesoe [3]
[1,2,3] Public Health Study Program
Postgraduate, Universitas Negeri Gorontalo, Indonesia

e-mail: ahmadmohune@gmail.com

Abstract

Indonesia is a developing country with high maternal and infant mortality rates. One of the causes of infant mortality in Indonesia is the incidence of Low Birth Weight (LBW) of 38.85%. The number of neonatal deaths in Gorontalo City between 2018 - 2021 is 83 cases. The novelty of this research is the effect of LBW on neonatal death. This study aims to see the impact of LBW on neonatal mortality in Gorontalo City after controlling for maternal risk factors in the form of a history of complications and the frequency of ANC. The research design used was analytic with a case-control approach. The sample in this study consisted of 30 cases and 60 controls. The results of the survey show that from the effects of bivariate analysis, the history of complications variable has an Odds Ratio Crude value of 55 and an Odds Ratio Adjusted of 13 and the Mantel-Haenszel test value: p-value $<\alpha$ (0.000 <0.05). In contrast, Antenatal Care has an Odds Ratio Crude value of 28 and Odds Ratio Adjusted by 17 and the value of the Mantel-Haenszel test: p-value $<\alpha$ (0.000 <0.05). The Odds Ratio value for LBW is 20 with a p-value $<\alpha$ (0.000 <0.05). This study concludes that LBW has a 20 times risk of neonatal death (95% CI = 6.506 – 61.485).
Keywords: ANC; LBW; neonatal death; history of complications

INTRODUCTION

Maternal Mortality Rate and Infant Mortality Rate are still a national priority in handling them, because MMR and IMR are indicators in assessing the level of welfare and health status of a country's people (1). The high infant mortality rate in a country indicates that the facilities in that country are incomplete and there is a lack of attention to nutrition during pregnancy.

According to the World Health Organization (WHO) that the neonatal period (the first 28 days of life) is the most vulnerable time in child survival. In 2013, nearly 1 million newborns died within the first 24 hours of life, accounting for 16% of total under-five deaths and more than one third of total neonatal deaths. There are 2 million newborns die in the first seven days of life or 73% of neonatal deaths(2) (3).

Indonesia is a developing country with high maternal and infant mortality rates. In 2015 the number of cases of infant mortality was 33,278 cases, and in 2017 there were 36,792 cases. One of the causes of infant mortality in Indonesia is the incidence of Low Birth Weight (LBW) of 38.85% (4).

The Program Action Plan of the Direktorat Jenderal Kesehatan Masyarakat

(2020) states that most neonatal deaths are caused by intrapartum complications (28.3%), respiratory and cardiovascular disorders (21.3%), low birth weight and premature birth (19%), congenital abnormalities (14.8%), and infection (7.3%). The most common neonatal and under-five deaths also occur in hospitals, namely 68% for neonatal deaths and 62.8% for under-five deaths(5).

Most of the direct causes of neonatal death are due to infection (pneumonia, diarrhea and tetanus) of 36%, premature birth 28% (6). The causes of death in the early neonatal and late neonatal periods are premature birth, asphyxia and congenital defects are the main causes of death in the first week after birth and infection is the main cause of death in the following weeks, while the indirect causes of neonatal death are low birth weight. in this case associated with premature birth is intrauterine growth retardation (IUGR)(7).

In the book Obstetrics, it says that the factors that influence neonatal mortality include maternal factors and infant factors. Maternal factors consist of socioeconomic status, low education level, age more than 30 years or less than 20

years, parity 1st and parity 5th or more, pregnancy without ANC services, nutritional disorders and anemia of pregnancy, history of pregnancy and childbirth with medical complications or obstetrics, history of childbirth ending in surgery or prolonged labour. Meanwhile, infant factors consist of babies born from high-risk pregnancies, LBW <2500 grams, babies born weighing more than 4000 grams, babies born at gestational age less than 37 weeks or more than 42 weeks, babies born with intrapartum infections, birth trauma or congenital abnormalities (8).

In a previous study conducted by Elyana Mafticha, the factors influencing neonatal mortality in Indonesia were maternal age (62.7%), non-standard ANC (40%), delivery complications (59.1%) and lower secondary education (90.1%) (9), whereas in a study conducted by Imelda Ferawati Bangun in 2018 concerning the risk factors for neonatal death in Mentawai Islands Regency, it was stated that neonatal death in the case group was caused by maternal age 42.1%, low education 68.4%, parity 63.2%, pregnancy spacing 94.7% and ANC which was not according to standard 36.8% (10).

The results of the initial data acquisition from the Gorontalo City Health Office show that the number of neonatal deaths between 2018 - 2021 was 83 cases, with details in 2018 of 14 cases; 2019 as many as 22 cases; in 2020 there were 23 cases; and in 2021 there will be 24 cases. From the data, these neonatal deaths were caused by several factors, namely LBW (39.53%), asphyxia (19%), frequency of ANC (30.46%) and parity (11.01%).

This study specifically analyzes the effect of Low Birth Weight (LBW) on neonatal mortality in Gorontalo City after controlling for maternal risk factors in the form of a history of complications and frequency of antenatal care.

METHOD

The research design used is analytic with a case control approach. This research was conducted in Gorontalo City with a sample of 30 cases who experienced neonatal deaths and 60 controls who did not experience neonatal deaths. The analysis used was univariate, bivariate, stratified and multivariate with a significance limit of 0.05.

RESULTS AND DISCUSSION

The data that has been obtained from the research results are presented in 4 (four) types of analysis, namely univariate analysis to present data in the form of a frequency distribution, bivariate analysis to see the relationship of each variable and stratification analysis to see confounding variables. The results of the univariate analysis are as listed in following table :

Table 1. Univariate Analysis Results

Variable	Category	Death			
		Neonatal Death		Not Neonatal Death	
		n	%	n	%
LBW	LBW	24	80	10	16.7
	Not LBW	6	20	50	83.3
Complication History	There are complaints	22	73.3	13	21.7
	No Complaints	8	26.7	47	78.3
Frequency of antenatal care	Incomplete	24	80	13	21.7
	Complete	6	20	47	78.3

The table shows that babies with LBW will experience greater neonatal death compared to those who are not LBW, namely 24 cases (80%), while mothers with a history of complications experience 22 cases (73.3%) of neonatal deaths compared to mothers who do not. a history of complications, namely 8 cases (26.7%), whereas mothers with incomplete ANC frequency experienced 24 cases (80%) of neonatal death compared to those with complete ANC frequency, namely 6 cases (20%).

The results of the bivariate analysis will see the effect of each variable on neonatal mortality, as shown in the following table:

Table 2. Results of Bivariate Analysis

Variable	Death				OR	95% CI	p Value
	Neonatal Death		Not Neonatal Death				
	n	%	n	%			
LBW							
LBW	24	80	10	16.7	20,000	6,506 – 61,485	0,000
Not LBW	6	20	50	83.3			
Complication History							
There are complaints	22	73.3	13	21.7	9,942	3,600 - 27,459	0,000
No Complaints	8	26.7	47	78.3			
Frequency of antenatal care					14.462	4,886 - 42,804	0,000
Incomplete	24	80	13	21.7			
Complete	6	20	47	78.3			

Table 2 shows that babies with LBW experience more neonatal deaths (80%) compared to those who are not LBW (20%). The results of statistical tests showed that there was an effect of LBW on neonatal mortality (p-Value 0.000). The OR calculation results show that babies with LBW will experience 20 times neonatal death compared to those who are not LBW (95% CI = 6.506 – 61.485).

Statistical test results in mothers with a history of complications experienced more neonatal deaths, namely 22 cases (73.3%) compared to 8 cases (26.7%) without complications. With a p-Value of 0.000 <0.05 and an OR value of 9.942 showed that there was an influence between a history of complications on neonatal death with a risk of this event of 9.942 times greater than those without a history of complications.

The results of statistical tests on the ANC frequency variable showed that those with incomplete ANC had more neonatal deaths (80%) compared to those with complete ANC (20%). Statistical test results showed that there was an effect of ANC frequency on neonatal mortality (p-Value 0.000). The OR calculation results showed

that the frequency of ANC was 14.462 times more likely to experience neonatal death compared to those with complete ANC frequency (95% CI = 4.886 – 42.804).

To see whether the variables history of complications and frequency of ANC were confounding variables (covariates) on the effect of LBW on neonatal mortality, a stratification test was carried out on the independent variables, confounding variables (covariates) and independent variables. As in the following table:

Table 3. The effect of LBW on neonatal mortality after controlling for maternal risk factors in the form of a history of complications

| Complication History | Birth Weight Status | Death | | Total |
		Neonatal Death	Not Neonatal Death	
There are complaints	LBW	20	2	22
	Not LBW	2	11	13
	Amount	22	13	35
No Complaints	LBW	4	8	12
	Not LBW	4	39	43
	Amount	8	47	55

OR *Crude* : 55,000
OR *Adjusted* : 13,104
Homogeneity : p = 0.064 > 0.05
Mantel-Haenszel : p = 0,000 < 0.05

The history of complications in pregnant women greatly influences the occurrence of neonatal deaths in Gorontalo City as in the results of statistical tests where mothers with a history of complications experienced more neonatal deaths (73.3%) than those without complications (26.7%). The results of the statistical test showed that there was an effect of history of complications on neonatal mortality (p-Value 0.000). The OR calculation results show a history of complications 9.942 times will experience neonatal death compared to those without complications (95% CI = 3.600 – 27.459).

The results of the stratification analysis illustrated that the history of complications in pregnant women did not interact with the LBW variable and neonatal death, but this history of complications was

a confounding variable in the effect of LBW on neonatal death. Adjusted OR value on the results of the Mantel-Haenszel analysis showed that a history of complications had a risk of LBW on neonatal death by 13.104 times with a p value of 0.000 less than α (α = 0.05).

Crosstabulation results between history and LBW and neonatal death showed that mothers with risk factors in the form of a history of complications gave birth to babies with LBW babies in 22 cases with 20 cases of neonatal death (90.9%) compared to those who did not have a history of complications, out of 8 LBW births there were 4 cases of neonatal death (50%). The 50% rate of deaths with no complaints or a history of complications is still considered very high, this is because these deaths are caused by LBW.

The results of this study are in line with research conducted by Arwinda Nugraheni et al in a study on the effect of pregnancy complications on early neonatal death in Indonesia which stated that one of the risk factors that causes neonatal death is a history of complications in pregnant women. Where the research was conducted using a cross-sectional approach with a p value of 0.013 (<0.05) which means statistically with a 95% confidence level there is an influence between pregnancy complications and early neonatal death (11).

The existence of an interaction between birth weight and pregnancy complications on neonatal mortality can logically be explained. Low birth weight itself can be caused by a history of pregnancy including pregnancy complications. There are many trigger factors that cause complications in pregnant women, including hypertension, hypotension, anemia, diabetes and obesity. Where these risk factors are predispositions that can be suppressed and controlled by diet.

Table 4. Effect of LBW on neonatal mortality after controlling for maternal risk factors in the form of frequency of antenatal care

Frequency of antenatal care	Birth Weight Status	Death		Total
		Neonatal Death	Neonatal Death	
Incomplete	LBW	20	2	22
	Not LBW	4	11	15

	Amount	24	13	37
	LBW	4	8	12
Complete	Not LBW	2	39	41
	Amount	6	47	53

OR Crude : 27,500
OR Adjusted : 17,157
Homogeneity : p = 0.434 > 0.05
Cochran's Mantel-Haenszel : p = 0,000 < 0.05

Antenatal care greatly influences neonatal mortality in Gorontalo City, as in the results of the study which stated that the frequency of incomplete ANC experienced more neonatal deaths, namely 24 cases (80%) compared to those with complete ANC frequency, namely 6 cases (20%). The results of the bivariate test showed that there was an effect of ANC frequency on neonatal mortality (p-Value 0.000). The OR calculation results show that the frequency of ANC is 14.462 times more likely to experience neonatal death compared to the complete ANC frequency (95% CI = 4.886 – 42.804).

The results of the stratification analysis showed that there was no interaction between the frequency of ANC and LBW and neonatal mortality, because the results of the homogeneity test had a significance value of 0.434 > 0.05. However, the frequency of ANC greatly influences the effect of LBW on neonatal death, because the results of the Haenszel mantle test have a significance value of 0.000 <0.05, with an adjusted OR value of 17.157, meaning that the frequency of ANC has a risk of 17.157 times greater in the effect of LBW on neonatal death.

Antenatal Care is very important to monitor and support the health of normal pregnant women and detect women with abnormal pregnancies. Pregnant women should be advised to visit a midwife or doctor as early as possible since they feel they are pregnant to get ANC. Pregnant women who do not get inadequate ANC have a risk of experiencing perinatal death (12).

This research is in line with research conducted by Ima Azizah in Anita (2017) in Grobogan District which stated that there is a relationship between the number of ANC visits and neonatal death, namely mothers

who make ANC visits <4 times have a 9.3 times risk of neonatal death compared to mothers who made ANC visits $\geq$ 4 times (13).

Similarly, a study conducted by Leandro Pereira Garcia, et al (2018) stated that mothers with less than 7 (seven) prenatal consultations experienced death 3 times higher than those with more than 7 (seven) prenatal consultations (OR). = 3.04; 95 % CI : 1.61 – 5.97) (14).

The purpose of antenatal surveillance is to prepare as well as possible physically and mentally for pregnant women and save mothers and children in pregnancy, childbirth and the postpartum period so that the mother's condition during postpartum is healthy and normal, not only physically but also mentally. The objectives of antenatal care services are; (1) Monitor the progress of pregnancy to ensure the health of the mother and the growth and development of the fetus; (2) improve and maintain the physical, mental and social health of the fetus; (3) Recognize early whether there are abnormalities or complications that may occur during pregnancy, including general medical history, obstetrics and surgery; (4) Preparing for full-term labour, giving birth

safely to both mother and baby with minimal trauma; (5) Preparing mothers so that the postpartum period runs normally and giving exclusive breastfeeding; (6) Preparing the role of the mother and family in receiving the birth of a baby so that it can grow and develop normally (15).

The schedule for ANC service visits at Health Services is 1 time in the first trimester (0 – 13 weeks) namely for screening and treatment of anemia, birth planning, identification of complications due to pregnancy and treatment; 1 time in the second trimester (14 – 28 weeks) to see complications due to pregnancy and medication, screening for preeclampsia, gemelli, infections of the reproductive organs and urinary tract; as well as 2 times in the third trimester (28 – 36 weeks and 36 – 40 weeks) which is done to identify abnormalities in the location and presentation, strengthen the birth plan, recognize the signs of labor.

CONCLUSION

From the results of the research that has presented the results and previous discussion, it can be concluded that the variables LBW, history of complications and frequency of ANC have an effect on

neonatal mortality, but each covariate variable does not interact with the independent and dependent variables, but is a confounding variable. For this reason, it is suggested to health workers to always provide education to pregnant women about the dangers of complications during pregnancy and the importance of prenatal checks at least 4 times during pregnancy.

ACKNOWLEDGEMENTS

REFERENCES

1. Novitasari A, Hutami MS, Pristya TYR. Pencegahan dan Pengendalian BBLR Di Indonesia: Systematic Review. Pencegah Dan Pengendali Bblr Di Indones. 2020;2(3):175–82.

2. Ultriani U. Faktor-Faktor Yang Berhubungan Dengan Kejadian Bblr Di Ruang Bersalin Rumah Sakit Umum Sekota Kendari. J Ilm Kebidanan (Scientific J Midwifery). 2019;5(2):45–50.

3. Simbolon D. Berat Lahir dan Kelangsungan Hidup Neonatal di Indonesia. Kesmas Natl Public Heal J. 2012;7(1):8.

4. Sujianti S. Literature Review Bayi Berat Lahir Rendah. J Kesehat Ibu dan Anak. 2017;11(2):8–14.

5. Kemenkes. Rencana Aksi Program 2020-2024. J Ilm Teknosains. 2020;2(1/Mei):1–33.

6. Eshete A, Alemu A, Zerfu TA. Magnitude and Risk of Dying among Low Birth Weight Neonates in Rural Ethiopia: A Community-Based Cross-Sectional Study. Int J Pediatr (United Kingdom). 2019;2019.

7. Lawn JE, Wilczynska-Ketende K, Cousens SN. Estimating the causes of 4 million neonatal deaths in the year 2000. Int J Epidemiol. 2017;35(3):706–18.

8. Wiknjosastro. Ilmu Kebidanan. Revisi III. Jakarta: PT. Bina Pustaka; 2017.

9. Mafticha E. Faktor yang mempengaruhi kejadian kematian neonatal di Indonesia. Bull Seismol Soc Am. 2018;106(1):6465–89.

10. Bangun IF, Abdiana A, Edison E. Faktor Risiko Kematian Neonatal di Kabupaten Kepulauan Mentawai. J Endur. 2019;4(1):26.

11. Nugraheni A, Mahkota R, Adisasmita AC. Pengaruh Komplikasi Kehamilan

terhadap Kematian Neonatal Dini Indonesia (Analisis Data SDKI 2007). Media Med Muda. 2016;1(1):57–66.

12. Yuliana, Jasmawati, Firdaus R. The Effect of Early Breastfeeding Initiation on Newborn Body Temperature Changes at RSUD.I.A Moeis Samarinda in 2022. Formosa J Sci Technol. 2022;1(8):1031–42.

13. Anita. Ima Azizah □, Oktiaworo Kasmini Handayani. Tech Pain Reduct Norm Labor Process Syst Rev. 2017;1(3):84–94.

14. Garcia LP, Fernandes CM, Traebert J. Risk factors for neonatal death in the capital city with the lowest infant mortality rate in Brazil. J Pediatr (Rio J). 2019;95(2):194–200.

15. Kemenkes. JANGKA MENENGAH NASIONAL 2020-2024. 2020;