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Factors of Low Birth Weight in Indonesia: An Analysis of the 2017 Indonesia Demographic and Health Survey (IDHS 2017)

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Abstract

Low birth weight (LBW) is one of the indicators of newborn mortality and also a health problem in infant growth and development. The case of LBW in Indonesia ranges from 5%-<10%, which makes Indonesia ranks sixth in Southeast Asia and in Indonesia as many as 1-3% of infant deaths occur. The aim of this study is to determine the factors associated with the case of LBW in Indonesia. This study had 903 samples taken from the 2017 Indonesian Demographic Health Survey (IDHS 2017) using a cross-sectional design. Analysis was conducted using descriptive analysis and followed by bivariate analysis with chi-square test and multivariate analysis using logistic regression. From the analysis multivariate results, factors that determined greater risk of LBW are lower economic status (p-value = 0.002; AOR = 2.026; 95% CI 1.292-3.111), urban residence (p-value = 0.012; AOR = 1.649; 95% CI 1.118-2.432), pregnancy complications (p-value = 0.011; AOR= 1.705; 95% CI (1.128-2.576), multiple pregnancy (p-value= 0.058; AOR= 4.405; 95% CI 0.954-20.344), and a negative association with LBW case was the first child category pregnancy interval (p-value= 0.007; AOR= 0.605; 95% CI 0.421-0.870). Factors that were associated with LBW in this study were economic status, urban residence, pregnancy complications, and multiple pregnancies.

INTRODUCTION

Asian and African nations have the highest rates of neonatal infant mortality globally, with Indonesia accounting for 1-3% of these deaths (Alifariki et al., 2019). One measure of health issues related to newborn mortality is low birth weight (LBW). According to the World Health Organisation (WHO), LBW is defined as a birth weight below 2500 grams (5.5 lb) (WHO, 2016).

More than 20 million babies globally which equates to 15-20% of all births, are estimated to have low birth weight (LBW). In the Asian region, the prevalence of LBW is 17.3%, while in the Southeast Asian region, it ranges from 7-21% (UNICEF & WHO, 2019)predicting mortality, stunting, and adult-onset chronic conditions. Global nutrition targets set at the World Health Assembly in 2012 include an ambitious 30% reduction in LBW prevalence between 2012 and 2025. Estimates to track progress towards this target are lacking; with this analysis, we aim to assist in setting a baseline against which to assess progress towards the achievement of the World Health Assembly targets. Methods: We sought to identify all available LBW input data for livebirths for the years 2000–16. We considered population-based national or nationally representative datasets for inclusion if they contained information on birthweight or LBW prevalence for livebirths. A new method for survey adjustment was developed and

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used. For 57 countries with higher quality time-series data, we smoothed country-reported trends in birthweight data by use of B-spline regression. For all other countries, we estimated LBW prevalence and trends by use of a restricted maximum likelihood approach with country-level random effects. Uncertainty ranges were obtained through bootstrapping. Results were summed at the regional and worldwide level. Findings: We collated 1447 country-years of birthweight data (281 million births. Indonesia ranks sixth in Southeast Asia for the case of LBW, with rates ranging from 5% to <10% (Chaparro et al., 2014). Based on data from RISKESDAS 2013, the case of LBW in 2013 reached 10.2%, which previously reached 11.1% in 2010. (Kementerian Kesehatan RI., 2013). In 2017 the percentage of LBW was 7.1% and in 2018 the percentage became 6.2%. Despite the issue of LBW being a concern in Indonesia, it is particularly significant for the future growth and development of children in the country (Kementerian Kesehatan RI., 2018, 2020).

Based on the Indonesian Health Profile in 2019, there is evidence of a relationship between LBW and neonatal mortality, deaths caused by LBW are the highest percentage of deaths among other causes of death, namely 35.3% (Kementerian Kesehatan RI., 2020). Research conducted by Tarigan in 2017 babies born with normal body weight have a lower mortality rate (14.2%) compared to babies who have LBW (28.6%) (Tarigan et al., 2017). The results of other studies also showed that 90% of LBW babies died in the neonatal period (≤ 28 days) (Jia et al., 2022). Short-term implications for LBW babies after birth tend to be vulnerable to the risk of complications and infections including asphyxia, sepsis, respiratory distress syndrome, and hypothermia (Jia et al., 2022). In other studies, other complications can include oxygen dependence, retinopathy of prematurity, intraventricular hemorrhage, necrotising enterocolitis, and periventricular leukomalacia (Olack et al., 2021). The long-term implications for infants who have LBW are malnutrition, stunting, long-term disability, the risk of medical disorders of non-communicable diseases, lower cognitive and motor abilities (Aryastami et al., 2017; de Mendonça et al., 2020; Upadhyay et al., 2019; WHO, 2014). Moreover, research has shown that LBW is linked to reduced social interactions, lower educational achievements, decreased employment opportunities, and increased reliance on social benefits among adults. (Bilgin et al., 2018; Saigal et al., 2016).

The case of LBW can be influenced by various conditions. Factors related to the mother and baby as well as the physical environment can affect the birth weight of the baby and the health conditions of the child in the future. Poor maternal reproductive conditions such as pregnancy complications, parity, birth distances and desired and unwanted pregnancies as determinants of LBW incidence (Alemu et al., 2019; Desta et al., 2019). The LBW cases in developing countries indicate poor maternal health, maternal malnutrition, suboptimal antenatal care (ANC), and low socioeconomic level of the mother (UNICEF & WHO, 2019). Low levels of socioeconomic status are associated with poor health knowledge, risky behaviours and ability to perform antenatal check-ups (Mahumud et al., 2017).

Furthermore, the empowerment of women plays a crucial role in attaining objectives related to family health development. Empowered women have the capacity to manage various aspects of life and decision-making, especially decisions regarding the health of themselves and their children (Miedema et al., 2018). Empowered women tend to give birth to fewer children, are more likely to access health services and have control over health resources (Hanik & Febri, 2017; Pennington et al., 2018). Furthermore, the ability to make family planning decisions can help mothers optimize the timing of births and achieve desired family sizes, and can lead to better nutritional outcomes for children (Öberg, 2015). In line with the background of these problems, the purpose of this study is to determine the factors that influence the case of LBW in Indonesia.

METHOD

This research employs the most recent data from the 2017 Indonesia Demographic Health Survey (IDHS), which is a cross-sectional study. The 2017 IDHS data encompassed 34 provinces in Indonesia and 49,627 women of reproductive age (15-49 years) were surveyed. The study utilized the modified Demographic Health Surveys VII (DHS VII) questionnaire as the foundation for data collection through interviews. The survey process and questions in the 2017 IDHS were reviewed and approved by the ICF Institutional Review Board (IRB). The survey's ethics were also authorized by the Agency for Health Research and Development, Ministry of Health of the Republic of Indonesia. During the survey, respondents signed consent forms, and their personal information was excluded from the data set (BKKBN, 2018). This research was also granted approval by the Health Research Ethics Committee of Universitas Negeri Semarang, with ethical clearance number 080/KEPK/EC/2023.

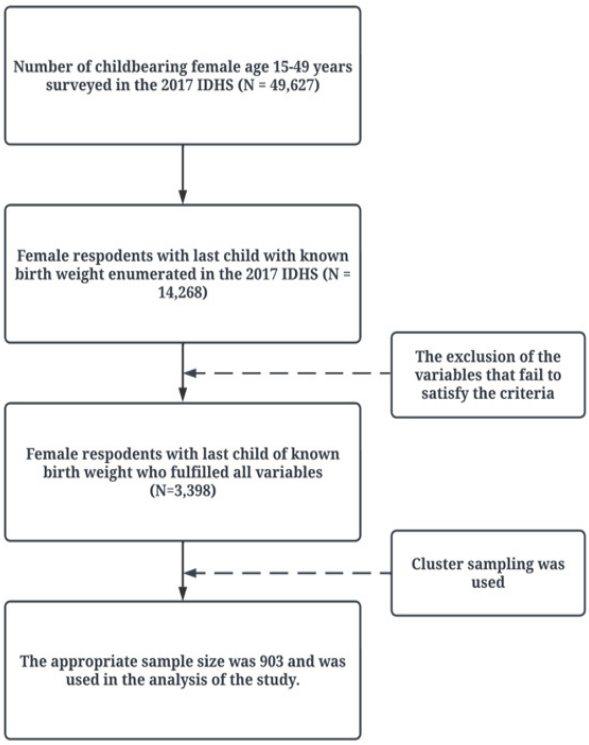

Figure 1. Sampling Method

The study population was mothers who gave birth in the last five years who participated in the survey interview. Inclusion criteria were mothers whose last child was weighed at birth and whose birth weight was known. Exclusion criteria were respondents who did not complete the questionnaire answers and those who did not know were excluded. After fulfilling the criteria, the sample size was 3398. After calculating the sample to 903 with cluster sampling as a sampling technique.

The dependent variable of this study is LBW, which is used from data on the weight of babies born in the last five years before the 2017 IDHS and the baby is the last child. It is known that LBW in accordance with WHO guidelines is a baby born weighing less than 2,500 grams and normal weight is more than 2,500 grams (WHO, 2016). While the independent variables have 3 factors, namely socio-demographic factors (maternal education, maternal occupation, economic status, and place of residence), maternal health and behavior (maternal age, ANC visits, pregnancy complications, parity, desired pregnancy, smoking behavior, iron intake, and decision-making on health), and infant characteristics factors (infant gender, multiple pregnancy, and pregnancy interval).

In the study, various analyses were conducted, including univariate, bivariate, and multivariate analyses. Bivariate analysis, which employed the chi-square test, was conducted to establish the relationship between each independent variable and the dependent variable, which is the infant birth weight status. Additionally, logistic regression analysis was performed to examine the association between independent factors and infant birth weight status, taking into account multiple variables simultaneously.

RESULT AND DISCUSSION

The univariate analysis results in table 1 revealed that out of the 903 samples examined, 158 mothers (17.5%) had babies with low birth weight, while 745 mothers (82.5%) delivered babies with normal weight. The characteristics of respondents regarding socio-demographic factors showed 2.4% of mothers aged <20 years, 42% of lower economic status, 51.5% of mothers who lived in urban areas. In the characteristics of maternal health and behavior showed 6.3% of mothers did not visit ANC, 18.5% of mothers who experienced pregnancy complications, 8.1% of mothers who did not want pregnancy, 1.7% and mothers who smoked, 51.9% of mothers who were incomplete in consuming iron intake, and 10% of mothers who did not play a role in decision making. In the univariate analysis of baby characteristics, 52.8% of the number of male babies, 0.8% of babies born as twins, and 31.6% of

mothers who gave birth to their first child.

The bivariate analysis of the 15 variables in Table 2, it is found that there are 3 variables that have an association with risk factors for LBW in Indonesia (p-value <0.05). The associated variables were lower economic status (poor) (p-value=0.010), pregnancy complications (p-value= 0.020), and pregnancy interval with the category of mothers who gave birth to the first child (p-value= 0.028). Logistic regression tests were performed on variables that had a p-value of 0.25 to determine the variables that have the strongest contribution in influencing the risk of LBW. Based on the results of bivariate analysis in Table 2, the variables that are suitable for logistic regression test are as follows: Maternal age, maternal education, economic status, place of residence, pregnancy complications, parity category one, multiple pregnancy, and pregnancy interval with category first child.

The logistic regression test described in table 3, found that there are 4 variables that have the strongest influence on the incidence of LBW, including lower economic status (p-value = 0.002; AOR = 2.026; 95% CI 1.292-3.111), urban residence (p-value = *0.*012; AOR = 1.649; 95% CI 1.118-2.432), pregnancy complications (p-value = 0.011; AOR = 1.705; 95% CI (1.128-2.576), and multiple pregnancy (p-value = 0.058; AOR = 4.405; 95% CI 0.954-20.344).

Table 1 Results of Univariate Analysis of Factors of LBW Incidence in Indonesia (N= 903)

Variable	N	%
Birth Weight		
LBW	158	17,5
Normal	745	82,5
Maternal Age		
<20	22	2,4
>35	237	26,2
20-35	644	71,3
Maternal Education		
Low	409	45,3
Hight	494	54,7
Maternal Occupation		
Yes	503	55,7
No	400	44,3
Economic Status		
Lower	379	42,0
Middle	180	19,9
Upper	344	38,1
Place of Recidence		
Urban	465	51,5
Rural	438	48,5
ANC Visits		
< 4 times	57	6,3
≥ 4 times	846	93,7
Pregnancy Complications		
Yes	167	18,5
No	736	81,5
Parity		
>4	59	6,5
1	284	31,5
2-4	560	62,0

Variable	N	%
Pregnancy Desire		
No	73	8,1
Yes	830	91,9
Smoking Status		
Smoking	15	1,7
Not Smoking	888	98,3
Iron Intake		
Incomplete	469	51,9
Complete	434	48,1
Health Decision-making		
No Role	90	10,0
Play a role	813	90,0
Baby's Gender		
Female	426	47,2
Male	477	52,8
Multiple Pregnancy		
Twins	7	0,8
Single	896	99,2
Pregnancy Interval		
< 2 years	59	6,5
First child	285	31,6
≥2 years	559	61,9

Based on the bivariate result variable of lower economic status (poor), the value of PR = 1.699 (95% CI: 1.136-2.543). This shows that families or mothers who have a lower economic status (poor) are likely to experience low birth weight babies 1.699 times compared to families or mothers who have an upper economic status (rich). Based on the multivariate results in Table 3, it is known that the lower economic status (poor) has a chance of influencing the occurrence of LBW 2.026 times greater than the upper economic status (rich).

Based on the results of the study, there is a high prevalence rate of LBW (11-50%) associated with low socioeconomic conditions (Kumar et al., 2020; Mathew et al., 2014; Sharma & Kader,

Table 2 Results of Multivariate Analysis of Factors of LBW Incidence in Indonesia

Variable	LBW		Normal		95 CI	*P-Value*
	N	%	N	%		
Maternal Age						
<20	3		19	86,4	0,600 (0,170-2,114)	0,427
>35	44			81,4	1,288 (0,831-1,997)	0,256*
20-35	111			82,8	Ref	
Maternal Education						
Low	80			80,4	1,239 (0,933-1,644)	0,163*
Hight	78			84,2		
Maternal Occupation						
Yes	90			82,1	1,053 (0,791-1,401)	0,793
No	68	17		83		

Variable	LBW		Normal		95 CI	*P-Value*
	N	%	N	%		
Place of Recidence						
Urban	89			80,9	1,215 (0,913-1,617)	0,211*
Rural	69			84,2		
ANC Visits						
< 4 times	11		46	80,7	1,111 (0,640-1,927)	0,850
≥ 4 times	147			82,6		
Pregnancy Complications						
Yes	40	24		76	1,494 (1,088-2,051)	0,020**
No	118	16		84		
Parity						
>4	10		49	83,1	0,808 (0,377-1,731)	0,583
1	55			80,6	1,303 (0,877-1,945)	0,188
2-4	93			83,4	Ref	
Pregnancy Desire						
No	13		60	82,2	1,019 (0,609-1, 705)	1,000
Yes	145			82,5		
Smoking Status						
Smoking	3	20	12	80	1,146 (0,412-3,184)	1,000
Not Smoking	155			82,5		
Iron Intake						
Incomplete	86			81,7	1,105 (0,832-1,469)	0,547
Complete	72			83,4		
Health Decision-making						
No Role	20		70	77,8	1,309 (0,864-1,983)	0,273
Play a role	138	17		83		
Baby's Gender						
Female	77			81,9	1,064 (0,802-1,413)	0,731
Male	81	17		83		
Multiple Pregnancy						
Twins	3		4	57,1	2,477 (1,041-5,897)	0,203*
Single	155			82,7		
Pregnancy Interval						
< 2 years	8		51	86,4	0,814 (0,371-1,784)	0,607
First child	62			78,2	1,507 (1,046-2,170)	0,028**
≥2 years	88			84,3	Ref	

***P-value* = <0,05; *Significant to Multivariable logistic regression

2013). Low economic status increases the occurrence of LBW children 1.4 times compared to middle and upper socioeconomic levels (Mahumud et al., 2017). In line with previous research that the higher the economic status of a family, the chance of having a child with LBW is significantly reduced at the level of middle and rich economic status (Gupta et al., 2019). Previous research (Wang & Geng, 2019) reported a relationship between socioeconomic status has a significant influence on physical health. A person's lifestyle becomes a link between socioeconomic status and physical health. However, some studies have also found that low socioeconomic

status is associated with low health knowledge, poor nutritional status and lack of antenatal care attendance, thus increasing the risk of LBW (Mahumud et al., 2017; Wang & Geng, 2019).

The pregnancy complication variable was found to have a PR value of 1.494 (95% CI: 1.088-2.051). This means that mothers who experience pregnancy complications tend to have LBW children 1.494 times greater than mothers who do not experience complications. Table 3 contains multivariate results it can be seen that the variable of pregnancy complications has 1.705 times the case of LBW compared to mothers who do not have pregnancy complications. Based on previous research, a mother who has pregnancy complications has a risk of 2.708 being a predictor of LBW (Hailu & Kebede, 2018).

Pregnancy complications can cause LBW due to a number of reasons based on pregnant women. Factors such as unhealthy lifestyles such as smoking, alcohol consumption, and poor nutrition can increase the occurrence of pregnancy complications (Xi et al., 2020). In addition, health characteristics in mothers who have a history of risky diseases, gravidity, pregnancy status, hemoglobin levels, unplanned pregnancies, parity, history of LBW, gestational hypertension, and maternal age are the causes of LBW (Mekie & Taklual, 2019; Njim et al., 2015). It is necessary to have adequate knowledge for prevention and risk management if pregnancy complications occur. In this study there is a limitation, the absence of detailed details on the complications experienced by mothers in the 2017 IDHS data set. Regardless, pregnancy complication variables can be considered as risk factors for LBW because they are associated with bivariate and multivariate analyses.

The pregnancy interval variable for mothers who have just given birth to their first child has a PR value of 1.507 (95% CI: 1.046-2.170). This explains that mothers who give birth to their first child have a chance of having a low birth weight 1.507 times greater than mothers who give birth within an interval of 2 years. Based on the results of the study (Shah., 2010 in Lin et al., 2021) related to a systematic review analysis of 41 studies found that a mother who has never given birth to a baby (nulliparity) is associated with an increased risk of LBW. There are other factors that increase the risk of LBW in the first pregnancy, such as young maternal age, hypertensive disorders in pregnancy, and an increased risk of preeclampsia (Luo et al., 2020). However, the multivariate analysis on pregnancy interval found a significant relationship with p-value=0.007, after adjusted OR has a value of 0.605 which means that the interval variable has a negative relationship. In this regard, there is a decrease in the risk after considering the influence of other factors.

Table 3 Results of Multivariate Analysis of Factors of LBW Incidence in Indonesia

Variabel	**B**	**SE**	**Wald**	**AOR (CI 95)**	***p*-value**
Economic status (Lower)	0,696	0,224	9,634	2,005 (1,292-3,111)	0,002
Place of residence	0,500	0,198	6,375	1,649 (1,118-2,432)	0,012
Complications of pregnancy	0,534	0,211	6,400	1,705 (1,128-2,576)	0,011
Multiple pregnancy	1,483	0,781	3,607	4,405 (0,954-20,344)	0,058

Based on the results of the residence variable in Table 3, there is a relationship between urban residents having a greater chance of 1.649 times LBW compared to mothers who live in rural areas. Different research results in Malaysia showed that rural areas were found to have more LBW than urban areas with a percentage of 9.8% and 2% respectively (Kaur et al., 2019). Then a research study in Ghana reported that there was a significant relationship between the population living in urban areas who had a chance of giving birth to LBW babies 1.77 times (Mohammed et al., 2019). This can be caused by the factor of 3 delays in delivery assistance which consists of being late in making decisions, being late in getting to the referral place, and being late in getting services at health facilities (Kemenkes, 2018). In other studies, there is an association between population size and larger city size, which is associated with a higher prevalence of LBW (Rodríguez López et al., 2021). Meanwhile, a study in the United States states that traffic congestion can affect up to 1.2 million pregnancies each year. Among 579,122 births, a consistent association between traffic congestion and low birth weight was found (Willis et al., 2022).

Multiple pregnancy variables based on multivariate results in Table 3. It can be seen that the variable of multiple pregnancy has 4.405 times greater occurrence of LBW compared to mothers who do not give birth to twins. The results of logistic regression analysis in other studies showed an association between multiple pregnancies and the incidence of LBW with a risk of 5.11 times (Dahlui et al., 2016). There is a risk of intrauterine growth restriction (IUGR) in twin pregnancies. The weight gain of twins is usually lower when compared to single pregnancies. This factor is based on increased uterine tension, the presence of two placentas, and excess amniotic fluid, as a result of which the babies are born prematurely (Ludwig., 2013 in Hartiningrum & Fitriyah, 2018).

CONCLUSION

Based on the results of bivariate analysis, there is a relationship between economic status (poor) (p-value = 0.010), pregnancy complications (p-value = 0.020), and pregnancy interval with the category of mothers who gave birth to the first child (p-value = 0.028) with the case of LBW. Based on multivariate analysis, there was an association between lower economic level (p-value= 0.002), urban residence (p-value= 0.012), pregnancy complications (p-value= 0.011), and multiple pregnancy (p-value= 0.058). Meanwhile, the pregnancy interval variable had a negative association in the multivariate analysis.

The recommendation in this study is that the prevalence of LBW can be reduced through early detection of pregnancy risks and appropriate prevention strategies in at-risk populations. Interventions in reducing the incidence of LBW involve mothers as primary targets, husbands and families as secondary targets, and stakeholders as tertiary targets. In addition, there are recommendations for mothers with lower economic status to obtain health knowledge and ANC services that are free and easily accessible.

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