LOW BIRTH WEIGHT AMONG SINGLE MOTHERS IN INDONESIA: WHAT'S THE MATTER?

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Abstract. The characteristics of pregnant women can be risk factors for low birth weight. Single pregnant women, in particular, bear a double burden. They have to earn a living and take care of their pregnancies at the same time. The present study aimed to analyze factors related to low birth weight (LBW) among single mothers in Indonesia. This study used secondary data from the 2017 Indonesia Demographic and Health Survey (IDHS), a subset of live births and birth weight records. Residence, age, marital status, education, employment, parity, and wealth status were independent variables in the survey. The analysis in this study used binary logistic regression in the final step. A total of 561 participants who were single mothers in Indonesia were included in the analysis. Of these participants, 57 (10.8%) were single women who gave birth to LBW babies. The results showed that low birth weight among single mothers tended to be higher in urban areas adjusted odds ratio (aOR) = 1.426; 95% CI: 1.425-1.427; $p<0.001$), single women who were never been married (aOR = 0.427; 95% CI: 0.426-0.427; $p<0.001$), and unemployed single women (aOR = 1.044; 95% CI 1.044-1.045; $p<0.001$). The study also found age, education, and wealth status to be predictors of the incidence of LBW among single women. Finally, primiparous women were 0.342 times as likely as multiparous women to have LBW babies. The study concluded that single mothers who lived in urban areas, aged 20-34 years old, had never been married, had secondary education, was unemployed, had borne more than one child (multiparous), and be the poorest were proven to be at risk for LBW in Indonesia.

Keywords: low birth weight, single mother, public health nutrition, health policy

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INTRODUCTION

Low birth weight (LBW) babies are babies with birth weights of less than 2,500 grams regardless of gestational age (WHO, 2004). The estimated prevalence of LBW worldwide in 2015 was 14.6%, in comparison to 17.5% in 2000 (Blencowe *et al*, 2019). In 2015, an estimated 20.5 million live births were LBW, and 91% came from low and middle-income countries, especially countries in South Asia (48%) and sub-Saharan Africa (24%) (Blencowe *et al*, 2019). To meet the World Health Assembly (WHA) low birth weight target by 2025 (reduction in the prevalence of LBW by 30%), the annual average rate of reduction (AARR) of 2.74 percent per year (2012 and 2025) is required (WHO, 2012). As a result of the slow reduction in LBW prevalence, LBW will continue to be a significant public health problem globally (WHO, 2014). LBW in Southeast Asia ranges from 8-20% of births. The four countries with the highest prevalence of LBW births were the Philippines (20%), Laos (17%), Myanmar (12%), and Cambodia (12%) (Blencowe *et al*, 2019). Indonesia was in the third position with the lowest prevalence of LBW births after Vietnam and Singapore. In 2015 in Indonesia, 9.969% of births were LBW (UNICEF-WHO, n.d.).

Risk factors for LBW can come from pregnancy complications, characteristics of pregnant women, and environmental conditions. Several studies state that the risk factors for LBW birth include mid-upper arm circumference (MUAC) under 23.5 cm, age less than 19 years or more than 35 years, improper household sanitation, low education, rural areas, birth attendance by non-medical personnel, passive smoking, low frequency of antenatal visits, and the incidence of pregnancy complications (Sohibien and Yuhan, 2019; Supadmi *et al*, 2020; Yozza *et al*, 2020). Other studies also

state that the factors that increase the risk of LBW birth are poverty and maternal stress, not consuming folic acid and other foods during pregnancy, primiparity, and environmental factors (Falcão *et al*, 2020; Pal *et al*, 2020; Putra *et al*, 2019).

The morbidity and mortality in LBW are significant (Haksari, 2019). Children born with low birth weights have a 9.89 times higher risk of experiencing neonatal death when compared to average birth weight babies (Suparmi *et al*, 2016). The mortality rate for LBW infants during hospitalization was 12.12%, and the sepsis mortality rate for LBW was 29.8% (Assa *et al*, 2020; Duara *et al*, 2016). LBW babies are at risk of asphyxia and hypothermia (Razak and Adisasmita, 2020; Tanigasalam *et al*, 2019). Deficient birth weight has morbidity of respiratory distress syndrome, bronchopulmonary dysplasia, patent ductus arteriosus, intracranial hemorrhage, hypothermia, and sepsis (Choi *et al*, 2018; Sahoo *et al*, 2020). LBW is associated with long-term neurological disabilities and impaired development of language. LBW also has the potential to increase the risk of chronic diseases, including cardiovascular disease and diabetes. Another impact of LBW is LBW children being 2-6 times more likely to exhibit unsatisfactory school performance in all areas than their normal-weight counterparts (Islam, 2015; Cutland *et al*, 2017).

Previous study reported that a LBW birth will have an impact on the parents and be associated with unpaid leave, increased debt, financial worries, unsafe home environment, and social isolation (Lakshmanan *et al*, 2017). LBW mothers with lower income will have moderate to severe anxiety (Tane *et al*, 2020). Moreover, if the LBW parents are single parents, there is a higher potential for child care problems. Single parents are a vulnerable group who may give birth to LBW babies. Single mothers will lose financial and psychological support from their partner while being pregnant. Single parents work harder to pay for maternity care and childbirth. Parents who work harder are prone to give birth to LBW babies (Schuler *et al*. 2019). One study reported that babies born to single parents had a higher mortality rate, had lower mean intelligence quotient (IQ) ≥1 standard deviation (SD),

and had neurological disorders (Lodha *et al*, 2018). LBW variables such as increasing mother age, socioeconomic factors, racial and ethnic diversity, and the availability of health care services have been described in prior studies (Saigal *et al*, 2003; Sims *et al*, 2008). The socio-demographic parameters related with LBW are still limited (Agorinya *et al*, 2018; Kelly *et al*, 2001). The present study thus aimed to analyze socio-demographic factors including area of residence, age group, marital status, education level, employment status, parity, and wealth status related to LBW among single mothers in Indonesia based on the background narration.

MATERIALS AND METHODS

Data source

The study used secondary data from the Indonesia Demographic and Health Survey (IDHS) as analysis materials. The research used a sample of single mothers with live births from five years before the survey, and with birth weight reports in the form of either written data or maternal memories. The IDHS itself employed stratification and multistage random sampling in the sampling process. The mothers were among the respondents in the 2017 IDHS. Around 94% of live births in the last five years had recorded birth weight. In total, the study looked at 561 babies as a weighted sample (Lavrakas, 2008).

Variables

The study used LBW as a dependent variable in the study. The research described LBW as a birth weight of less than 2,500 grams, regardless of gestational age (BKKBN/BPS/Kemenkes/ICF, 2018). The study looked at seven independent variables in addition to LBW as the dependent variable: area of residence, age group, marital status, education level, employment status, parity, and wealth status. The study separated area of residence based on Statistics Indonesia's requirements: urban and rural. The research

assigned the participants into seven age groups, namely, 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49. Meanwhile, education level was defined as the most recent diploma a mother held. The report divided education levels into four levels: no education, primary education, secondary education, and higher education. There were two marital statuses: never been married and divorced/widowed.

Based on employment, the research divided work into two types: unemployed and employed. Meanwhile, the respondents' recognition of the number of live babies they had ever given birth to was referred to as parity. Parity was divided into two types, namely, primiparous (<2) and multiparous (≥2) (Genovesi *et al*, 2017; Lindblad *et al*, 2022).

According to the 2017 IDHS, wealth status refers to respondents' appreciation of a household's socioeconomic quintile. Meanwhile, the survey evaluates household income based on furniture types and costs, as well as items like a television (TV) set, a bicycle, a car, and household goods such as drinking water supplies, bathroom facilities, and flooring materials. In the survey, the wealth index variable used principal component analysis to evaluate the value. The study used every household's score to create national wealth quintiles, which were divided into five classes, each equally accounting for 20% of the population (Wulandari *et al*, 2019). The research split wealth status into five levels: poorest (quintile 1), somewhat poor (quintile 2), middle (quintile 3), somewhat rich (quintile 4), and richest (quintile 5).

Data analysis

In the first step, the investigator used a bivariate test to evaluate all of the variables in the description. The study used a chi-square test in this step. The investigator used binary logistic regression in the final step. The investigator carried out all statistical analyses involving a study team using the Statistical Package for the Social Sciences (SPSS) version 21 (IBM Corp, Armonk, NY).

Ethical consideration

The study used secondary data from the 2017 IDHS for its material analysis. The 2017 IDHS removed all respondent's identities from the dataset. Respondents signed written consent forms to participate in this study. For this study, the author obtained permission to use data from the website: https://dhsprogram.com/data/new-user-registration.cfm.

The Institutional Review Board of Inner-City Fund (ICF) International and ORC Macro (ICF IRB FWA00000845) granted ethical approval for the 2017 IDHS. It adhered to the United States Department of Health and Human Services requirement for the protection of human subjects; information given by the participants was kept anonymous.

RESULTS

The national average percentage of LBW among single mothers was 9.5%, which was higher than the national average for the entire population, which was 7.0%. Furthermore, Table 1 presents the descriptive analysis of LBW among single mothers in Indonesia. Based on the area of residence,

Table 1
Descriptive analysis of low birth weight among single mothers in Indonesia, 2017

Variable	Low birthweight		*p*-value
	No (N = 504)	Yes (N = 57)	
Type of residence, *n* (%)			<0.001
Urban	241 (89.2)	27 (10.8)	
Rural	263 (91.8)	30 (8.2)	
Age group in years, *n* (%)			<0.001
<20	44 (93.7)	5 (6.3)	
20-34	332 (89.8)	44 (10.2)	
≥35	128 (91.5)	8 (8.5)	

Table 1 (cont)

Variable	Low birthweight		*p*-value
	No (N = 504)	Yes (N = 57)	
Marital status, *n* (%)			<0.001
Never been married	25 (84.3)	5 (15.7)	
Divorced/Widowed	479 (90.7)	52 (9.3)	
Education level, *n* (%)			<0.001
No education	8 (98.5)	1 (1.5)	
Primary	152 (94.7)	9 (5.3)	
Secondary	280 (88.4)	38 (11.6)	
Higher	64 (89.0)	9 (11.0)	
Employment status, *n* (%)			<0.001
Unemployed	169 (90.9)	19 (9.1)	
Employed	335 (90.3)	38 (9.7)	
Parity, *n* (%)			<0.001
Primiparous	224 (93.9)	21 (6.1)	
Multiparous	280 (87.7)	36 (12.3)	
Wealth status, *n* (%)			<0.001
Poorest	190 (90.3)	21 (9.7)	
Poorer	99 (93.5)	10 (6.5)	
Middle	89 (92.7)	8 (7.3)	
Richer	78 (86.5)	11 (13.5	
Richest	48 (88.7)	7 (11.3)	

Note: The wealth index is calculated using easy-to-collect data on a household's ownership of selected assets, such as televisions and bicycles; materials used for housing construction; and types of water access and sanitation facilities. Demographic and Health Survey (DHS) separates all interviewed households into five wealth quintiles to compare the influence of wealth on various population, health, and nutrition indicators, which were divided into five classes, each equally accounting for 20% of the population. The research split wealth status into five levels: poorest (quintile 1), somewhat poor (quintile 2), middle (quintile 3), somewhat rich (quintile 4), and richest (quintile 5) (Wulandari *et al*, 2019).

the proportion of LBW in urban areas is higher than in rural areas. According to the age group, the group of 20-34 years old mothers have a higher proportion of LBW than other age groups. Regarding marital status, the ratio of LBW infants was more significant in mothers who were never been married.

Based on education level, the result shows that the highest proportion of LBW occurs in infants whose mothers have secondary education. Employed mothers have a higher proportion of LBW babies based on employment status. Meanwhile, multiparous mothers have almost twice the proportion of LBW babies compared to primiparous mothers. Moreover, the richer has the highest proportion of LBW babies according to wealth status.

Table 2 shows the results of binary logistic regression of LBW among single mothers in Indonesia. The results show single mothers in urban areas had a probability of 1.426 compared to single mothers living in rural areas delivering LBW babies (aOR = 1.426; 95% CI:1.425-1.427; p<0.001).

Table 2
Result of binary logistic regression of low birth weight among single mothers in Indonesia, 2017

Predictor	Low birthweight	
	aOR (95% CI)	p-value
Residence		
Rural (Reference)	-	<0.001
Urban	1.426 (1.425-1.427)	
Age group		
<20 years (Reference)	-	<0.001
20-34 years	1.330 (1.328-1.332)	
≥35 years	0.874 (0.873-0.876)	
Marital status		<0.001
Never in union	0.427 (0.426-0.427)	
Divorced/Widowed (Reference)	-	

Table 2 (cont)

Predictor	Low birthweight	
	aOR (95% CI)	*p*-value
Education		<0.001
No education	0.090 (0.090-0.091)	
Primary	0.386 (0.385-0.386)	
Secondary	1.157 (1.156-1.158)	
Higher (Reference)	-	
Employment		<0.001
Unemployed	1.044 (1.044-1.045)	
Employed (Reference)	-	
Parity		<0.001
Primiparous	0.342 (0.342-0.343)	
Multiparous (Reference)	-	
Wealth status		<0.001
Poorest	1.203 (1.201-1.204)	
Poorer	0.711 (0.710-0.712)	
Middle	0.625 (0.624-0626)	
Richer	1.107 (1.106-1.108)	
Richest (Reference)	-	

Note: The wealth index is calculated using easy-to-collect data on a household's ownership of selected assets, such as televisions and bicycles; materials used for housing construction; and types of water access and sanitation facilities. Demographic and Health Survey (DHS)separates all interviewed households into five wealth quintiles to compare the influence of wealth on various population, health, and nutrition indicators, which were divided into five classes, each equally accounting for 20% of the population. The research split wealth status into five levels: poorest (quintile 1), somewhat poor (quintile 2), middle (quintile 3), somewhat rich (quintile 4), and richest (quintile 5) (Wulandari *et al*, 2019).

aOR: adjusted odds ratio; CI: confidence interval

Based on age group, single mothers in the 20-34 are 1.330 times more likely to deliver LBW babies than single mothers in the <20 (aOR = 1.330; 95% CI: 1.328-1.332; p<0.001). Meanwhile, single mothers in the ≥35 are 0.874 times less likely than single mothers in <20 to deliver LBW babies (aOR= 0.874; 95% CI: 0.873-0876; p<0.001). Moreover, according to marital status, single women who were never been married are 0.427 times less likely than single mothers who were divorced/widowed to deliver LBW babies (aOR = 0.427; 95% CI: 0.426-0.427; p<0.001).

Based on the education level, Table 2 informs that single mothers with no education are 0.090 times less likely than single mothers with higher education to deliver LBW babies (aOR = 0.090; 95% CI: 0.090-0.091; p<0.001). Single mothers with primary education are 0.386 times less likely than mothers with higher education to deliver LBW babies (aOR = 0.386; 95% CI: 0.385-0.386; p<0.001). Moreover, single mothers with secondary education are 1.157 times more likely than single mothers with higher education to deliver LBW babies (aOR = 1.1157; 95% CI: 1.156-1.158; p<0.001).

On the other side, unemployed single women are 1.044 times more likely than employed single mothers to deliver LBW babies (aOR = 1.044; 95% CI: 1.044-1.045; p<0.001). Regarding parity, primiparous mothers are 0.342 times less likely to have LBW babies than single mothers with many children (aOR 0.342; 95% CI: 0.342-0.343; p<0.001).

Based on wealth status, the poorest mothers are 1.203 times more likely than the wealthiest mothers to deliver LBW babies (aOR = 1.203; 95% CI: 1.201-1.204; p<0.001). Meanwhile, based on wealth status, the poorer mothers are 0.711 times less likely than the wealthiest mothers to deliver LBW babies (aOR = 0.711; 95% CI: 0.710-0.712; p<0.001). On the other hand, based on wealth status, the median wealth status mothers are 0.625 times less likely than the wealthiest mothers to deliver LBW babies (aOR = 0.625; 95% CI: 0.624-0.626; p<0.001). Moreover, based on wealth status, the poorest mothers are 1.107 times more likely than the wealthiest mothers to deliver LBW babies (aOR = 1.107; 95% CI: 1.106-1.108; p<0.001).

DISCUSSION

In our study, LBW babies among single mothers was associated with all factors studied such as residence, age group, marital status, education level, employment status, parity, and wealth status. In Indonesia, single mothers in urban areas were more likely to have LBW than those in rural areas. A single mother's life in the metropolitan area is full of demands and obstacles, leading them to a higher likelihood of experiencing stress and depressive episodes than other female groups (Jayakody and Stauffer, 2000). Research findings indicated that depression during pregnancy was substantially related to LBW (Ghimirea *et al*, 2021; Neggers *et al*, 2006). The results confirmed previous community-based studies showing that poor urban women were at least twice as likely as middle-class women to experience depression during pregnancy and the postpartum period (Hobfoll *et al*, 1995). Unlike its Indonesia counterpart, a Malaysian study found that rural women had a higher risk of giving birth to LBW babies than urban women due to variations in physical activity and nutritional status (Kaur, 2019).

Despite the lack of a trend, the findings showed that age group was correlated with the incidence of LBW among Indonesian single mothers. Pregnancy at over 34 years of age in this study showed less likely to give birth LBW babies. This result contrary to the previous finding that reported pregnancy at advanced age put a woman at the risk of giving birth to an LBW baby. Several studies have shown that women over 35 years of age had an increased likelihood of giving birth to LBW babies compared to women aged 25-29 (Carolan, 2011; Liu and Zhang, 2014; Goisis, 2017). Following the findings of studies conducted in China, the maternal age threshold for LBW risk is 36 years, implying that the risk of LBW increases significantly when the mother's age exceeds 36 years, but fewer studies have reported this (Wang *et al*, 2020). The biological mechanism by which maternal age causes the term LBW, on the other hand, is uncertain (Ganchimeg *et al*, 2014). Low birth weight babies are a concern not just in advanced age, but also in adolescence. Adolescents (15-19 years of age) are at a greater risk than

those between the ages of 25 and 29 of giving birth to LBW babies (Liu and Zhang, 2014).

According to the marital status, the results informed that women never been married were less likely to give birth to LBW babies in Indonesia than those who were divorced. First, the length of the relationship may be an important factor in determining maternal severity risk for a significant pregnancy outcome. Previous studies finding, the quality of the relationship between biological mothers and the infant's father figure may be more important than legal status (Bird *et al*, 2000; MacDonald *et al*, 1992). Second, depending on the level of support received by the mother, psychosocial stress levels can be increased or suppressed (Shah *et al*, 2011). Furthermore, the lack of social support is a risk factor for LBW. The lack of social support could increase LBW by 3.59 times (Paredes Mondragón, 2019).

This study found that education level was a determinant factor of LBW incidence among single women in Indonesia. Similar to the report of a previous research work conducted in Indonesian rural areas, a higher level of education was found to be a barrier to LBW (Kusrini *et al*, 2021a; Kusrini *et al*, 2021b). The correlation between maternal education and LBW is likely to be attributable to the mother's socioeconomic status. The situation could be linked to the fact that women with higher education levels are more likely to look after themselves and better understand how to care for themselves and their children. Moreover, women with higher education levels have a higher socioeconomic status and rational arguments when making health and care choices (Wulandari and Laksono, 2020; Laksono *et al*, 2021).

Several studies have shown that socioeconomic factors were correlated with evidence of LBW (Agorinya *et al*, 2018; Taywade, 2017). In line with these studies, the results of the present study showed that unemployed single women were more likely to give birth to LBW babies than employed single women in Indonesia. In addition, good health and the stable socioeconomic condition of the pregnant mother are also considered to be essential prerequisites for the mental and physical well-being of the infant (WHO, 2006).

The results also showed that having few children was related to give birth LBW babies for single women in Indonesia. Nulliparity is associated with an increased risk of complications during childbirth (Kramer and Lancaster, 2010). This analysis confirms the results of a previous study by Kozuki *et al* (2013) who stated that nulliparity and para levels above 3 put women at risk of having LBW babies. The finding is in line with a previous study in Ethiopia, which found that, primiparity had 83% reduced risk of giving birth to LBW babies compared with those who were multiparity (Mekie and Taklual, 2019). Finally, many studies have shown that grand multiparous women were not at an increased risk since they were financially stable and had a good access to treatment (Eidelman *et al*, 1988; Kumari and Badrinath, 2002).

Finally, the study found wealth status to be a predictor of LBW incidence among single mothers in Indonesia. Consistent with a research work in Eastern Indonesia, wealth status was also a predictor of women giving birth to LBW babies (Kusrini *et al*, 2021a; Kusrini *et al*, 2021b). Several studies in Indonesia also revealed that the majority of children were not born with low birth weight. The LBW prevalence was around 6-9% of all births. During their first years of life, however, the majority of children had growth delays. We discovered that the more impoverished the region the slower the growth (Julia *et al*, 2008; Schmidt *et al*, 2002). Consistent with the previous studies in Indonesia, increased household wealth was one of the main determinants of improved birth outcomes (Sebayang *et al*, 2012).

Our study has certain limitations. First, the 2017 IDHS is across-sectional study, so that we could not infer the causal relationships, the gaps found and revealed in this study are still limited to a depthless understanding. Second, we should note that marital status cases of this study were self-reported. Therefore, we should cautiously interpret the results as this could lead to biases (*eg*, reporting bias and social desirability bias).

Based on the results, the study concluded that seven variables were correlated with LBW among single mothers in Indonesia. The seven variables were residence, age group, marital status, education level, employment status, parity, and wealth status.

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CONFLICT OF INTEREST DISCLOSURE

The authors declare no conflict of interest.

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