Socioeconomic Disparities in Low Birth Weight in Indonesia's Rural Areas: A Population-Based Study

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Abstract. Poverty could increase a mother's chances of giving birth to a baby with a low birth weight (LBW). Low-income families have trouble supplying food for all family members, including pregnant women. Insufficient food availability at the household level is not limited to food quantity and includes food quality, and the situation in poor households can last for a long time. The study analyzed socioeconomic disparities in rural Indonesia's yield LBW incidence. The study involved mothers (15–49 years) who have given birth in Indonesia's rural areas. The study analyzed 7,786 mothers who received the task as samples. The variables analyzed were LBW, socioeconomic, age, marital, education, employment, and antenatal care. The study used a binary logistic regression test to determine disparities. The study shows the poorest mothers were 1.500 times more likely than the wealthiest mothers to give LBW infants (AOR 1.500; 95% CI 1.499–1.500). Mothers with a more inferior wealth status were 1.531 times more likely than the most prosperous mothers to give birth to LBW infants (AOR 1.531; 95% CI 1.530–1.531). Mothers with a median wealth status were 1.411 times more likely than the richest mothers to give birth to LBW infants (AOR 1.411; 95% CI 1.410–1.412). Wealthier mothers were 1.211 times more likely than the most affluent mothers to give birth to LBW infants (AOR 1.211; 95% CI 1.210–1.211). In addition to the socioeconomic status, all control variables, including age group, marital status, education level, employment status, and antenatal care, were also associated with LBW babies incidence. The study concludes that socioeconomic disparities exist in LBW incidence in Indonesia's rural areas.

Keywords: low birth weight · socioeconomic disparities · wealth quintile · antenatal care · maternal health · public health

1 Introduction

Low birth weight (LBW) is when the infant's body weight is less than 2,500 g. LBW may happen due to genetic components or signs of premature birth [1]. LBW was recorded in 15.5% of births globally and 90% in developing countries in 2014 [2]. In Indonesia, the

I. Nurlaila et al. (Eds.): ICHR 2022, AHSR 56, pp. 403–413, 2023.
https://doi.org/10.2991/978-94-6463-112-8_37

prevalence of LBW has risen from 9.30% in 2002 to 10.2% in 2013. The 2018 Indonesia Basic Health Survey reports that the prevalence of LBW has dropped to 6.2% [3, 4]. However, LBW still requires serious attention from the government because 20% of stunting that occurs since birth is experienced by premature babies and LBW [5].

The disorder is also informed that it can occur due to asphyxia and prematurity in the first week of birth [6]. Babies born with LBW have a greater risk of newborn death, stunting, delays in brain neuron development, and other disorders during their development [1]. Children aged 0–2 years who experience LBW in Indonesia are at risk of 2.55 times to share stunting; meanwhile, children aged 12–23 months who experience LBW have 1.74 times the risk of experiencing stunting compared to those born with average weight [1, 7]. Moreover, LBW has another effect: it might increase the newborn mortality rate by 60–80% globally [8].

LBW matters to health professionals, politicians, and parents as it can hinder the development of the baby's brain, mental retardation, and the possibility of many other infectious diseases. When a child reaches puberty, the chance of LBW can be more complicated. In young adults, LBW children have an elevated risk of coronary heart disease, diabetes, immune system disorders, and metabolism [9]. LBW defines maternal health problems, maternal malnutrition, sporadic access to ANC facilities, and the low socioeconomic status of mothers in general [10]. Several studies have explained that parental, nutrition, educational, medical, environmental, and socio-cultural factors cause LBW [6, 11, 12].

Indonesia has diversified socio-cultural values and adheres to a patriarchal ideology that puts men and women in power and influence over women as family leaders [13–15]. Gender ideology undermined the negotiating position against household decisions by placing females as accompanying husbands, household regulators, and children's primary caregivers. Ultimately this subordination is not economically autonomous for women and can affect healthcare access during pregnancy and childbirth [16]. Such gender subordination often occurs, particularly in rural areas [13, 17].

Low-income families have trouble supplying food for all family members, including pregnant women. Insufficient food availability at the household level is not limited to food quantity and includes food quality, and the situation in poor households can last for a long time [18]. The condition is a severe challenge for low-income families to increase macro and micro nutrition requirements, especially for pregnant women and fetuses [19].

People living in rural areas are also, in general, more deficient than those living in urban areas, and access to health care providers is often of low quality [20–22]. Previous research has shown that mothers are more likely to give LBW babies in rural areas [23]. The community's socioeconomic status, income index, forms of sanitation, and drinking water sources were the most important contributors to health issues, including malnutrition [24]. This study analyzes information on the socio-economic role in the LBW's occurrence in rural areas. Based on the background, the study aimed to examine the socioeconomic disparities in LBW incidence in Indonesia's rural areas based on the context.

2 Materials and Methods

Study Design and Data Source

The study was a cross-sectional study. The analysis employs secondary data from the Indonesian Demographic and Health Survey (IDHS) data of 2017. Meanwhile, the 2017 IDHS collected data from July 24 to September 30, 2017. The analytical research units were mothers aged 15–49 years and born in Indonesia's rural areas in the last five years. Furthermore, the study obtained a weighted sample of 7,786 mothers using stratification and multistage random sampling.

Outcome Variables

The study uses the occurrence of LBW as the outcome variable. The study establishes the WHO LBW as less than 2.500 g (or 5.5 lb) of birth weight, regardless of gestational age. Birth weight is the infant's first body weight measured after birth in the first hour of life before significant postnatal weight loss occurs [2].

Exposure Variable

The study employed socioeconomic status as an exposure variable. The IDHS calculated the socioeconomic status based on the family-rich quintiles. Meanwhile, the survey estimated the number and types of everyday items, including televisions, bicycles, cars, and housing features, such as drinking water, sanitation facilities, and household primary flooring materials. Moreover, the research measures the results of these variables using critical factor analysis. The survey arranged national wealth quintiles based on household scores for each family member. The survey comprises five socioeconomic categories, 20% of which accounted for the population: quintile 1, quintile 2, quintile 3, quintile 4, and quintile 5 [25, 26].

Control Variables

Moreover, the study used five other independent variables as control variables, including age group, marital status, education level, employment status, and antenatal care (ANC) visits. The age group comprises seven categories: 15–19, 20–24, 25–29, 30–34, 35–39, 40–44, and 45–49. Marital status consists of two categories: single (never in a relationship, divorced, widowed) and married/living with a partner. Meanwhile, education consists of primary, secondary, and higher education. The study made up of employment status of two types: unemployed and employed. ANC visits consist of two kinds: incomplete ANC visits (<4 times) and complete ANC visits (≥ 4 times). The Ministry of Health of the Republic of Indonesia recommends that pregnant women carry out ANC visits four times. It consists of once during the first trimester, once during the second, and twice during the third [27].

Data Analysis

The study employs the Chi-Square test in the initial phase. Then, the examination conducts to see the relation between LBW and other variables. Finally, the research uses binary logistic regression to evaluate predictors and see their odds ratios in the final analysis. The study used SPSS 26 software to perform all statistical processes.

Ethical Approval

The study performs analysis by utilizing secondary data. For this reason, there is no need for ethical approval for its implementation. On https://dhsprogram.com, the authors have obtained permission to use ICF International's 2017 IDHS data.

The 2017 Indonesia DHS adheres to the Standard DHS survey protocol under The Demographic and Health Surveys (DHS) Program (DHS-7), which has been approved by ICF International's Institutional Review Board and was previously reviewed and approved by the ORC Macro IRB in 2002. DHS surveys that adhere to the standard are classified as DHS-7 Program approved. ICF International's Institutional Review Board followed the US Department of Health and Human Services requirements for the "Protection of Human Subjects" (45 CFR 46).

3 Results

The analysis found that nationally the average LBW in Indonesia's rural areas was 6.2%. In addition, Table 1 shows the descriptive statistics of the respondents' socioeconomic status in Indonesia's rural areas. Mothers who gave birth to not LBW babies led all socioeconomic status categories from the table. Based on age group, the 25–29 age group dominated all socioeconomic status types, and the 30–34 age group occupied the wealthiest group.

Married mothers or those who lived with their partners led all socioeconomic status categories based on marital status. Regarding education level, mothers with secondary education are mainly all socioeconomic status groups, except the poorest, dominated by women with primary schooling. Besides, unemployed mothers ruled the poorest, poorer, and middle groups. On the other hand, employed mothers occupied the richer and the wealthiest groups. Moreover, mothers who completed ANC visits during pregnancy led all socioeconomic status observed from ANC visits.

Table 2 describes the results of the binary logistic regression test of LBW in rural Indonesia. The findings indicate that socioeconomic status was one of the powerful predictors of LBW in Indonesia's rural areas. The poorest mothers were 1.500 times more likely than the richest mothers to give LBW infants (AOR 1.500; 95% CI 1.499–1.500). Mothers with a poorer wealth status were 1.531 times more likely than the wealthiest mothers to give birth to LBW infants (AOR 1.531; 95% CI 1.530–1.531). While mothers with a median wealth status were 1.411 times more likely than the richest mothers to give birth to LBW infants (AOR 1.411; 95% CI 1.410–1.412). Lastly, wealthier mothers were 1.211 times more likely than the most prosperous mothers to give LBW infants (AOR 1.211; 95% CI 1.210–1.211). The study indicates that the lower the socioeconomic status, the higher the possibility of LBW babies giving birth.

After this, the five control variables analyzed were also significantly associated with LBW incidence in Indonesia. Based on age group, mothers in all age groups have a lower probability of giving birth to LBW infants than mothers in the 45–49 age group. Regarding marital status, single mothers were 1.459 times more likely than married mothers to give birth to LBW infants (AOR 1.459; 9%% CI 1.458–1.459).

Mothers with primary education were 0.920 times less likely than mothers with higher education to give LBW infants (AOR 0.920; 95% CI 0.920–0.921). Mothers

Table 1. The descriptive statistics of the socioeconomic status of respondents in rural Indonesia

Variables	Socioeconomic Status					p-value
	Poorest (n = 3386)	Poorer (n = 1836)	Middle (n = 1283)	Richer (n = 837)	Richest (443)	
Low Birth Weight						<0.001
• No	93.2%	93.3%	93.9%	94.9%	95.8%	
• Yes	6.8%	6.7%	6.1%	5.1%	4.2%	
Age group						< 0.001
• 15–19 years	4.2%	3.0%	2.9%	0.9%	1.6%	
• 20–24 years	19.3%	22.2%	20.4%	14.5%	11.3%	
• 25–29 years	24.8%	24.5%	26.0%	27.4%	27.9%	
• 30–34 years	22.5%	23.9%	24.4%	27.1%	29.5%	
• 35–39 years	18.6%	17.8%	17.2%	20.4%	18.9%	
• 40–44 years	8.0%	6.9%	7.6%	7.8%	9.0%	
• 45–49 years	2.6%	1.6%	1.4%	1.8%	1.9%	
Marital status						<0.001
• Single	3.9%	2.3%	3.1%	2.3%	1.8%	
• Married/Living with a partner	96.1%	97.7%	96.9%	97.7%	98.2%	
Education Level						<0.001
• Primary	53.5%	36.5%	27.0%	17.1%	8.0%	
• Secondary	42.9%	57.5%	64.3%	63.3%	50.5%	
• Higher	3.6%	6.0%	8.7%	19.6%	41.5%	
Employment status						<0.001
• Unemployed	56.1%	61.5%	58.2%	47.0%	42.9%	
• Employed	43.9%	38.5%	41.8%	53.0%	57.1%	
ANC visits						<0.001
• <4 times	9.6%	7.2%	5.9%	4.4%	2.3%	
• ≥4 times	90.4%	92.8%	94.1%	95.6%	97.7%	

with secondary education were 0.847 times less likely to provide LBW infants than mothers with higher education (AOR 0.847; 95% CI 0.846–0.847). The results indicate that higher-education mothers are more likely to provide LBW infants.

Table 2 shows unemployed mothers were 1.227 times more likely than employed mothers to give birth to LBW infants (AOR 1.227; 95% CI 1.227–1.2270. Moreover, this study shows that mothers who did not complete total ANC visits (<4 times) during pregnancy were 1.885 times more likely to give birth to LBW babies than mothers who met ANC visits during pregnancy (≥4 times) (AOR 1.885; 95% CI 1.885–1.886). The

Table 2. Results of binary logistic regression of LBW in rural Indonesia

Predictor	Low Birth Weight			
	p-value	AOR	95% CI	
			Lower Bound	Upper Bound
Socioeconomic status: Poorest	<0.001	1.500	1.499	1.500
Socioeconomic status: Poorer	<0.001	1.531	1.530	1.531
Socioeconomic status: Middle	<0.001	1.411	1.410	1.412
Socioeconomic status: Richer	<0.001	1.211	1.210	1.211
Socioeconomic status: Richest	–	–	–	–
Age group: 15–19 years	<0.001	0.911	0.910	0.912
Age group: 20–24 years	<0.001	0.958	0.958	0.959
Age group: 25–29 years	<0.001	0.879	0.879	0.880
Age group: 30–34 years	<0.001	0.719	0.718	0.719
Age group: 35–39 years	<0.001	0.954	0.954	0.955
Age group: 40–44 years	<0.001	0.660	0.659	0.660
Age group: 45–49 years	–	–	–	–
Marital status: Single	<0.001	1.459	1.458	1.459
Marital status: Married/Living with partner	–	–	–	–
Education Level: Primary	<0.001	0.920	0.920	0.921
Education Level: Secondary	<0.001	0.847	0.846	0.847
Education Level: Higher	–	–	–	–
Employment status: Unemployed	<0.001	1.227	1.227	1.227
Employment status: Employed	–	–	–	–
ANC visits: <4 times	<0.001	1.885	1.885	1.886
ANC visits: ≥4 times	–	–	–	–

study indicates that a complete ANC visit is a protective factor for mothers to deliver normal body-weight babies.

4 Discussion

The study results show that the higher the mother's socioeconomic level, the lower the chances of having an LBW infant. Thus, the study suggests that Indonesia's rural areas' socioeconomic status is critical for LBW events. Previous studies show that LBW occurs because of insufficient maternal food intake in mothers with low socioeconomic status. This result indicates that family-inherent poverty impacts the availability and diversification of pregnant women's food intake and induces mothers to deliver LBW babies [28].

Several studies have also identified socioeconomic differences in mothers with LBW babies in low-income countries, including India and Ethiopia [29]. The studies verified a previous systematic review that assessed three electronic databases (PubMed, Scopus, and Science Direct). In addition, the study found that 11 English-language studies explored the socioeconomic differences of mothers who gave birth to LBW children [30].

Another research in India has found numerous results. It indicates an insignificant association between socioeconomic status and LBW events. They would give birth to a typical baby if a weak pregnant woman maintains a good nutritional status and prevent possible medical problems during pregnancy [31]. This result may guide the government's strategies to minimize the incidence of LBW by introducing nutritional programs for vulnerable pregnant women.

The study discovers the age of a mother giving birth to an LBW infant as one of the research indicators. Several prior research in various nations based their conclusions on the same findings. Compared to moms between the ages of 20 and 35, children born to moms between 15 and 19 have a 94% greater risk [32]. In contrast, mothers who give birth to children under the age of 20 are not at risk of giving birth to LBW children [10].

The study informs single mothers are more likely than married mothers to give birth to LBW infants in Indonesia's rural areas. According to the research, becoming a single mother entails an unfavorable social position that harms their health. Furthermore, LBW is associated with a lack of social support, and lack of social support has been linked to a 3.59-fold increase in LBW [33, 34].

The analysis results indicate that mothers with higher education have a higher probability of giving birth to LBW infants. Several studies on the culture and value of children of several ethnic groups may cause this finding [13, 35], including the culture of food taboos for pregnant women [36]. Research in Brazil showed a significant decrease in LBW neonates born to higher-education mothers, and a slight rise in mothers with poor education was reported [37]. These results align with previous studies in various countries, stating that better mothers' education level was a protective factor for LBW cases [12, 19, 38].

The result indicates mothers' unemployment was a risk factor in giving birth to LBW infants. This situation explains WHO's argument that pregnant women's good health and stable socioeconomic conditions are essential prerequisites for infants' mental and physical well-being [39].

The finding also shows a complete visit to the ANC was a protective factor in Indonesia's rural areas. The resulting study reaffirms the value of monitoring pregnancy by health workers [27]. Furthermore, it considers ANC beneficial to pregnant women's health, and strong ANC quality may also decrease the incidence of LBW [40]. ANC offers standard height and weight gain monitoring, maternal or fetal medical issues detection, tobacco or drug use therapy, psychosocial help, health guidance, and early intervention to decrease adverse effects of pregnancy, including LBW. Thus, pregnant women should emphasize access to high-quality ANC as it enhances maternal health and offers resources for therapy and other pregnancy-related risk assessments [10].

Strength and Limitation

There are at least two strengths to this analysis. The 2017 IDHS first used a validated and standardized survey tool to interview participants. Second, logged-verified LBW data was used in this analysis, removing the risk of recall bias. Meanwhile, as this study was a cross-sectional study, the study only can verify the temporal association between exposure and outcome variables. Another drawback is that some recognized risk factors from previous research that examined LBW, including dietary and nutritional factors, were not investigated [41]; genetic factors, pollution, and environmental factors [42]. Another limitation of this data source is that the IDHS collected information about the birth weight from either the child's card or the mother's recall; therefore, there is a chance of recall bias. This limitation is more prevalent due to local secondary data from the 2017 IDHS.

5 Conclusion

Based on the results, the study concluded that socioeconomic disparities exist in LBW incidence in Indonesia's rural areas based on the research findings. The present study provides a specific aim that the government can target to reduce LBW prevalence in Indonesia. The key goals may be pregnant women with low socioeconomic status. According to government guidelines, a strategy must enable vulnerable pregnant women with insufficient teaching to regularly make ANC visits. Moreover, the government must also plan a nutritional intervention for these mothers.

Acknowledgments. The author would like to thank ICF International for agreeing to allow this paper to review the 2017 IDHS data.

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