Determinant Factors of Low Birth Weight in Infants

Wahyu Gito Putro[1], Putri Septiani Azzahra Pranoto[2], Lela Kania Rahsa Puji[2], Chori Elsera[3], Kadek Darmawan[4]
[1]Department of Public Health, Faculty of Medicine, Universitas Muhammadiyah Semarang
[2]Department of Health Administration and Policy, Bachelor of Public Health, Widya Dharma Husada College of Health Sciences
[3]Department of Maternity Nursing, Vocational Studies in Nursing Science, Universitas Muhammadiyah Klaten
[4]Centre for Excellence in Higher Education Science and Technology Center for Public Health Innovation, Udayana University
[1]Email: wahyugitoputro@unimus.ac.id

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ABSTRACT

Low Birth Weight (LBW) is a significant public health issue as it contributes to morbidity and mortality rates in neonates, infants, and children. Although many studies have examined the risk factors for LBW, no research has yet explored LBW cases in South Tangerang. This study aims to identify the determinant factors affecting LBW incidence in South Tangerang. This research employed a descriptive-analytic design with cross-sectional approach conducted at South Tangerang Hospital from October 2022 to January 2023. The study population consisted of 130 LBW cases, and sample of 97 respondents was randomly selected using Lameshow (5%). Data were collected through interviews using a validated and reliable questionnaire. Data analysis was performed using univariate and bivariate analysis with the Chi-square test, and Fisher's Exact Test was used as an alternative when expected values were not met. The significance level was set at p-value <0.05. The results showed no significant relationship between maternal age (p=0.655), parity (p=1.000), gestational age (p=1.000), birth spacing (p=0.118), or chronic illness (p=0.152) and LBW incidence. Although no significant associations were found, further research is needed. These findings can serve as a foundation for more targeted intervention programs in maternal and child healthcare to prevent and address LBW.

INTRODUCTION

According to the Ministry of Health of the Republic of Indonesia (MOH RI), babies who weigh <2500 grams are low birth weight babies (LBW) (MOH RI, 2023a). This condition is of serious concern because it contributes to high mortality and disease rates in neonates, infants, and children (Putri et al., 2019). In Indonesia, LBW is the main driver of the newborn mortality rate in 2021-

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2022, which is 34.5% in 2021 and 28.2% in 2022 (Ministry of Health, 2023a). Research results show that the risk of death in LBW babies reaches 20 times (Dewanti and Widyanthini, 2023). Research in Serang Regency in 2023 supported this finding, where LBW became the main cause of neonate death with a contribution of 46% of the total 215 cases of neonate death in the district (Kurniatillah et al., 2023).

According to the World Health Organization (WHO), the impact of LBW is not only limited to the risk of high mortality in neonates, but also affects long-term quality of life, such as an increased risk of stunting (WHO, 2018). Research conducted in 2023 at the Santi Meliala Inpatient Primary Clinic found that there was a significant correlation between LBW and the frequency of under-five stunting (Siregar et al., 2024). Another study also revealed that LBW has a vulnerability to various diseases, long-term neurological disorders, difficulties in understanding and receiving language, problems in academic achievement, and a higher risk of experiencing chronic or systemic diseases such as heart disease and diabetes (DeSilva et al., 2017).

Faced with the significant impact of LBW, countries around the world have set reducing LBW rates as a top priority on the global agenda. The Sustainable Development Goals (SDGs) target a 30% reduction in LBW by 2025, with a relative reduction of 3% each year from 2012 to 2025. WHO estimates that the total number of LBW could be reduced from 20 million to 14 million by 2025 (WHO, 2014). This effort reflects a global commitment to improving the health of infants and children and reducing the burden of disease associated with LBW.

Based on data from the United Nations International Children's Emergency Fund (UNICEF) and WHO, 15% of infants are LBW, with more than half coming from Asia (UNICEF and WHO, 2019). According to a report from UNICEF and the National Development Planning Agency (BAPPENAS), Indonesia, as a developing country, is ranked fifth highest among 88 countries in terms of the number of babies born with LBW (UNICEF and BAPPENAS, 2017). By 2023, the prevalence of LBW in

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Indonesia will reach 6.1%, representing a decrease of 0.1% compared to 2018 (Ministry of Health, 2018, 2023b). Although Indonesia experienced a decrease in the prevalence of LBW, this percentage has not yet reached the target of 3% per year (WHO, 2014).

In 2023, Banten Province Health Profile data recorded that the percentage of babies born alive with LBW reached 14.95%. South Tangerang City ranked second in Banten Province with the highest ratio of LBW babies in the same year, reaching 19.39%. There was a significant increase from 16.06% to 19.39% in 2023 compared to 2021 (Badan Pusat Statistik Provinsi Banten, 2022, 2024). This illustrates a significant increasing trend every year in the city.

Several researchers continue to search for variables that have an influence on the frequency of the increase in LBW cases in various regions. Research on the determinants of LBW conducted by Merzalia found a significant correlation between LBW and haemoglobin levels of pregnant women, including mothers with undernourished status, maternal age, delivery distance, and gestational age (Merzalia, 2012). Another study conducted in 2023 at Puskesmas Kedungmundu Semarang City found variables associated with LBW including maternal age, body mass index during pregnancy (LILA), gestational age, and distance between pregnancies (Maria and Arulita, 2023). However, no research has explored LBW cases in South Tangerang City. Therefore, the researcher is interested in identifying the determinant variables that have an influence on LBW cases in the area.

RESEARCH METHODS

This study was a descriptive analytical quantitative research with a cross-sectional design conducted at the Regional General Hospital (RSUD) of South Tangerang City from October 2022 to January 2023. The study population included all mothers who had babies with LBW less than 2500 grams, who were registered at the South Tangerang City Hospital, with a total population of 130 people. Sample size calculation was conducted using the Lameshow formula (1997) with an error rate of 5%, which resulted in a sample of 97 respondents. The sampling stage

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was carried out using random sampling technique, where all members of the population were given a serial number, then the sample selection was carried out randomly using a random number table to ensure that every mother in the population had the same chance of being selected as a respondent.

The variables in this study include dependent variables such as LBW cases, as well as independent variables such as maternal age, parity, gestational age, type of birth, and history of chronic/severe illness. The questionnaire used in this study was designed to collect data from mothers of LBW infants and measure various variables related to the incidence of LBW. The questionnaire included questions related to the demographic, socio-economic, and health accessibility characteristics of the respondents.

The validity of the questionnaire was tested through construct validity to ensure that each question item was relevant to the concept being measured. The validity test was conducted by correlating each item with the total score, and items that had a correlation value of more than 0.30 were declared valid. Questions in the questionnaire also included variables such as age, latest education, occupation, family income per month, and distance of residence to health facilities.

The reliability of the questionnaire was tested using the Cronbach's Alpha method, with the results showing a value of more than 0.70, indicating that the instrument had good reliability. This test ensures internal consistency between items in the questionnaire, so that each question is reliable in measuring the variables studied.

Interviews were conducted directly with a questionnaire guide. The questions were designed to obtain accurate information related to the demographic characteristics, socio-economic status, and access to health services of the respondents. With proven validity and reliability and questions designed based on theory and previous research, the questionnaire was expected to be able to measure factors affecting LBW incidence precisely and accurately.

Data analysis began with descriptive statistics or univariate analysis to describe sample characteristics, then continued with

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bivariate analysis using the Chi-Square test. Fisher's Exact Test was used as an alternative because there were 5 cells (25.0%) that had an expected value of less than 5. The relationship between variables was considered significant at the 95% significance level (α = 0.05) if the p-value was <0.05.

This study has paid attention to the ethical aspects of research by obtaining a research permit from the Faculty of Medicine, Public Health, and Nursing, Gadjah Mada University with a research permit letter number: KE/FK/1426/EC/2023.

RESULTS AND DISCUSSION

There were 97 respondents involved in this study. Respondents who were interviewed were mothers who had LBW babies recorded at the South Tangerang City Hospital. There were no respondents who refused to be interviewed or the response rate was 100%.

Table 1. Characteristics of families with LBW infants

Characteristics	n (%)	Characteristics	n (%)
Mother's Education		Mother's occup	
Not in school	1 (1)	Civil Servant/ The Indonesian National Army /Police	3 (3,1)
Graduated from primary school/equivalent	13 (13,4)	Private Employee	43 (44,3)
Graduated from junior high school/equivalent	20 (20,6)	Traders / Entrepreneurs	28 (28,9)
Graduated from senior high school/equivalent	48 (49,5)	Teacher/Lecturer	1 (1)
Diploma	4 (4,1)	Labourer	22 (22,7)
Bachelor Degree	11 (11,3)	Access to Hospital	
Family Income		1.1 kilometres - 5 kilometres	26 (26,1)
≤ Rp4.280.214	67 (69,1)	5 kilometres - 10 kilometres	37 (38,1)
Rp4.280.214-Rp. 5.000.000	20 (20,6)	≥ 10 kilometres	34 (35,1)
≥ Rp5.000.000	10 (10,3)	LBW according to recovery	
LBW by Weight		LBW Returned to Normal	50 (51,5)
LBW (≤ 2.500 g)	90 (92,8)	LBW Continues	8 (8,2)
VLBW (< 1.500 g)	7 (7,2)	LBW Continued LBW with Comorbidities	25 (25,8)
		LBW subsequently died	14 (14,4)

Table 1 shows the conditions of the 97 people who wanted to participate as respondents in this study. According to the education level of the mothers, most had a senior high school education (49.5%). The majority of mothers

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worked as private employees (43.44%) and the majority of family income per month was less than IDR 4,280,214 (69.1%). For access to health care facilities, the distance travelled from home to the hospital was mostly 5-10 km (38.1%). In addition, 92.8% of LBW babies weighed ≤2500 grams, while very low birth weight babies (VLBW) weighing <1500 grams accounted for only 7.2%. In particular, the LBW category that returned to normal showed the highest percentage of 51.5%, while the LBW category that remained LBW had the lowest percentage of 8.2%.

Table 2. Test Results of the Relationship between Maternal Age, Parity, Gestational Age, Pregnancy Spacing, and Chronic or Severe Illness of the Mother with LBW Cases.

Variables	Weight Classification				*p-value*
	LBW		VLBW		
	n	%	n	%	
Mother's age					
At risk (less than 20 years/more than 35 years)	20	20,4	2	1,6	0,655
Not at risk (20-35 years)	70	69,6	5	5,4	
Parity					
At risk (First childbirth or parity > 3)	50	50,1	4	3,9	1,000
Not at risk (2 - 3 births)	40	39,9	3	3,1	
Gestational Age					
Old gestational age (third trimester)	85	85,4	7	6,6	1,000
Young gestational age (first and second trimester)	5	4,6	0	0,4	
Distance between pregnancies					
Not at risk (2 - 3 years)	44	41,8	1	3,2	0,118
Risky (less than 2/more than 3 years)	46	48,2	6	3,8	
Chronic or Major Illness					
Presence of disease	8	9,3	2	0,7	0,152
No disease	82	80,7	5	6,3	

Table 2 identifies the determinants of maternal LBW, including maternal age, parity, gestational age, interval between births, and presence of chronic or severe disease.

Relationship between Maternal Age and LBW Cases

Maternal age in the study was calculated from the date of birth to the time of the study and expressed in years. Maternal age was divided into two groups: at risk (<20 years or >35

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years) and no risk (20 to 35 years) (Winarsih, 2017).

Table 2 states that the majority of mothers who had LBW infants were in the non-risk category, with a percentage of 69.6%. This means that more than half of them were in the age range of 20-35 years.

Based on the Fisher exact test, the p-value was 0.655 > α (0.05) with a cell of 25.0%. This means that there is no significant relationship between maternal age and the incidence of LBW. In a sense, this finding indicates that maternal age, in this study, was not a factor influencing the incidence of LBW in the study area. Although maternal age is often considered an important risk factor in LBW incidence, this study shows that in this specific context, age does not have a significant direct impact.

The results of this study are similar to many previous studies. Research at Namira Maternal Hospital (RSI) in 2018 stated that there was no association between maternal age and LBW cases, resulting in a p-value of 0.699 > α (0.05) (Yanti, Sriwiyanti and Susanti, 2020). This finding shows that maternal age is not the only direct factor that causes LBW.

A similar study at RSUD Tidar Magelang in 2017 also found no significant relationship between maternal age at delivery and LBW cases, with a p-value of 0.315. Most of the mothers in the study were in the non-risk age group (20-35 years), 74.5% (Permatasari and Puspita, 2017).

In addition, research at Cilacap Regional Hospital in 2021 also supports this result. The study found that there was no significant correlation between the age of pregnant women and LBW cases, with a p-value of 0.656. The majority of pregnant women in this study were also in the non-risk age group (Apriani, Subandi and Mubarok, 2021).

The results of various studies consistently show that maternal age in the non-risk range (20-35 years) has no significant relationship with LBW cases.

Relationship between parity and LBW cases

Parity is the total number of childbirths the mother has gone through. In this study, parity was categorised into two categories: at risk (primigravida or

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parity > 4) and not at risk (parity 2-4 times) (Putri and Ismiyatun, 2020).

Based on table 2 which states the parity of mothers who have babies with LBW incidence is more at risk in parity> 3, with the highest percentage level of 50.1%. Based on the Fisher Exact Test, the p-value of 1.000 > α (0.05) with a cell of 50.0%. It can be interpreted that there is no significant correlation between parity and LBW cases.

Although high parity is often considered a risk factor that can increase the likelihood of LBW, this result shows that in the context of the population studied, parity is not significantly associated. The number of children a mother has (parity) is not always a determinant of LBW risk if other variables are well controlled.

This study is similar to a study conducted in 2021 at the Kersik Tuo Health Centre, which also stated that parity did not have a significant correlation with the incidence of LBW. In this study, the p-value was 0.576 > α (0.05). However, with a 95% confidence interval value (0.206-1.886) and Odds Ratio = 0.623, these results show that mothers with parity ≥4 have a 0.623 times greater risk than mothers with parity 1 to 3. However, this suggests that parity is not a major risk factor for LBW (Putri and Rifdi, 2021).

Another study conducted at RSUD Cilacap in 2021 also found that there was no significant relationship between parity and LBW cases, with a p-value of 0.236. This is due to the fact that mothers with more than 3 parities generally have more experience in providing care for babies and are more physically and mentally prepared for pregnancy. In addition, mothers with high parity do not always experience more severe risk factors (Apriani, Subandi and Mubarok, 2021).

A previous study conducted in 2015 by Mahayana et al, showed that there was no significant correlation between parity and the incidence of LBW, either premature or delayed, with a p-value of 0.160 (Mahayana, Chundrayetti and Yulistini, 2015).

The results of this study are similar to previous studies, showing that first-time parity and parity more than three are not associated with the incidence of LBW, due to unmet statistical requirements, with expected frequency <5 or 20% cells. Further

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analysis, the Fisher Exact Test, resulted in a p-value = 1.000. This may be influenced by the impact of parity on maternal anxiety before labour, which is related to psychological aspects. Mothers experiencing their first labour often experience excessive anxiety and fear, which can affect their psychological state. In contrast, mothers who have given birth >3 times may have experienced various fears and tensions from previous deliveries, which may increase anxiety about the pain of the next delivery. However, in this study, parity of more than three was not considered as a risk factor affecting LBW cases.

Relationship between gestational age and LBW cases

Gestational age is an indicator that shows the duration of pregnancy and can be calculated from the first day of the last menstruation or from the time of conception to delivery. In this study, gestational age was grouped into two categories: old gestational age (third trimester) and young gestational age (first and second trimester) (Septiani and Ulfa, 2018).

Table 2 shows that LBW cases were highest in the category of mothers who were in the third trimester of pregnancy, with a percentage reaching 85.4%. Based on the Chi-Square test and Fisher Exact Test, the p-value was 1.000 with a cell of 50.0%. This resulted in no significant correlation between gestational age and LBW cases. The meaning of this result is that gestational age in the final trimester does not directly affect low birth weight. Although gestational age is important in foetal development, other more complex factors may play a greater role in determining the birth weight of the baby.

The results of this study are consistent with the findings of a 2014 study at a rural health centre in Banjarnegara district, which also found no significant correlation between gestational age and LBW, with a p-value of 0.102. In general, the causes of LBW are premature birth and delayed foetal growth. Premature birth occurs when the gestational age is <37 weeks, while delayed fetal growth occurs when there is a growth disorder in the fetus so that the fetal weight is below the 10th percentile (Sulistyorini and Putri, 2015).

This study, similar to previous studies, showed that third trimester

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gestational age did not have an association with LBW. This is because in the third trimester, babies are generally mature enough to be born. Meanwhile, gestational age in the younger trimesters (I and II) is a gestational age that is close to perfect but has not reached perfection like the third trimester.

Relationship between birth spacing and LBW cases

Birth spacing refers to the period of time between the previous birth and the next pregnancy. This study categorised birth spacing into two categories: no risk (2-3 years) and risk (<2 years or >3 years) (Merzalia, 2012).

Table 2 shows that birth spacing in mothers with LBW had the highest percentage in the risk category (<2 or >3 years), which was 48.2%. Based on the Chi-Square statistical test with Fisher Exact Test showed a p-value of 0.118 > α (0.05) with a cell of 50.0%. This means that birth spacing does not have a significant relationship between LBW cases. The meaning of this result indicates that although risky birth spacing (too short or too long) is often associated with LBW in other studies, in this population birth spacing did not have a statistically significant impact on LBW incidence.

This result is similar to a study at RSI Namira in 2018 which also found that there was no significant correlation between birth spacing and LBW cases, with a p-value of 0.407 > α (0.05). In the study, birth spacing was not the majority at risk (≥2 years) (Yanti, Sriwiyanti and Susanti, 2020).

Research conducted by Bili et al, also supports this finding by showing birth spacing does not have a significant association with LBW cases, namely with an expected frequency of less than 5 or 20% in all cells, further analysis using the Fisher Exact Test, which resulted in a p-value of 0.476. This result may be due to the fact that pregnancy spacing <2 years may result in suboptimal fetal development and increase the risk of bleeding during labour, as the uterus is not fully recovered (Bili, Liana and Bunturo, 2019).

This study, supported by previous studies, found that birth spacing (< 2 or > 3 years) was not associated with LBW. This is because the statistical requirements were not met due to the presence of cells with expected

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frequency <5 or 20%, which was then further analysed, namely the Fisher Exact Test which resulted in a p-value of 0.118. Birth spacing < 2 years can affect the uterine wall that has not recovered optimally, while birth spacing > 3 years causes the condition of the uterus to be not as optimal as at birth spacing less than 3 years.

Association of Chronic or Severe Disease with LBW Incidence

Mothers who have LBW babies often have chronic or severe illnesses. In this study, a chronic or severe illness was defined as a condition suffered in the last five years or diagnosed by a health professional. Diseases included stroke, hypertension, cancer, diabetes, asthma, tuberculosis (TB), chronic lung disease, liver disease, arthritis, gout, heart disease, and kidney failure. The category of disease in mothers in this study divides two groups: having a disease and not having a disease (Winarsih, 2017).

Table 2 shows that the highest percentage of mothers who did not suffer from annual or severe illnesses in the last 5 years was 80.7%, which is included in the category of most of the mothers who did not suffer from annual or severe illnesses. Based on the Chi-Square test using the Fisher Exact Test, the p-value was 0.152 > α (0.05). This means that annual disease or severe disease does not have a significant correlation with LBW cases. The meaning of this result indicates that in the population studied, the factor of history of annual or severe illness does not contribute directly to the risk of LBW. This could mean that there may be other factors that are more dominant in influencing the incidence of LBW in healthy mothers.

This study is similar to a study at Prambanan Regional Hospital in 2015 which found that there was no correlation between annual or severe illness at the time of delivery and LBW cases. Based on the statistical test conducted, the p-value = 0.28 > α (0.05) was obtained. This happened because, most of the total respondents who had chronic diseases were only 16 respondents with a percentage of 11.4% of the total number (Hidayati and Warsiti, 2016).

This study, supported by a similar study, stated that annual or severe illness did not have a significant correlation between LBW cases, which

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was due to the relatively small number of respondents who suffered from severe illness or annual illness, namely only 8 people or 9.3% of the total respondents.

CONCLUSIONS

There was no significant association/correlation between maternal age (p-value = 0.655), parity (p-value = 1.000), gestational age (p-value = 1.000), birth spacing (p-value = 0.118), and chronic or severe disease (p-value = 0.152) with LBW incidence.

Although this study did not identify a significant association between the factors analysed and the incidence of LBW, further research with a more comprehensive approach may improve understanding of the factors that contribute to the incidence of LBW. The results of this study can also be used as a basis for the development of more targeted maternal and child health service programmes. Such programmes could include interventions that focus more on educating mothers about care during pregnancy, improving access to prenatal health services, and more intensive monitoring of maternal and infant health. The implementation of these interventions will not only help reduce the incidence of LBW, but also improve the overall health of mothers and children. Therefore, integration of the study results with maternal and child health care policies is crucial to ensure a broader impact on LBW prevention.

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