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RISK FACTORS FOR LOW BIRTH WEIGHT IN PUSKESMAS GANDING

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ABSTRACT: Background: The high incidence of low birth weights (LBW) is due to interrelated factors from both the mother and the fetus. Maternal health status affects birth weight directly. Periodic health checks for pregnant women (antenatal care visits) are one of the main activities in maintaining the health of the mother and the fetus.
Objective: To examine the risk factors for LBW.
Method: This was an observational analytical study with a case-control approach. The sample was 48 respondents, with 24 mothers experiencing LBW as the case respondents and 24 mothers whose babies were in the normal weight range as the control respondents. The size of the sample was determined using a 1:1 comparison with a purposive sampling method.
Findings: The average height of the respondents was 151.23 cm, weight gain was 9.00 kg, systolic blood pressure was 113.75, mid-upper arm circumference (MUAC) was 23.58 cm, gestational age was 37.42 weeks, and infant birth weight was 2604.17 g. On average, the examination of multiparous status, fetal position, head presentation, counseling, and laboratory tests were also determined. A chi-squared test showed no statistically significant relationships with LBW for the height of the pregnant woman, the blood pressure, the fetal position, the status of TT vaccinations, the administration of iron tablets, counseling, or laboratory examination. In contrast, weight gain, MUAC, fundal height, parity, and maternal age had significant relationships with LBW.
Conclusion: The maternal age, weight gain during pregnancy, MUAC, fundal height, and parity were associated with LBW.

Keywords: LBW, antenatal care

1. BACKGROUND

The World Health Organization (WHO) defines low birth weight (LBW) babies as those born with a bodyweight below 2500 grams. LBW is a major indicator of the health and nutrition of the mother and the fetus. Newborns with LBW have a higher risk of death in the first 28 days of life.[1, 2]

More than 20 million babies were born with LBW or around 1 in 7 births in the world, according to 2015 data. This means in a decrease in LBW in 2000 and 2015 by 1.2%, and WHO has targeted a 30% reduction in the prevalence of LBW between 2012 and 2025. Thus, a 2.7% reduction in LBW incidence rates each year is needed to meet the target.[3]

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The results of the RISKESDAS survey in Indonesia confirmed an increase of LBW by 5.4 to 6.2.4 between 2007 to 2018, and infant and neonatal mortality rates for LBW babies was 47%. The main causes of death were premature birth, asphyxia, infection, and birth defects.[5] LBW is the result of preterm labor (gestational age < 37 weeks)—mothers who give birth before a gestational age of 37 weeks are ten times more likely to give birth to LBW babies compared with mothers having a full-term birth (≥ 37 weeks). Increased LBW is the main predictor of infant mortality, especially in the first month of life, and those who survive are more likely to suffer growth retardation, and lower IQ[6] and its effects will continue into adulthood, increasing the risk of chronic conditions such as obesity and diabetes.[7]

Many interrelated factors (both from the mother and the fetus) increase the risk of LBW. Maternal health status affects birth weight directly. Periodic health checks on pregnant women (antenatal care visits) are one of the main activities for maintaining the health of the mother and the fetus. The importance of antenatal care for pregnant women is related to the promotion of health, screening and diagnosis, and the prevention of disease. WHO recommends that antenatal care should consist of at least four visits for a woman with a normal pregnancy.[8] Regular antenatal care is the first step in preventing LBW.[9] Consequently, the quality and quantity of antenatal care must be maintained. Antenatal care in Indonesia is carried out in an integrated manner comprising ten examination measures: measurement of height and weight, measurement of blood pressure, measurement of fundal height, measurement of mid-upper arm circumference (MUAC), examination of the fetal position and fetal heart rate, a check on the status of the tetanus toxoid (TT) vaccination, administration of blood-booster tablets, laboratory tests, pregnancy counseling, and counseling related to health problems during pregnancy. These services must be available for pregnant women since these factors may contribute to the risk of LBW. After consideration of these measures, we decided to study the risk factors of LBW in *Puskesmas Ganding* to determine which risk factors were associated with LBW.

2. METHOD

This was an observational analytical study with a case-control approach conducted at *Puskesmas Ganding* of Sumenep Regency from January to December 2019. Our study involved 48 mothers divided into two groups: 24 mothers experiencing LBW as the case respondents, and 24 mothers with normal weight babies as the control respondents. The size of the sample was determined using a 1:1 comparison with a purposive sampling method.

The independent variables were the ten antenatal care measures taken by midwives (measurement of height and weight, measurement of blood pressure, measurement of fundal height, measurement of MUAC, examination of the fetal position and fetal heart rate, a check on the status of the tetanus toxoid vaccination, administration of blood-booster tablets, laboratory tests, pregnancy counseling, and counseling related to health problems during pregnancy) documented in the KIA book. The dependent variable was LBW. We used a bivariate analysis with a chi-squared test to determine which of the independent variables were associated with LBW.

3. FINDINGS AND DISCUSSION

The average height of the respondents was 151.23 cm, the average weight gain was 9.00 kg, systolic blood pressure was 113.75, MUAC was 23.58 cm, gestational age was 37.42 weeks, and infant birth weight was 2604.17 g. The parity of multiparous children, fetal position, head presentation, counseling, and laboratory tests were also conducted.

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Those factors are the rights of pregnant women in the integrated ANC examination at *Puskesmas Ganding*. A bivariate analysis was done after the examination to reveal the factors affecting LBW at *Puskesmas Ganding*, see Table1.

Table 1. LBW Risk Factors

Variable	**Case Group**	**Control Group**	**P-Value**
	n%	**n%**	
Maternal age < 20 years old 20 – 35 years old >35 years old	 3 (12.5%) 8(33.33%) 13 (54.16%)	 5 (20.83%) 13 (54.16%) 6 (25%)	0.05
Height < 145 cm >145 cm	 2 (8.33%) 22(91.66%)	 1 (4.16%) 23 (95.83%)	0.80
Weight < 9 kg > 9 kg	 22 (91.22%) 2 (8.33%)	 0 24 (100%)	0.00
Blood pressure (systolic) < 120 ≥ 120	 10 (41.66%) 14 (58.33%)	 12 (50%) 12 (50%)	0.24
MUAC < 23.5 cm ≥ 23.5cm	 16 (66.66%) 8 (33.33%)	 1(4.16%) 23 (95.83%)	0.00
Fundal Height Suitable Not suitable	 6 (25%) 18 (75%)	 24 (100%) 0	0.00
Fetal Position Vertex presentation Breech presentation	 23 (95.83%) 1 (4.16)	 22 (91.66%) 2 (8.33%)	0.20
TT Vaccination Complete (5TT) Not complete	 24 (100%) 0	 24 (100%) 0	0.23
Administration of Fe tablet Yes No	 24 (100%) 0	 24 (100%) 0	0.23
Pregnancy Counseling Yes No	 24 (100%) 0	 24 (100%) 0	0.08
Parity Primiparous Multiparous Grand multiparous	 3 (12.5%) 7 (29.16%) 14 (58.33%)	 12 (50%) 9 (37.5%) 3 (12.5%)	0.00
Laboratory checks Yes No	 24 (100%) 0	 24 (100%) 0	0.33

The chi-square test showed no significant relationship with LBW for the height of the pregnant woman (p = 0.080), the blood pressure (p = 0.24), the fetal position (p = 0.20), the

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status of the TT vaccination ($p = 0.20$), the administration of iron tablets ($p = 0.21$), counseling ($p = 0.08$), or laboratory checks ($p = 0.33$) because the value of $p > 0.05$. In contrast, weight gain ($p = 0.00$), MUAC ($p = 0.00$), fundal height ($p = 0.00$), parity (0.00), and maternal age ($p = 0.05$) showed significant relationships with LBW because the value of $p \leq 0.05$.

The relationship between height and LBW was not significant because most mothers in the case and control groups had an average height of more than 145 cm—a study by Ismi confirmed that heights > 145 cm were not a risk factor for LBW.[10] In contrast, mothers' height also has a relationship with stunting. Short mothers with a height of < 145 cm have a 2.14-times higher risk of having children experiencing stunting than mothers of a normal height.[11]

There was no significant relationship between blood pressure and LBW because mothers in both groups had normal blood pressure (below 130 mmHg), which means that they did not suffer from hypertension. Hypertension is a triad of preeclampsia that causes LBW. Thus, for blood pressure, the risk of LBW can be predicted with a sensitivity and specificity of 70%.[12]

The fetal position had no significant relationship with LBW because most of the fetuses had a normal or vertex presentation. Normal presentation and head presentation all determine the fetal position, which affects the delivery process (normal or abnormal). Our study confirmed that the delivery process had no significant relationship with LBW[13], and theoretically, there has been no pathophysiology as well.

There was no significant relationship between TT vaccination and LBW, as most of the respondents had been vaccinated. TT is a protein-based subunit vaccine that elicits IgG1 immune responses, with antibodies actively transported across the placenta with efficiencies > 100%. WHO recommends giving two doses of TT to be given twice, one in the first pregnancy and one for every subsequent pregnancy for a maximum of five doses.[14] Pregnant women who have not had a TT vaccination have 9.50 times more risk of experiencing LBW than those who have had the vaccination.[15]

Iron administration had no significant relationship with LBW because all the respondents had taken iron tablets. However, there were LBW cases in the case group, and some respondents were not taking their iron tablets as recommended. Pregnant women who consume fewer than 90 iron tablets have a 2.1 times greater risk of LBW compared with those who consume more than 90 iron tablets.[16] The non-compliance in consuming iron tablets leads to pregnant women suffering from anemia, which has a very significant impact on LBW.[17, 18] Our study did not measure the number of iron tablets given during pregnancy, so the statistical test showed no significant relationship between the administration of iron tablets and LBW.

Pregnancy counseling and counseling related to health problems during pregnancy also had no significant relationship with LBW. All of the respondents visiting midwives were given the choice of pregnancy counseling from health workers. However, there was a shortage of time for counseling, and mothers could not gain a comprehensive knowledge and understanding of their pregnancy. This might have contributed to the LBW in the case group. Good counseling results in a comfortable and warm relationship between mothers and health workers that can help to create certainty for the mothers.[19]

There was no significant relationship between LBW and the laboratory tests and examinations. Every pregnant mother visiting *Puskesmas Ganding* had to have a laboratory

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examination to assess the health status of the mother and the fetus. Although laboratory tests were conducted, LBW still occurred—thus, further investigations are needed because laboratory tests at *Puskesmas Ganding* only covered hematological examinations (checking hemoglobin and blood type). Blood chemistry and complete urine examinations were only done if mothers mentioned that they were suffering from a complaint. We believe that complete hematological, blood chemistry, and urine examinations could help to predict LBW.

There was a significant relationship between the independent variables – weight gain, MUAC, fundal height, parity, and gestational age – and the dependent variable LBW. Weight gain during pregnancy in the case group was mostly below 9 kg as recommended by WHO, who recommend that weight gain in pregnancy should be around 9 kg with a weight gain of 1 kg per month. The baby's birth weight is affected by the baby's weight gain during pregnancy, and maternal weight gain must be in harmony with the fetus's weight gain because a lack of nutrition in mothers indirectly leads to LBW and affects the delivery process.[20, 21] MUAC had a significant relationship with LBW because it represents the nutritional status of the pregnant women. If mothers experience a lack of nutrition during pregnancy, there is a higher possibility of LBW, so mothers must get counseling to understand their nutritional needs during pregnancy. [22] This finding was consistent with the results of similar studies.[23, 24] Fundal height had a significant relationship with LBW since it helps to predict a baby's weight and gestational age with a high degree of accuracy before delivery.[25] Measurement of fundal height is a mandatory procedure in antenatal care. Parity was also related to LBW events because the average parity of the respondents was > 3 and represented the nutritional status of mothers. Parities > 3 represent a 1.9 times risk of LBW compared with parities < 3.[26] Maternal age also had a significant relationship with LBW because of the decrease in the function reproductive organs when women reach the age of 35 or more. A higher risk for various complications also occurs in pregnant women over the age of 35. Studies of older pregnant women showed that they were more vulnerable to preeclampsia, hypertension related to pregnancy, and cesarean sections.[27] Our findings supported other studies which found that maternal age affected infant birth weight or LBW.[28-30] Weight gain, MUAC, fundal height, parity, and gestational age are related to each other, and all of them can be used to predict LBW if the antenatal examination is performed well. Thus, the quality of antenatal care needs to be improved.

4. CONCLUSIONS

This study investigated ten factors that could influence LBW. We found that LBW was affected by maternal age, weight gain during pregnancy, mid-upper arm circumference, fundal height, and parity. A detailed assessment and examination are needed to improve the quality of antenatal care so that LBW can be minimized.

Cohort studies to determine the factors responsible for LBW are recommended as a follow-up of the present study.

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