Volume 12, Issue 2, 2024: 151-167
p-ISSN 2354-7642 e-ISSN 2503-1856
Accredited by Directorate General of Higher Education, Research and Technology, Republic of Indonesia No. 35/E/KPT/2019

Jurnal Ners dan Kebidanan Indonesia
(Indonesian Journal of Ners and Midwifery)
DOI : http://dx.doi.org/10.21927/jnki.2024.12(2).151-167
Available online at: http:ejournal.almaata.ac.id/index.php/JNKI

Preeclampsia is a risk factor for Low Birth Weight (LBW) infants

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ABSTRACT

Background: *Infant mortality remains high and is more common in the neonatal period. Causes of neonatal death include asphyxia, sepsis, infection and LBW(LBW) in preterm and term infants. One of the factors influencing the incidence of LBW is pre-eclampsia. This is because pre-eclampsia affects the utero-placental circulation so that it affects the delivery of nutrients to the fetus, resulting in fetal nutrient deprivation and intrauterine growth restriction.*
Objectives: *This study aimed to assess the relationship between pre-eclampsia and the incidence of LBW in the Mawar Room of Dr M. Yunus Bengkulu Hospital.*
Methods: *This study used a case-control design. The sample was all babies born in M Yunus Hospital in the years 2019-2022.The case group were LBWbabies and the control group were normal birth weight babies. The total sample size was 128 with a ratio of 1:1. Samples were collected using purposive sampling with inclusion criteria of babies born alive with complete medical records. Data analysis in this study used univariate analysis to view frequency distribution, bivariate with chi-squared test and multivariate with logistic regression using SPPS software version 24.*
Results: *The incidence of pre-eclampsia was 13.3%, 34% age at risk, parity 37.5% garande multipara, 4imipara and multipara and most (62.5%) had primary education 47.5%. There is an association of pre-eclampsia with the incidence of LBW. There is an association of age, parity and education with the incidence of LBW, but pre-eclampsia is the most dominant factor that is the most dominant risk variable that affects the incidence of LBW.*
Conclusions: *There is an association between pre-eclampsia, age, parity and education with the incidence of LBW. Pre-eclampsia is the most dominant factor in the incidence of LBW.*

KEYWORD: *preeclampsia; age; parity; education; LBW;*

Article Info :
Article submitted on March 15, 2024
Article revised on April 16, 2024
Article received on May 30, 2024

INTRODUCTION

WHO data show that the global neonatal mortality rate has fallen to below 44%, but as many as 47% of deaths of children under 5 years of age occur in the first 28 days of life. This suggests that this is the most vulnerable period (1). The WHO goal is to reduce neonatal mortality to 12/1000 live births and under-five mortality to 25/1000 live births by 2030(2). The results of the 2017 Indonesian Demographic and Health Survey (IDHS) showed an IMR of 24 per 1,000 live births and a neonatal mortality rate of 15 per 1,000 live births and the most neonatal deaths in Indonesia in 2020 were caused by babies born with low body weight as much as 35.2% (3). In addition, the results of the 2017 IDHS showed that the proportion of neonatal deaths was (Low Birth Weight) LBW at 27.0% and the percentage of LBW in Indonesia was 6.2%(3).

LBW is also caused by the mother's condition during pregnancy (teenage pregnancy, malnutrition, and pregnancy complications), Twins, and fetuses have congenital abnormalities and placental disorders that interfere with fetal growth and complications in pregnant women who give birth to LBW, one of which is preeclampsia(4). LBW is caused by preeclampsia that occurs in abnormal placentas, chronic placental ischemia, vascular spasm, and decreased uteroplacental perfusion, then blood circulation to the fetus will decrease so that the fetus experiences a decrease in the supply of nutrients and oxygen. This can cause Intra Uterine Growth Retardation (IUGR) which is one of the manifestations of LBW (5). Preeclampsia is a disease in pregnancy characterized by symptoms of hypertension and proteinuria and mothers who experience hypertension during pregnancy, half to two-thirds are diagnosed with preeclampsia (6). Preeclampsia is hypertension accompanied by proteinuria and edema due to pregnancy after 20 weeks of gestation or immediately after delivery (7). In line with Winknjosastro who defines preeclampsia as a disease with signs of hypertension, edema, and urine protein that arise due to pregnancy(8).

LBW babies can occur in premature and full-term babies (9). Some of the factors that cause preterm labor are: 1) Pregnancy Factors (Preterm labor can occur due to multiple pregnancies, pregnancy with hydramnios, antepartum hemorrhage, and pregnancy complications such as preeclampsia, eclampsia, and premature rupture of membranes), 2) Maternal factors (Lack of nutrition during pregnancy, the mother has given birth prematurely, the mother's age is too young or too old, namely less than 25 years of age or above 35 years of age, the distance between pregnancy and childbirth is very close, the mother has a history of chronic diseases, such as hypertension, heart disease, or vascular disorders (smokers), the mother has too heavy work, Primigravida, and has experienced antepartum bleeding, hydramnios, and uterine abnormalities and 3)

Fetal factors, 4) habitual factors and other undetected factors.

Meanwhile, some factors that influence LBW in Dysmaturity are: 1) Maternal factors (mother has hypertension, chronic renal failure, smoking, diabetes militias, toxemia, maternal hypoxia, poor nutrition, and alcohol drinking), and 2) Fetal factors (fetuses have chromosomal abnormalities, Gemelli, intrauterine infections (toxoplasmosis, rubella, herpes, and syphilis), and congenital defects, 3) Uterine and Placental Factors (uterine and placental factors are due to blood vessel abnormalities (hemangiomas), abnormal cord insertion, uterus bicornis, placental infarction, partial detachment of the placenta, and transfusion from one twin to another) and 4) Other causes (low socioeconomic conditions and other unknown conditions).

Based on data from the Bengkulu Provincial Health Office, in 2019 the IMR was 297 babies and neonatal deaths were 236 people (79.4%), in 2020 the IMR was 298 babies and neonatal deaths were 212 people (71.1%), in 2021 the IMR was 300 babies and neonatal deaths were 194 people (64.6%), and in 2022 the IMR was 237 babies and neonatal deaths were 217 people (91.5%). This indicates that there was an increase in neonatal deaths from 2019-2022 in Bengkulu Province(10).

Data on infant deaths with LBW in Bengkulu Province in 2019 were 65 infant (21.9%), in 2020 were 73 infant (24.5%), in 2021 were 85 infant (28.3%), and in 2022 were 904 infant (381.4%). This shows that the LBW mortality rate in Bengkulu Province from 2019-2022 in Bengkulu Province has increased, whereas in 2022 there was a very high increase in cases of LBW deaths(10).

Data from the Bengkulu City Health Office in 2019 showed that there were 19 neonatal deaths caused by LBW (47.4%), in 2020 there were 12 neonatal deaths caused by LBW (2 people (16.7%), and in 2021 there were 14 neonatal deaths caused by LBW (11 people (7.1%). This data shows that neonatal deaths based on LBW in Bengkulu City in the last 3 (three) years have decreased.

The results of the initial survey in the Mawar Room of Dr. M. Yunus Bengkulu Hospital in 2019 the number of births babies born was 603 people IMR was 105 people (17.4%), in 2020 The number of births babies born was 252 people and IMR was 78 people (30.9%), in 2021 the number of births of babies born was 113 people and IMR was 68 people (60.1%) and in 2022 the number of births of babies born was 202 people and IMR was 93 people (46.0%).

Data from the Mawar Room of Dr. M. Yunus Bengkulu Hospital also shows that in 2019 the number of babies born was 603 people and the incidence of LBW was 70 people (11.6%), in 2020 the number of babies born was 252 people and the incidence of LBW was 31 people (12.3%), in 2021 the number of babies born was 113 people and the incidence of LBW was 10 people (8.8%) and in 2022 the number of babies born was 202 people and the incidence of LBW was 21

people (10.3%). This shows that in the last 4 (four) years, namely from 2019-2022, there has been an increase in the incidence of LBW in the Mawar Room of Dr. M. Yunus Bengkulu Hospital.

The results of a survey conducted in the Mawar room of Dr. M. Yunus Bengkulu Hospital in 2019 the number of mothers who gave birth was 595 people and the incidence of preeclampsia was 74 people (12.4%), 2020 The number of mothers who gave birth was 252 people and the incidence of preeclampsia was 52 people (20.6%), in 2021 the number of mothers who gave birth was 113 people and the incidence of preeclampsia was 24 people (21.2%), and in 2022 the number of mothers who gave birth was 200 people and the incidence of preeclampsia was 44 people (22.0%). This shows that the incidence of preeclampsia in RSUD Dr. M. Yunus Bengkulu in the last 4 (four) years in hospitalization has increased.

Previous studies have shown that maternal factors or maternal health conditions during pregnancy are a risk factor for LBW (11,12). Pre-eclampsia is a risk factor for LBW that occurs after 20 weeks gestation and is associated with prematurity, impaired intrauterine fetal growth and fetal distress, resulting in LBW and intrauterine fetal death due to inadequate placental function. Furthermore, conditions of impaired placental function, oxidative stress and systemic inflammation lead to chronic placental ischaemia and reduced uteroplacental perfusion, resulting in stunted fetal growth and preterm birth (13,14). The increasing incidence of pre-eclampsia is consistent with the increasing incidence of LBW, so further research is needed to determine the risk of LBW in pre-eclampsia.

Therefore, this study uses the case-control method because many risk factors cause LBW and the high incidence of LBW and preeclampsia, so through research interested in examining the relationship between Preeclampsia and the incidence of LBW in the Mawar Room of Dr. M. Yunus Bengkulu Hospital.

MATERIALS AND METHODS

This study used an analytic observation method with a case-control design. Therefore, in this study the case variable (LBW) and the control variable (No LBW). In this study, the measurement of the dependent variable (LBW) was identified at this time, and then the independent variables (preeclampsia, age, parity, and education) were identified or occurred in the past(15).

The population of this study was all babies born in the Mawar Room of Dr. M. Yunus Bengkulu Hospital from 2019-2022 totaling 1,170 babies. The sample of this study was all babies born in the Mawar Room of Dr. M. Yunus Hospital Bengkulu with LBW babies from 2019-2022 totaling 132 babies and the number of normal-born babies was 1,038 babies. The sample in this study consisted of a case group, namely babies born in the Mawar Room of Dr. M. Yunus Bengkulu Hospital as many as 1,170 babies,

and a case group in this study of 132 babies. The control group ratio was 1:1. Samples were taken by purposive sampling.

The analysis in this study included univariate analysis to explain or describe the characteristics of the variables studied, namely preeclampsia and LBW in the Mawar Room of Dr. M. Yunus Bengkulu Hospital using the percentage calculation formula (%) and bivariate analysis to analyze the relationship between the two variables, namely the independent variable and the dependent variable using bivariate analysis with the chi-square test and multivariate analysis used to see the most dominant factors associated with the incidence of LBW at Dr. M. Yunus Hospital Bengkulu City. In conducting multivariate analysis, a logistic regression test was used because the variables used nominal and ordinal scales which were processed using SPSS For Windows Version 24.00.

RESULTS AND DISCUSSION

RESULTS

Univariate Analysis

An overview of preeclampsia, age, parity, and education with the incidence of LBW is presented in the following table:

Based on **Table 1** shows that out of 128 respondents, it is known that there are half of the respondents (50.0%) have LBW babies. Of the 128 respondents, almost all respondents (86.7%) did not experience preeclampsia. Of the 128 respondents, most respondents (66.4%) had an age that was not at risk (20 and 35 years). Of the 128 respondents, most respondents (68.8%) were primiparous and multiparous. Of the 128 respondents, most (62.5%) had high school and college education.

Table 1. Overview of Preeclampsia, Age, Parity, Education, LBW in Mawar Room, Dr. M. Yunus Hospital, Bengkulu

Variable	Frequency (f)	Percentage (100%)
(Dependent)		
LBW incidence		
LBW	64 people	50.00%
Not LBW	64 people	50.00%
(Independent)		
Preeclampsia		
Preeclampsia	17 people	13.30%
Not Preeclampsia	111 people	86.70%
Age		
At risk <20 and >35 years	43 people	33.60%
Not at risk 20-35 years	85 people	66.40%
Parity		
≥ 4 (Grandemultipara)	40 people	31.30%
1-3 (Primipara and Multipara)	88 people	68.80%
Education		
Low (elementary and junior high school))	48 people	37.50%
High (high school and college)	80 people	62.50%
Total	128 people	100.00%

Source: Research results, processed, 2023

Bivariate Analysis

Bivariate analysis to see the relationship between Preeclampsia, Age, Parity, and Education with the incidence of LBW in the Mawar Room of Dr. M. Yunus Bengkulu Hospital, is presented in the following table :

Based on **Table 2** shows that in the case group, there were 64 LBW babies as many as 15 mothers experienced pre-eclampsia and in the control group there were 64 babies who were not LBW as many as 62 mothers did not experience preeclampsia and there were a significant relationship between preeclampsia and the incidence of LBWbabies at Dr. M. Yunus Bengkulu Hospital. The results of the Risk Estimate test showed that the OR value was 9.490, meaning that mothers with preeclampsia were 9.490 times more likely to experience LBW babies than mothers without pre-eclampsia.

Table 2. Associations of Preeclampsia with LBW in the Rose Room of Dr. M. Yunus Hospital Bengkulu

Preeclampsia	Baby Weight						x^2	*P*	*OR*
	LBW		Not LBW		Total				
	F	%	F	%	F	%			
Preeclampsia	15	23	2	3.1	17	100	9.77	0	9.5
Not Preeclampsia	49	77	62	96.9	111	100			
Total	64	100	64	100	128	100			

Source: Research results, processed, 2023

Based on **Table 3**, shows that in the case group, there are 64 LBW babies as many as 31 mothers with at-risk age, and in the control group there are 64 babies who are not LBW as many as 52 mothers with non-risk age and there is a significant relationship between maternal age and the incidence of LBWbabies at Dr. M. Yunus Bengkulu Hospital. The results of the Risk Estimate test showed that the OR value was 4.071, meaning that mothers with risky ages were 4.071 times more at risk of having LBWbabies than mothers with non-risk ages.

Table 3. Relationship between Age and the Incidence of LBW in the Mawar Room Dr. M. Yunus Hospital Bengkulu

Mother's age	Baby Weight						x^2	*P*	*OR*
	LBW		Not LBW		Total				
	F	%	F	%	F	%			
At risk (<20 and >35 years)	31	48	12	19	43	34			
Not at risk (20 and 35 years)	33	52	52	81	85	66	11.35	0	4.07
Total	64	100	64	100	128	100			

Source: Research results, processed, 2023

Based on **Table 4**, shows that in the case group, there are 64 LBW babies as many as 29 mothers with risky parity, and in the control group there are 64 babies who are

not LBW as many as 53 mothers with non-risky parity and there is a significant relationship between maternal parity and the incidence of LBWbabies at Dr. M. Yunus Bengkulu Hospital. The Risk Estimate test results showed that the OR value was 3.992, meaning that grand multiparous mothers were more at risk 3.992 times to experience the incidence of LBWbabies compared to primiparous and multiparous mothers.

Table 4. Relationship between Parity and the Incidence of LBW in Mawar Room Dr. M. Yunus Hospital Bengkulu

Parity	Baby Weight						x^2	*P*	*OR*
	LBW		Not LBW		Total				
	F	%	F	%	F	%			
At risk ≥ 4 Grandemultipara	29	45.3	11	17.2	40	31.3	10.509	0.001	3.992
Not at risk 1-3 Primipara and Multipara	35	54.7	53	82.8	88	68.8			
Total	64	100	64	100	128	100			

Source: Research results, processed, 2023

Based on **Table 5**, shows that in the case group, there are 64 LBW babies as many as 29 mothers with low education, and in the control group of 64 babies who are not LBW as many as 47 mothers with high education and there is a significant relationship between maternal education and the incidence of LBW babies at RSUD Dr. M. Yunus Bengkulu. The results of the Risk Estimate test showed that the OR value was 2.597, meaning that mothers with low education were 2.597 times more likely to experience the incidence of LBWbabies than mothers who had high education.

Table 5. Relationship between Education and the Incidence of LBW in the Mawar Room of Dr. M. Yunus Bengkulu Hospital Education

Education	Baby Weight						x^2	*P*	*OR*
	LBW		Not LBW		Total				
	F	%	F	%	F	%			
Low	31	48.4	17	26.6	48	37.5	5.633	0.017	2.597
High	33	51.6	47	73.4	80	62.5			
Total	64	100	64	100	128	100			

Source: Research results, processed, 2023

Multivariate Analysis

The results of multivariate analysis of the most dominant factors associated with the incidence of LBW in the Mawar Room of Dr. M. Yunus Bengkulu Hospital are presented in the following table.

Table 6 .Results of Multivariate Analysis in Mawar Room of Dr. M. Yunus Hospital Bengkulu

Variabel	Exp(B)	95% C.I for EXP(B)		P
		Lower	Upper	
Preeclampsia	5.969	1.219	29.224	0.027
Age	2.145	0.864	5.327	0.1
Parity	2.548	1.023	6.345	0.044
Education	1.373	0.583	3.231	0.468

Source: Research results, processed, 2023

The amount of influence in the table above the influence is indicated by the Exp (B) value also called the Odds Ratio (OR). Preeclampsia variable with OR = 5.969 (CI 95% 1.219-289.224), then respondents who experienced preeclampsia were more at risk of giving birth to LBW babies by 5.969 times compared to mothers who did not experience preeclampsia.

DISCUSSION

Overview of Preeclampsia, Age, Parity, Education, and Incidence of LBW(LBW)

The results showed that out of 128 respondents, half of the respondents (50.0%) had LBW babies. Of the 128 respondents, almost all respondents (86.7%) did not have preeclampsia. Of the 128 respondents, most respondents (66.4%) had an age that was not at risk (20 and 35 years). Of the 128 respondents, most respondents (68.8%) were primiparous and multiparous. Of the 128 respondents, most (62.5%) had high school and college education. This finding is in line with a 2020 study showing that the incidence of pre-eclampsia predicted 7.1-10.5% of the total variation in birth weight, compared to 0.05-0.7% for all combinations of maternal, and fetal characteristics(14).

Associations of Preeclampsia, Age, Parity, and Education with the Incidence of LBW(LBW)

The Relationship of Preeclampsia with the Incidence of LBW

Based on the results of the study showed that for the case of 64 LBW babies, 15 mothers experienced preeclampsia and for the control of 64 babies who were not LBW, 62 mothers did not experience preeclampsia and there was a significant relationship between preeclampsia and the incidence of LBW babies at Dr. M. Yunus Bengkulu Hospital. The Risk Estimate test results showed that the OR value was 9.490, meaning that mothers with preeclampsia were 9.490 times more at risk of experiencing LBW babies than mothers without preeclampsia.

The results of this study support previous findings that mothers with pre-eclampsia tend to give birth to babies of lower length and weight (16). Similar findings have also shown that pre-eclampsia is a cause associated with LBW (17). The state of pre-

eclampsia causes a decrease in utero-placental perfusion, so that uteroplacental blood flow is reduced, resulting in low oxygen uptake of nutrients to the fetus, leading to intrauterine growth restriction (IUGR) (18). Therefore, the average birth weight of babies born to mothers with pre-eclampsia is 2.48 kg, compared to 3.06 kg for normal mothers, showing that pre-eclampsia is a dominant factor in the incidence of LBW, but this risk decreases with increasing gestational age (14).

The findings also showed that out of 111 respondents without preeclampsia, 76.6% experienced LBW, this happened because many factors influenced not only pre-eclampsia, but there were other factors outside this study, such as fetal factors including premature rupture of membranes and multiple pregnancies and placental factors including vascular abnormalities and placental abnormalities. The results of this study are consistent with the findings that demographic factors also influence the incidence of LBW, such as antenatal visits, education, economic status and income(19).

Hypertension in pregnancy is a serious complication of the second-third trimester with clinical symptoms such as edema, hypertension, proteinuria, seizures to coma with gestational age above 20 weeks and can occur antepartum, intrapartum, and postpartum. With hypertension, there is a spasm of blood vessels, resulting in impaired placental function, uteroplacental circulation will be disrupted, the supply of nutrients and O2 will be disrupted so that the fetus will experience impaired growth and the baby will be born with a LBW(6).

It is also supported that preeclampsia is one of the factors causing LBW, Pre-eclampsia occurs in the abnormal placenta, chronic placental ischemia, vascular spasm, and decreased uteroplacental perfusion, then blood circulation to the fetus will be reduced so that the fetus experiences a decrease in the supply of nutrients and oxygen. This can cause stunted fetal growth which is one of the manifestations of LBW(5).

This finding is in line with the opinion (14). that pregnant women with preeclampsia can cause fetal growth retardation in the womb which can give birth to a fetus to be much smaller and weaker than expected. This condition allows babies to be born with LBW (20). In addition, other studies have found that there is a relationship between mothers who experience preeclampsia and the incidence of LBWand mothers who experience preeclampsia are 4-50 times more likely to give birth with LBW(21).

Relationship between Maternal Age and LBW

The results showed that for the case of 64 LBW babies, there were 31 mothers with at-risk age and for the control of 64 babies who were not LBW there were 52 mothers with non-risk age and there was a significant relationship between maternal age and the incidence of LBWbabies at Dr. M. Yunus Bengkulu Hospital. The results of the Risk Estimate test showed that the OR value was

4.071, meaning that mothers who have an at-risk age are 4.071 times more at risk of experiencing the incidence of LBW babies than mothers with an age that is not at risk. The findings also showed that of the 85 respondents who had an age not at risk, some experienced LBW much as 51.6%, This happened because many factors influenced not only age, but there were other factors outside this study, fetal factors including premature rupture of membranes and multiple pregnancies and placental factors including vascular abnormalities and placental abnormalities.

This finding is supported by Wiknjo-sastro's opinion that one of the factors that influence the incidence of LBW is the age of the mother (22). Agorinya et al., and Prasojo explained that mothers aged < 20 years and > 34 years have a greater risk of giving birth to LBW babies than mothers aged 20-34 years (11). This is also in line with the opinion of the Ministry of Health, which explains that one of the risk factors for LBW in Indonesia is pregnant women aged 35 years.

Mothers who are too young or too old have an increased risk of LBW. There was a non-linear relationship between maternal age, birth weight and risk of LBW. When maternal age was less than 24 years, birth weight increased by 16,204 g (95% CI: 14,323, 18,086). When maternal age was between 24 and 34 years, birth weight increased by 12,051 g (95%CI: 11,609, 12,493). However, this birth weight decreased with increasing maternal age from 35 years onwards, with a decrease of 0.824 g per year (95% CI: -3.112, 1.464). The risk of low birth weight decreased before maternal age of 36 years (OR = 0.917, 95%CI: 0.903, 0.932), so that the risk of LBW increased after maternal age of more than 36 years (OR = 1.133, 95% CI: 1.026, 1.250).

The association between age and birth weight remains uncertain, possibly due to maternal age-related complications caused by epigenetic DNA reprogramming during embryonic or fetal development. Maternal mitochondrial DNA is unable to repair DNA, so the risk increases with age. In addition, the quality of maternal eggs declines dramatically with age, leading to an increased risk of complications associated with age-related pregnancy, including chronic disease, pregnancy complications, obesity, anaemia and diabetes. All human body systems age, including the reproductive system, and age after 35 years correlates with other factors that increase the incidence of LBW (23,24).

In young mothers <20 years of age, reproductive organs and physiological functions are not optimal. Psychological and emotional conditions are immature, so the mother's response to her pregnancy is excessive, putting her at risk of complications, and inadequate antenatal care puts the mother at risk of LBW (25,26). Research in 2021 showed that maternal age was found to be a significant maternal risk factor for LBW birth (11). Research in 2020 shows that there is no relationship between the variables of maternal age and multiple pregnancies with

the incidence of LBW (27). Research in 2019 showed that age was associated with the incidence of LBW (28)(25,26).

In general, LBW babies are associated with gestational age (prematurity) and dismaturity. This means that the baby is born at term (38 weeks gestation), but the birth weight (BW) is smaller than the gestation period, which does not reach 2,500 grams. Usually, this happens because of the baby's growth disturbance while in the womb caused by maternal diseases such as placental abnormalities, infections, hypertension, and other conditions that cause the food supply to the baby to be reduced (29).

Relationship between Parity and LBW

The results showed that for the case of 64 LBW babies, 29 mothers with parity were at risk, and for the control of 64 babies who were not LBW, 53 mothers with parity were not at risk and there was a significant relationship between maternal parity and the incidence of LBW babies at Dr. M. Yunus Bengkulu Hospital. The Risk Estimate test results showed that the OR value was 3.992, meaning that grandemultiparous mothers were 3.992 times more likely to experience LBW babies than Primiparous and Multiparous mothers.

The findings also showed that of the 88 respondents who were not at risk, there were respondents who experienced LBW as much as 68.8%, This happened because many factors influenced not only parity, but there were other factors outside this study such as fetal factors including premature rupture of membranes and multiple pregnancies and placental factors including vascular abnormalities and placental abnormalities.

This finding is in line with Prawirohadjos theoretical concept that LBW with a high parity history factor occurs because the mothers reproductive system has experienced thinning due to frequent childbirth. This is due to the higher parity of the mother so that the quality of the endometrium will decrease. Repeated pregnancies will affect the circulation of nutrients to the fetus where the amount of nutrients will decrease compared to the previous pregnancy (22). Khoiriah explained that high parity causes disruption of placental function in providing nutrients to the fetus due to frequent childbirth, this condition will have an impact on the disruption of fetal growth (23)

The opinion of Sembiring et al that mothers with high parity have a deteriorated uterine function because the condition of the uterus that is no longer fertile causes the function of the placenta to supply oxygen and nutrients to be disrupted as well and high parity also not only has an impact on the mother but also has an impact on the baby being conceived and mothers who experience labor too often are at risk of giving birth to babies with LBW or babies with disabilities (23).

This finding is supported by research in 2020 showing that there is an association between the maternal parity variable and the incidence of LBW (27). Research in 2021

showed parity was found to be a significant maternal risk factor for LBW birth (11). This finding is also in line with research in 2019 showing parity is associated with LBW (28). Factors that can cause LBW are maternal, fetal, and placental. Maternal factors include age, number of parties, spacing of pregnancies, and work/activity during pregnancy. Fetal factors include early rupture of membranes and multiple pregnancies. Placental factors include vascular abnormalities and placental abnormalities (27).

Relationship between Education and the Incidence of LBW

The results showed that for the case of 64 LBW babies, there were 29 mothers with low education and for the control of 64 babies who were not LBW there were 47 mothers with high education and there was a significant relationship between maternal education and the incidence of LBW babies at Dr. M. Yunus Hospital Bengkulu. The Risk Estimate test results showed that the OR value was 2.597, meaning that mothers with low education were more at risk of 2.597 times experiencing the incidence of LBW babies than mothers who had high education. The findings also show that out of 80 respondents with high education, some experience LBW as much as 51.6%.

This happens because many factors influence not only education, but there are other factors outside this study such as fetal factors including premature rupture of membranes and multiple pregnancies, and placental factors including vascular abnormalities and placental abnormalities.

Factors included in maternal factors as a trigger for LBW are the mother's education level employment status and income because a low level of education is likely to affect the receptivity and understanding of information so that respondents do not know about reproductive health, maintenance, and care during pregnancy (23).

Other factors included in the maternal factor as a trigger for LBW are the mother's education level employment status and income because a low level of education is likely to affect the receptivity and understanding of information so that respondents are less aware of reproductive health, maintenance, and care during pregnancy (23).

The research results showed that there was a significant relationship between education level (p-value 0.014) and the incidence of LBW. Respondents who give birth generally come from rural areas with low educational backgrounds, and there is still a culture of marrying at a young age (23).

Dominant Variables Associated with the Incidence of LBW (LBW)

The results of the study found that the most dominant variable of preeclampsia influenced the incidence of LBW in the Mawar Room of Dr. M. Yunus Bengkulu Hospital.The results of the study are in line with research in 2020 in a study conducted from 70 mothers giving birth with a history of preeclampsia

during pregnancy at Karanganyar Hospital there were 16 babies (22.9%) with LBW. This study concludes that there is a relationship between pregnancy preeclampsia and the incidence of LBW at Karanganyar Hospital (30). The findings of this study are also supported by research in 2020 showing that there is a relationship between the variables of maternal parity, preeclampsia, and anemia with the incidence of LBW at RSUD Dr. Soekardjo Tasikmalaya and there is no relationship between the variables of maternal age and multiple pregnancies with the incidence of LBW(27).

The research is also in line with research in 2021 which in its research found maternal age, parity, arm circumference, hemoglobin levels, gestational age, and complications during pregnancy, were found to be significant maternal risk factors for LBW birth (11). The research is also in line with research in 2021 which in its research found maternal age, parity, arm circumference, hemoglobin levels, gestational age, and complications during pregnancy, were found to be significant maternal risk factors for LBW (28). Pre-eclampsia increased LBW by 7.75 times. This is probably because pre-eclampsia causes endothelial dysfunction in the mother, which disrupts the utero-placental circulation, causing the placenta to become ischaemic. This reduces the supply of nutrients and oxygen to the foetus, which affects intrauterine fetal growth and development, resulting in low birth weight. However, the risk of LBW can be minimised by adequate antenatal care, a balanced diet, avoiding drug use, not smoking or drinking alcohol, and managing medical conditions if you have comorbidities (31). Changes in diastolic blood pressure during pregnancy are closely related to fetal growth. In pre-eclampsia, there are large changes in diastolic blood pressure that significantly affect intrauterine foetal growth.

There is no reduction in blood pressure in pregnant women with pre-eclampsia. Blood pressure continues to rise from the second half of pregnancy until delivery, resulting in a high risk of foetal growth retardation and LBW. This situation occurs due to poor remodelling of the spiral artery, so that the supply of nutrients and oxygen to the foetus is compromised, so close attention and monitoring is required in pregnant women with pre-eclampsia, particularly in relation to aspects of intrauterine fetal growth and development(32).

CONCLUSION AND RECOMMENDATION

This study concludes that there is a relationship between preeclampsia and the incidence of LBW babies, so if you find a preeclampsia patient to be able to carry out supervision as early as possible for more optimal and appropriate labor management because mothers with preeclampsia can be the cause of LBW.

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