

Research Article

Role of Maternal Factors in Low Birth Weight**Peran Faktor Ibu dalam Kejadian Berat Bayi Lahir Rendah**Gita S. Candijaya¹, Edihan Mardjuki², Edward Surjono³¹ Faculty of Medicine and Health Science² Department of Obstetrics and Gynecology³ Department of PediatricsFaculty of Medicine and Science Universitas Katolik Atma Jaya
Jakarta**Abstract**

Objective: To determine the correlation between body mass index, age, parity, gestational weight gain and low birth weight at Atma Jaya Hospital in 2016-2019.

Methods: This was a cross-sectional study of 111 sample medical records of pregnant women who gave birth at Atma Jaya Hospital in 2016-2019 and met the inclusion and exclusion criteria. Data management was performed using the Chi-square test and multivariate logistic regression test.

Result: Most of the mothers were in the group with normal BMI (60.4%), the G1 age group (21-29 years old) (45.9%), the low multiparity group (parity 1-3 times) (57.7%). The analysis showed that there was a significant relationship between parity group grand multipara ($p=0.028$; $OR=5.206$; $95\% CI=1.195-22.686$) with the incidence of LBW. There was no significant relationship between BMI group lean ($p=0.303$; $OR=1.646$; $95\% CI=0.638-4.246$), group normal ($p=0.532$), group fat ($p=0.440$; $OR=1.957$; $95\% CI=0.357-10.737$), maternal age group G1 ($p=0.141$), group G2 ($p=0.587$; $OR=1.327$; $95\% CI=0.478-3.687$), group G3 ($p=0.111$; $OR=0.262$; $95\% CI=0.050-1.360$), parity group nulliparity ($p=0.494$; $OR=0.669$; $95\% CI=0.212-2.117$), group low multiparity ($p=0.051$), and gestational weight gain group low ($p=0.955$; $OR=1.028$; $95\% CI=0.396-2.667$), group normal ($p=0.986$), group high ($p=0.897$; $OR=0.917$; $95\% CI=0.245-3.424$) with the incidence of LBW.

Conclusions: There is a significant relationship between parity with the incidence of low birth weight. There is no relationship between body mass index, age, and gestational weight gain with the incidence of low birth weight.

Keywords: age, BMI, gestational weight gain, LBW, parity.

Abstrak

Tujuan: Mengetahui apakah terdapat hubungan antara indeks massa tubuh, usia, paritas, dan penambahan berat badan ibu hamil terhadap kejadian berat bayi rendah di Rumah Sakit Atma Jaya tahun 2016-2019.

Metode: Penelitian ini merupakan penelitian analitik potong lintang dengan menggunakan rekam medis sebanyak 111 sampel ibu hamil yang melangsungkan persalinan di RS Atma Jaya pada tahun 2016-2019 dan memenuhi kriteria inklusi dan eksklusi. Pengelolaan data dilakukan dengan menggunakan uji Chi-square dan uji regresi logistik multivariat.

Hasil: Didapatkan sebagian besar ibu berada pada kelompok dengan indeks massa tubuh normal (60,4%), kelompok usia G1 (21-29 tahun) (45,9%), kelompok paritas low multiparity (paritas 1-3 kali) (57,7%), dan kelompok penambahan berat badan normal (47,7%). Hasil analisis menunjukkan terdapat hubungan antara paritas kelompok grand multipara ($p=0,028$; $OR=5,206$; $95\% CI=1,195-22,686$) terhadap kejadian BBLR. Tidak terdapat hubungan signifikan antara indeks massa tubuh kelompok kurus ($p=0,303$; $OR=1,646$; $95\% CI=0,638-4,246$), kelompok normal ($p=0,532$), kelompok gemuk ($p=0,440$; $OR=1,957$; $95\% CI=0,357-10,737$), usia ibu hamil kelompok G1 ($p=0,141$), kelompok G2 ($p=0,587$; $OR=1,327$; $95\% CI=0,478-3,687$), usia kelompok G3 ($p=0,111$; $OR=0,262$; $95\% CI=0,050-1,360$), paritas kelompok nulliparity ($p=0,494$; $OR=0,669$; $95\% CI=0,212-2,117$), kelompok low multiparity ($p=0,051$), penambahan berat badan ibu hamil kelompok kurang ($p=0,955$; $OR=1,028$; $95\% CI=0,396-2,667$), kelompok sesuai ($p=0,986$), dan kelompok lebih ($p=0,897$; $OR=0,917$; $95\% CI=0,245-3,424$) dengan kejadian BBLR.

Kesimpulan: Terdapat hubungan yang signifikan antara paritas dengan kejadian berat bayi lahir rendah. Tidak terdapat hubungan antara indeks massa tubuh, usia, dan penambahan berat badan ibu hamil dengan kejadian berat bayi lahir rendah.

Kata kunci: BBLR, IMT, paritas, penambahan berat badan, usia.

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INTRODUCTION

Low birth weight (LBW) is one of the big problems, especially in developing countries or countries with low socio-economic conditions, such as Indonesia. LBW are babies born weighing less than 2500 grams, where the normal weight of babies according to the Indonesian Ministry of Health is between 2500 grams - 4000 grams. The level of LBW that occurs in an area can be a benchmark for measuring maternal health, nutrition, and poverty.¹⁻³

LBW can occur due to poor maternal condition, such as extra-uterine infections, chorioamnionitis, trauma, and certain diseases. Conditions that can also occur such as IUGR, infection in the fetus, anomalies, and abnormalities that can occur in the placenta, namely placenta ablatio (placenta separated from the uterus) and placenta previa (the placenta covers part or all of the birth canal). The Indonesian Ministry of Health stated that in DKI Jakarta there were 9.3% of babies born with LBW from all over Indonesia in 2013, and is ranked 24th out of 33 provinces in Indonesia.^{4,5}

The high rate of low birth weight can affect human resources in the future. The government has started efforts to prevent the incidence of LBW, namely by closely maintaining and controlling the risk factors that can cause LBW.⁶

Therefore, the purpose of this study was to determine whether there was a relationship between body mass index, age, parity, and weight gain of pregnant women. on the incidence of low birth weight at Atma Jaya Hospital in 2016-2019.

METHODS

The research design used in this study was analytical using a cross-sectional study with a retrospective approach. The population of this study were pregnant women who gave birth at Atma Jaya Hospital from January 2016 - December 2019. Samples were collected by the patient's medical record. The total population was 96 patients that match the inclusion and exclusion criteria.

The inclusion criteria were pregnant women who gave birth at Atma Jaya Hospital as of January 2016, with a gestation age of 37-42 weeks, and patients with spontaneous labor. The exclusion criteria were if there are complications during pregnancy and childbirth, pregnant women with history of diabetes mellitus and hypertension before and during pregnancy, those

who has a history of infection during pregnancy, patients who smoke, drink alcohol, or consume opioids, cocaine, and immunosuppressive drugs during pregnancy, and the babies are born with congenital abnormalities.

Data collection was carried out using secondary data based on medical records. Data will be retrieved retrospectively from January 2016 to December 2019.

Data were analyzed by Chi Square-test to determine the correlation between body mass index, age, parity, gestational weight gain and low birth weight. Then, using the Logistic Regression test to find out the most dominant variable related to the dependent variable LBW. Data were processed with the help of Statistical Product and Service Solutions (SPSS) for Windows version 22.0.

RESULTS

Table 1. Distribution of BMI Frequency, Age, Parity, Gestational Weight Gain, and Birth Weight

Characteristics	n	%
Body mass index		
Lean	11	9.9
Normal	67	60.4
Fat	33	29.7
Age		
G1*	51	45.9
G2*	36	32.4
G3*	24	21.6
Parity		
Nulliparity	30	27.0
Low multiparity	64	57.7
Grand multipara	17	15.3
Gestational Weight Gain		
Less	42	37.8
Appropriate	53	47.7
Over	16	14.4

*G1 (21-29 years old); G2 (30-34 years old); G3 (≥35 years old).

Table 2. Factors that Most Affecting LBW

Variable	B value	P-value	OR	95% CI	
				lower	upper
Age					
G1		0.141			
G2	0.283	0.587	1.327	0.478	3.687
G3	-1.340	0.111	0.262	0.050	1.360
Parity					
Nulliparity	-0.401	0.494	0.669	0.212	2.117
Low multiparity		0.051			
Grand multiparity	1.650	0.028	5.206	1.195	22.686
Constants	0.925				

Interpretation: parity and age are the most affecting factors.

Table 3. Factors that Most Affecting LBW

Risk factors	Grand multiparity	Nulliparity	Low multiparity	G3	G2	G1	Lean BMI	Less gestational weight gain	Probability %
2	√			√					28
2	√				√				67
2	√					√			60
2		√		√					5
2		√			√				20
2		√				√			16
2			√	√					7
2			√		√				28
2 s			√			√			23
3	√			√			√		29
4	√			√			√	√	36

DISCUSSION

Body mass index (BMI) can be used for screening to determine weight categories that can lead to health problems. Pregnant women with a BMI that is categorized as overweight (>25) will increase the risk of complications, both for pregnant women and for their babies.⁷⁻⁹

The results of this study showed that most mothers were in the normal BMI group (18.5 - 25.0) (60.4%), 11 people (9.9%) thin BMI, and 33 people (29.7%) fat BMI. The average BMI in this study was 23.4. The bivariate test results obtained p value = 0.532 (p > 0.05). This shows that there is no statistically significant relationship between body mass index of pregnant women and the incidence of low birth weight. However, through data analysis, it was found that mothers with body mass index in the thin category showed OR = 1.646 (95% CI 0.638 - 4.246), which means mothers with body mass index underweight category has a 1.6 times greater risk of giving birth to babies with low birth weight compared to mothers with normal body mass index. Mothers with body mass index in the fat category showed OR = 1.957 (95% CI 0.357 - 10.737), which means that mothers with body mass index category fat have a 1.9 times greater risk of giving birth to babies with low birth weight than mothers with normal body mass index.

This study is different from the research at RSUD Wonosari Gunungkidul, which states that there is a significant relationship between body mass index and the incidence of low birth weight babies. The difference in results in this study can be caused by several factors. One of the factors that causes no relationship between the variables in this study is because LBW can be caused by many factors, not only body mass index, but also

maternal age, parity, and maternal weight gain. In addition, it can also be caused by other factors that can influence the occurrence of LBW that cannot be controlled and analyzed by researchers such as the gender of the newborn, socioeconomic status, marital status, and education.¹⁰⁻¹¹

A low BMI can indicate that the mother's nutritional needs have not been fulfilled, so the nutrition for the fetus will be difficult to fulfill.¹⁰

Maternal age at childbirth and pregnancy is very influential on readiness and maturity both physically, emotionally and psychologically.¹² The Ministry of Health of the Republic of Indonesia states that a mother's age of 20-35 years is the safest maternal age to get pregnant, because besides being physically mature, women also feel that they are ready to become mothers.¹³ Based on data from the Japan Society of ObsGyn & WHO, the age of pregnant women is divided into groups G1, G2, and G3.¹⁴ Mothers who are pregnant with more than 35 years of age have a very high risk of complications during pregnancy and childbirth meanwhile, pregnant women less than 20 years old have a pelvis and uterus that are still small and their reproductive organs are still immature.¹²⁻¹⁵

The highest age group for pregnant women was G1 with 51 people (45.9%), G2 with 36 people (32.4%), and G3 with 24 people (21.6%). The average age of pregnant women in this study was 29 years. The bivariate test results obtained p value = 0.428 (p > 0.05), means that there is no significant relationship between the age of pregnant women and low birth weight. Mothers in the G2 age category had an OR = 0.727 (95% CI 0.205 - 2.574), which means that mothers in the G2 age category were 0.7 times less likely to give birth to a baby with low birth weight than mothers in the G1 age category. Mothers in the

G3 age category had an OR = 0.455 (95% CI 0.126 - 1.646), which means that mothers with the G3 age category were 0.4 times less likely to give birth to a baby with low birth weight than mothers with the G1 age category. There is no relationship between these variables may be due to the lack of time available at the time of data collection.

Previous research in Tangerang states that there is no relationship between maternal age and the incidence of LBW (OR = 2.092 95% CI = 0.760-5.759).¹⁶ The results of this study also support the results of previous research in several cities in Japan, the results of their research stated that there was no relationship between maternal age and infant birth weight ($p = 0.397$).¹⁴

The results of the multivariate analysis test found that age is one of the factors that most influences the occurrence of low birth weight when compared to other variables studied. It was said that pregnant women who were in the G2 group had the same relative risk as pregnant women in the G1 group for giving birth to babies with low birth weight (95% CI 0.478 - 3.687). Then for the G3 group the p value was 0.111 where > 0.05 , which means that there was a significant relationship between pregnant women and the G3 group with the incidence of low birth weight. Compared with women in the G3 group who had a 0.26 times lower risk of giving birth to a baby with low birth weight compared to pregnant women in the G1 group (95% CI 0.050 - 1.360).

According to the American College of Obstetricians and Gynecologists, parity is the number of pregnancies that reach gestation more than 20 weeks, and divided into three categories, namely nulliparity, low multiparity (mothers with a total of 1-3 parities), and grand multiparity (mothers with a total of 4-8 parities).¹⁷

The most parity groups were low multiparity with 64 people (57.7%), nulliparity with 30 people (27.0%), and grand multiparity with 17 people (15.3%). The average parity in this study is 1. The bivariate test results showed the value of $p = 0.162$ ($p > 0.05$) which means that it is statistically insignificant between the relationship between parity and low birth weight. Mothers in the nulliparity group had an OR = 2.500 (95% CI 0.805 - 7,764), which means that mothers in the nulliparity group were 2 times more likely to give birth to babies with low birth weight than mothers in the low multiparity group. Mothers in the grand multiparous group had an OR = 3.500 (95% CI 0.897 - 13.663), which means that

mothers in the grand multiparous group were 3 times more likely to deliver babies with low birth weight than mothers in the low multiparity group. The absence of a relationship between variables may occur due to a lack of sample size and there are interactions with other risk factors.

According to previous research which stated that there was no relationship between parity and the incidence of low birth weight ($p = 0.912$). However, clinically, this study shows that the incidence of LBW is increased in women with parity at risk (primiparous and grand multipara) with an OR > 1 .^{10,18}

The researcher then performed a multivariate analysis and the results showed that parity is one of the most influencing factors on the incidence of low birth weight, when compared to other variables that were also studied. In the group of mothers with grand multiparous p value obtained was 0.028 (< 0.05), which means that there is a significant relationship between the grand multiparous group and the incidence of low birth weight. In addition, mothers in the grand multiparity group had a 5 times greater risk of giving birth to babies with low birth weight compared to mothers in the low multiparity group (OR = 5.206; 95% CI 1.195 - 22,686).

Adequate gestational weight gain is very important for fetal development and growth as well as for the storage of maternal fat itself, conversely, if the weight gain is inadequate, the fetus can experience intrauterine growth retardation and also perinatal mortality.^{19,20} The guidelines set by the Institute of Medicine (IOM) in 2009 are in accordance with the BMI before pregnancy and are divided based on the total weight gain of the mother and also the gain per kg / week. Pregnant women who gain more than the recommended weight can increase the risk of having a cesarean section, babies born with macrosomia (babies born larger than 90% of babies of the same age), and can also cause overweight and obesity during the growing period of the child. Meanwhile, pregnant women who gain weight less than recommended can increase the risk of preterm, babies born smaller than 90% of babies of the same age, and mothers who have difficulty in breastfeeding.²¹

The most group of gestational weight gain was normal weight gain, with 53 people (47.7%), pregnant women with less gestational weight gain were 42 people (37.8%), and pregnant women with over in gestational weight gain were 16 people (14.4%). The average gestational weight

gain in this study was 11 kg. Bivariate analysis was carried out on the relationship between maternal weight gain and the incidence of low birth weight, the results obtained were $p = 0.986$ ($p > 0.05$). This shows that there is no significant relationship between the weight gain of pregnant women and the incidence of LBW. Mothers who gained less gestational weight during pregnancy had an OR = 1.028 (95% CI 0.396 - 2.667), which means that mothers with less than normal weight gain during pregnancy had the same relative likelihood of women gaining weight during normal pregnancy for giving birth to babies with low birth weight. Mothers who gain more weight during pregnancy have an OR = 0.917 (95% CI 0.245 - 3.424), which means that mothers who gain more weight during pregnancy are 0.9 times less likely than mothers who gain normal weight during pregnancy.

This study is not in accordance with the previous research where it was stated that there was a significant relationship between maternal weight gain and LBW ($p = 0.000$ OR = 16,724). This study also opposes the results of previous research, where it was found that mothers with less pregnant weight gain based on IOM had a tendency to give birth to low birth weight babies ($p = 0.027$ OR = 2.2).¹⁸⁻²² This difference in results may occur due to the insufficient number of samples studied due to limited research time.

Multivariate Analysis

The results of the multivariate analysis in this study found that the risk factor that most influenced the occurrence of low birth weight was parity. Where mothers in the grand multiparous group got a p value = 0.028 ($p < 0.05$), which means that there is a significant relationship between the grand multiparous group and the incidence of low birth weight, and the OR = 5.206, when compared, mothers with the grand multiparous group have a risk of 5 times greater to deliver babies with low birth weight compared to mothers in the low multiparity group (95% CI 1.195 - 22,686).

The probability value is also obtained from multivariate analysis, the probability of the occurrence of a baby with low birth weight by doing some calculations. It was found that pregnant women who had risk factors at age G3

and also with parity in the grand multiparous group had a 28% chance of delivering babies with low birth weight. Mothers with risk factors were at age G2 and also with parity in the grand multiparous group had a 67% chance of giving birth to a baby with low birth weight. Mothers with risk factors were at age G1 and also with parity in the grand multiparous group had a 60% chance of giving birth to a baby with low birth weight.

Mothers with age risk factors were in the G3 group and the nulliparity group had a 5% chance of giving birth to babies with low birth weight. Mothers with age risk factors were in the G2 group and the nulliparity group had a 20% chance of giving birth to a baby with low birth weight. Mothers with age risk factors were in the G1 group and the nulliparity group had a 16% chance of giving birth to a baby with low birth weight.

Mothers with age risk factors were in the G3 group and the low multiparity group had a 7% chance of giving birth to low birth weight. Mothers with age risk factors were in the G2 group and the low multiparity group had a 28% chance of giving birth to low birth weight. Mothers with age risk factors were in the G1 group and the low multiparity group had a 23% chance of giving birth to a baby with low birth weight.

Researchers calculated the probability of pregnant women having several other risk factors, although the previous analysis did not show a significant relationship. Pregnant women who had age risk factors in the G3 group, the grand multipara group, and classified as having a thin body mass index of 29% gave birth to babies with low birth weight. Then if analyzed further, pregnant women with age risk factors in the G3 group, the grand multipara group, are classified as having a thin body mass index, and with less gestational weight gain during pregnancy, resulting in a 36% probability of giving birth to a low birth weight baby.

CONCLUSIONS

There is a significant relationship between parity with the incidence of low birth weight. There is no significant relationship between body mass index, age, and gestational weight gain with the incidence of low birth weight.

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