Relationship Between Maternal Age and Chronic Energy Deficiency Status with Low Birth Weight Incidence in the Working Area of Arjuno Public Health Center

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ABSTRACT

Indonesia ranked as the nine most LBW cases with a percentage of more than 15.5% of infant births in 2018. The trend of the incidence of LBW in East Java has increased from 2016 (3.6%) to 2017 (3.8%). In 2018, Arjuno Public Health Center experienced a trend of increasing the prevalence of LBW events from 4.5% to 9.0% and ranked first with the highest prevalence of LBW events in Malang. This study aims to find out the relationship between maternal age and CED status with LBW events in the working area of Arjuno Public Health Center in 2019. This study used case control design and sampling method using purposive sampling. The total sample used was 93 people consisting of 31 people in the case group and 62 people who were in the control group (1:2). Data collection using secondary data in the form of mother cohort, Mother and Child Book ("Buku KIA") and Low Birth Weight case recapitulation records of village midwives in 2019. Data analysis provides chi square testing and logistic regression. The results of the analysis bivariate maternal age obtained p-value = 0.000 OR = 12.27 95% CI = 2.458-61.286 and CED status p-value = 0.000 OR = 5.63 95% CI = 2.152-14.729 while multivariate analysis shows the results of maternal age obtained p-value = 0.003 OR = 0.077 95% CI = 0.14-0.42 and CED status p-value = 0.00 1 OR = 0.171 95% CI = 0.061-0.480 means there is a relationship between maternal age and CED status with LBW occurrence and CED status is the most dominant variable related to LBW events.

Keywords: low birth weight, chronic energy deficiency, maternal age, Arjuno Public Health Center

1. INTRODUCTION

The Infant Mortality Rate (IMR) in the world is still a serious problem because it was one of the national health indicators in the 2015-2018 National Medium Term Development Plan with a target of 24 per 1,000 live births. Medical status in a country is good when IMR is low. In 2017 IMR in Indonesia reached 75% or 3/4 of all infant deaths. Based on a report from National Family Planning Coordinating Agency, in three consecutive years the Infant Mortality Rate (IMR) in Indonesia fluctuated, in 2015 of 22. 2/1,000 live births, in 2016 it increased to 25.5/1,000 births live and decreased in 2017 to 24/1,000 live births [1]. WHO reported that infant mortality was dominated by infant born with Low Birth Weight (LBW), LBW infant or less than 2,500 grams had

a 40-fold risk of death compared to babies with normal weight [2].

Low Birth Weight (LBW) is a newborn who weighs less than 2500 grams regardless of gestation [3]. LBW causes significant public health problems because it will harm health in short and long term [2]. According to UNICEF, when compared to babies who was born normally, babies born with low birth weight had a higher risk of stunting, low IQ, death, and non-communicable diseases such as being overweight, heart disease, and diabetes [4].

WHO reported that the percentage of LBW cases in Indonesia was more than 15.5% of births and Indonesia was 9th most LBW cases. In 2016 the prevalence of LBW

in Indonesia was 11.8%, then in 2017 it decreased to 7.1% and in 2018 it decreased again to 6.2% [2].

Incidence trend of LBW in East Java in the last three years had a increasing and decreasing phenomenon, in 2016 there were 3.6% of LBW then in 2017 it increased to 3.8% and decreased to 3.5% in 2018 [5–7]. Based on data from 2016 East Java Province Health Profile Report, Malang City was ranked 5th out of districts or cities with a high proportion of events which is 4.5%. In 2017 the incidence of LBW in Malang increased 4.9%, which was higher than previous year but in 2018 it was decreased by 4.5% [8],[9]. Although it has decreased, the prevalence of LBW in Malang is still higher than the average prevalence at the provincial level.

In 2016 LBW incidence in the work area of Arjuno Public Health Center was 4.8% or 27 LBW cases and decreased in 2017 to 4.7% or as many as 21 cases. In 2018 Arjuno was ranked first with highest prevalence of LBW in Malang, which was 9.0% or 49 cases. This percentage must be kept to a minimum because it is still above the government's target to be achieved in the 2015-2019 RPJMN, which is 8%. This means that efforts are still needed to reduce the prevalence of and reach the RPJMN target [9].

The incidence of LBW needed more attention because it was related to perinatal and neonatal mortality. LBW babies had a higher risk of experiencing cognitive development delays, neurological weakness and poor learning abilities. Even LBW babies had a complex impact when they are adults including high risk of coronary heart disease, diabetes, metabolic and immune disorders and physical endurance [3]. This condition would cause to the emergence of new problems in a country because every baby who was born with low birth weight was a candidate for degenerative disease. So if in a country it was estimated 1,000 LBW babies every year, there will be 1,000 adults who will become sufferers of degenerative diseases every year.

Factors that can affected LBW were extreme maternal age, multiple pregnancies, pregnancy complications, chronic pregnancy conditions (eg, hypertensive disorders of pregnancy), infections (eg, malaria), and nutritional status. Other contributors that also affect LBW were tobacco and drug consumption, and air pollution [10].

Women whose poor nutritional status at the time before pregnancy or during the first week of pregnancy usually gave birth to babies with brain and bone marrow damage because the central nervous system was very sensitive in the first 2-5 weeks. If this happens until the last week of pregnancy, the mother would tend to give birth LBW (< 2500 grams). Pregnant women with Chronic Energy Deficiency (CED) had a greater risk to giving birth LBW which would have an impact on the growth and development of children [11].

2. MATERIAL AND METHOD

The study used a case-control design with a retrospective approach. The independent variables in this study were 1) maternal age which consists of two categories, risky if the respondent's age were < 20 years and > 35 years and not at risk if the respondent's age were 20-35 years and 2) CED status consists of two categories, CED if the size respondent's LILA were < 23.5 cm and not CED if the respondent's LILA size were 23.5 cm. The dependent variables studied were incidence of LBW which was categorized into 2, namely LBW if the baby's birth weight was < 2,500 grams and BBLN if the baby's birth weight was 2,500 grams.

The study was conducted in working area of the Arjuno Public Health Center which includes four villages, Kauman, Oro-Oro Dowo, Kidul Dalem, and Penanggungan from February to March 2020. Population in this study were all mothers who gave birth to live births in 2019 and the sample of this study had two types, the case group and the control group which were calculated with a ratio of 1:2 (31:62). The sample for the case group was selected based on the inclusion criteria, namely mothers who gave birth to babies with birth weight less than 2,500 grams, domiciled in working area of the Arjuno Public Health Center, and mothers who had complete data on maternal cohort document. The inclusion criteria for the case group sample were mothers who gave birth to babies weighing more than 2,500 grams, domiciled in the working area of the Arjuno Public Health Center, and mothers who had complete data on the maternal cohort documents. Meanwhile, the exclusion criteria in the case and control groups were mothers who had abortions and mothers who gave birth to live babies with incomplete data. This study used secondary data obtained from the cohort of mothers, Book of Mother and Child Health (Buku Kesehatan Ibu dan Anak/KIA) and records of recapitulation of LBW cases by village midwives. Bivariate test analysis using Chi-Square test and multivariate test analysis using Multiple Logistics Regression Test.

3. RESULTS

3.1 Incidence of Low Birth Weight

The description of newborn weight in working area of the Arjuno Public Health Center in 2019 is described in Table 1.

Table 1. Description of newborn weight in working area of the Arjuno Public Health Center Malang City in 2019

Newborn weight	n	%
Low birth weight	31	33
Normal	62	67

Based on Table 1. The frequency distribution of newborns' weight, LBW babies were 31 cases or 33% of

93 people and babies born normal were 62 or 67% of 93 people.

3.2 Maternal Age

The description of maternal age who gave birth to live born baby in working area of the Arjuno Public Health Center in 2019 is explained in Table 2.

Table 2. Frequency Distribution of Maternal Age between Case-Control Group

Maternal age (years old)	Case		Control	
	n	%	n	%
< 20 (risky)	1	3	0	0
20-35 (unrisk)	22	71	2	3
> 35 (risky)	8	26	60	97
Total	31	100	62	100

Based on table 2 on the frequency distribution of maternal age, it is known that most of the case group maternal respondents had an age that was not at risk (22 people or 71% of 31 people) of the control group maternal respondents had an age that was not at risk (60 people or 97% of 62 people). The mean age of respondents in case group is 29 years and the mode is 26 years, while the average age of respondents in control group is 29 years and the mode is 28 years.

3.3 Chronic Energy Deficiency Status

The description of Chronic Energy Deficiency Status (CED status) of mothers who gave birth to live-born babies in working area of the Arjuno Public Health Center in 2019 is explained in Table 3.

Table 3. Frequency Distribution of Chronic Energy Deficiency Status Between Case-Control Group

CED status	Case		Control	
	n	%	n	%
Yes	17	55	11	18
No	14	45	51	82
Total	31	100	62	100

Based on Table 3 on the frequency distribution of CED status, it is known that most of case group maternal respondents there are 17 people or 55% of 31 people and most of control group maternal respondents did not CED, there are 51 people or 82% of 62 people. The average MUAC size of respondents in the case group is 23.45 cm and the mode is 21 cm, while the average age of the respondents in the control group is 26.94 cm and the mode is 25 cm.

3.4 The Relationship Between Maternal Age And The Incidence of Low Birth Weight

The results of bivariate test using Chi-Square test between maternal age and incidence of LBW are described in Table 4.

Table 4. Relationship Between Maternal Age and Low Birth Weight

Maternal age	Case		Control		p-value	OR (95% CI)
	n	%	n	%		
Risky	9	29	2	3	0.000	12.27 (2.46–61.29)
Unrisk	22	71	60	97		
Total	31	100	62	100		

Table 4 shows that there are 9 (29% of 31) LBW babies who were born from risk mother, there are 22 (71% of 31) children were born from unrisk mothers. For a chi-square test, a p-value that is 0.000, while OR value of 12.27 with 95% confidence interval (95%CI) of 2.458-61.286, it means that there was statistically significant association between maternal age and incidence of LBW. Compared with women with non-risky age, women with risky age were 12.27 times more likely to have LBW babies.

3.5 The Relationship Between Chronic Energy Deficiency Status And The Incidence of Low Birth Weight

The results of bivariate test using Chi-Square test between chronic energy deficiency status and incidence of LBW are described in Table 5.

Table 5. Relationship Between Chronic Energy Deficiency Status and Low Birth Weight

CED status	Case		Control		p-value	OR (95% CI)
	n	%	n	%		
Yes	17	55	11	18	0.000	5.63 (2.15-17.73)
No	14	45	51	82		
Total	31	100	62	100		

Table 5 shows that 17 (55% of 31) babies were born to mothers who are CED, while 14 (45% of 31) babies were born to mothers without CED. For a chi-square test, a p-value that is 0.000, while an OR of 5.63 with a 95% confidence interval (95%CI) of 2.152-14.729, it means that there was statistically significant association between CED status and incidence of LBW. Compared with women with a non-CED during pregnancy, women with CED had a 5.63-fold greater risk of incidence LBW.

3.6 The Relationship Between Maternal Age And Chronic Energy Deficiency Status With The Incidence of Low Birth Weight

The results of the multivariate test using multiple logistic regression between maternal age and CED status with the incidence of LBW are described in Table 6.

Table 6. Relationship Between Maternal Age and Chronic Energy Deficiency Status with Low Birth Weight

Variables	B	p-value	OR	R^2	95% CI	
					Lower	Upper
Maternal age	2.328	0.003	0.08	0.2	2.46	61.29
CED status	1.672	0.001	0.17		2.15	14.73

Table 7. Hosmer and Lemeshow Test Goodness of Fit

Step	Chi-square	df	Sig.
1	0.029	1	0.864

Table 6 above shows that CED status is a dominant variable associated with the incidence of LBW in working area of Arjuno Public Health Center in 2019. This is indicated by the Multiple Logistics Regression Test analysis results which has a significant value of $0.001 < 0.05$ with an OR value of 5.630. , it means that CED woman had a 5.6 times more likely to giving birth LBW babies compared to non-CED woman.

Table 7 shows that the goodness of fit test results obtained a p-value of 0.864. This shows that the p-value is greater than = 0.05, it means that the model obtained is fit or suiitable with the 5% test level.

4. DISCUSSION

4.1 Relationship Between Maternal Age And Low Birth Weight Incidence

Based on the study result, it shows that the p-value was 0.000, OR value of 12.27 with 95% confidence interval (95%CI) of 2.458-61.286. The result indicate that there is a significant relationship between maternal age and the incidence of LBW. Pregnant woman under 20 years or above than 35 years are a group that has a 12.27-fold greater risk of giving birth to a LBW babies. Pregnancy complications in woman under 20 years are caused by reproductive organs are immature to get pregnant and it will impact on mother and fetus health (12).

The results of this research are in line with Alya's study which stated that there was a significant relationship between maternal age and the incidence of LBW with an OR of 6.163, it means that mothers aged < 20 years or > 35 years had a 6.163 times greater risk for giving birth to LBW compared to pregnant women aged between 20-35 years (13). Research conducted by Kader and Perera shows results are in line with this study, that the maternal age factor shows a significance coefficient with the Person Chi-Square test of 0.000, it means that there is a significant relationship between maternal age and the incidence of LBW in India (14).

Research conducted by Khoiriah also shows the same results that there is a relationship between the maternal age variable and the incidence of LBW and the OR is 4.92, it means that mothers under 20 years or above than 35 years had a 4-5 times greater risk to give birth to LBW babies compared to pregnant women aged between 20-35 years (15). A study with the same result was also conducted by Hailu and Kebede at the Referral Hospital in Northern Ethiopia, it obtained a significance coefficient of 0.029, which means that there is a significant relationship between maternal age and the incidence of LBW (16). A similar study conducted by Shokri, et al showed that the coefficient of significance between maternal age and the incidence of LBW was 0.024. This means that there is a significant relationship between maternal age and the incidence of LBW because the significance value (p-value) < 0.05 (17).

Thus, it can be concluded that the efforts can be made by mothers for prevent LBW babies are to prepare for physical and mental health and increase economic readiness.

4.2 The Relationship Between Chronic Energy Deficiency Status And Low Birth Weight Incidence

Based on the study results, the p-value was 0.000, the OR value was 5.63 with a 95% confidence interval (95%CI) of 2.152-14,729. The results indicate that there is a significant relationship between CED status and the incidence of LBW. Compared to mothers who are not have CED during pregnancy, mothers who have CED status has a 5.63-fold greater risk of giving birth to a LBW babies.

The results of this research are in line with Assefa, et al study which stated that Mid Upper Arm Circumference (MUAC) which is less than 23 cm has a significant relationship with LBW babies and the OR value was 1.62, it means that MUAC mothers less than 23 cm have a risk 1-2 times more likely to give birth LBW baby compared to mothers who have a MUAC more than 23 cm (18). Another study was conducted by Sumiaty and Restu regarding CED with LBW babies, it show that the p-value of 0.000 and RR of 4.215. These results indicate that there is a significant relationship between CED status and the incidence of LBW and mothers with CED status have 4 times the risk of giving birth to LBW babies (19).

A study with the same result was also conducted by Widati, et al. regarding the risk of CED of pregnant women to the incidence of LBW. The results of the analysis obtain p-value of 0.001 and OR 5.9 which means that there is a relationship between CED status and the incidence of LBW and mothers with CED status have a risk of 5.9 times to give birth to LBW babies compared to mothers who do not have CED (20).

Based on research conducted by Adane and Dachew (2018), CED is a factor that is significantly associated with the incidence of LBW and mothers who have MUAC < 23 cm had a 3-fold risk of giving birth to LBW babies compared to mothers who have MUAC 23 cm (21). According to research conducted by Kaur (2019), a significant coefficient was 0.02 and OR 0.735, it means that mothers with low Mid Upper Arm Circumference have a significant relationship with the incidence of LBW (22).

Thus, it can be concluded that preparation should be made before pregnancy, one of which is screening the nutritional status of pre-pregnant mothers by means of Mid Upper Arm Circumference examination. Through this screening, prospective mothers will get the right nutritional intervention so it is hoped that the mother's nutrition will be good before pregnancy.

5. CONCLUSION

The results showed that there was a relationship between maternal age and the incidence of LBW. Pregnant woman under 20 years or above than 35 years are a group that has a 12.27-fold greater risk of giving birth to a LBW. This study also found that there was a relationship between maternal age and the incidence of LBW. Compared to mothers who are not have CED during pregnancy, mothers who have CED status has a 5.63-fold greater risk of giving birth to a LBW babies.

AUTHORS' CONTRIBUTIONS

NF contributed to the design and study selection, data collection, data analysis, and writing the manuscript. Meanwhile, LRA and SN contributed to validation, review, and writing the manuscript.

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