The Influence of Maternal Factors on the Incidence of Low Birth Weight Babies (LBW) at the Betun Border Buffer General Hospital

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ABSTRACT

Introduction: Low birth weight (LBW) is a problem in the health sector, especially perinatal health. The incidence of low birth weight in Indonesia is still a problem that we must pay attention to collectively, because low birth weight babies can experience an impact on subsequent growth and development. Study objective was to determine the effect of maternal factors on the incidence of low birth weight babies (LBW) in Betun Border Buffer General Hospital.

Material and methods: The research design used was a case control study, with a total sample of 156 consisting of 78 low birth weight groups and 78 normal birth weight babies. The data collection technique used in this study was purposive sampling. The bivariate analysis technique used chi-square and multiple logistic regression for the multivariate test.

Results: bivariate analysis showed that there were factors influencing birth spacing (p = 0,000), ANC visits (p = 0,000), KEK (p = 0,000), anemia (p = 0,000), weight gain (p = 0,000), maternal height (p = 0.000), with the incidence of low birth weight. The results of multivariate analysis showed a significant effect when the analysis was carried out jointly between the variables of birth spacing, ANC visits, chronic energy deficiency, anemia, weight gain, maternal height, with the greatest to the smallest influence which are maternal height (OR = 10,041), birth spacing (OR = 3,115), ANC visits (OR = 2,217), anemia (OR = 1,819), chronic energy deficiency (OR = 1,540).

Conclusion: There is an influence of maternal factors on the incidence of low birth weight at Betun Border Buffer General Hospital, namely birth spacing, ANC visits, anemia, chronic energy deficiency, weight gain, height.

Keyword: Maternal Factors, Low Birth Weight

INTRODUCTION

Low birth weight (LBW) is a problem in the health sector, especially perinatal health. Low birth weight consists of less-months low birth weight and full-term low birth weight or more months. Underweight or premature low birth weight is a health problem that requires adequate care. The incidence of low birth weight in Indonesia is still a problem that we must pay close attention to, because low birth weight babies can experience an impact on subsequent growth and development.[1] Data from 172 countries in the world, Indonesia ranks 70th with the highest percentage of deaths due to low birth weight, which is 10.69%.[2]

The results of basic health research Riskesdas in 2018, the prevalence of low birth weight in Indonesia was 6.2% with a range between 2.6% - 8.9%, the highest prevalence was in Central Sulawesi of 8.9% and the lowest prevalence of low birth weight in Jambi was 2.6%.[3] The prevalence rate of low birth weight in NTT is 8.4%, this figure is higher than the national figure. The mortality rate for low birth weight is 35 times higher than that of babies with birth weight of more than 2500 grams.[4]

District / city health profile data for the period of 4 years, namely 2014-2017, showed that babies with low birth weight experienced fluctuations, among others in 2014 amounted to 3,830 (5.1%), 2015 5,577 (7.7%) and in 2016 amounted to 4,792 (5.7%) while in 2017 the number of babies with low birth weight was 5,318 (5.6%) from 94,433 live births weighed. Based on NTT profile data (2017), the incidence of low birth weight from several districts can be described as follows: TTS 767 (8.3%), Kupang 367 (6.4%), TTU 359 (7.1%), Belu 307 (6 , 7%), Kupang City 298 (3.7%) and Malaka 105 (3.3%).[5]

A report from the Malaka District Health Office in 2018 showed that the incidence of low birth weight in 2015 was 156 (4.5%) babies and increased in 2016 by 214 (6.1%) babies while in 2017 it decreased, that was 105 (3.3%).[6] The results of a preliminary study conducted at the Betun Border Buffer General Hospital on September 29, 2019, obtained low birth weight data which has increased every year, including in 2016 of 66 babies, 2017 of 83 babies and in 2018 of 106 babies. Data taken for the last three months from July to August 2019 obtained 255 mothers who gave birth to 78 babies with low birth weight and 177 normal birth weight babies.

Infants with low birth weight have a higher risk of experiencing death, growth and development delays during childhood than those who are not low birth weight.[7] Research conducted [8] states that low birth weight can be caused by several things such as maternal factors (nutritional status, age, parity, economic status), bad obstetric history (having given birth to low birth weight, abortion), poor antenatal care, the state of the fetus. The results of research conducted

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[9] showed that maternal height contributed to infant birth weight.

Based on the data and synthesis above and it is not known the dominant risk factors for the incidence of low birth weight at Betun Border Buffer General Hospital, the researchers are interested in conducting a study "The Influence of Maternal Factors and Pregnancy Factors on the Incidence of Low Birth Weight Babies (LBW) at the Betun Border Buffer General Hospital"

MATERIAL AND METHODS

This study was an observational analytic study with a case control approach to determine the risk factors for low birth weight babies in the case group and the control group. The population in this study were all babies born in RSUPP Betun in 2019 consisting of a case population of 78 babies and a control population of 117 babies. Sampling in this study using a sample size calculation formula and the result is n1 = n2 = 78 samples. Sampling in this study was carried out by means of mecthing, namely the age of the mother with a ratio of 1: 1. The number of samples in this study were 156 samples consisting of a case sample of 78 babies who were LBW and 78 control samples, namely normal birth weight. The sampling technique used in this study was purposive sampling.

The research was carried out from March 2020 to April 2020 with the research location at Betun Hospital. Types of data used in this study are primary data and secondary data with the independent variable being maternal factors including pregnancy distance, ANC visits, KEK, anemia, weight gain and maternal height, while the dependent variable is low birth weight babies. Collecting data in this study using a wide checklist and questionnaire. The data analysis used was univariate analysis, bivariate analysis using chi-sqaure and multivariate analysis using multiple logistic regression tests. The study has passed an ethical review based on the decision of the health research ethics commission, Faculty of Medicine, University of Nusa Cendana Kupang on February 24, 2020 with Number: U N 0 2 2 0 0 2 0 6

RESULT

Table 1 showed that the mean age of mothers who gave birth to babies with low birth weight and normal birth weight was 26 years old with the most dominant work being housewives compared to teachers and civil servants and the average monthly income in the case was IDR 1,186,878 while in control of average income per month Rp. 1,330,910. The variable height of mothers who gave birth to babies with normal birth weight was 3 cm higher than mothers who gave birth to babies with low birth weight. Maternal weight gain during pregnancy between cases and controls averaged 8 kg to 9 kg. The average of maternal Hb levels was 10 g / dl and the average mid-upper arm circumference of mothers who gave birth to low birth weight babies was 22 cm while mothers who gave birth to babies with normal weight were 23.6 cm, for the average gestational age of mothers who gave birth to low birth weight was 26 weeks younger than

with a mother who gave birth to a baby with normal birth, which was 38 weeks.

Table 2 showed that more female babies are born than male babies. Table 2 explained that the average birth weight in the case group was 1940 grams and 2950 grams in controls. The two groups had a difference in the average birth weight of 1.010 grams. The average length of infants in the case group was 45 cm and in the control group was 48 cm.

Based on table 3 above, the variable birth spacing is known to be 48 respondents with a risky birth spacing, as many as 35 respondents (68.6%) who gave birth to low birth weight babies, 13 respondents (26.5%) who gave birth to normal weight babies. In the birth spacing variable, there were 56 other respondents who were primiparous mothers. The results of statistical tests showed p-value = 0.000 so that $p < 0.05$ means that there was a significant influence between birth spacing and the incidence of low birth weight. Statistically, the OR = 3.115, which means that the pregnancy interval was at risk of 3.115 times giving birth to low birth weight babies compared to mothers who were not at risk of pregnancy.

The ANC visit variable contained 28 respondents whose ANC visits were not according to standards, 25 respondents (32.1%) who gave birth to low birth weight babies and 3 respondents (3.8%) who gave birth to normal weight babies. The results of statistical tests showed a p-value of 0.000 so that $p < 0.05$ means that there was a significant influence between ANC visits and the incidence of low birth weight. Statistically, the OR = 2,217 value means that mothers whose ANC visits were not according to the standard had a risk of 2,217 times giving birth to low birth weight babies compared to mothers who had ANC visits according to standards.

The chronic energy deficiency variable contained 85 respondents who experienced chronic energy deficiency, 62 respondents (79.5%) who gave birth to low birth weight babies, 23 respondents (29.5%) who gave birth to normal weight babies. The statistical test results obtained a p-value of 0.000 so that $p < 0.05$ means that there was a significant effect between chronic energy deficiency and the incidence of low birth weight and statistically obtained OR = 1,540 times the birth of low birth weight babies compared to mothers who did not experience chronic energy deficiency.

The anemia variable showed 92 respondents who had anemia, where 58 respondents (74.4%) gave birth to low birth weight babies and 34 respondents (43.6%) gave birth to normal weight babies. The statistical test results showed a p-value of 0.000 so that $p < 0.05$ means that there was an influence between anemia and the incidence of low birth weight and statistically the OR = 1.819 means that women with anemia were at risk of giving birth to 1819 times low birth weight babies compared to mothers who did not have anemia.

Variables of maternal weight gain during pregnancy were 75 respondents who were at risk (weight gain <10 kg), 49 respondents (62.8%) who gave birth to low birth weight babies, and 26 respondents (33.3%) who gave birth to normal weight babies. The statistical test results obtained a p-value of 0.000 so that $p < 0.05$ means that there was an influence between the increase in body weight during pregnancy and

Variable	Case		Control	
	Average	Min - Max	Average	Min- Max
Age (year)	26	16 – 41	26	16 – 41
Occupation				
Housewives	72		66	
Civil Servants	2		7	
Teachers	4		5	
Income	Rp.1.186.878	Rp.500.000-2.756.000	Rp. 1.330.910	Rp.500.000-2.275.600
Height (cm)	150	140 – 170	153	139 – 162
Weight gain during pregnancy (kg)	8	4 -13	9	6 – 13
Hemoglobin levels (gr/di)	10	8 -13	10	6 – 13
Mid-upper arm circumference (cm)	22	16 -20	23.6	22 - 36
Gestational age (week)	26	29 – 43	38	35 - 41
source: Secondary data of Betun Border Buffer General Hospital Medical Records (2019)				

Table-1: Distribution of General Characteristics of Mothers of the Subject

Variable	Case		Control	
	Average	Min- Max	Average	Min- Max
Gender				
Male	38		39	
Female	40		38	
Birth weight (gram)	1940	1030-2490	2950	2500-3800
Baby length (cm)	45	35-52	48	40-55
source: Secondary data of Betun Border Buffer General Hospital Medical Records (2019)				

Table-2: Distribution of Research Subject Characteristics

Variabel	Case		Control		P Value
	n	%	n	%	
Birth spacing (year)					
At risk <2	35	68.6	13	26.5	0.000
Not at risk ≥2	16	31.4	36	73.5	
ANC Visits Frequency (time)					
Not according to standard <4	25	32.1	3	3.8	0.000
According to standard ≥4	53	67.9	75	96.2	
Chronic Energy Deficiency (cm)					
Chronic Energy Deficiency if Mid-upper arm circumference <23,5	62	79.5	23	29.5	0.000
No Chronic Energy Deficiency if Mid-upper arm circumference ≥23,5	16	20.5	55	70.5	
Anemia (gr/dl)					
Anemia if Hb <11 gr/dl	58	74.4	34	43.6	0.000
Without anemia if Hb ≥11	20	25.6	44	56.4	
Weight gain (kg)					
At risk <10	49	62.8	26	33.3	0.000
Not at risk ≥10	29	37.2	52	66.7	
Height (cm)					
At risk <145	25	32.1	2	2.6	0.000
Not at risk≥145	53	67.9	76	97.4	
source: Secondary data of Betun Border Buffer General Hospital Medical Records (2019)					

Table-3: Results of Bivariate Analysis Based on Maternal Factors

Variable	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Birth spacing	1.136	.676	2.827	1	.093	3.115	.829	11.709
ANC Visits Frequency	.796	1.122	.503	1	.478	2.217	.246	19.975
Chronic Energy Deficiency	.432	.664	.423	1	.516	1.540	.419	5.663
Anemia	.598	.678	.779	1	.377	1.819	.482	6.867
Height	2.307	1.553	2.207	1	.137	10.041	.479	210.652
Constant	-19.201	4.783	16.117	1	.000	.000		

Table-4: Final Results of Logistic Regression Test

the incidence of low birth weight and statistically the OR = 3.379 means that mothers who gain weight <10 kg had a risk of 3,379 times giving birth to low birth weight babies compared to those who weight gain ≥ 10 kg.

The variable of maternal height showed 27 respondents whose height was <145 cm, 25 respondents (32.1%) who gave birth to low birth weight babies and 2 respondents (2.6%) who gave birth to normal weight babies. Based on the results of statistical tests, the p-value was 0.000, so that p <0.05 means that there was an influence between the mother's height and the incidence of low birth weight and statistically the OR = 10.041 means that mothers who had a height <145 cm were at risk of 10,041 times giving birth to low birth weight babies compared to mothers who height ≥ 145 cm.

The final results of the multivariate analysis modeling showed that there was a significant effect when the analysis was carried out together, namely birth spacing, ANC visits, chronic energy deficiency, anemia, maternal height, in order of the strength of influence from largest to smallest, which was maternal height (OR = 10,041), birth spacing (OR = 3.115), ANC visits (OR = 2,217), anemia (OR = 1,819), chronic energy deficiency (OR = 1,540). Of the nine maternal factors and pregnancy factors affecting the incidence of low birth weight, the most dominant factors that had direct influence were maternal height (OR = 10,041).

DISCUSSION

The Influence of Maternal Factors on the Incidence of Low Birth Weight Babies (LBW)

Short birth spacing will cause a mother not to have enough time to recover her body condition after giving birth beforehand, so that the risk of disruption of the reproductive system which will affect birth weight.[10] The results of this study indicate that there is a significant effect between birth spacing and the incidence of low birth weight. This study is in line with [11] study which stated that there was a significant effect between birth spacing and low birth weight (p = 0.005). Mothers who get pregnant too often can deplete the reserves of nutrients in the body and pregnancies that are too often with a time interval between 2 pregnancies that are too short can result in malnutrition in the mother and child. The lack of knowledge and the biological and behavioral mechanisms that make short birth spacing puts the mother and baby at greater risk.

One of the things that plays a role in causing low birth weight babies is the frequency of antenatal care, this is because antenatal care visits are an important indicator in increasing vigilance and monitoring the nutritional health of mothers during pregnancy and the fetus. The results of this study indicate that there is a significant effect between ANC visits and the incidence of low birth weight. This research is supported by research conducted [12] which stated that the frequency of ANC in a term pregnant woman had an influence on the incidence of low birth weight. The same results are also shown from the results [13] study which stated that there was an interaction between the frequency of ANC visits and

the birth weight of the baby, namely mothers who did not make ANC visits or <4 times during their pregnancy and had babies with birth weights <2500 grams who had 2.6 times greater chance of neonatal mortality than mothers who had ANC visits ≥ 4 times during their pregnancy. Antenatal care must be done, so that the condition of the mother and fetus can be well controlled. The goal is to keep pregnant women through pregnancy, childbirth and puerperium properly and safely, and produce healthy babies.

The nutritional status of pregnant women greatly affects the growth of the fetus in the womb. If the malnutrition status or chronic energy deficiency, both before pregnancy and during pregnancy will disrupt the growth of the fetus, cause fetal brain growth to be obstructed, anemia in newborns, newborns prone to infection, abortion and so on so that they have the risk of giving birth to a baby with low birth weight.[14] The results of this study indicate that there is a significant effect between chronic energy deficiency and the incidence of low birth weight. This research is in line with research conducted [15] which stated that there was a relationship between chronic energy deficiency in pregnant women and low birth weight. Pregnant women with chronic energy deficiency have 4 times the risk of giving birth to a baby with low birth weight. Regarding the importance of the nutritional status of pregnant women on fetal growth, the nutritional status of pregnant women must really receive attention. The nutritional status of the fetus determines the weight of the newborn and the nutritional status of the fetus is determined by the nutritional status of the mother during pregnancy to delivery.

The incidence of anemia experienced by pregnant women will increase with increasing gestational age, this can occur because there is an imbalance between the amount of blood plasma and red blood cells found in the body of pregnant women and this imbalance can be seen from the decrease in hemoglobin (Hb) levels.[16] The results of this study indicate that there is a significant effect between anemia and the incidence of low birth weight. This study is in line with the research [17] in the District Lady Hospital who stated that anemic mothers had a 3.11 times greater risk of giving birth to low birth weight babies than mothers who were not anemic. The incidence of anemia increases with increasing gestational age. During pregnancy, the mother undergoes physiological changes starting at the sixth week, where there is an imbalance in the amount of blood plasma and red blood cells. Low levels of Hb, especially during the third trimester of pregnancy when it requires more iron and there is rapid growth in the fetus. This will affect oxygen to the uterus and interfere with intrauterine conditions, especially placental growth which results in impaired fetal growth so that the fetus is born with low birth weight.

Maternal weight gain is a reflection of the nutritional status of pregnant women. Increased maternal weight means a lot to the health of both mother and fetus. Mothers who suffer from a lack of energy and protein (lack of nutritional status) will cause the placenta to be smaller and the supply of nutrients from mother to fetus is reduced, resulting in retardation of

intra-uterine fetal development and babies with low birth weight (LBW).[18] The results of this study indicate that there is a significant effect between weight gain and the incidence of low birth weight. The results of this study are in line with research conducted [19] of 120 respondents, 47 respondents (39.17%) normal weight gain and 73 respondents (60.83%) who were not normal. According [20] nutritional adequacy during pregnancy and appropriate weight gain during pregnancy will affect the process of developing a baby in the uterus. Appropriate weight gain describes the fulfillment of the needs of the mother and the fetus that can support fetal growth in the womb. Maternal weight gain that is not appropriate will allow the occurrence of miscarriage, preterm birth, low birth weight, and bleeding after delivery. In this study, researchers did not look at maternal weight gain per month or per trimester during pregnancy.

Pregnant women who are too short and less than 145 cm are one of the high-risk groups. The results of this study indicate that there is a significant effect between maternal height and the incidence of low birth weight. This study is in line with research [21] in Japan, mothers who had short stature in the first group (131.0-151.9 cm) were associated with low birth weight (OR 1.91 [95% CI 1.64, 2.22]), the second group (152.0- 157.9 cm) and the third (158.0-160.9 cm) also showed a relationship with low birth weight. This is supported by research [9] showing that maternal height contributes to infant birth weight. The high risk of short mothers giving birth to low birth weight babies shows the need for immediate nutrition and health interventions for Indonesian women, starting from improving their nutritional status from an early age as an effort to reduce the incidence of low birth weight.

CONCLUSION

Based on the results of the study entitled "The inluence of maternal factors on the incidence of low birth weight babies (LBW) at the Betun Border Buffer General Hospital", it can be concluded that there is an effect of maternal factors on the incidence of low birth weight babies (LBW) in Betun Border Buffer General Hospital, which are birth spacing, ANC visit, anemia, chronic energy deficiency, weight gain, height.

Recommendations

The results of this study show that maternal factors including pregnancy distance, ANC visits, anemia, KEK, weight gain, height, have a significant influence on the incidence of BBLR, therefore there needs to be efforts to improve antenatal care services in pregnant women in order to facilitate in early detection of these risk factors.

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REFERENCES

1. Ramadhan, N. Hubungan Ibu Hamil Perokok Pasif Dengan Kejadian Bayi Berat
2. Lahir Rendah Di Badan Layanan Umum Daerah Rsu Meuraxa Banda Aceh. Jurnal STiKES Ubudiyah Banda Aceh. 2012
3. WHO. Global Nutrition Targets 2025 Low Birth Weight Policy Brief. In WHO publications. 2014
4. Kementerian Kesehatan RI. Hasil Utama Riset Kesehatan Dasar 2018. Kementrian Kesehatan Republik Indonesia. 2018
5. Kemenkes RI. Profil Kesehatan Indosnesia. Jakarta: Kementerian Kesehatan Republik Indonesia. 2011
6. Dinas Kesehatan Propinsi NTT. Profil kesehatan NTT tahun 2017. Kementrian Kesehatan Republik Indonesia. 2017
7. Dinkes Malaka. Profil Malaka 2018. Malaka: Dinkes. 2018
8. Rajashree, K., Prashanth, H., & Revathy, R. Study on the factors associated with low birth weight among newborns delivered in a tertiary-care hospital, Shimoga, Karnataka. International Journal of Medical Science and Public Health. 2015
9. Sutan, R., & Berkat, S. Does cultural practice affects neonatal survival- a case control study among low birth weight babies in Aceh Province, Indonesia. BMC Pregnancy and Childbirth. 2014
10. Lada, C. O., Bardosono, S., Irawati, A., & Batubara, J. R. L. Intrauterine, extrauterine predisposing factors, oxidative stress and metabolic adaptation and cardiometabolic risk in stunting children aged 6-24 month, Bogor city. Annals of Nutrition and Metabolism. 2019;23:34-39.
11. Trihardiani, I., & Puruhita, N. Faktor Risiko Kejadian Berat Badan Lahir Rendah di Wilayah Kerja Puskesmas Singkawang Timur dan Utara Kota Singkawang. Program Studi Ilmu Gizi Fakultas Kedokteran Universitas Diponegoro. 2011
12. Suryanti. Faktor – Faktor yang Mempengaruhi Kejadian BBLR di Wilayah Kerja Puskesmas Air Dingin Tahun 2013. Jurnal Kesehatan Masyarakat Andalas (JKMA). 2014;8:72-78.
13. Fatimah, N., Utama, B. I., & Sastri, S. Hubungan Antenatal Care dengan Kejadian Bayi Berat Lahir Rendah pada Ibu Aterm di RSUP Dr. M. Djamil Padang. Jurnal Kesehatan Andalas. 2018;3:45-49.
14. Noor Latifah A,. Hubungan Frekuensi Kunjungan ANC Selama Kehamilan dengan Kejadian Kematian Nenonatal (Analisis Data SDKI 2007). Tesis, FKM UI Depok. 2012
15. Supariasa, I Nyoman & Bakri,Bachyar & Fajar,Ibnu. Penilaian Status Gizi, EGC, Jakarta. 2013
16. Sumiaty dan Restu S,. Kurang Energi Kronis (Kek) Ibu Hamil Dengan Bayi Berat Lahir Rendah (BBLR). Jurnal Husada Mahakam. 2016;4:162-170.
17. Darmayanti, L. Hubungan Antara Status KEK Dan Status Anemia Dengan Kejadian BBLR Pada Usia

Remaja (Studi Di Wilayah Kerja Puskesmas Cerme Kabupaten Bondowoso). Skripsi. Universitas Jember. 2015

18. Ganesh Kumar, S., Harsha Kumar, H. N., Jayaram, S., & Kotian, M. S. Determinants of low birth weight: A case control study in a district hospital in Karnataka. Indian Journal of Pediatrics. 2010

19. Walyani, S. E. Asuhan Kebidanan Pada Kehamilan. Yogyakarta: Pustaka Baru. 2015

20. Ratnasari, D., Suhartono., dan Rafiludin, M. Z,. Faktor Risiko Kejadian Berat Badan Lahir Rendah di Area Pertanian (Studi di Kabupaten Brebes). J Gizi Pangan; 12(1); dari http://Journal.ipb.ac.id/index.php/jgizipangan. 2017

21. Waryana,. Gizi Reproduksi. Yogyakarta: Pustaka Rihama. 2010

22. Inoue S, Naruse H, Yorifuji T, Kato T, Murakoshi T, Doi H, Subramanian SV, Association between Short Maternal Height and Low Birth Weight: A Hospital-based Study in Japan. J Korean Med Sci 2016; 31: 353-359.