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Analysis of the Factors Affecting Infant Birth Weight in a Neonatal Care Unit in RSD Dr. Soebandi Jember

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Abstract--- *Infant birth weight is an important indicator of a child's vulnerability to the risk of illness in childhood. Infant birth weight is very closely related to the health and survival of newborns. Low birth weight (LBW) is a major cause of death in newborns. Therefore the identification of the factors that contribute to infant birth weight is very important to be able to reduce the risk factors and promote care in all stages of pregnancy. The purpose of this study was to explore the factors that influence infant birth weight in a neonatal care unit. This study used an observational analysis with a cross-sectional approach. The sample consisted of 92 respondents. The sampling technique used was simple random sampling. The variables in this study were antenatal care (ANC) history, complications in the pregnancy, birth method and infant birth weight. The data was collected using a structured questionnaire and analyzed using logistic regression. The results showed that (1) history of antenatal care (ANC) ≥ 4 times (OR 3,4) and complications in the pregnancy (OR 4.0) have a significant effect on the infant's birth weight and (2) the birth method has no significant effect concerning the infant's birth weight. The antenatal care (ANC) history factors and complications in the pregnancy are logically adequate at explaining the affect o an infant's birth weight in the neonatal care unit. Health workers are expected to be able to apply an infant birth weight prediction model to provide early warnings about situations where there are difficulties or complications. They should conduct immediate management with appropriate therapy to anticipate the LBW events that will occur.*

Keywords--- *Infant Birth Weight; Antenatal Care; Neonatal Care Unit*

I. INTRODUCTION

Intrauterine growth and development is one of the most vulnerable processes in the human life cycle and the impact of intrauterine growth and developmental deviations has a significant effect on later life. Birth weight is a reliable indicator of the growth index and intrauterine development. Birth weight is a sensitive predictor of a newborn's chances of survival, growth and development [1], [2]. However, sometimes there are factors that affect fetal growth so then the babies born have a Low Birth Weight (LBW) [3]. Low birth weight refers to a birth weight that is below 2500 grams [4]. This is one of the main determinants perinatal survival, infant morbidity and death as well as the risk of future developmental disabilities and

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illness [5]. The World Health Organization (WHO) estimates that globally, out of 139 million live births, more than 20 million babies worldwide represent 15.5% of all births where the baby has a low birth weight [6]. LBW is considered to be the most important predictor of infant mortality, especially regarding death in the first month of life [5].

The number of LBW events in Indonesia according to the WHO in 2018 was 675,700 or 6.2% of national births [7]. The prevalence of LBW in East Java province is 10.1% (RI Ministry of Health, 2010) with the number of low birth weight babies (LBW) in East Java according to the Central Statistics Agency (BPS) totaling 14,882 infants. Jember Regency ranks first in the LBW incidence rate at 1,887 babies with a percentage of LBW incidence of 5.3% in 2018 [8]. The high prevalence of low birth weight babies in Java, especially East Java, is because of the large population which will continually result in a high number of births [9]. This shows that the prevalence of LBW is still high.

Many factors affect the occurrence of low birth weight babies [3][10]. Maternal health factors include the poor nutritional status of women, inappropriate pregnancy care (ANC), low maternal socioeconomic status, pregnancy complications, gestational age ((born before 37 weeks of gestation), birth history (e.g. stillbirth, neonatal death) and maternal morbidity (e.g. malaria and HIV infections). These all play an important role in increasing the occurrence of LBW [2], [3]. Maternal and child health problems have been considered to be the indicators of health service performance [11]. The Ministry of Health of the Republic of Indonesia through the National Medium-Term Development Plan (RPJMN) 2020-2024 has a strategic step that is focused on reducing mortality and increasing the development related to LBW survival through the First 1000 Days of Life Movement (HPK). This will be done by providing optimal care during pregnancy to children up to the age of 2 years [12]. In line with the program, nurses can find cases early through the identification of factors that influence infant birth weight in order to better describe the right strategy to use to reduce the incidence of low birth weight babies.

Dr. Soebandi Jember Hospital is a referral hospital in the eastern region of the East Java province that has a baby care unit with a low birth weight average. There are 80 nurses caring for low birth weight babies each month. The number of low birth weight babies is quite high. However, the available treatment facilities are limited when compared to the average number of low birth weight babies every month. Efforts to improve the low birth weight baby care facilities will not be optimal if the incidence of LBWs in Jember is still high. Efforts to minimize the occurrence of LBW need to begin with the identification of factors that influence the birth weight of the baby, especially the maternal factors. Thus this study will conduct an analysis of the factors affecting the birth weight of infants specifically those related to the maternal factors of pregnancy care (ANC), pregnancy complications, birth methods and gestational age in the baby care unit of RSD Dr. Soebandi Jember.

II. METHODS

The design of this study was an explanatory research design survey with a cross-sectional approach. The study was conducted at Dr. Soebandi Jember. The target population consisted of postnatal mothers with infants who were being treated in the RSD perinatology room of Dr. Soebandi Jember. This study involved 92 respondents who were selected purposively following the inclusion and exclusion criteria that targeted 120 respondents. Of the 92 respondents, 54 newborns had a low birth weight and the remaining 38 babies had a normal birth weight. The inclusion criterion for the babies was to be a single live birth. The exclusion criteria for the mothers were that they did not have an antenatal care card and their infants had a congenital abnormality. A total of 28 respondents were not included in the study due to the baby having congenital abnormalities (congenital heart diseases, seizures etc).

This study is based on a logbook of medical records from the nursery of Dr. RSD. Soebandi Jember and the maternal and child health card (KIA) owned by the respondent. The data was collected using a structured questionnaire. The research assistant screened the logbook and medical records from the nursery of Dr. RSD. Soebandi Jember and the maternal and child health card (KIA) owned by the respondent. All of the respondents who fulfilled the requirements on the prepared list (N = 92) were approached and signed the informed consent sheet. All of the respondents (N = 92) agreed to participate in this study. Each participant was provided with brief information about the research and their confidentiality was guaranteed. Ethical permission was obtained from the University of Muhammadiyah Jember and the RSD Review Committee Dr. Soebandi Jember before the data collection.

The independent variables of this study are gestational age, history of antenatal care (ANC), pregnancy complications and birth methods. The dependent variable is the baby's birth weight. The scale of the data in this questionnaire was nominal (baby birth weight 1 <2500 gram; 2 ≥ 2500 gram; the history of antenatal care (ANC) 1 <4; 2 ≥ 4); pregnancy complications 1: none, 2: present; 1: method of spontaneous birth, 2: non-spontaneous birth; gestational age 1 <36, 2 ≥ 36).

The data was analyzed using SPSS version 19. Logistic regression analysis was used to identify possible LBW predictors (<2500 g). The adjusted odds ratios for all of the variables significantly related to LBW was calculated using a multiple logistic regression model to control for the simultaneous confounding effect of possible confounders. The Hosmer-Lemeshow goodness-of-fit test was used to assess the adequacy of the model. All of the statistical tests were two-sided and P <0.05 was considered to be statistically significant. Ethical permission was obtained from the University of Muhammadiyah Jember and the RSD Review Committee Dr. Soebandi Jember before the data collection was conducted.

III. RESULTS

The results show that the average birth weight of infants was 2590.22 grams with a standard deviation of 648.58 grams. The incidence of low birth weight (<2500 g) was 58.7% according to the multivariate analysis which showed that there were 4 independent variables involved, namely gestational age, history of antenatal care (ANC), pregnancy complications and birth method. The results of the analysis of the interactions between the 4 independent variables and the dependent variable showed that there were no interactions between 3 of the independent variables indicated by the value of p <0.05. There was one independent variable with a value of p > 0.05, namely the birth method variable (p-value .516). Thus antenatal care history (ANC) ≥ 4 times (OR 3,4), pregnancy complications (OR 4.0) and gestational age have a significant impact on infant birth weight (2) whereas birth method does not significantly influence birth weight.

Table 1. Results of the Multiple Logistic Regression Analysis

Risk Factors	ORadjusted	95% CI	P-value	R square
Antenatal care (ANC)	4.385	1.102-17.450	.036	0,351
Complications in pregnancy	4.217	1.227-14.493	.022	
Birth method	.665	.194- 2.279	.516	
Gestational age	.116	.041- .331	.000	
Antenatal care (ANC)	3.421	1.082-10.810	.036	0,346
Complications in pregnancy	4.098	1.201-13.988	.024	
Gestational age	.114	.040- .325	.000	

From Table 1, it can be seen that the R-square value of 0.346 means that a history of antenatal care (ANC) ≥ 4 times, pregnancy complications and gestational age can explain the variability of the independent variable of birth weight by 34.6%. The rest, 65.4%, is explained by other variables not examined in this study.

IV. DISCUSSION

The results show that the history of antenatal care (ANC) had a significant effect on the birth weight of infants, where the mothers with a history of antenatal care (ANC) ≥ 4 had a 3.4 time greater chance (OR 3,421; 95% CI (1,082-10,810)) of giving birth to a baby whose weight is normal (≥ 2500 grams). This is supported by a study that said that pregnant women who attended less than 5 ANC visits tended to give birth to low birth weight babies [13]. Mothers who had never visited the ANC were 5 times more likely (OR 5.1; 95% CI (1.1–22.6)) to have LBW infants and the mothers who visited the ANC less than 4 times were 3 times more likely (OR 3.4; 95% CI (1.1-10.2)) to have LBW infants compared to the mothers who visited 4 times or more [10]. Pregnant women who start antenatal care late in the third trimester of pregnancy (7-9 months) have a 26.7% chance of their babies being in the LBW group, compared to about 20% and 9% of women who start ANC in the second and first trimesters respectively ($X^2 = 13.39$; $P < 0.05$) [2]. This shows that the lack of utilization of antenatal care services (as indicated by no ANC visits) and less than 4 ANC visits increases the risk of LBW infants. An adequate number of antenatal visits (ANC) helps in the early detection of pregnancy complications and it promotes the maternal nutrition and care needed during pregnancy [14]. Antenatal care (ANC) is given to pregnant women by the health workers. Treatment includes risk identification, prevention and the management of illnesses related to pregnancy or illnesses that are concurrent. This is in addition to health education and health promotion. Mothers should be encouraged to attend their ANC visits to detect difficulties such as the premature rupturing of the membranes and timely preterm labor [13], [15]. Pregnant women need to make at least 4 ANC visits as an effort to reduce the risk of low birth weight babies.

Pregnancy complications significantly influence the birth weight of the baby where mothers who do not have pregnancy complications have a 4 times greater chance (OR 4,098; 95% CI (1,201-13,988)) of having a normal birth weight babies (≥ 2500 grams). This is supported by a study which said that pregnant women with HDP (hypertension, preeclampsia and eclampsia) have 4 times the chance of having a low birth weight baby (OR 4.17, 95% CI 3.19-5.45), more than triple the risk of stillbirth (OR 3.51, 95% CI 2.43–5.06) and 5 times the chance of maternal death (OR 5.13, 95% CI 1.53–17.25). Eclampsia is associated with the greatest likelihood of side effects with 5 times the possibility of having a low birth weight baby (OR 5.00, 95% CI 2.84-8.79) [16]. Likewise, babies born to women with diabetes have a higher risk of adverse birth outcomes. This suggests that the complications that occur during pregnancy affect the health of the baby which can cause neonatal outcomes [17]. The health of the pregnant woman has a profound effect on the health of the developing fetus and subsequent newborn.

Gestational age has a significant effect on the birth weight of babies, where the mothers with a gestational age ≥ 36 weeks will have a normal birth weight baby (≥ 2500 grams). Gestational age is the strongest variable associated with the risk of having a low birth weight baby (p-value .000). This is supported by a study that said that gestational age at delivery is statistically significant and related to birth weight [18], [19]. The possibility of having LBW in babies born before 37 weeks gestation is 18 times higher compared to babies born at 37 weeks gestation or older [2], [19]. The effect of gestational age at delivery is because fetal growth has to increase at an exponential rate. About 70% of the total fetal growth occurs in the last trimester of pregnancy with the most growth occurring in the last 2 months of pregnancy [20]. Thus more low birth weight babies will be birthed to women with a gestational age < 36 weeks.

The results show that antenatal care history (ANC) ≥ 4 times, pregnancy complications and gestational age are able to explain the variability of the independent variable of the birth weight of babies by 34.6%. The remaining 65.4% is explained by other variables not examined in this research. Birth weight is thus found to be influenced by various maternal and fetal

factors such as maternal age, multi-parity, the nutritional status of the women, maternal socioeconomic status and fetal sex in a manner that is statistically significant [18].

1 V. CONCLUSION

Birth weight was found to be influenced by both maternal and fetal factors. Maternal factors include the history of antenatal care (ANC) and pregnancy complications while the fetal factor refers to the gestational age at delivery. These factors are good predictors to use when predicting a baby's birth weight. Historical antenatal care (ANC) factors, pregnancy complications and gestational age are logically adequate when it comes to affecting the birth weight of the baby in the baby care unit. Health workers are expected to be able to apply a baby birth weight prediction model to provide them with early warnings about the difficulties or complications that will occur. They can use this to conduct immediate management with appropriate therapy to anticipate the LBW events that will occur. Mass awareness must be increased by involving the posyandu cadres and utilizing mass media and print media concerning the early signs of complications among pregnant women, active antenatal care (ANC) visits and important family planning practices in order to promote basic education for LBW prevention.

CONFLICT OF INTEREST

The authors declare that there has been no conflict of interest, financial or otherwise.

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