ATLANTIS PRESS

Advances in Health Sciences Research, volume 26

2nd Bakti Tunas Husada-Health Science International Conference (BTH-HSIC 2019)

The Role of Assistance Toward Pregnant Women Against Low Birth Weight

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***Abstract*— Low birth weight (LBW) is mostly used to investigate the conditions for survival and the quality of life of children. The study aimed to assess the role of assistance toward pregnant women in the risk of children with LBW. This is part of operational research entitled "Development of Model for Assisting Pregnant Women in Increasing the Use of Maternal and Child Health Services" carried out in 7 districts/cities in Indonesia. The study design was quasi-experiment where two primary health centers (*puskesmas*) were selected for each district/city as a control and treatment group. The study population was all pregnant women living within the area of selected *puskesmas*. A sample of 40 pregnant women were included from each *puskesmas* so the total sample was respectively 280 women, both in the treatment and control group. Assistance was carried out by midwifery students of Health Polytechnic located in the same region of study locations. The dependent variable was the incidence of LBW while the independent variables were age, mother and father's education, mother and father's working status, the pre-pregnancy weight of mother and gestational age at delivery. The logistic regression analysis was used to investigate the effect of student assistance on the risk of LBW. The results showed that there was nearly 6.5 percent of children with LBW. The results of logistic regression analysis showed that pregnant women who were not assisted by the students had 2.60 times higher risk of having a baby with LBW compared to those who were assisted [OR: 2.60; 95% CI: 1.13-5.99]. Therefore, the student assistance for pregnant women is highly recommended to reduce the risk of LBW.**

Keywords: assistance, midwifery student, pregnant women, low birth weight

I. INTRODUCTION

The birth weight of newborns is an important marker for the status of the health and nutrition of the mother and fetus. Newborns with low birth weight (LBW) have a higher risk of death in the first 28 days of life. LBW babies who survive are more likely to experience stunted growth and lower IQ. The consequences of LBW continue into adulthood, increasing the risk of adults in chronic diseases such as obesity and diabetes. The global commitment adopted from The Global Nutrition Targets 2012 is an effort to reduce LBW and recognized as a public health priority. In the 65th World Health Assembly (WHA), country members support the 30 percent target for the reduction of LBW globally between 2012 and 2025 [1].

In the Sustainable Development Goals (SDGs), it is stated that a healthy life supports welfare for all ages. The SDGs are re-enacted through several targets, including ending preventable deaths for newborns and infants by 2030, as each country targets the reduction of neonatal deaths to at least 12 per 1,000 births and under-five deaths to 25 per 1000 births [2]. In Indonesia, infant mortality is expected to fall to 24 per 1000 live births in 2019 [3]. As a developing country, Indonesia still has high infant morbidity and mortality rates. Based on data from the Indonesian Demographic and Health Survey (IDHS) in 2017, the neonatal mortality rate in Indonesia has remained relatively unchanged or stood at 19 per 1000 live births [4]. One of the main causes of neonatal death is LBW babies [5].

The prevalence of LBW varies widely across the world, ranging from 7.2 percent in more developed regions to 17.3 percent in Asia. There are also variations between sub-regions. In South Asia, the prevalence of LBW was 26.4 percent in 2015, more than five times higher than that of East Asia at 5.1 percent [1], whereas in Indonesia based on Basic Health Research Data, it is known that the prevalence of LBW was 10.2 percent in 2013 and decreased to 6.2 percent in 2018 [6, 7].

Many factors are found to be associated with LBW. UNICEF-WHO states that premature birth (<37 weeks) and/or failure to grow in the uterus can increase the risk of LBW [1]. Other factors are maternal nutritional problems (anemia, underweight, overweight before or during pregnancy); maternal health problems including high blood pressure, diabetes, and infectious diseases; maternal characteristics including maternal age, number of births, short birth spacing; as well as other risk factors such as smoking and alcohol consumption [1]. Another case-control study in Northern Ethiopia involving 441 samples at the referral hospital revealed that preterm birth (AOR 5.32), history of physical trauma experienced during pregnancy (AOR 13,714) and history of pregnancy complications (AOR 2,708) were predictors of LBW [8].

A retrospective study in Ghana showed that almost 10 percent of babies born during the study period had birth weight under 2,500 grams. In addition, the findings reveal that the likelihood of giving birth to an LBW baby is very high (OR 1.77) among women living in an urban area. However, mothers who completed secondary school or higher education were 63

percent, or less likely to deliver LBW babies when compared to mothers without education. It was also shown that the chance of LBW decreased significantly as gestational age increased one week (OR 0.67) and increased parity (OR 1.43). Furthermore, the likelihood of giving birth to an LBW baby decreases with each additional ANC visit (OR 0.78) [9]. A study by Ahmed et.al also showed that the absence of iron and folate supplementation, nutritional counseling and food supplementation, maternal malnutrition, maternal anemia, and inadequate food diversity during pregnancy are currently found to be significant as determinants of LBW [10].

The Cohort Study of Child Growth and Development conducted in Bogor from 2012 to 2013 in 220 mothers and infants stated that the nutritional status of the mothers before pregnancy was the most influential factor of birth weight (RR 3.8) after controlling for other factors (height, maternal weight gain, maternal age, parity, energy and protein consumption) [11]. A further analysis of Basic Health Research (Riskesdas) 2010 in East Nusa Tenggara, Central Kalimantan and Papua also revealed that the main determinant factors for LBW were gestational age at delivery (OR 7.01), number of ANC visits (OR 3.83), maternal smoking (OR 3.29) and maternal height (OR 2.55) [12].

There are some strategies needed to prevent LBW, including improving the nutritional status of mothers; ensuring adequate maternal health and care services before, during and after delivery; and strengthening social support [1]. One of the strategies of the Ministry of Health and Universities in improving public health status is community empowerment. Since 2017, the Directorate of Family Health has synergized health programs with tertiary institutions through the assistance of pregnant women by students. The assistance aims to increase the knowledge and positive attitudes of pregnant women, so it will reduce delays in making decisions to access maternal and child health services. This study thus was conducted to determine how the role of assistance to pregnant women in the incidence of LBW.

II. METHODS

A. Design and Setting

This paper is a part of operational research conducted in January-December 2018 by the National Institute of Health Research and Development (NIHRD) collaborated with the Directorate of Family Health, Ministry of Health. The study used a quasi-experimental design through pre and post-assessment of two groups of pregnant mothers. Seven locations were selected as part of Maternal and Child Health (MCH) priority districts, namely Bandar Lampung, Palembang, Lebak, Kawarang, Semarang, Surabaya, and Makassar.

In every district and city, two primary health centers (*puskesmas*) were selected with comparable criteria including a high number of pregnant women within the area, and relatively low coverage of maternal and child health services. Later, one *puskesmas* was selected for the intervention group, and one *puskesmas* was selected for the control group.

B. Study Population and Sample

The study population was pregnant women living in the area of two selected *puskesmas*. The inclusion criteria of the sample were: (1) Pregnant women with 24-32 weeks of gestation; (2) Living within the last six months in the selected *puskesmas* area; and (3) Willing to be accompanied for 4 months (voluntary). The exclusion criteria of the respondents were: (1) Respondents were not found or have moved from the study area, and (2) Respondents refused to be interviewed. For each group, 40 pregnant women were randomly selected based on the lists of women provided by *puskesmas*. Therefore, there were a total of 280 pregnant women respectively, both in the treatment and control group.

C. Variables

Our primary dependent variable, low birth weight, was determined as the recorded weight at birth of less than 2,500 g while the main independent variable is student assistance, which was operationalized as the process of assisting pregnant women carried out by the midwifery students and health volunteers in accordance with the provisions.

In detail, the assistance was defined as follows: (a) Pregnant women are accompanied by a student, while a health volunteer can assist more than one pregnant woman; (b) Mentoring is carried out through one-on-one consultation at home; (c) Assistance is done once a week for a total of 16 visits; (d) Assistance is carried out for four months; (e) Monitoring is conducted by supervisors, *puskesmas* and district health office once a month; and (f) A supervisor is responsible for 10 students.

Other explanatory variables included mother's age, mother's working status, mother's education, father's working status, father's education, the pre-pregnancy weight of mother and gestational age of delivery. The age of the mother is divided into two groups, namely 20-34 years and <20 or ≥35 years. A mother's education is divided into two groups, high degree belongs to those who graduated from senior high school and university/academy, whereas low degree is for those who graduated primary and junior high school. Gestational age at delivery (in weeks) was based on certain last menstrual period or clinical estimate if the last menstrual period was not available.

D. Data analysis

Descriptive analysis aims to show the distribution of the student's assistance by sociodemographic and maternal characteristics. To assess the relationship of student's assistance and other independent variables, bivariate analysis was conducted using a chi-square test with the significance level (α) of 0.05. Multivariate analysis was then done by using a logistic regression model. The adjusted odds ratios (ORs) and two-sided 95% confidence intervals were reported. Statistical analysis was performed using SPSS.

III. RESULTS

A total of 477 women (237 treatment group and 240 control group) was matched in this study. Table 1 shows that the majority of women who received assistance were 20-34 years old (71%) and unemployed (84%). Most women (62%) and

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their husbands (67%) in the treatment group had a higher degree of education. Around 80% of women who received assistance also had normal pre-pregnancy weight (≥45kg) and gestational age during delivery (≥37 weeks).

TABLE I. DISTRIBUTION OF STUDENT'S ASSISTANCE BY BACKGROUND CHARACTERISTICS

Variables	With assistance		Without assistance		Total	
	n	%	n	%	n	%
Mother's age						
20-34 years	169	71.3	174	72.5	343	71.9
<20 or ≥35 years	68	28.7	66	27.5	134	28.1
Mother's working status						
Not working	200	84.4	223	92.9	423	88.7
Working	37	15.6	17	7.1	54	11.3
Mother's education						
High degree	147	62.0	137	57.1	284	59.5
Low degree	90	38.0	103	42.9	193	40.5
Father's occupation						
Civil servant/employee	87	36.7	68	28.3	155	32.5
Entrepreneur/other informal sectors	149	62.9	170	70.8	319	66.9
Not working	1	0.4	2	0.8	3	0.6
Father's education						
High degree	158	66.7	142	59.2	300	62.9
Low degree	79	33.3	98	40.8	177	37.1
Pre-pregnancy weight of the mother						
≥45kg	198	83.5	193	80.4	391	82.0
<45kg	39	16.5	47	19.6	86	18.0
Gestational age at delivery						
≥37 weeks	201	84.8	206	85.8	407	85.3
<37 weeks	36	15.2	34	14.2	70	14.7

Table 2 provides the results of a cross-tabulation analysis between low birth weight and students' assistance. Overall, women who were not assisted by the students tended to have a substantially higher percentage of delivering a baby with LBW (9%). More women who had delivery before 37 weeks had LBW baby (21.4%).

TABLE II. BIVARIATE ANALYSIS

Variables	Birth weight				Total		P
	Normal (≥2500 gram)		LBW (<2500 gram)				
	n	%	n	%	n	%	
Intervention							
With assistance	227	95.8	10	4.2	237	100	0.05*
Without assistance	219	91.3	21	8.8	240	100	
Mother's age							
20-34 years	323	94.2	20	5.8	343	100	0.35
<20 or ≥35 years	123	91.8	11	8.2	134	100	
Mother's working status							
Not working	397	93.9	26	6.1	423	100	0.39
Working	49	90.7	5	9.3	54	100	
Mother's education							
High degree	269	94.7	15	5.3	284	100	0.19
Low degree	177	91.7	16	8.3	193	100	
Father's occupation							
Civil servant/employee	143	92.3	12	7.7	155	100	0.41
Entrepreneur/ other informal sectors	300	94.0	19	6.0	319	100	
Not working	3	100	0	0	3	100	
Father's education							
High degree	281	93.7	19	6.3	300	100	0.85
Low degree	165	93.2	12	6.8	177	100	
Pre-pregnancy weight of the mother							
≥45kg	368	94.1	23	5.9	391	100	0.24
<45kg	78	90.7	8	9.3	86	100	
Gestational age at delivery							
≥37 weeks	391	96.1	16	3.9	407	100	0.00*
<37 weeks	55	78.6	15	21.4	70	100	

* significant at P<0.05

TABLE III. MULTIVARIATE ANALYSIS

Variables	P	Adjusted OR (95% CI)
Intervention		
With assistance	0,024	Reference
Without assistance		2,60 (1,13 – 5,99)
Gestational age at delivery		
≥37 weeks	0,000	Reference
<37 weeks		6,81 (3,10 – 14,99)

The main interest is to examine the relationship between LBW and the students' assistance and other covariates. The result of this analysis is presented in Table 3. It can be seen that the students' assistance and gestational age of delivery had a significant relationship with LBW. Women without assistance had 2.6 times higher likelihood of having an LBW baby than those who were assisted. Also, women who had delivery before 37 weeks were 6.8 times more likely to have an LBW baby.

IV. DISCUSSION

The study results show a strong association between students' assistance and LBW. It can be explained that the effect of maternal and child health education on the risk of LBW is significant. One of the materials which had been given to pregnant women during assistance is nutrition education and counseling, including food or micronutrient supplements, nutritious food during pregnancy and breastfeeding.

One media used in assisting pregnant women is the Maternal and Child Health (MCH) handbook published by the Ministry of Health. Materials delivered by the facilitator refers to the MCH handbook. There are 16 materials delivered by the students to pregnant women including the signs of a healthy pregnancy, danger signs of pregnancy and things that should be avoided during pregnancy, nutritious food for pregnant women, advice for attending pregnant women classes, birth preparedness (P4K) stickers and childbirth preparation, early signs of labor, childbirth, danger signs of labor and postpartum and breastfeeding. The meeting which was held 16 times by the students was able to increase the mother's knowledge. Based on the main results of the study entitled "Development of Model for Assisting Pregnant Women in Increasing the Use of Maternal and Child Health Services", it is shown that students' assistance towards pregnant women had an effect on increasing women's knowledge. An increase in the composite score of women's knowledge about danger signs of pregnancy, postpartum and newborns in the intervention group was 3.3 percent higher than in the control group [13].

Some studies also explain how the influence of the MCH handbook on knowledge, attitudes, and behaviors related to the

health status of mothers and their children both during pregnancy or after childbirth. A study by Yanagisawa et.al in Cambodia revealed that knowledge of all the topics discussed in the MCH handbook among women in the intervention group has increased except for the risk of severe bleeding after childbirth. The study also showed increased ANC visits, deliveries at health facilities and deliveries by trained health workers [14].

A study in Semarang that conducted students' assistance towards pregnant women using the One Student One Client (OSOC) method also found that students' assistance was able to increase mothers' knowledge. In addition, there were significant results as pregnant women took more than 90 iron tablets since the beginning of pregnancy; pregnant women and families prepared for the childbirth; and prevention of complications. All of the pregnant women also joined the pregnancy class. Therefore, the OSOC program can improve the health status of mothers and fetuses [15].

Based on these findings, it depicts that the knowledge obtained by the mothers during assistance can influence the attitudes and behaviors of mothers as they were more concern about their conditions and the health status of their babies. They tended to have more antenatal visits. Antenatal Care (ANC) is a health service provided by the health workers for pregnant women and is carried out in accordance with the Midwifery Standard of Services (*Standard Pelayanan Kebidanan*/SPK) [16]. The health workers mentioned above referred to obstetricians, general practitioners, midwives, and nurses. Pregnancy health services are any activities and/or series of activities carried out from the time of conception to childbirth. Pregnancy Health Services aims to fulfill the right of every pregnant woman to obtain quality health services as she is able to have a healthy pregnancy, to deliver safely, and to deliver healthy and quality babies.

Based on the Minister of Health Decree number HK.01.07/ MENKES/422/2017 regarding the Ministry of Health's strategic plan 2015-2019 states that one of the performance indicators of the Ministry of Health is the percentage of pregnant women who receive at least four antenatal care services (K4) [4]. It is defined as the proportion of women who have access to pregnancy health services by the health workers at least 4 times and meet the criteria 1-1-2, namely at least once in 1st trimester, at least once in 2nd trimester and at least twice in 3rd trimester. Research by Suparmi et.al showed a 21 percent higher chance of mothers within the intervention group to receive at least four ANC services (K4) compared to those in the control group [13].

Research conducted by Aiga et.al in 810 mothers of children aged 6-18 months in four provinces in Vietnam also illustrates that the proportion of pregnant women who visited ANC more than two visits among those who received the intervention through integrated MCH handbook was significantly higher. In other words, the MCH handbook tends to increase the likelihood of women to have more than two ANC visits by changing their attitudes [17].

A study by Mori et al in Bulgan, Mongolia also did a similar intervention using the MCH handbook. This MCH handbook contains information and record regarding maternal health, pregnancy period, childbirth and postnatal health, maternal weight during and after pregnancy, dental health, parenting classes, development of children 0-6 years, immunizations and anthropometric charts. The study revealed that the MCH handbook increased antenatal visits and promoted sustainable services in the intervention group. The results showed that the intervention group (253 women) had an average ANC visit 6.9 times, while the control group (248 women) 6.2 times. Interventions will help women to identify maternal morbidity during pregnancy and encourage their health-seeking behavior [18].

Having a positive behavior to always maintain the health status of the mother and fetus during pregnancy, the pregnancy condition of the mother will be monitored, which in turn can affect to lower possibility of the mother to deliver LBW baby. As explained above, the determinant factors that cause LBW include pregnancy examination.

This study findings also present a strong association between gestational age at delivery and LBW. Women who had delivery before 37 weeks were 6.8 times more likely to have an LBW baby. As previously explained, preterm birth (<37 weeks) and/or growth failure can increase the risk of LBW [1]. This is supported by the study conducted by Mohammed et.al in Ghana stating that each a week increase in gestational age significantly decreases the likelihood of LBW. It was also revealed that premature babies are usually underweight [9]. Similar to studies in East Nusa Tenggara, Central Kalimantan and Papua, the main determinant factor of LBW babies in gestational age at delivery (OR 7.01; 95% CI 2.68 -18,35) [12]. It is clear that premature fetus will not achieve normal physical development in the womb and at higher risk to have low weight at birth. In other words, any gynecological or medical condition that could trigger premature delivery should be timely recognized and properly managed during pregnancy [8].

V. CONCLUSION

In conclusion, assistance for pregnant women can be used as an alternative method to increase knowledge and change the behavior of pregnant women in order to reduce the risk of low birth weight. The MCH handbook should be properly distributed and utilized as a media for providing MCH information as well as monitoring the development of the fetus through ANC visits at health facilities. Helped by volunteers, health workers should encourage pregnant women to use the handbook optimally to gain more information on a healthy pregnancy.

ACKNOWLEDGMENT

We would like to express our gratitude to the Director of the Center for Research and Development of Public Health Efforts and the Scientific Advisory Committee, National Institute of Health Research and Development for giving permission to conduct the study in 2018.

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