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RISK FACTORS OF LOW BIRTH WEIGHT, A COHORT RETROSPECTIVE STUDY HOSPITAL BASED AT REFERRAL HOSPITAL BAUCAU TIMOR-LESTE

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ABSTRACT

Low birth weight (LBW) is currently identified as a serious public health problem entire the world. There was because of the LBW babies are commonly facing a further harmful impact in the future. LBW children are higher risk to die within the first five years than the normal birth weight. When LBW children survive within the first five years, they will face a various constraints during their life compared to normal birth weight (WHO SEARO 2009). The main objective of the research was to identify the risk factors of LBW in Timor-Leste. This research was conducted in the Baucau Referral Hospital which is located in the eastern part of Timor-Leste. The hospital was assigned for referral patients from 16 Community Health Centers (CHCs) from three district health service area. The type of the research was cohort retrospective study where 109 LBW babies and 158 normal birth weight (NBW) babies were assigned as subjects of the research during January – June 2010. The mothers from both LBW and NBW were interviewed to trace their record on related risk factors of LBW. To identify association between risk factors and LBW we used *odds ratio* approach with 95% confidence interval. There were some factors identified through X^2 test which have an association with LBW. The factors mentioned were height of mother which lower than 145 cm (*p-value*: 0.008, OR: 2.05), mother worked during pregnancy (*p-value*: 0.034, OR: 5.35), mother which suffered from fever during pregnancy, (*p-value*: 0.000, OR: 25.7), inadequate ANC visited to the health facility (*p-value*: 0.000, OR: 4.02), smoking habits of mothers (*p-value*: 0.034, OR: 5.35), husband smoker (*p-value*: 0.000, OR: 56.3), upper arm boundary less than 23.5 cm (*p-value*: 0.000, OR: 8.54), mother living in the rural area (*p-value*: 0.000, OR: 7.39), interval pregnancy less than two years (*p-value*: 0.007, OR: 3.06). Among the risk factors mentioned, only six factors identified as predominant factors of LBW. They were husband smoker, mother which suffered from fever during pregnancy, mother living in the rural area, mother working during pregnancy, upper arm boundary less than 23.5 cm, and interval pregnancy less than two years. Enhancement of accessibility of health services particularly for pregnant women and growing of food and agriculture local production are identified as the main factors which are needed to be considered together with localized free smoking area for those who need, to decrease the LBW babies in Timor-Leste.

Key Words: Risk Factors, LBW, Timor-Leste.

A. Background

"Children's health is tomorrow's wealth" [1] Children's health was has been started when they were in the utero of the mother. Fetal weight at birth is accepted as the single parameter that is directly related to the health and nutrition of the mother, and other relevant factor which direct or indirect influenzed the fetal in the utero during pregnancy. The World Health Organization (WHO) categorized the birth weight of babies into two categories. They are Low Birth Weight (LBW) < 2500 gram and Normal Birth Weight (NBW) ≥ 2500 gram.

Low birthweight is closely associated with foetal and neonatal mortality and morbidity, inhibited growth and cognitive development, and chronic diseases later in life. LBW babies are usually got a higher risk to die within first five years of life than the normal birth weight. For those survived within first five years commonly faced multiple constraints on their life compared to normal birth weight.[2] Unsurprisingly, babies which born from teenager mother are higher risk to get LBW and die due to diseases infection and malnutrition before their first anniversary.[3]

Substantially, LBW contributed to the infant mortality and morbidity. LBW is one of the major problem of public health entire thve world including develop contries like USA.[4] Studies show that LBW infants contribute to 70% of infant mortality. Seventy-five percent of neonatal mortality occurs among LBW infants who also have a high risk of morbidity. About 25 to 30 million LBW infants are born each year. Twelve to 15 million or about half of all LBW infants are born with low birth weight in Asia.[2]

According to the results of some research which have been done in some countries, various factors identified as contributor factors which enhanced a risk for LBW are the mother got malaria infection during pregnancy, [5,6,7,8,9,10,11,12,13,26] multiple pregnancy,[7] age of the mother (less than 18 years and older than 34 years),[16] short interval pregnancy,[15,16,18] low socio-economic status,[15,19] user drugs and alcohol,[14,21] anemia,[21] inadequate antenatal care,[23,24] smoking,[14,17,22] and physically labor during pregnancy.[25]

This research was aimed to identify independent factor which supposed as contributor factors on LBW in Timor-Leste. The research was conducted in the Baucau Referral Hospital Timor-Leste.

B. Methods

The research used an *observational analytic design* with cohort retrospective approach to identify the risk factors of LBW at the Referral Baucau Hospital Timor-Leste 2010. Each baby which delivered at the hospital and met the

exclusion and inclusion criteria was weighed to identify LBW and NBW.

The inclusion criteria were all of babies which delivered at the Baucau Referral Hospital who assisted by health staffs during January–June 2010. The exclusion criteria composed of still birth babies, premature babies, twin babies, baby delivered from up normal mothers, babies without LISIO.

Mothers from both LBW and NBW were investigated to identify exposure factors during pregnancy. The exposure factors of the research consist of mother residence, fever suffering during pregnancy, active smoking, passive smoking, and drank alcohol. Other relevant factors which included as an independent factors were parity, age of mothers, height of mother, work status, nutrition status, pregnancy interval, source of income, sex of neonates, and antenatal care.

The data collection was conducted by three batches. First batch was weighting the new born baby to separate LBW and NBW. The second batch was interviewing the mother used questionnaire. The data which colleted from interviewing the mother consists of suffering fever during pregnancy, frequency of suffering malaria, husband occupation, drank alcohol, smoking, and parity. The third batch was checking the LISIO (Livrinho Saude Inan ho Oan= Health Monitoring Book for Mother and Babies) for confirming antenatal visit to the health facilities, MUAC (Mother's Upper Arms Circle), height of mother, and interval pregnancy.

Statistical analysis was done to identify the association between dependent and independent factors and at the mean time it also used to measure the risk factors of the LBW of babies which delivered at the Baucau Referral Hospital. The statistical analysis which used consists of bivariate analysis and multivariate analysis. The bivariate analysis was used to describe an association between dependent and independent factors. And the multivariate analysis was used to identify the predominant factors on LBW babies.

C. Results

There were 158 newborn babies which met an inclusion and exclusion criteria of research. They were included as research subject. Of those, 109 (40.8%) were born as LBW neonates and 158 (59.2%) were born as NBW. Ratio LBW and NBW in this research was 1:1.45. They were coming from the three districts under the Baucau Referral Hospital catchment area.

Results of bivariate analysis showed that there were nine factors among fourteen independent factors associated to the LBW. Passive smoking was identified as a biggest risk factor for LBW in this research (*p-value*: 0.000, OR: 56.3, 95% CI: 26.5 – 119.6). The mother who

suffered from fever during pregnancy were morelikely 25 times delivered LBW babies than those who did not (*p-value*: 0.000, OR: 25.7, 95% CI: 13.4 – 49.7). Age of mothers, source of family income, parity, sex of newborn baby, and drank alcohol had not associated to the LBW.

There were 108 mothers which suffered from fever during pregnancy. All of them (100%) got fever and pain bone, 96.3% got fever, pain bone and headache. According to the frequency of got fever, there were 56.5% which got once time fever during pregnancy and 43.5% which got more than once times fever during pregnancy. According to time occurance, there were 88.9% of mothers which got fever within first three-months pregnancy and only 11.1% which got fever within second three-months pregnancy. Among those who suffered from fever during pregnancy, 80.56% delivered LBW baby.

The multivariate analysis showed five factors identified as predominant factor of LBW. They were passive smoker, got fever during pregnancy, MUAC less than 23.5 cm, living in the rural area, and interval pregnancy less than two years.

Table 1

Distribution of LBW and NBW regarding to the mother characteristics

Characteristics	*LBW*		*NBW*		*Total*	*OR 95% CI*	*p- value*
	n	*%*	*n*	*%*			
Passive smoking (Husband smoke)							
• Yes	95	87.2	17	10.8	112	56.3 (26.5–119.6)	0.000
• No	14	12.8	141	89.2	155	Ref	
Got fever during pregnancy							
• Yes	87	79.8	21	13.3	108	25.7 (13.4–49.7)	0.000
• No	22	20.2	137	86.7	159	Ref	
MUAC (nutrition status)							
• < 23.5 cm	83	76.1	43	27.2	126	8.54 (4.8 –14.99)	0.000
• ≥ 23.5 cm	26	23.9	115	72.8	141	Ref	
Residence of mother							
• Rural	82	75.2	46	29.1	128	7.39 (4.25–12.87)	0.000
• Sub urban	27	24.8	112	70.9	139	Ref	
Number of ANC visited							
• < four times	73	67.0	53	33.5	126	4.02 (2.39–6.74)	0.000
• ≥ four times	36	33.0	105	66.5	141	Ref	

Characteristics	LBW		NBW		Total	OR 95% CI	p- value
	n	%	n	%			
Interval of pregnancy							
• < two years	17	15.6	9	5.7	26	3.06 (1.31 – 7.15)	0.007
• ≥ two years	92	84.4	149	94.3	241	Ref	
Height of mothers							
• < 145 cm	42	38.5	37	23.4	79	2.05 (1.20–3.49)	0.008
• ≥ 145 cm	67	61.5	121	76.6	188	Ref	
Work status during pregnancy							
• Worked	7	6.4	2	1.3	9	5.35 (1.09–26.3)	0.034
• Not worked	102	93.6	156	98.7	258	Ref	
Active smoking							
• Yes	7	6.4	2	1.3	9	5.35 (1.09–26.3)	0.034
• No	102	93.6	156	98.7	258	Ref	
Age of mothers							
• < 20 and >35 years old	30	27.5	29	18.4	59	1.69 (0.94 – 3.02)	0.076
• 20 – 35 years old	79	72.5	129	81.6	208	Ref	
Source of family income							
• Non monthly salary	14	12.8	32	20.3	46	0.58 (0.29–1.15)	0.115
• Monthly salary	95	87.2	126	79.7	221	Ref	
Parity							
• > 2 times	43	39.4	69	43.7	112	0.84 (0.51–1.38)	0.49
• 1 – 2 times	66	60.6	89	56.3	155	Ref	
Sex of newborn baby							
• Male	50	45.9	68	43.0	118	1.12 (0.68 – 1.83)	0.647
• Female	59	54.1	90	57.0	149	Ref	
Drunk alcohol							
• Yes	11	10.1	17	10.8	28	0.93 (0.42–2.07)	0.86
• No	98	89.9	141	89.2	239	Ref	

Note: MUAC: Mothers upper arms circle

Table 2

Results of multivariate analysis

Characteristics	B	p – value	Adjusted OR	95% C.I.	
				Lower	Upper
Husband smoking	2.976	0.000	19.601	7.556	50.844
Got fever during pregnancy	2.619	0.000	13.720	5.107	36.863
MUAC < 23.5 cm	1.963	0.000	7.124	2.634	19.268
Residence in the rural area	1.884	0.000	6.577	2.441	17.723
Interval of pregnancy<2 years	1.800	0.040	6.048	1.084	33.748
Constant = -6.055					

Therefore the formula of the logistic regression is:

y = -6.055 + 2.976 (husband smoker) + 2.619 (got fever during pregnancy) + 1.963 (MUAC less than 23.5) + 1.884 (mother living in the rural area) + 1.800 (interval of pregnancy)

The formula applied to predict the probability of LBW baby. The role of probability is:

$$p = \frac{1}{1 + e^{-y}}$$ --►Rule of probability[31,32]

Where:

p = probability of LBW baby

e = natural number 2.7

If the risk valued "one" and the non risk valued "zero," then the probability of LBW for baby who from the mother with: smoker husband, got fever during pregnancy, MJAC < 23,5 cm, residence in rural area, interval pregnancy less than two years:

$$y = -6.055 + 2.976\ (1) + 2.619\ (1) + 1.963\ (1) + 1.884\ (1) + 1.800\ (1)$$
$$y = 5.187$$

$$p = \frac{1}{1 + 2.7^{-5.187}}$$

$$p = 0.994 \text{ or } 99.4\%$$

Then the probability of baby with normal weight is: 1 – 0.994 = 0.006 or 0.6%. Therefore almost valid that baby who delivered from mother which husband smoker, has a fever experienced during pregnancy, MUAC less than 23.5 cm, stayed in rural area, interval pregnancy less than two years would suffer from LBW.

D. Discussion

Timor-Leste, eight years old (2010), recognized by the international community as a country as per as 20 May 2002. In the health sector, maternal and child mortality is a major challenge for Timor-Leste's public health programs. Worldwide, various studies have been conducted and documented several risk factors for LBW babies.

The results of this study showed that there was no relationship between maternal age and birth weight. There was no significant difference between the proportion of age groups of mothers who gave birth to LBW babies and mothers who gave birth to normal-weight babies (*p_value: 0.07*6). Mothers who belong to the age group of less than 20 years and more than 35 years are at risk of giving birth to a baby with LBW 1.69 times more than mothers aged 20 – 35 years with a 95% CI: 0.94 – 3.02. The same is pointed out from a study conducted by Delgado-Rodriguez et al. (1988) that age is not a risk factor for LBW. This study is not in line with the research of Singh et al. (2006) and Deshmukh, et al. (1998) who stated that one of the risk factors for giving birth to a LBW baby is the mother's age that is too young or too old.

The results of this study show that there is a relationship between the height of the mother and the weight of the baby born. Mothers who are less than 145 cm tall have a 2.05 times higher risk of giving birth to LBW babies than mothers with a height of 145 cm and above. This shows that mothers or mothers-to-be whose height is less than 145 cm should consult intensively with a competent health professional if they want to have children. This effect not only affects the incidence of LBW shown in this study but also affects the health and safety of the mother both during the fetus in the womb and at the time of delivery.

This study shows that there is a relationship between working mothers and the weight of the baby born. Working mothers had a 5.35 times higher risk of giving birth to a baby with LBW than non-working mothers (p-value: 0.034, OR: 5.35, 95% CI: 1.09 – 26.3). The results of this study are similar to

several studies conducted in other countries, including a study conducted by Viengsakhone, et al. (2010) in four hospitals in Vientiane, Lao, PDR that maternal work affects the birth weight of babies.

In terms of socioeconomic level, mothers whose husbands do not receive a monthly salary are not a risk factor for the incidence of LBW (p-value: 0.115, OR: 0.58, 95%CI: 0.29 – 1.15). The results of this study are in line with the results of a UNDP survey which states that the people of Timor-Leste are still classified as poor people in the world with 77.5% of people living on less than $2.00 US per day.[27]

Symptoms of chilling fever are the most typical main symptom of malaria that can cause anemia and placental parasitaemia both of which could be resulted low birth weight.[13] This study shows that there is a relationship between the mother's history of suffering from symptoms of fever and the incidence of LBW babies. Mothers who have suffered from symptoms of meningococcal fever, have a 25.7 times risk of giving birth to a LBW baby compared to mothers who have no history of suffering from symptoms of migraine during nine months of pregnancy (p-value: 0.000, OR: 25.7, 95% CI: 13.4 – 49.7). A history of mothers who have suffered from symptoms of fever during pregnancy is strongly suspected to be a symptom of malaria.[10]

Multivariate analysis showed that mothers who had a history of suffering from chills and fever symptoms during pregnancy were one of the dominant factors in the incidence of LBW (p-value: 0.000, adjusted OR: 11.926).

This research shows that there is a relationship between ANC visits and birth weight (p-value: 0.000, OR: 4.02, 95% CI: 2.39 – 6.74). The results of this research are in line with research conducted by Siza, (2008) in Tanzania. Treatment during pregnancy is carried out through ANC visits to health facilities.

. The results of this study did not find a relationship between alcohol drinking habits and the baby's birth weight (p-value: 0.86, OR: 0.93, 95% CI: 0.42 – 2.07). The results of this study are not in line with research conducted by Conley et al. (2003).

Parity in this study was not a risk factor for LBW. Statistically, parity is not related to the baby's birth weight (p-value: 0.49, OR: 0.84, 95% CI: 0.51 – 1.38). The results of the study showed that mothers with an upper arm circumference of less than 23.5 cm had an 8.54 times risk of giving birth to a LBW baby compared to mothers with an upper arm circumference of 23.5 cm and above.

Healthy food is an important component for the growth and development of the fetus in the mother's womb. Nutritional factor in this study is one of the dominant factors for the incidence of LBW (OR: 6,449). The interval or distance between birth and the previous child is related to the weight at birth. Infants born with an interval of less than two years with the previous child had a risk of being born with a LBW of 3.06 times compared with infants with an interval of two years or more with the previous child (p-value: 0.007, OR: 3.06, 95% CI: 1.31 – 7.15). The birth interval is in line with Deshmukh's research, et al, 1996.

There was no relationship between the origin of the maternal district and the birth weight of the baby. None of the three districts were suspected to be the source of risk factors for LBW incidence in this study (p-value: 0.524, OR: 0.78, 95% CI: 0.35 – 1.70).

This study shows that mothers from rural areas are at 7.39 times more likely to give birth to babies with LBW than mothers from urban areas (p-value: 0.000, OR: 7.39. 95% CI: 4.25 – 12.87). This study is considered as preliminary study for further

research to identify the risk factors for LBW babies in Timor-Leste.

E. Conclusion

Factors related to LBW and statistically significant at a significance level of 5% (α = 0.05), p-value < 0.05 include: maternal height of less than 150 cm, mothers with working status, mothers with a history of suffering fever during pregnancy, mothers with less than four ANC visits, mothers with smoking habits, mothers with smoking husbands, mothers with MUAC less than 23.5 cm, babies born with a body length less than 45 cm, babies with a birth distance less than two years from the previous child, mothers who living in rural areas. Those mothers were gave birth between January till April 2010.

The predominant risk factors for the incidence of LBW babies for multivariate analysis in this study were: husband's smoking habits, mother's history of suffering from fever and chills during pregnancy, mother's who stayed in the rural area, mother's nutritional status measured by MUAC which less than 23.5 cm and pregnancy interval was less than two years.

F. Suggestions

1. The husband's smoking habit is the main predominant factor in the incidence of LBW babies, the suggestions to prevent LBW due to smoking are: (1) To teenagers, do not smoke tobbaco. (2) To husbands, don't smoke when close to wife, (3) To mothers and mothers-to-be, do not smoke. (4) To the leaders of policy makers in Timor-Leste to create smoke-free areas and establish special smoking areas (5) To mothers and mothers-to-be who have working status so as not to force themselves to do heavy work both physically and psychologically during pregnancy.
2. To pregnant women to sleep in mosquito nets to avoid contact malaria mosquito during pregnancy.
3. To competent ministries, especially the Ministry of Agriculture, to increase local production of agricultural products with guaranteed quality for consumers.
4. To the Ministry of Health of Timor-Leste, especially the research and development section, so that it can consider for further research on the risk factors for LBW babies in Timor-Leste.

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