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FACTORS AFFECTING LOW BIRTH WEIGHT AT FOUR CENTRAL HOSPITALS IN VIENTIANE, LAO PDR

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ABSTRACT

The purpose of this study was to determine the factors affecting low birth weight (LBW) at four central hospitals in Vientiane, the capital city of Lao PDR. We collected data from 235 mothers with LBW babies and 265 with babies of normal birth weight (NBW) who had delivered them at four central hospitals from March to June of 2008. Among the mothers of LBW babies, 84.7% were aged 18–35 years, 7.7% aged <18 years, and another 7.7% aged >35 years, while the corresponding figures among those with NBW babies were 97.7%, 1.1%, and 1.1%, respectively. The mothers in a low income group earning <1 million Kips (1 USD=8,700 Kips) per month numbered 68.9% for the LBW group and 15.1% for the NBW group. We estimated both odds ratios (ORs) and 95% confidence intervals (CIs) to explore associations between LBW outcomes and related factors. Significant associations with LBW were found for delivery at age <18 years (OR=8.6, 95% CI=2.4–30.7), monthly family income <1 million Kips (OR=13.9, 95% CI=8.8–21.9), physical labor during pregnancy (OR=5.0, 95% CI=3.1–8.1), and first child birth (OR=2.2, 95% CI=1.5–3.3). Mothers with an inadequate level of knowledge regarding healthy pregnancy practices were at 10.1 times higher risk of developing LBW babies (95% CI=6.7–15.2). Mothers lacking adequate nutritional practices were more prone to deliver LBW babies with an OR of 8.9 (95% CI=5.6–14.3). The ORs of LBW babies for those factors were high among Lao mothers. Improving a mother's knowledge of and practice for a healthy pregnancy needs to be emphasized to reverse these LBW trends.

Key Words: Low birth weight, LBW, Mother of LBW baby, Vientiane, Laos

INTRODUCTION

According to the World Health Organization (WHO) definition, infants with birth weights of less than 2,500 g are classified as low birth weight (LBW).[1)] Annually there are almost 23 million LBW infants worldwide per 121 million births, a high proportion of which are in developing countries.[2)] LBW is not only a sensitive indicator for predicting the chances of both infant survival and healthy childhood growth and development, but is also a reflector of the present and past health status of the mother. LBW is a leading cause of prenatal and neonatal deaths, and as such it remains a worldwide issue and one of the most important public health problems,

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particularly in developing countries.

Birth weight is a major factor in determining child survival, future physical growth, and mental development,[3] It is also sensitive to changes in the physical and socio-demographic status of the mother. In addition, the incidence of LBW babies is linked to maternal nutritional status. The quality of the maternal diet is related to the level of education and income, and affects the health status of the mother. Moreover, the fear of experiencing a difficult labor and birth prompts some pregnant women to restrict their food intake during the third trimester. There are other cases in which low income and/or demanding physical labor of expectant mothers seem to be significant factors that result in LBW babies.[4]

LBW occurred in 60.0% of prenatal deaths, and in those deaths occurring within the first week of life, the incidence of LBW was 71.0%. As a rule, LBW might constitute the single most important factor affecting neonatal mortality and morbidity, as evidenced by the fact that LBW babies are 40 times greater contributors to neonatal mortality and morbidity.[2] Even if an LBW baby survives, it likely to suffer a high incidence of malnutrition, diarrhea, acute respiratory infection, infectious disease, neurodevelopment problems such as cerebral palsy, and physical defects. In addition, LBW also determines the postnatal mental, physical, and neurological development of children.[5]

Lao PDR is among the poorer countries with high rates of infant mortality, especially at the neonatal stage. A huge proportion of this neonatal mortality in Laos is attributable to LBW, the incidence of which is 11.0% nationwide. That is higher even when compared with Vietnam at 7.0% and Uzbekistan at 5.0%.[6] The statistics of four central hospitals revealed an LBW incidence of 9.8% in 2007. Currently, 10.3% of mothers have no access to health services during pregnancy. The data show that although 38.7% receive services and attend health education classes before delivery, only 13.1% do so due to signs of complication during their pregnancy.[7] Vientiane has a total area of 3,920 square kilometers with an approximate population of 610,000. There are four central hospitals in Vientiane, which was specifically selected because of the availability of data regarding factors affecting low birth weight. Hence, the aim of this research is to explore the severity of LBW prevalence and to discover its determining factors. Results of these studies can aid in promoting policies related to maternal and childhood health and in establishing measures of preventing maternal childhood mortality.

MATERIALS AND METHODS

This research was conducted as a case-control study using data from women who had delivered their children at four central hospitals in Vientiane during the period of March to June, 2008. Birth weights of the new born babies, as well as maternal weights and heights were measured by trained staffs. The total number of women who gave birth during that time was 2,398, including 280 mothers with LBW babies. In addition, mothers with normal birth weight (NBW) babies were sampled from those who gave birth prior to an LBW delivery. When a prior NBW delivery was not available, a mother with a NBW baby born subsequent to an LBW delivery was sampled instead. Mothers who delivered multiple babies or one with a congenital malformation were excluded from our analysis. Data were collected during face-to-face interviews using a structured questionnaire after having heard an explanation of the purpose, benefits, risks, anonymity, and confidentiality of the study, and given their subsequent consent. Subjects with incomplete data were further excluded, and the remaining 235 mothers with LBW babies and 265 with NBW babies were analyzed.

The questionnaire contained five sections: a) the first contained questions related to socio-

demographic background; b) the second investigated the mother's knowledge regarding a healthy pregnancy, addressing issues on nutrition, chronic diseases, etc. as a cause of LBW; c) the third surveyed the mother's health status which included questions on the complications arising from pregnancy, such as convulsion, hypertension and abortion; d) the fourth focused on health practices, such as nutrition (history of meat consumption, drinking alcohol, smoking, etc.), health information (antenatal care, get nutrition's information during pregnancy etc.); and e) the fifth and final section was concerned with family factors such as the influence of parents and husbands as contributors to a healthy pregnancy and childbirth.

Descriptive statistics were use to describe the socio-demographic characteristics of the respondents. Continuous variables were presented as mean and standard deviations (SD), and categorical data were presented based on frequency and percentage. To explore the determinants of LBW, mothers with LBW and NBW babies were compared for different related factors. Moreover, a logistical model was applied to estimate odds ratios (ORs) and 95% confidence intervals (CIs) as a measure of the associations between LBW and related factors. OR was adjusted for the age of the mothers at delivery, educational status, and family income with different variables. A P value of <0.05 was considered significant. Data were analyzed using SPSS version 17.0 for Windows.

RESULTS

Most respondents were in the age group of 18–35 years as described in Table 1. The percentage of mothers in that group was as much as seven times higher in the LBW than in the NBW groups. Almost 96% of the mothers belonged to the Laolum ethnic group, and were mostly Buddhist in religion. Most mothers of LBW babies (88.9%) belonged to the hard physical labor group, and 68.9% of them had incomes of less than one million Kips per month.

Table 2 summarizes the different factors which might have influenced LBW outcomes. Most first-born children were LBW (60.9%), whereas 39.1% of second children were. LBW prevalence was 6.8% among those mothers who had a family history of LBW babies, while it was 93.2% of those mothers who never had such a family history. We determined the level of knowledge and practice on different issues involving LBW babies, their causes and nutritional roles using a set of questions for each component. The knowledgeability of mothers having scores of 75% or more for giving the correct answers to knowledge related questions was ranked as 'adequate', while below 75% were regarded as 'inadequate'. Accordingly, we found that only 27.2% of all mothers had adequate knowledge. As for the level of practicing healthy behavior during pregnancy, we determined that only 48.9% of mothers with LBW babies had adequate practice, in contrast to 89.4% of mothers of NBW babies. Indeed, few mothers of LBW babies were in good health (69.8%) in comparison to mothers of NBW babies (88.7%).

Table 3 explains the contribution of different factors affecting the outcome of LBW babies. As expected, mothers below 18 years of age were eight times more prone to deliver LBW babies (95% CI=2.4–30.7). Mothers engaging in strenuous physical labor were also at high risk of giving birth to LBW babies at an OR of 5.0 (95% CI=3.1–8.1). Knowledge about the details of a healthy pregnancy is an important contributor to giving birth to a healthy baby. Our results showed that a lack of such knowledge played a significant role in delivering LBW babies (OR=10.1 95% CI=6.7–15.2). Similarly, mothers in poor health were at three times the risk of having LBW babies (95% CI=2.1–5.4). Family incomes of mothers were one of the most reliable indicators in our analyses, which was reflected by the fact that low-group mothers were as much as 13.9 times at higher risk of having LBW babies (95% CI=8.8–21.9). Overall, we discovered significant ($p<0.01$) contributions of several studied factors to the development of LBW babies.

Table 1 Socio-demographic characteristics of low birth weight (LBW) mothers and normal birth weight (NBW) mothers

Factors	LBW mothers (n=235)		NBW mothers (n=265)	
	n	%	n	%
Age group (in years)				
<18	18	7.7	3	1.1
18–35	199	84.7	259	97.7
>35	18	7.7	3	1.1
Weight group (kg)				
<45	20	8.5	0	0
45–70	184	78.3	264	99.6
>70	31	13.2	1	0.4
Height (cm)				
Up to 150	16	6.8	12	4.5
>150	219	93.2	253	95.5
Ethnic group				
Laolum	225	95.7	253	95.5
Other	10	4.3	12	4.5
Religion				
Buddhism	218	92.8	227	85.7
Other	17	7.2	38	14.3
Level of education				
High school and university	45	19.1	39	14.7
Secondary school	67	28.5	145	54.7
Primary school	123	52.3	81	30.6
Occupation of mother				
Manual labor	209	88.9	163	61.5
Employee (public/private)	26	11.1	102	38.5
Monthly Income (in Kips*)				
<1 million	162	68.9	40	15.1
1–2 million	45	19.1	214	80.8
>2 million	28	11.9	11	4.2

*1 USD = 8,700 kips

DISCUSSION

This study documented that women at the reproductive ages of 18 years or less and 35 years and over were more prone to deliver LBW babies. Mothers less than 18-years-old are prone to have physical and emotional maturity issues which may contribute to their elevated incidence of LBW infants. Their ignorance of how to take care of themselves during pregnancy works against a healthy outcome. Accordingly, among mothers who are 35 years or older, there is a greater tendency to develop prenatal complications and a higher probability of inadequate nutrition, thus increasing their likelihood of delivering LBW babies.

The results of this study were in agreement with those of many similar studies.[8-11] Belonging to certain occupational groups during pregnancy could affect the risk of LBW and preterm birth. The risk of delivering LBW babies was 5.0 times higher in women with hard physical jobs,

Table 2 Differences of perception between mothers of low birth weight (LBW) infants and normal birth weight (NBW) infants

Factors	LBW mothers (n=235)		NWB mothers (n=265)	
	n	%	n	%
Birth order of the child				
First child	143	60.9	117	44.2
Second child	92	39.1	148	55.8
Family history of LBW babies				
Yes	16	6.8	8	3.0
No	219	93.2	257	97.0
Knowledge of mother				
Inadequate (<75%)	171	72.8	56	9.2
Adequate (≥75%)	64	27.2	209	90.8
Health status of mother				
Poor health	71	30.2	30	11.3
Good health	164	69.8	235	88.7
Practice of nutrition				
Inadequate (<75%)	120	51.1	28	10.6
Adequate (≥75%)	115	48.9	237	89.4
Practice during pregnancy				
High (≥75%)	192	81.7	149	56.2
Low (<75%)	43	18.3	116	43.8
Influence of family				
Yes	152	64.7	96	36.2
No	83	35.3	169	63.8

i.e., rural homemakers and laborers, than for women who were housewives and public/private employees. Women who worked as agricultural laborers had a higher risk of preterm births and LBW babies which may be due to long hours of hard physical labor in the fields. In addition, based on the WHO 1984[9] report, hard physical work during pregnancy has been proven to retard fetal growth.

The results of this study, in relation to the health and nutritional knowledge of the mother, showed a significant association between those factors and the infant's birth weight ($p<0.001$). Mothers who demonstrated a good grasp of nutrition and health delivered LBW infants 10.1 less frequently than mothers who showed more limited knowledge. An understanding of appropriate nutrition and good eating habits during pregnancy is considered to be a significant element of prenatal nutritional education.[12] Nutritional factors were also related to LBW in the preterm delivery group. Women who delivered LBW infants were more likely to have had a history of fewer pregnancies, previous LBW infants, lower weight at time of delivery, and lower gestational weight gain.[13] In addition, a surfeit or insufficiency of nutrition during pregnancy could both lead to abnormal birth weight, and both low and high birth weights could cause abdominal obesity as well as insulin and leptin resistance in adulthood, although via different mechanisms.[14] Previous research has also shown that maternal energy deficiency, possibly exacerbated by very low-fat intakes (<15% of energy), is one key determinant in the etiology of low birth weight.[15]

While considering the health status of mothers, it was found that those in poor health had LBW infants 3.4 times more often than healthy mothers. Maternal health, then, plays a major

Table 3 Associations between low birth weight (LBW) and related factors

Factors	LBW		NBW[a]		OR[b]	95% CI[c]	p-value
	n (235)	% (100.0)	n (265)	% (100.0)			
Age of mother							
≥18 years old	217	92.3	262	98.9	1	Reference	
<18 years old	18	7.7	3	1.1	8.6	2.4–30.7	0.001
Weight of mother							
Less than 70 kg	204	86.8	264	99.6	1	Reference	
More than 70 kg	31	13.2	1	0.4	36.9	5.0–273.6	<0.001
Level of education							
High education	112	47.7	184	69.4	1	Reference	
Low education	123	52.3	81	30.6	2.5	1.5–4.2	<0.001
Occupation							
Sedentary worker	26	11.0	102	38.5	1	Reference	
Hard manual labor	209	89.0	163	61.5	5.0	3.1–8.1	<0.001
Monthly income							
High income	73	31.1	225	84.9	1	Reference	
Low income	162	68.9	40	15.1	13.9	8.8–21.9	<0.001
Birth order							
Second child	92	38.3	148	55.8	1	Reference	
First child	143	55.0	117	44.2	2.2	1.5–3.3	<0.001
Family history of LBW							
No	219	93.2	257	97.0	1	Reference	
Yes	16	6.8	8	3.0	2.4	1.0–5.6	0.054
Knowledge of mother							
Adequate	64	27.2	209	78.9	1	Reference	
Inadequate	171	72.8	56	21.1	10.1	6.7–15.2	<0.001
Health status of mother							
Normal Health	164	69.8	235	88.7	1	Reference	
Poor health	71	30.2	30	11.3	3.4	2.1–5.4	<0.001
Nutritional Practice							
Adequate	115	48.9	237	89.4	1	Reference	
Inadequate	120	51.1	28	10.6	8.9	5.6–14.3	<0.001
Influence of family							
No	83	35.3	169	63.8	1	Reference	
Yes	152	64.7	96	36.2	3.2	2.2–4.7	<0.001

[a]NBW: Normal birth weight; [b]OR: Odds ratio; OR was adjusted for education and family income in case of age of the mother and body weight; for other variables ORs were adjusted for mother's age at delivery only. [c]CI: Confidence interval.

role in the health of the baby. Among several contributing factors, family structures play a pivotal role in the well-being of a pregnant mother and her chances for a healthy pregnancy and a normal baby. In the traditional society of Lao PDR, women have little independence to decide their own future. For a pregnant mother to get medical support, she must wait for the decision of her husband or other family members before consulting a medical doctor for a check-up of her pregnancy status. The necessity of a nutritious diet and the extent of its availability is, except in some rare situations, again dependent on the wishes of the family. Taken together, family influence is the overriding factor on any woman's decision making, even in pregnancy-related issues.

One of the major health factors affecting the outcome of a pregnancy is the occurrence of proteinuria in combination with hypertension. This condition is one of the major causes of disease for both an expectant mother and her fetus, and one that significantly affects the incidence of prenatal morbidity and mortality.[16] While the prognosis of isolated hypertension is good, the combination of hypertension and proteinuria leading to pre-eclampsia is a primary cause of maternal death, being responsible for 20–25% of prenatal mortalities. The most dangerous complication of pre-eclampsia is eclampsia, which is characterized by general tonic-clonic convulsions.[17] The incidence of eclampsia decreases significantly with increasing gestational age.[18] In addition, pre-eclampsia is also associated with stillbirth, the risk of which in late pregnancy is related to the function of the placenta in early pregnancy.[19] A study by Badshah *et al*.[9] found histories of maternal health and pregnancy (previous abortion/miscarriage) to be significantly associated with the incidence of LBW. All of these factors could be strongly related to the serious consequences of ignorance about proper care, and inadequate nutrition during pregnancy.

The results of this study showed that the maternal factors significantly associated with LBW infants included the mother's age and occupation, her knowledge and health status, and the family's income. It may not be possible to address all these issues at once, but early and regular antenatal visits by prospective mothers and conducting awareness programs through the mass media focusing on proper care during pregnancy could alleviate many of these problems.

The results of the current study at four central hospitals in Vientiane provided valuable information on the significant risk factors associated with delivering a LBW infant based on an analysis of the most recently available individual data. The findings presented in this study will provide further scientific evidence that healthcare workers and public health professionals will be able to use for instituting intervention programs to decrease the incidence of LBW births in these hospitals as well as in the health services offered in Vientiane and other provinces. By identifying the significant risk factors associated with LBW, appropriate intervention programs and communication tools can be designed by policy makers targeting women at risk, and thus reducing the percentage of LBW infants born in Lao PDR.

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