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Maternal Risk Factors of Low Birth Weight at Maharat Nakhon Ratchasima Hospital

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ABSTRACT

Objective: To identify maternal risk factors associated with Low birth weight Infant (LBW)

Materials & methods: Cross-sectional, descriptive case-control study. Six hundred and thirty three mothers who delivered single alive baby between 1 May and 31 August 2010 at the Obstetrics-Gynecology Unit, Maharat Nakhon Ratchasima Hospital were enrolled. The studied group was divided into 268 mothers who delivered newborn with birth weight equal to or less than 2,500 grams. The controlled group comprised of 268 mothers who delivered normal birth weight newborn. The univariate analysis was done. The factors which had statistic significant were included into multiple logistic regression model in order to evaluate the significance factors related with LBW ($p < 0.05$).

Results : The significant factors that associated with LBW were family's monthly income ≤10,000 Bath ($p<0.05$, 95 % CI 2.86-7.81), hard work intensity ($p<0.05$, 95 % CI 1.02-3.85), sleep 6-8 hours/day ($p<0.05$, 95 % CI 2.82-6.93), coitus in the last 3 months ($p<0.05$, 95 % CI 1.42-3.50) and delivery interval <2 years ($p<0.05$, 95 % CI 1.42-3.56). The protective factor is total weight gain more than 11 kilograms.

Conclusion : The mother who have history of low family's monthly income, hard work intensity, sleep 6-8 hours/day, had coitus in the last 3 months and short delivery interval ≤2 years had the significant risk factors for LBW. The preventive factors was the appropriate total weight gain.

Keywords: low birth weight, maternal risk factors

Introduction

Low birth weight (LBW) refers to the infants with birth weight less than 2,500 grams(g) which may result from preterm birth with either appropriate for gestational age or small for gestational age, intrauterine growth restriction (IUGR) or term birth with intrauterine growth restriction. Low birth weight infant are associated with high mortality rate (4 times), and morbidity rate (5 times) compare with normal birth weight infant (NBW). Low birth weight infants account for greater than 70 % of all

neonatal deaths[1]. The most common cause of LBW in the developing country is IUGR where as prematurity is the most common cause in the developed country[2]. The long term morbidities include birth asphyxia, respiratory distress syndrome, meconium aspiration syndrome, intraventricular hemorrhage, neonatal sepsis, infantile infections (ie, pneumonia and diarrhea), increasing risks of postnatal mental retardation, physical disabilities, poor neurological development of childhood, inhibited growth, poor cognitive development and adult chronic diseases such as hypertension, coronary heart disease, stroke and non-insulin dependent diabetes[3,4].

At present, 16 % of all births or the total of 19 millions of births worldwide are LBW. The incidence is higher in the developing countries[2]. In Thailand, the LBW incidence reported by Ministry of Public Health of Thailand (MOPH) in 2006 was 8.86%, 8.5%, and 8.7% in year 2003-2005, respectively.[5] 10th National Economic and Social Development Plan (2007-2011) was aimed to reduce the LBW incidence to lower than 7% of all births. Maharat Nakhon Ratchasima Hospital is the tertiary center with full facility care and services with more than 500 inpatients. The incidence of LBW in our hospital was still high and keep on increasing 2007, 2008 from 11.80%, 12.65%, 12.34% to 13.38% during 2006 and 2009, respectively. Our hospital could not also reach the national's goal of below 7% (Fig. 1). Nowadays, LBW is still one of the major problems of public health in Thailand which is costly. The objective of our study was to identify the maternal risk factors of LBW in our hospital and also investigate the obstacle of reaching the goal of MOPH[5]. Our results would help us to understand the problems in order to find the solution for this problem.

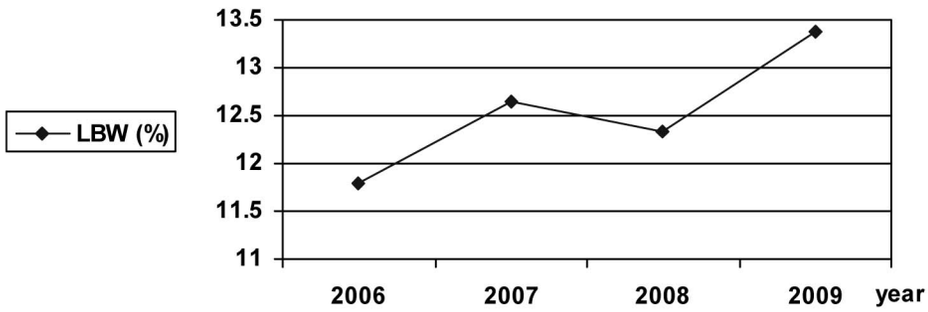

Fig. 1. LBW incidence in Maharat Nakornratchasima Hospital, Thailand (2006-2009)

Materials and methods

This study was approved by the Ethics Committee of Maharat Nakhon Ratchasima Hospital and was conducted during 1 May to 31 August 2010. The mothers who delivered singleton live birth in our department and met the inclusion criteria were enrolled unless they did not want to participate. The data were collected, and validated by reviewing medical records and interviewing mothers at the delivery room. Six-hundred and thirty six mothers were included, two-hundred and sixty eight mothers had LBW infant while the other two-hundred and sixty eight mothers were control. Control groupwere randomly selected from parturients who delivered their babies with birth weight above 2,500 g on the same day as LBW mothers. The weight of infants was record within first hour after birth by the same digital balance and technique.

Data were presented as means and standard deviations (SD), mode or median (range) and frequency. The results were analyzed by univariate analysis followed by multiple logistic regression analysis including all of the significant factors from univariate analysis. The correlation of maternal factors and LBW were shown in Odds ratio (OR) and 95 confidence interval (95% CI). A p-value < 0.05 was considered statistical significance. All analyses were performed using STATA version 11.0.

Results

Maternal baseline characteristics of NBW and LBW are shown in Table 1. In NBW group, two hundred sixty eight infants, means (±SD) of their weights were 3,174 (±390) g and their gestational age were 38.4+1.4 weeks. And in LBW groups, the other two hundred sixty eight infants, means (±SD) of their weights were 2,102 (±401) g and their gestational age were 34.8±3.2 weeks

Univariate analysis demonstrated thatthe significant factors were single marriage status, low educational level, no career, low family's income, hard work intensity, not enough sleep hour day, coitus in last 3 months, smoking and underweight pre-pregnant body mass index (Table 2). The significant factor correlations between maternal obstetric and medical factors and LBW were gestational age <37 weeks, maternal underlying diseases such as chronic hypertension, overt DM, valvular heart diseases, hyperthyroidism, asthma etc. , inappropriate delivery interval, prior LBW delivery, gestational age at first antenatal care (ANC), numbers of ANC, improper total weight gain (TWG) and anti-HIV status (Table 3).

Multivariate analysis (Table 4) demonstrated that the significant factors were family's monthly income ≤ 5,000 Baths (p<0.05, Odds Ratio 4.74, 95%CI 2.54-8.84), family's monthly income 5,001-10,000 Baths (p<0.05, Odds Ratio 4.73, 95%CI 2.86-7.81), hard work intensity (p<0.05, Odds Ratio 1.98, 95%CI 1.02-3.85), sleep 6-8 hours/day (p<0.05, Odds Ratio 4.43, 95%CI 2.82-6.93) and coitus in last 3 months (p<0.05, Odds Ratio 2.23, 95%CI 1.42-3.50). The risk factors in obstetric and medical factors category were delivery interval < 2 years (p<0.05, Odds Ratio 2.25, 95%CI 1.42-3.56) and number of ANC ≤ 3 (p<0.05, Odds Ratio 4.71, 95%CI 2.54-8.84). The protective factors were smoker in home (p<0.05, Odds Ratio 0.3, 95%CI 0.19-0.48), number of ANC ≤ 3(p<0.05, Odds Ratio 0.32, 95%CI 0.15-0.69), TWG > 11 kg during pregnancy (p<0.05, Odds Ratio 0.35, 95%CI 0.22-0.58).

Table 1. Maternal baseline characteristics

Characteristics	NBW group (n=268)	LBW group (n=268)
Maternal age (years)	27.9 ±6.6	26.7 ± 7.6
Pre-pregnant BMI (kg/m^2)	22.5±4.6	21.2±4.1
Nulliparous*	136 (50.74%)	160(59.7%)
Numbers of ANC (times)	9.34±2.8	7.4±3.2
GA at delivery (weeks)	38.4±1.4	34.8±3.2
Maternal underlying disease*	20 (7.46%)	17 (6.34%)
Chronic hypertension	4	1
Overt Diabetes Millitus (DM)	3	1
Valvular heart disease	5	2
Hyperthyroidism	4	4
Asthma	1	5
Others eg. SLE, renal insufficiency	3	2

*Data define as mean±SD, number and frequency (%)

NBW = Normal Birth Weight, LBW = Low Birth Weight

Table 2. The univariated analysis of maternal bio-socio-economic factors between NBW group and LBW group.

Factors	NBW N(%)	LBW N(%)	p-value
Age group			
≤ 19 years	31 (11.56)	50 (18.7)	
> 19- < 35 years	191 (71.3)	171 (63.8)	0.06
≥ 35 years	46 (17.2)	47 (17.5)	
Marriage status			
Divorce	2 (0.8)	2 (0.8)	
Married	263 (98.1)	249 (90.3)	0.01*
Single	3 (1.1)	17 (6.3)	
Education			
Less than elementary	1 (0.4)	2 (0.8)	
Elementary	52 (19.4)	64 (23.9)	
High school	80 (29.9)	95 (35.5)	0.02*
Senior high school	84 (31.3)	82 (30.6)	
Bachelor's degree	51 (19)	25 (9.3)	
Career			
No career	109 (40.7)	121 (45.2)	
Trader	23 (8.6)	23 (8.6)	
Work for company or factory	61 (22.7)	80 (29.9)	<0.01*
Agriculturist	51 (19)	26 (6.5)	
Work in government service	55 (20.5)	18 (6.5)	
Family's monthly income (Baht)			
≤ 5000	37 (13.8)	62 (23.1)	
5001-10000	74 (27.6)	138 (51.5)	
10001-15000	57 (21.3)	28 (10.5)	<0.01*
15001-20000	30 (12.2)	20 (7.5)	
>20000	70 (26.1)	20 (7.5)	
Work intensity			
Mild (< 4hours/day)	193 (72)	148 (55.2)	
Moderate (4-8 hours/day)	49 (18.3)	72 (26.8)	<0.01*
Hard (>8 hours/day)	26 (9.7)	48 (17.9)	
Sleep hour/day			
< 6	8 (3)	9 (3.4)	
6-8	80 (29.9)	171 (63.8)	<0.01*
>8	180 (67.2)	88 (32.8)	
Coitus within 3 months (before delivery)			
No	196 (73.1)	133 (49.6)	<0.01*
Yes	72 (26.9)	135 (50.4)	

Table 2 . The univariated analysis of maternal bio-socio-economic factors between NBW group and LBW group.(cont.)

Factors	NBW N(%)	LBW N(%)	p-value
Smoking			
Non-smoker	118 (44)	156 (58.2)	<0.01*
Smoker in home	150 (56)	107 (39.9)	
Smoker	0 (0)	5 (1.9)	
Alcohol drinking			
No	266 (99.3)	261 (97.4)	0.09
Yes	2 (0.7)	7 (2.6)	
Pre-pregnant BMI (kg/m^2)			
<18.5	46 (17.2)	67 (25)	
18.5-24.9	159 (59.2)	16 (60.5)	0.02*
25-29.9	41 (15.3)	27 (10)	
≥30	22 (8.2)	12 (4.5)	

Table 3. The univariated analysis of Maternal obstetric and medical factors between NBW group and LBW group

Factors	NBW N (%)	LBW N (%)	p-value
Parity			
≤ 1	236 (88.1)	30 (11.2)	0.60
> 1	32 (11.9)	238 (88.8)	
Gestational age (weeks)			
< 37	56 (20.9)	208 (77.6)	<0.01*
≥ 37	212 (79.1)	609 (22.4)	
Maternal underlying disease			
Yes	17 (6.3)	30 (11.2)	0.04*
No	251 (93.7)	238 (88.8)	
Delivery interval			
< 2 years	140 (52.2)	167 (62.3)	<0.01*
2-10 years	103 (38.4)	67 (25)	
>10 years	25 (9.3)	34 (12.7)	
Prior LBW delivery			
No	256 (95.5)	237 (88.4)	0.01*
Yes	12 (4.5)	31 (11.6)	
History of abortion			
No	218 (81.3)	221 (82.5)	0.74
Yes	50 (18.7)	47 (17.5)	

Table 3. The univariate analysis of Maternal obstetrics and medical factors between NBW group and LBW group.(cont.)

Factors	NBW N (%)	LBW N (%)	p-value
GA at first ANC			
< 12 weeks	115 (42.9)	93 (34.7)	0.04*
12-14 weeks	61 (22.8)	55 (20.5)	
> 14 weeks	92 (34.3)	120 (44.8)	
Numbers of ANC			
≤ 3	6 (2.2)	93 (34.7)	<0.01*
4-6	31 (11.6)	55 (20.5)	
> 6	231 (86.2)	120 (44.8)	
Total weight gain (Kg)			
< 9	45 (16.8)	109 (40.1)	<0.01*
9-11	39 (14.6)	50 (18.7)	
> 11-16	103 (38.4)	78 (29.1)	
> 16-18	28 (10.5)	12 (4.5)	
> 18	53 (19.8)	19 (7.1)	
Hematocrit (%)			
<25	2 (0.8)	6 (2.2)	0.08
25-33	61 (22.8)	68 (25.4)	
34-42	197 (73.5)	177 (66)	
>42	8 (3)	17 (6.3)	
Anti HIV			
negative	268 (100)	264 (98.5)	0.04*
positive	0 (0)	4 (1.5)	
Prior obstetric complication			
No	237 (88.4)	245 (91.4)	0.25
Yes	31 (11.6)	23 (8.6)	

Table 4. Demonstrate the significant factors (p < 0.05) associated with LBW after analyze with multiple logistic regression.

Factors	OR (95%CI)	p-value
Bio-socio-economic factors :		
Family's monthly income (Bath)		
≤ 5000	4.74 (2.54-8.84)	<0.01*
5001-10000	4.73 (2.86-7.81)	<0.01*
Hard work intensity		
(> 8 hours/day)	1.98 (1.02-3.85)	0.04
Sleep hour/day (6-8)	4.43 (2.82-6.93)	<0.01*
Coitus in last 3 months	2.23 (1.42-3.50)	<0.01*
Smoker in home	0.30 (0.19-0.48)	<0.01*
Obstetrics and medical factors :		
Delivery interval < 2 years	2.25 (1.42-3.56)	<0.01*
Number of ANC ≤ 3 times	0.32 (0.15-0.69)	<0.01*
Total weight gain (Kg)		
>11-16	0.35 (0.22-0.58)	<0.01*
>16-18	0.29 (0.20-0.70)	0.01
>18	0.14 (0.06-0.30)	<0.01*

Discussion

After analysis with multiple logistic regression models, the rest of statistically significant maternal factors related to LBW are low maternal socioeconomic status, go along with many studies[6-11], low family's monthly income (<10,000 Baht), inadequate sleep hour day (≤8 hours) and hard work intensity during pregnancy (more than 8 hours per day). Improper delivery interval was also one of the LBW risk[8,12]. Our study show that the interval between pregnancies should be more than 2 years. Coitus during pregnancy especially in third trimester is still controversy issue [13,14], but we found that this factor increase risk of LBW.

The good total weight gain (TWG) of >11 kilograms was the protective factorfor LBW similar to previous report[15]. This relationship is directly the results of maternal adequate amount and diversity of substance provide the nutrients to fetal growth especially in third trimester[6].

Smoking, even for passive smoking, can effect fetal growth. Nicotine directly constricts blood vessels including uterine vessels. Carbon monoxide can cross placenta and tightly bind with fetal-Hb, decreasing the efficiency of oxygen delivering to the cells. The combination of fetal tissue hypoxemia and the obstruction of nutritional elements make the fetuses unable to achieve their full genetic growth[16]. Although we found the passive smoker was the protective factor for LBW, it contradicted withother reports[8,9,15,17]. We prefer to avoid smoking and smoker in the family of pregnant women.

Another protective factor was a lower numbers of ANC. This may be resulted from the responsibility to take care of high risk pregnant women which is inconsistence with other literatures[8,15]. This may suggest that we had enough staff to detect the high risk patients and saw them more often than low risk women.

In conclusion, we found the factors associated with high risk of LBW in our population settings are the mothers with low socioeconomic status: low family's monthly income, inadequate sleeping, hard work during pregnancy, and inadequate total weight gain.

Our preventive management policy is to identify these women from ANC, close follow up, educate and to avoid risks of LBW, such as avoiding hard work likewise standing or walking jobs, work hour should be less than 8 hour/day, adequate sleep > 8 hours/day, suitable meals to meet the proper weight gain, abstinence in third trimester period and delivery interval time > 2 years. These women with risk factors must be close monitoring by frequent ANC visits and close monitoring of fetal conditions throughout antepartum, intrapartum and postpartum periods.

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ปัจจัยเสี่ยงของมารดาต่อการเกิดทารกแรกเกิดน้ำหนักน้อยที่โรงพยาบาลมหาราชนครราชสีมา

อรวิน ตรีเพ็ชร, ศักดา อาจองค์, อรพรรณ อัศวกุล

วัตถุประสงค์หลัก *: เพื่อศึกษาปัจจัยเสี่ยงด้านมารดาที่มีผลต่อการเกิดทารกแรกเกิดน้ำหนักน้อย*

วัสดุและวิธีการ *: ศึกษาเปรียบเทียบปัจจัยเสี่ยงของมารดาด้านในสตรีตั้งครรภ์ที่มาคลอดบุตรที่โรงพยาบาลมหาราชนครราชสีมา ระหว่างวันที่ 1 พฤษภาคม 2553 ถึง 31 สิงหาคม 2553 ทั้งหมดจำนวน 636 ราย แบ่งเป็นกลุ่มศึกษา (มารดาที่คลอดทารกแรกเกิดน้ำหนัก ≤ 2,500 กรัม) จำนวน 268 รายและกลุ่มควบคุม (มารดาที่คลอดทารกแรกเกิดน้ำหนักปกติ) จำนวน 268 ราย*

ผลการศึกษา *: จากการวิเคราะห์ด้วย UNIVARIATE ANALYSIS และ MULTIPLE LOGISTIC REGRESSION MODEL พบว่าปัจจัยที่มีนัยสำคัญทางสถิติต่อการเกิดทารกแรกเกิดน้ำหนักน้อย ได้แก่ รายได้ครอบครัว < 10,000 บาทต่อเดือน, ทำงานหนัก > 8 ชั่วโมงต่อวัน, ชั่วโมงการนอน 6-8 ชั่วโมง/วัน, มีเพศสัมพันธ์ในช่วง 3 เดือนก่อนคลอด และระยะห่างของการตั้งครรภ์ < 2 ปี และปัจจัยที่ลดการเกิดทารกแรกเกิดน้ำหนักน้อย ได้แก่ มีคนสูบบุหรี่ในบ้าน, ฝากครรภ์ < 3 ครั้ง และน้ำหนักที่เพิ่มขึ้นระหว่างตั้งครรภ์ > 11 กิโลกรัม*

สรุป *: มารดาที่มีรายได้ของครอบครัวน้อย, ทำงานหนัก, นอนหลับไม่เพียงพอ, มีเพศสัมพันธ์ในช่วง 3 เดือนก่อนคลอด และระยะห่างของการตั้งครรภ์ < 2 ปีมีปัจจัยเสี่ยงที่จะคลอดทารกแรกเกิดน้ำหนักน้อย โดยปัจจัยที่สามารถลดการเกิดทารกแรกเกิดน้ำหนักน้อย คือ น้ำหนักที่เพิ่มขึ้นระหว่างตั้งครรภ์ > 11 กิโลกรัม*