The Effect of Mother's Hypertension and Weight and Parent's Smoking Habit on Low Birth Weight Deliveries in Hospital, Kuala Lumpur, Malaysia

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Abstract

Objective: Maternal factors such as age, health, diet, and environment are significantly associated with low birth weight. The objectives of this study were to determine the incidence, distribution and major risk factors of low birth weight in Hospital Kuala Lumpur.

Materials and methods: A hospital based case–control study was done in Obstetric Ward of Maternity Hospital in Hospital Kuala Lumpur. Data was obtained using questionnaire and Performa. Out of 1021 deliveries, 330 were selected randomly as respondents that comprises of 110 cases and 220 controls. The outcome measure was low birth weight (<2500 grams).

Results: The incidence of low birth weight was 10.8%. Among races, the highest occurrence of low birth weight was in Malay, while the highest age group was between 21 years old to 34 years old with majority of the respondent were married. Among the maternal socio-demographic factors, maternal height of less than 150 cm has a significant relationship with low birth weight. In addition, maternal weight of 45 kg and less and maternal weight gain during pregnancy of less than 10 kg were also found to be risk factors. However, none of the socio-demographic factors were significantly associated with low birth weight deliveries. Similarly, signs of premature delivery, maternal vaginal bleeding and fetal growth retardation (IUGR) had a significant association.

Conclusion: The mothers that have experienced any of the risks that were identified should be monitored and effective prevention should be taken to decrease the chances of low birth weight but not forgetting to promote a health lifestyle to the mother and father as well.

Keywords: low birth weight, lifestyles, Malaysia, demographic factors

Introduction

Low birth weight (LBW) has been defined by the World Health Organization (WHO) as weight at birth of less than 2500 grams (5.5 pounds) (1). Infants weighing less than 2500 g are approximately 20 times more likely to die than heavier babies which contribute to a range of poor health outcomes where it is more common in developing than developed countries. Maternal factors such as age, health, diet, and environment are significantly associated with low birth weight (2). Not to miss the common risk factors for low birth weight which are prematurely, intrauterine growth retarda-

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tion, genetics, poor socio–economic status and poor antenatal care (3,4,5). Fetal factors are also associated with low weight births such as gender, and congenital abnormalities (6,7).

However, the risk factors for low birth weight decribed do not occur as isolated events; rather, they are part of a complex web of social, environmental, and individual factors (8). To understand the importance of these individual risk factors, we try to fit them into a framework that represents a realistic picture of what is occurring in women's life. There are many potential interactions between factors which would result in a compounding of adverse effects such as alcohol abuse and heavy cigarette smoking as well as the role of protective factors (9). Not excluding the role of paternal factors that can directly affect the maternal factor.

Although interventions exist to prevent many of these factors before and during pregnancy, the incidence of LBW has not decreased (10,11). Therefore, the purpose of this case–control hospital-based study is to identify epidemiological correlates of low birth weight to enable planning of intervention studies and execution of population–based follow–up.

Materials and Methods

Three hundred and thirty respondents, consisting of mothers who delivered in Obstetric Ward of Maternity Hospital in Hospital Kuala Lumpur (HKL) were selected for this case control study from 5 April to 4 May 2008. The sampling method used was simple random sampling. This is a prospective study using pre–tested questionnaire and Performa.

The maternity log book was used to find cases who were mothers who gave birth to low birth weight babies during the study period. Two controls comprised mothers who delivered normal birth weight babies were taken subsequently after each case. The mothers were then asked questions using the pre–tested questionnaire and the performa was filled in simultaneously.

Before the data collection started, a conceptual framework was designed to identify the risk factors that will contribute to the research project. After all the risk factors had been identified, case register, pre–tested structured questionnaires and performa were used as research instruments to obtain the information.

Case register, questionnaires and performa which were designed in both language, Malay and English were used as the research instruments for this study. The questionnaires consisted of five parts covering personal profiles, maternal medical history, problems in current pregnancy, present and past obstetric history and current pregnancy and labor profiles.

Data Analysis

All statistical analyses were performed with using the SPSS 10.0 (Statistical Package for Social Science). Descriptive statistics including means and SDs for the outcome variables of interest were computed. The probability levels of significance reported are based on the 2–tailed *t*–test. Correlations test were used to determine the association between low birth weight and the different variables.

Results

A total of 330 respondents were selected during data collection from 5th April to 4th May 2008. From them 220 women were controls and 110 were cases. Control respondents were mothers who delivered a normal birth weight baby in Hospital Kuala Lumpur while for cases were mothers who delivered a low birth weight baby of less than 2,500 grams.

The incidence of low birth weight was 10.8%. Among races, the highest occurrence of low birth weight was in Malay, while the highest age group was between 21 years old to 34 years old and majority of the respondent were married.

Table 1, shows that mothers that had height of 150 centimeters and below had increased chance of getting low birth weight baby by 2.52 times (P<0.05, 95% CI: 1.46–4.34). In addition, maternal weight of 45 kg and less (OR: 1.89; 95% CI: 1.09–3.27) and maternal weight gain during pregnancy of less than 10 kg (OR: 10.37; 95% CI: 5,734–18,754) were also found to be risk factors. It also shows that maternal weight and weight gain were positively associated with fetal weight. The higher maternal weight and weight gain during pregnancy will increase in fetal weight and according to table 1 below mothers that gained weight 10 kg or less were 10.37 times more likely to have a low birth weight baby. However, the other socio–demographic factors were not significantly associated with low birth weight deliveries.

20 of the cases and 46 of the controls had anemia during their pregnancy (Table 2). In the case group, 23 had hypertension during their pregnancy and 26 in the control group had hypertension as well. In fact, mothers that experienced hypertension during their pregnancy had increased risk of delivering a low birth weight baby (O.R: 1.973; 95% CI: 1.066–3.650).

Table 3 shows the distribution of problems during current pregnancy among mothers who delivered low

Table 1. Distribution of cases and control according to socio-demographic factors

	Case n (%)	Control n (%)	*P*–Value
Age group			
20 years and below	7 (33.3)	14 (66.7)	1.000
21 years to 35 years	87 (32.6)	180 (67.4)	0.552
35 years to 39 years	12 (37.5)	20 (62.5)	0.598
40 years and above	4 (40.0)	6 (60.0)	0.736
Religion			
Islam	78 (30.0)	182 (70.0)	0.010*
Buddha	7 (41.2)	10 (58.8)	0.481
Hindu	15 (48.4)	16 (51.6)	0.062
Christian	8 (47.1)	9 (52.9)	0.217
Others	2 (40.0)	3 (60.0)	0.540
Height			
150 cm and below	41 (49.4)	42 (50.6)	0.000*
151 cm to 160cm	61 (31.0)	136 (69.0)	0.266
More than 160 cm	8 (16.0)	42 (84.0)	0.000*
Weight			
45 kg or less	36 (44.4)	45 (55.6)	0.014*
46 kg to 50 kg	24 (30.8)	54 (69.2)	0.582
51 kg to 55 kg	15 (36.6)	26 (63)	0.637
56 kg to 60 kg	14 (28.6)	35 (71.4)	0.385
61 kg and above	21 (25.9)	60 (74.1)	0.103
Weight gain			
10 kg or less	56 (73.7)	20 (26.3)	0.000*
10.1 kg or more	54 (21.3)	200 (78.7)	0.000*
Occupation			
Housewife / non–working	67 (36.6)	116 (63.4)	0.158
Non–skilled	11 (26.2)	31 (73.8)	0.293
Skilled	28 (30.8)	63 (69.2)	0.542
Professional	4 (28.6)	10 (71.4)	0.781
Household income			
RM529 and below	6 (40.0)	9 (60.0)	0.575
RM530 to RM1000	27 (37.5)	45 (62.5)	0.396
RM1001 to RM2049	46 (35.4)	84 (64.6)	0.523
RM2050 to RM3010	17 (27.9)	44 (72.1)	0.315
RM3011 and above	14 (26.9)	38 (73.1)	0.285

* Significant at *p*–value <0.05

birth weight baby during this period of study and its significance value. 80.9% of the mothers who had delivered low birth weight baby had experienced signs of premature delivery and it shows a significant association with the odds ratio 12.373 (95% CI: 5.705-26.838). Totally 62.2% of the mothers who had delivered low birth weight baby had experienced vaginal bleeding (OR: 3.89; CI: 1.912–7.913). However, the most common problem that arise during the pregnancy faced by mothers who give birth to low birth weight babies is fetal growth retardation (FGR) which was about 90% (OR: 19.515; C.I: 2.439–156.111) among cases.

Frequency for non–standard antenatal care is higher than standard antenatal care in both cases and controls. Mothers who had non-standard antenatal care had increased risk of delivering low birth weight babies (OR: 2.71, 95% CI: 1.56–4.74). This is also true for mothers with previous history of low birth weight baby (OR: 2.33, 95% CI: 1.10–4.90) (Table 4).

The study found that Preterm deliveries (OR 16.01, 95% CI: 8.25–31.4) and utilization of non–standard antenatal care (OR: 2.71, 95% CI: 1.56–4.74) were shown to be major risks factors. Babies who were delivered by mothers who failed to receive standard ante-

Table 2. Distribution of maternal medical history and its risk

Medical history	Cases	Control	*P*–Value
Anemia	20 (30.3)	46 (69.7)	0.559
Gestational diabetes	6 (22.2)	21 (77.8)	0.201
Hypertension in pregnancy	23 (46.9)	26 (53.1)	0.029*
Congenital heart disease	2 (66.7)	1 (33.3)	0.259
Kidney disorder	3 (75)	1 (25)	0.110
Endometriosis	15 (42.9)	20 (57.1)	0.206

* Significant at *p*–value <0.05

natal care and those who were delivered by cesarean section had twice the chance to be low birth weight babies (OR: 2.04, 95% CI: 1.17–3.56).

Previous maternal low birth weight baby is one of the risk factors found in our study. 16 cases and 14 controls found to have history of previous maternal low birth weight baby. In terms of inter–pregnancy interval, normal inter–pregnancy interval was found higher both in cases and control. We observed that female newborns had higher frequency in both cases and control.

We found that the increase in value of APGAR score 1 minute, APGAR score 5 minutes, APGAR score 10 minutes, number of maternal antenatal check–up or maternal parity were associated with an increase in fetal weight.

For paternal lifestyle factors, 64 of the respondents' husbands were smokers with low birth weight babies and 146 of the husbands who smoked had normal birth weight babies. The study showed 20 fathers who drank alcohol beverages had low birth weight babies and 15 fathers that drank were from the control group. Results also show that fathers that drink alcoholic beverages have almost a 3.037 times (95% CI: 1.487–6.201) risk more likely to get a low birth weight baby.

Discussion

The objective in this study was to determine the major risk factors associated with low birth weight deliveries in Hospital Kuala Lumpur. A total of 330 mothers gave consent to participated in this study with 110 of them were mothers delivering low birth weight babies and 220 of them were mothers delivering normal birth weight babies.

Form our findings, it shows that mothers with height of 150 cm and below had increased chances of getting a low birth weight baby by 2.52 times ($p< 0.05$, 95% CI: 1.46–4.34). Where as maternal weight of 45 kg and less (OR: 1.89; 95% CI: 1.09–3.27) and weight gain during pregnancy of less than 10 kg (OR: 10.37; 95% CI: 5,734–18,754) also found to be risk factors. Epidemiological evidence has showed the association between maternal weight gain during pregnancy and birth weight as a nearly linear association thus decreasing rate of low birth weight. It is said by Virginia *et al* (5). that the weight gain reflects the growth of the fetus itself. Total weight gain of 10 kilograms or less during pregnancy was two to three times more likely to have growth-retarded full-term babies than were women with a gain of more than 10 kg.

Hypertension in pregnancy was also found to be a risk factor for delivering low birth weight baby (OR: 1.973; 95% CI: 1.066–3.650). This coincides with a study done by Steer et al (12) on blood pressures saying that high blood pressure causes poor placental perfusion. Brian *et al* (13) also showed that higher maternal blood pressure was associated with lower birth weight in offspring.

In this study, it also showed that women with signs of premature delivery during their current pregnancy

Table 3. Distribution of Problems During Current Pregnancy and Its Significance

Factors	Case Yes n (%)	Control Yes n (%)	*P*–Value
Signs of preterm delivery	38 (80.9)	9 (19.1)	0.000*
Vaginal bleeding	23 (62.2)	14 (37.8)	0.000*
FGR	9 (90.0)	1 (10.0)	0.000*

FGR: fetal growth retardation. * Significant at *p*–value <0.05

Table 4. Distribution for past obstetric history among case and control and it significance

Factors	Case n (%)	Control n (%)	*P*–Value
Maternal Visit			
None	1 (100)	0 (0)	0.157
Hospital Clinic	14 (41.2)	20 (58.5)	0.306
Health Department Clinic	30 (27.5)	79 (72.5)	0.116
Private Doctor's Clinic	19 (35.8)	34 (64.2)	0.672
Community Health Clinic	45 (35.2)	83 (64.8)	0.576
Others	1 (20)	4 (80)	0.157
Maternal Antenatal Booking			
Late Booking	53 (33.3)	106 (66.7)	0.907
Early Booking	55 (34.0)	107 (66.0)	0.907
Types of Maternal Antenatal Care			
Non–standard Care	82 (41.4)	116 (58.6)	0.000*
Standard Care	25 (20.7)	96 (79.3)	0.000*
Previous maternal premature delivery	10 (50.0)	10 (50.0)	0.103
Previous maternal fetal distress syndrome baby	1 (50.0)	1 (50.0)	0.616
Previous maternal caesarean section	13 (43.3)	17 (56.7)	0.223
Previous maternal low birth weight baby	16 (51.6)	14 (48.4)	0.023*
Experience of surgery in past pregnancy	12 (27.3)	32 (72.7)	0.360
Maternal Blood Group			
O	42 (31.1)	93 (68.9)	0.871
A	24 (31.6)	52 (68.4)	0.997
B	20 (27.4)	53 (72.6)	0.377
AB	11 (47.8)	12 (52.2)	0.082
Maternal Blood Rhesus			
Negative	0 (0.0)	6 (100.0)	0.097
Positive	95 (31.7)	205 (68.3)	0.097
Maternal VDRL Result			
Negative	98 (31.5)	213 (68.5)	0.498
Positive	0 (0.0)	1 (100.0)	0.498

* Significant at *p*–value <0.05**,** Venereal Disease Research Laboratory test (VDRL)

had significant relationship with low birth weight. This may be due to the fact that low birth weight increase in proportion with premature delivery as stated in previous studies (5). It shows that mothers with signs of premature delivery almost have 12 times more likely the chance to deliver a low birth weight baby (95% CI: 5.705–26.838)

Furthermore, mothers experiencing vaginal bleeding have a 3.89 chance of also delivering a low birth weight baby. This maybe connected to be one of the signs of premature delivery. Since there has been no other studies relating vaginal bleeding and low birth weight, this study demonstrated for the first time that vaginal bleeding in pregnancy is associated with low birth weight.

In this present study, babies with fetal growth retardation (FGR) while in utero also showed to be significantly associated with low birth weight. This is also supported by other journals saying that low birth weight may be due to retarded growth in uterus (3,4).

This study also supports the finding of a previous study saying that a mother who had delivered a previous low birth weight baby had a higher chance of having a subsequently low birth weight child (5).

In this study, it was found that mothers who previously delivered a low birth weight baby have a 2.33 chance (95% CI: 1.10–4.90) of delivering another low birth weight child.

The increase in number of maternal antenatal check –up or maternal parity causes increase in fetal weight. In maternal parity, there is support from studies done by Hindmarsh *et a*l (14), where they found that both

birth weight and placental weight were influenced by parity, with highest birth weight increase with parity. The increase in newborn's weight was found to be associated with the increase in the value of APGAR score 1 minute, APGAR score 5 minutes, APGAR score 10 minutes,

For standard antenatal check-up, it was as a protective factor to low birth weight baby. Support can be obtained by study done by Hall *et al* (11) where standard prenatal care visits could help in reducing low birth weight births.

Result in our studies also shows that non–standard antenatal care is a risk factor to low birth weight baby. Preterm labour was also a risk factor to low birth weight (OR: 16.01, 95% CI: 8.25–31.4).

Spontaneous vaginal delivery was the highest mode of delivery followed by caesarean section. According to the study, using cesarean section (OR: 2.04) also apposed as a major risks factor. Comparing to study done by Sermer *et al* in the period from 1978–79 to 1994 in Brazil, they found that the high rate of caesarean sections increase in preterm births and decrease in birth weight (15). In contrast, by using the same statistical analysis, it proved that mode of delivery by using spontaneous vaginal delivery apposed as a protective factor (OR: 0.551; CI: 0.331–0.916) and it was significant.

Conclusion

In conclusion finding in this study is the involvement of the paternal role in the birth of low birth weight baby. It has been shown that fathers who drink alcoholic beverages increases the risk of having a low birth weight baby as much as 3 times. However, the mechanism of how paternal drinking affects birth weight is not known.

It is recommended that more studies should be done with bigger sample size, longer duration, using advanced study design to increase the awareness on the importance of mothers' health status and well–beings during pregnancy to decrease the chances of having low birth weight baby.

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