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کارگاه‌ها و فیلم‌های آموزشی مرکز اطلاعات علمی



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Original Article

MATERNAL DETERMINANTS OF GIVING BIRTH TO LOW-BIRTH-WEIGHT NEONATES

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Background: Low-birth-weight (LBW) is universally used as an indicator of health status and is an important subject of national concern and a focus of health policy. LBW has been shown to be associated with a higher risk for childhood mortality and morbidity.

Objective: To determine the important risk factors which could affect the delivery of LBW neonates.

Methods: This case-control study was undertaken to determine some risk factors for LBW in two university hospitals in Tehran during a 12-month period between 2002 and 2003. One hundred and sixty neonates constituted the LBW group and 300 neonates constituted the control group. Maternal risk factors including body mass index (BMI), educational level, interval between pregnancies, history of previous delivery of LBW neonates, abortion, infertility, unwanted pregnancy, and diseases were analyzed between the two groups. Mean of maternal age was similar between the two groups.

Results: Of 160 LBW neonates, 58% were females and 42% males. It was found that mother's BMI, unwanted pregnancy, educational level of mother, short and long intervals between pregnancies, previous history of delivering LBW neonates, and maternal diseases are associated with an increased risk of LBW.

Conclusion: The majority of factors which lead to the delivery of LBW neonates are preventable.

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Keywords: Low-birth-weight (LBW) • maternal risk factors

Introduction

Low-birth-weight (LBW) is defined as a weight at birth of 2,500 g or less.^{1,2} In 1997, World Health Organization (WHO) estimated that 17% of babies born worldwide are LBW, with marked differences between the incidence in developing (19%) and industrialized countries (7%).³

LBW babies are 17 times more likely than those weighing > 2,500 g, to die during the perinatal period, and 40 times more likely to die during the neonatal period which accounts for 71% of all the neonatal deaths.⁴

It is generally assumed that prevention of LBW results in a corresponding reduction in perinatal mortality. The identification of factors contributing to LBW is therefore of paramount importance.⁵

Low socioeconomic status, maternal under-nutrition, anemia and illness, inadequate prenatal care, obstetric complications, and maternal histories of premature LBW infants have all been reported to influence the occurrence of LBW. These factors operate to various extents in different environments and cultures.⁴ Neonatal LBW rate in Iran was 5% in 1995 (WHO reported).³

The purpose of this study was to determine the important maternal risk factors associated with the delivery of LBW neonates.

Patients and Methods

This investigation was a case-control study carried out at two university hospitals in Tehran

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from 2002 to 2003. All live neonates with a birth weight of $\leq 2,500$ g, delivered in these two hospitals during one year, were included as cases. Two babies with birth weights of $> 2,500$ g who were born consecutively after each case, constituted the control group. Twenty neonates who showed complications were excluded from the study. Therefore, 300 neonates remained in the control group. Weighing of neonates was carried out after birth. Obstetric history was obtained by personal interview and from the antenatal records, and was recorded on a standardized and pretested questionnaire.

Maternal characteristics included age, height, weight, educational status, interval between birth of the newborn baby and the previous delivery, medical diseases, and an unwanted pregnancy. Baby characteristics included sex and the birth weight.

Information regarding the history of previous LBW deliveries, abortions, and infertilities was obtained during the interview. Maternal height was measured against a wall height scale to the nearest centimeter. Maternal weight was measured to the nearest kilogram and body mass index (BMI) was subsequently calculated. Babies were weighed to the nearest 10 g by trained midwives in the labor ward, using a balanced Seca scale, within 15 min after birth. The scale was always checked and

zeroed before weighing.

All the data were entered into the SPSS package (version 10). Proportional differences between cases and controls were analyzed using the Chi-square or Fischer's exact test, taking a level of significance of $P < 0.05$. In addition, the *t*-test was also used to compare the mean of two quantitative variables. For computing the odds ratio (OR) and comprehensive analysis, logistic regression models were applied.

Results

The mean birth weight in LBW group babies ($n = 160$) was 2,293 g and in the control group ($n = 300$) was 3,293 g. There were more females among the LBW neonates (58%). In the LBW group, 141 neonates had a weight of 2,000 – 2,500 g, 16 neonates weighing between 1,500 – 1,999 g, and three weighed between 1,000 – 1,449 g.

Maternal characteristics

Among the studied mothers, the most frequent age group was 20 – 35 years (Table 1). The mean \pm SD maternal age among the LBW group was 27.3 ± 5.0 years, and in normal group was 26.8 ± 5.3 years ($P > 0.05$).

Mothers were divided into three subgroups according to their BMI: favorable (20 – 25),

Table 1. Maternal and neonatal characteristics.

Factors	Neonatal birth weight			
	≤ 2500 g (case)		> 2500 g (control)	
	Number	%	Number	%
Maternal age (yr)				
< 20	18	11.25	23	7.6
20 – 35	132	82.5	258	86
>35	10	6.2	16	5.3
Maternal body mass index (BMI)				
20 – 25 (favorable)	18	11.25	31	10.33
25 – 30 (acceptable)	113	70.62	245	81.66
< 20, > 30 (unfavorable)	29	18.12	24	8
History of ...				
previous delivery of LBW neonates	20	12	13	4.3
abortion	33	20.6	45	15
infertility	17	10	26	8
Unwanted pregnancy	10	6	3	1
Maternal diseases				
Diabetes mellitus	8	5	18	6
Preeclampsia	16	10	4	1.3
Hypertension	36	22	24	8
UTI	60	37	60	20
PROM	43	27	8	2.6
Sex of newborns				
Male	67	44	156	52
Female	93	56	144	48
Mean birth weight of newborns				
Male	2237	SD = 218.4	3327	SD = 343.7
Female	2240	SD = 260.3	3255	SD = 326.8

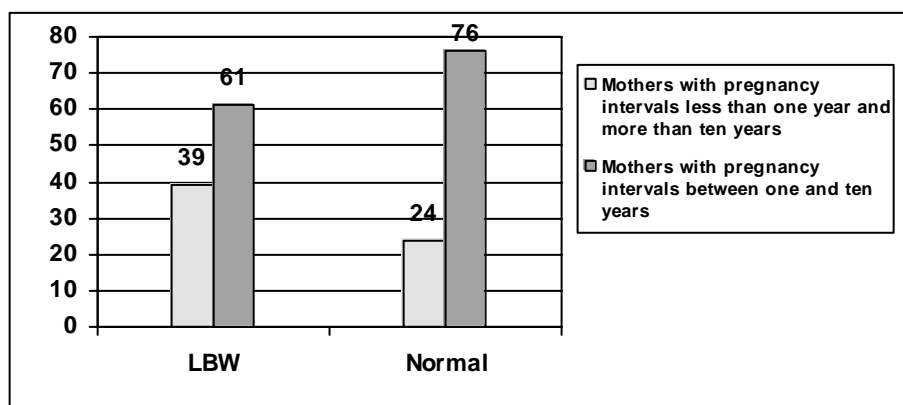


Figure 1. Difference in the frequency of giving birth to a LBW neonate among mothers with varying inter-pregnancy intervals.

acceptable (25 – 30), and unfavorable (< 20 or >30). In the LBW group, 18% of mothers had an unfavorable BMI. In the control group, on the other hand, only 8% of mothers had an unfavorable BMI (Table 1, $P = 0.004$).

Mothers were divided into five subgroups according to their education: 1) illiterate, 2) primary school certificate, 3) guidance school certificate, 4) high school diploma, and 5) university degree. In the LBW group, 20% of mothers, and in the control group, 7% had elementary school education (Table 2, $P < 0.05$).

Intervals < 1 year or ≥ 10 years between pregnancies were also associated with giving birth to LBW neonates ($P < 0.05$, Figure 1).

In the LBW group, 20 (13%) mothers had a history of previous delivery of LBW neonates in contrast to the mothers of control group, in whom 13 (4%) had a history of previous delivery of LBW neonates ($P < 0.001$).

In the LBW group, 10 mothers had unwanted pregnancies in contrast to the mothers of normal group, in whom only three had unwanted pregnancies ($P < 0.00001$).

Maternal diseases such as preeclampsia, hypertension, and urinary tract infection (UTI) are also related to the delivery of LBW neonates. A history of UTI was detected in 60% of mothers in the LBW group, in contrast to 28% in the control group ($P < 0.00001$). History of preeclampsia was observed in 16% of mothers in the LBW group, in contrast to 1.3% in the control group ($P <$

0.00001). History of hypertension was noted in 24% of mothers in the LBW group, in contrast to 8% in the control group ($P < 0.00001$).

There was no relationship between the history of abortion, infertility, consanguine marriage, maternal diabetes, and the delivery of LBW neonates.

In our study, the number of mothers drinking alcohol or smoking cigarettes was remarkably low.

Discussion

Our findings have proven the existence of some important risk factors regarding the delivery of LBW neonates. Since the maternal age has been the same in both groups (LBW and control), other risk factors which could affect the delivery of LBW neonates have been analyzed below.

One of the most important factors is mother's BMI at the beginning of pregnancy (Table 1). The relationship between a low maternal prepregnancy BMI and adverse pregnancy outcomes has been known for several decades. Other evidence indicates that women with a low prepregnancy BMI are still more likely to give birth to smaller infants than heavier women, even when their gestational weight gains were similar.^{7, 8} Our finding was in keeping with previous studies.⁹

The second risk factor for giving birth to a LBW neonate is the mother's education (Table 2). As the education increases, the chance of delivering LBW neonates decreases. Among

Table 2. Relationship between the mothers' education and the birth weight of neonates.

Birth weight (g)		1	2	3	4	5	Total
> 2500	<i>n</i>	1	21	31	154	93	300
	%	50	39.6	64.5	68.2	71	65.2
≤ 2500	<i>n</i>	1	32	17	72	38	160
	%	50	60.4	35.5	31.8	29	34.8

Table 3. Maternal risk factors associated with LBW.

	B	SE	OR	95% CI for OR
Previous delivery of LBW neonates	1/42	0/44	4/14	1/72 – 9/94
Unwanted pregnancy	2/01	0/75	7/45	1.68 – 32/86
Twin pregnancy	2/73	0/5	15/43	5/78 – 41 – 14
Preeclampsia	1/53	0/7	4/61	1 – 16 – 18/35
Hypertension	1/01	0/39	2/74	1/27 – 5/92
Urinary tract infection	1/43	0/31	4/19	2/27 – 7/71

OR = odd ratios; B = beta angle; SE = standard error; CI = confidence interval.

mothers's with elementary education, 60% had LBW neonates. This is in contrast to the frequency (30%) observed among group of mothers with a university degree. Certainly, educated mothers have a better reproductive behavior. Our finding is in agreement with other studies.^{9, 10}

The third risk factor is the interval between pregnancies. The results of this study support the findings of Zhu et al.¹¹ They found that infants conceived less than six or more than 120 months after a live birth had a respective OR of 1.4 and 2 for the LBW delivery.¹¹ This is in contrast to Fourn et al who found that a short interval between pregnancies had no significant correlation with LBW.¹²

Another important risk factor is unwanted pregnancy which increases the likelihood of delivery of a LBW neonate by 7 folds; a finding in keeping with Ko et al.¹³

Another risk factor is the history of previous delivery of LBW neonates (OR = 4). This finding is in agreement with other reports.^{9, 14 – 16} Mansour et al found that the history of giving birth to a LBW neonate increases the chance delivering LBW neonates by three times.⁹ It is probable that multiple etiologic factors that affect neonatal weight are generally the same in all pregnancies of the same mother.

There was also a significant relationship between maternal diseases such as preeclampsia, hypertension, premature rupture of membrane (PROM), UTI, and the delivery of LBW neonates.

There is a four-fold increase in delivering LBW neonates in preeclamptic mothers (OR = 4.59). This finding supports other studies, reporting preeclampsia to be associated with a 3.8-fold increase in the risk of delivering LBW neonates.^{14, 18 – 20}

Hypertension also increases the risk of delivering LBW neonates by 2.69 folds.^{14, 15, 19, 20} UTI during pregnancy also increases the risk of delivery of LBW by 4.09 folds.¹⁶ There was no relationship between maternal diabetes and the delivery of LBW neonates. On the contrary, diabetic mothers gave birth to heavier neonates.

Since LBW is one of the important risk factors determining the infant mortality and morbidity, and since the majority of factors which lead to the delivery of LBW neonates are preventable, it is hoped that with close cooperation of gynecologists and pediatricians along with training of mothers and young women, the number of such incidences would be minimized.

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