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Determining risk factors associated with low birth weight of newborns in Birjand: A case-control study

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Abstract

Background: Low birth weight is a major indicator of health assessment in neonates and infants and is associated with increased morbidity and mortality of infants. Low birth weight of newborns can be prevented by identification and control of the associated risk factors. This study aimed to investigate factors associated with low birth weight of newborns in the city of Birjand.

Methods: This case-control study incorporated babies born in Birjand in 2015. Newborns weighing less than 2500 grams (N=140) were considered as the case group and those weighing more than 2500 g were regarded as the control group. For every member of the case group, two controls that were closest to birthdate of the case were selected from the Office of Continuous Care for Under One Year Infants. The data obtained were analyzed in SPSS-16, and the significant level was considered at α=0.05.

Results: The chance of low birth weight in women with a history of low birth weight labor was 3.54 times greater than other women. The chances were 28.38 and 9.44 times greater in mothers with pluriparity and hypertension, respectively. However, parity rank, interval from previous delivery, type of birth, season of birth, abortion history, gestational diabetes, and preeclampsia were not significantly associated with the incidence of low birth weight.

Conclusions: As low birth weight is associated with some preventable factors, measures such as training people, especially women and young girls, and provision of quality care during pregnancy are recommended, especially in the case of high risk pregnancies.

Keywords: Low birth weight; Pluriparity; Hypertension; Risk factor

1. Introduction

One of the major health indicators of a newborn is birth weight (1). This is a determinant of survival and future physical and mental growth as well as a credible evidence of intrauterine growth (2). According to the World Health Organization, low birth weight (LBW) is defined as a birth weight less than 2500 g regardless of gestational age (3).

According to surveys of the World Health Organization, some 25 million LBW infants are born every year. In other words, one out of every 6000 babies are underweight on the global scale, out of whom 90 percent are born in the developing countries (4, 5).

The prevalence of low weight at birth in the United States is estimated to be 8.2 percent (6). In general, from the 121 million babies born worldwide every year, approximately 23 million suffer from LBW, and they are mainly born in the developing countries (6). For example, LBW rates are reported as 19.9 percent in Zimbabwe, 39.1 percent in India, 16.2 percent in Mozambique, and 21.5 in Nepal (7, 1). The prevalence in Iran, according to the latest figures, ranges from 9.6 to 11.8 percent (6). Mortality rates

in LBW and very LBW infants are 40 and 200 times higher than babies born with normal weight (3, 8).

Several factors affect LBW including demographic factors (black race, low socioeconomic status of the family, single-parent), issues before pregnancy (low weight for maternal height, short stature, malnutrition, history of LBW labor, abnormalities of the uterus or cervix, primiparity or multiparity over 5 times, mother's chronic illness, young age of the mother, problems during pregnancy (pluriparity, anemia, hypertension, placental problems, maternal infection, burdensome duties, etc., parity rank over four), and behavioral issues (low education, smoking, health care, addiction, short gap between pregnancies, physical and mental stress, preparedness of parents, mother's attitude to pregnancy, wanted or unwanted children, and marital satisfaction) (1, 3, 8).

In a study by Mirzarahimi et al in Ardabil Province, the most important risk factors for LBW in the region were premature or gestational age less than 37 weeks, pluriparity, premature rupture of the amniotic membranes, maternal age over 35 years, mother's weight less than 50 kg, and the mother's diseases (7). Zayghami and colleagues in a study conducted in Kohkiluyeh and Boyer Ahmad Province found that as the interval between pregnancies increases, the risk of LBW babies decreases (9). In the study of Pakniat et al, low weight was found related with abnormal BMI, abnormal weight, and preterm delivery (10). In Viengsakhone et al, mothers with inadequate levels of knowledge about healthy pregnancy practices and mothers who lacked proper nutritional habits were greater risks of LBW (11).

As the prevalence of low weight and associated factors are not necessarily the same under different social and health conditions, they need to be assessed in different regions. Since similar studies are not newly conducted in Birjand, we therefore decided to determine some risk factors for LBW in Birjand.

2. Methods

This case-control study incorporated neonates born in the city of Birjand in 2015. Based on the results from Taheri et al's study, the sample size was calculated as 140 people concerning sample size formula for two proportions and given α=0.05 and β=0.01 (1). In this study, there were 280 persons in the control group and 140 persons in the case group. The samples were selected non-probabilistically from Birjand-based health centers from among newborns that had inclusion criteria. The case group included newborns with a birth weight less than 2500 g born in the city of Birjand, with information being extracted from files of households with children under one-year-old from four health centers. The controls involved babies weighing over 2500 grams born mostly in the city of Birjand who were similarly selected from household files available in the four health centers. Controls were selected such that there were two controls per case most similar in terms of birthdate.

The groups were matched in terms of the geographical location of residence and month of birth. The data collection instruments consisted of a researcher-made questionnaire designed according to the purposes of the study. Its content validity was confirmed by five faculties in the fields of pediatrics, obstetrics, midwifery, and health. The questionnaire contained information about the mother's age, level of education, abortion history, height, weight, type of child birth, employment status, history of LBW, pluriparity, unwanted pregnancies, drug addiction, smoking, diseases of the mother e.g. hypertension, diabetes, heart disease, kidney disease, epilepsy, asthma, mental disorders, coagulation disorders, hepatitis, tuberculosis, thyroid disease, abnormalities of genitalia, and breast cancer, as well as information about the neonate including its sex, season of birth, date of birth, and weight at birth.

All the obtained data were completed by trained public health experts based on household files. To observe ethical considerations, permission was obtained from the vice-chancellery of health at university, and the questionnaires were completed anonymously and the information collected remained confidential. The data were analyzed in SPSS-16 using Mann-Whitney, Chi-square, Fisher's exact test, and logistic regression. The significant level was set at α=0.05.

3. Results

The study included 140 LBW newborns in the case group and 280 newborns weighing over 2500 g in the control group. The mean age of mothers of the cases was 27.91±6.15 years and that of controls was 28.08±5.34 years (P=0.53). The mean parity rank in the case group was 1.82±1.13 and for the controls, it was 1.82±0.91 (P=0.48). The mean BMI of mothers of cases was 23.94±5.12 and that of controls was 23.9±4.66 (P=0.96). There was no significant difference between the groups in terms of age,

birth rank, and mothers' BMI. Moreover, the groups were similar in terms of sex and season of birth (Table 1).

In this study, abortion, type of delivery, unwanted pregnancy, infertility history, gestational diabetes, anemia, smoking and drug abuse, history of abnormality, interval from previous delivery, and eclampsia did not show a significant association with LBW. On the other hand, history of stillbirth, history of LBW (P=0.023; OR=0.014), hypertension (P=0.014; OR=9.44), and pluriparity (P=0.004; OR=28.37) were significantly associated with LBW (Table 2).

Table 1: Comparison of frequency distribution of sex and season of birth in case and control groups

Variable		Case		Control		Chi-square and Fisher's tests
		Number	Percentage	Number	Percentage	
Sex	Boy	65	46.4	141	50.4	P=0.44
	Girl	75	53.6	139	49.6	
	Total	140	100	280	100	
Season of birth	Spring	28	20	66	23	P=0.62
	Summer	41	29.3	67	23.9	
	Fall	36	25.7	71	25.4	
	Winter	35	25	76	27.1	
	Total	140	100	280	100	

Table 2: Absolute and relative frequency of variables in case and control groups in terms of variables and estimation of the odds ratio

Risk factors		Case Frequency (percentage)	Control Frequency (percentage)	Odds ratio	Confidence interval 95%	Significance level
Stillbirth history	No	126 (90)	268 (95.7)	1	-	0.02
	Yes	14 (10)	12 (4.3)	2.48	1.5-11.52	
Abortion history	No	113 (80.7	252 (90)	1	-	0.082
	Yes	27 (19.3)	28 (10)	2.26	0.5-9.9	
Type of delivery	Natural	69 (49.3)	150 (53.6)	1	-	0.67
	Caesarean	71 (50.7)	130 (46.4)	1.16	0.2-562.42	
Unwanted pregnancy	No	128 (91.4)	254 (90.7)	1	-	0.49
	Yes	12 (8.6)	26 (9.3)	0.707	0.1-26.92	
Pluriparity	No	123 (87.9)	279 (99.6)	1	-	0.004
	Yes	17 (12.1)	1 (0.4)	28.37	2.269-98.59	
History of infertility	No	131 (93.6)	275 (98.2)	1	-	0.087
	Yes	9 (6.4)	5 (1.8)	5.89	0.45-78.5	
History of LBW	No	128 (91.4)	269 (96.1)	1	-	0.023
	Yes	12 (8.6)	11 (3.9)	3.54	1.10-21.53	
Hypertension	No	132 (94.3)	277 (89.9)	1	-	0.014
	Yes	8 (5.7)	3 (1.1)	9.44	1.9-59.3	
Gestational diabetes	No	136 (97.1)	277 (98.9)	1	-	
	Yes	4 (2.9)	3 (1.1)	2.38	0.19-29.6	
Anemia	Normal	132 (95.7)	267 (96.7)	1		0.254
	Mild	3 (2.2)	9 (3.3)	0.31	0.2-41.32	0.99
	Moderate	3 (2.2)	0	0		
Body Mass Index	Normal	62 (44.3)	160 (57.1)	1	-	-
	Lean	21 (15)	27 (9.6)	0.238	0.0-0.69.815	0.022
	Heavy	42 (30)	61 (21.8)	0.377	0.0-168.847	0.018
	Obese	15 (10.7)	32 (11.4)	0.687	0.2-218.161	0.52
Interval from prior labor	> 36 months	54 (77.1)	115 (78.2)	1	-	-
	< 36 months	16 (22.9)	32 (21.8)	1.18	0.2-491.87	0.703
Eclampsia	No	134 (95.7)	274 (97.9)	1	-	-
	Yes	6 (4.3)	6 (2.1)	1.29	0.8-207.09	0.78

4. Discussion

LBW sharply raises the chance of mortality and morbidity. In recent years, the rate of LBW in developing countries has been on the rise for which different reasons have been posed (5). In this study, a risk factor for LBW was pluriparity, a finding that corresponds with those of Mirzarahimi et al (7) and Zayghami et al's (9) studies. In pluriparity, the number of fetuses increases, leading to reduced weight of them at birth. Therefore, it is necessary for women with pluriparity to receive special prenatal care and have an appropriate nutritional diet.

In this study, the chance of LBW delivery in women with a history of LBW was 3.54 times greater than in mothers without such a history. This is in line with the results from Shadzi et al's (12) study. In addition, in this study, the chances of LBW in lean and overweight mothers were 0.24 and 0.38 lower than mothers with normal BMI. This relationship was significant indicating that chances of LBW increases as BMI increases.

The chance of LBW in women with hypertension was 9.44 times greater than normal women. This corresponds with findings from Taheri et al (1), Mirzarahimi et al (7), and Talebian et al's (3) studies. In fact, hypertension of the mother may increase chances of LBW through interference in the mother's bloodstream and the placental efficiency (1).

In this study, the relationship between the interval from previous pregnancy and LBW was not significant. In the studies by Zayghami et al (9) and Mirzarahimi et al (7), however, the interval from previous pregnancy was a risk factor for LBW (i.e., the shorter the interval from the previous pregnancy, the greater the chance of LBW.). Thus, in pregnancies with intervals less than 3 years, LBW is more probable to occur. In this study, the prevalence of LBW was not associated with the mother's education level (i.e., illiterate, elementary, secondary school, high school, and college). Since all the pregnant women were under supervision of the physician or community health networks, this can diminish the role of parents' education level on LBW rates. As a result, there were no significant differences between different levels of education and birth weight. This finding was similar to the results of Mirzarahimi et al (7), Taheri (1), and Shadzi et al's (12) studies.

In the case of mother's smoking or addiction, there was a low prevalence of LBW in the sample under study. This, however, may be possibly due to poor cooperation in provision of answers in this regard in the current study. At any rate, smoking or addiction of the mother did not correlate with LBW, which corresponds with the results from Mirzarahimi et al's (7) study. Among factors that play a role in the incidence of LBW is parity rank which did not show a significant correlation in this study. This corresponds with the results of Mirzarahimi et al (7) and Taheri's (1) studies. However, in a study conducted in 1993 by Shadzi and quoted in Aldous, there was a significant relationship between parity rank and LBW (12).

In the current study, no significant relationship was found between abortion, stillbirth, and LBW, which is similar to the results of Zayghami et al (9) and Karimiyan et al's (2) studies. No significant relationship was observed between pre-eclampsia, gestational diabetes and maternal occupation, a finding that contradicts with those of Mirzarahimi et al (7) and Fallah et al's (13) studies. One of the reasons for this discrepancy can lie with demographic characteristics of the sample under study.

5. Conclusion

According to this study, pluriparity, previous delivery of low weight baby, and hypertension were associated with LBW. It seems that LBW of neonates can be reduced through enhanced knowledge of women and girls of fertility age concerning the necessity of observing pre-delivery care as well as proper diagnostic and therapeutic measures against maternal diseases.

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