Original Article

Maternal risk factors associated with low birth weight

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Abstract

Background and purpose: Since a large proportion of fetal mortality is associated with low birth weight (LBW) and considering the fact that fetal development is a vulnerable process influenced by maternal risk factors, this study examined some maternal risk factors associated with LBW infants.

Materials and Methods: This cross-sectional study was conducted based on the medical records of 250 infants born in Zeynabeieh Hospital. The required data were registered in a pre-developed checklist. Then, the collected data were analyzed by Chi-square in SPSS Software using descriptive and inferential statistics.

Results: The mean weight of the sample was 3.2 ± 0.25 (1.5-4.7) kg. About 18% of the infants had birth weight of 2500 g or less. The most frequent educational level among the mothers was illiteracy and elementary education (60%), and the least was secondary education (9.2%). There was found a significant correlation between the mothers' education and low birth weight ($P < 0.001$). Regarding the association between the mothers' age and low birth weight, 18- to 35-year-old mothers comprised the highest number of mothers (75%), and upper 35-year-old mothers did the lowest (11.2%). Based on chi-square test, a significant correlation was observed between the mothers' ages and low birth weight ($p<0.001$). In addition, concerning the occupation of mother and low birth weight, there was documented a significant correlation between their occupation and low birth weight ($P < 0.001$).

Conclusion: Maternal biosocial, medical, and obstetric factors have strong association with LBW. To overcome this problem, special attention is required so as to strengthen the mother and child healthcare services in the community.

Key words: LBW; Maternal Risk Factorsz; Shiraz

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1. Introduction

The birth weight of < 2500 g is one of the serious health problems of the infants in the world today (1). Low birth weight (LBW) (neonate weighing<2500 g) is a multifactorial phenomenon (2). Many maternal and fetal factors are found significantly to be associated with LBW (3). Regardless of gestational age, LBW is a multifaceted public health problem with significant individual and societal impact worldwide, especially in developing countries (4). Globally, an estimated 20 million LBW infants are born each year, with over 18 million of these in developing countries, LBW infants are at a disproportionately higher risk of mortality, morbidity, poor growth, and impaired psychomotor, and cognitive development (5, 6). These LBW infants are also disadvantaged when they become adults, as they are more susceptible to type 2 diabetes, hypertension, and coronary heart disease. LBW is related not only to basic maternal characteristics during pre-pregnancy, but also to potential risk factors during pregnancy, including maternal age, educational attainment, lifestyle, health status, and diseases (5), of which maternal age, educational attainment, and marital status are more closely associated with LBW. In addition, most current studies of LBW risk factors have focused on environmental, psychosocial, behavioral, and medical factors (7-9). Many medical factors and basic diseases are also reported to be related to LBW, including diabetes, preeclampsia, and oligohydramnios (10). It should be noted that across the world, neonatal mortality is 20 times more likely for LBW babies compared to heavier ones (≤ 2.5 kg) (11). It is documented that in Iran, 289 children under 5 years of age die each day, while 48% of these mortalities occur within the first month of life, and the majority of the deceased infants have a birth weight of < 2500 g (12). Determining the indices of height, weight, and head circumference (anthropometric indices) is one of the most common and easiest methods of assessing development to examine the infants' health of a community (13). The reduction in LBW of infants is also an important objective of millennium development goal 4, which seeks to reduce child mortality by two-thirds by the year 2015 (14). The main objective of this study was then to determine the association between socio-demographic, maternal, medical and obstetric risk factors, and low birth weight.

2.Materials and Methods

In this cross-sectional study, 250 infants who were born in 2015 in Zeynabeieh Hospital, Shiraz city, Iran were chosen as sample via the census. This center covers a large population, and is referred to from different parts of the city. The data in the medical files of the infants born in this center in the year 2015 were collected for conducting the present study. The collection of data was performed through a predeveloped checklist comprising items on maternal factors, such as occupation of mother, age of mother, antenatal care, birth spacing, pre-delivery weight, pregnancy weight gain, antenatal care, economic status, maternal education, and mother hypertension. This study was not an ethical consideration because not mentioned on the name of people. The data were analyzed by appropriate statistical tests, such as Chi-square through SPSS Software (Version 19), and the significance level was defined to be $P < 0.050$.

3. Results

Totally, 250 infants were studied for birth weight. The mean weight was 3.2 ± 0.25 (1.5-4.7) kg. About 18% of the infants had birth weight of 2500 g or less. Also, the mean height was 47.4 ± 0.25 (40-51) cm. About 12.4% of the infants had birth height less than the standard birth height. The mean head circumference of the infants was 34.00 ± 1.54 (28-39) cm. About 20% of the infants had a head circumference of <32 cm. The most frequent educational level among the mothers was illiteracy and elementary (60%), and the least was secondary (9.2%). At the same time, 21.2% of the mothers had completed their guidance education at school, while 9.6% of them had an academic education. The results of the analysis are presented in Table 1. As can be observed, there was a significant correlation between the mothers' education and low birth weight (P < 0.001). On the association between the mothers' age and low birth weight, 18- to 35-year-old mothers comprised the highest number of mothers (75%), and over 35-year-old mothers did the lowest (11.2%). Based on chi-square test, a significant correlation was also documented between the mothers' age and low birth weight (p<0.001).

Concerning the occupation of mother and low birth weight, a significant correlation was also seen through Chi-square (P < 0.001); however, no significant correlation was observed between maternal hypertension levels at the onset of pregnancy and low birth weight (p=0/06). It should be mentioned that the birth spacing was <36 month in 24.8% of the studied mothers, resulting in a significant correlation between birth spacing and low birth weight. The findings of the current study also showed a significant correlation between the type of pregnancy (wanted or unwanted) and low birth weight and height (P < 0.001), meaning that unwanted pregnancy could cause an increase in low birth weight (p<0.001). At the same time, a significant correlation was observed between pre-delivery weight and low birth weight (P < 0.001), meaning that the pre-delivery weight<45kg caused increased low birth weight. However, a significant correlation was observed between mothers' antenatal care and low birth weight (P < 0.001) meaning that increased antenatal care had decreased low birth weight. One other significant correlation was also noted between maternal weight gain and low birth weight and height (P < 0.001), meaning that increased maternal weight gain affected the newborn child through causing decreased low birth weight.

One further significant correlation was seen between economic status and low birth weight and height (P < 0.001), meaning that good economic status decreased low birth weight (p<0.001). (The related results are shown in Table 1).

In this study, logistic regression analysis was also done to eliminate the effects of potential confounders, and to identify the independent effect of various risk factors. Hence, as shown in Table 2, it was found that the most important risk factors associated with the low birth weight of babies were Age of mother (OR =3.36), Occupation of mother (OR =3.32), Mother's education (OR =2.17), Type of pregnancy (OR =2.26), Birth spacing (OR =3.36), pregnancy weight gain (OR =4.98), pre-delivery weight (OR =3.81), antenatal care (OR =5.98), and Low economic status (OR =2.27).

Table1. Maternal risk factors associated with low birth weight

Variables		low birth weight		Result	
		yes	No		
Age of mother	<18year	17	20	$\chi2 = 76.75$	df = 2
	18-35year	3	182	P < 0.001	
	>35year	11	17		
	total	31	219		
Occupation of mother	housewife	7	180	$\chi2 = 91.1$	df = 1
	Employee	24	39	P < 0.001	
	total	31	219		
Mother's education	Illiterate and elementary	31	119	$\chi2 = 23.59$	df = 3
	Secondary	0	23	P < 0.001	
	guidance	0	53		
	Academicians	0	24		
	total	31	219		
Type of pregnancy	wanted	3	190	$\chi2 = 91.66$	df = 1
	unwanted	28	29	P < 0.001	
	total	31	219		
Birth spacing	<36 month	27	35	$\chi2 = 74.64$	df = 1
	>36month	4	184	P < 0.001	
	total	31	219		
Pre-delivery weight	<45kg	21	9	$\chi2 = 96.63$	df = 1
	>45kg	10	210	P < 0.001	
	total	31	219		
Pregnancy weight gain	<6kg	31	21	$\chi2 = 134.74$	df = 2
	6-9kg	0	142	P < 0.001	
	>9kg	0	56		
	total	31	219		
Antenatal care	<3	31	21	$\chi2 = 134.74$	df = 2
	3-5	0	142	P < 0.001	
	>5	0	56		
	total	31	219		
Maternal hypertension	yes	0	27	$\chi2 = 4.28$	df = 1
	No	31	192	P =0.06	
	total	31	219		
Economic status	good	0	56	$\chi2 = 134.74$	df = 2
	moderate	2	142	P < 0.001	
	Weak	29	21		
	total	31	219		

Table2. Logistic Regression Analysis

Factor	Odds Ratio	95% CI	P value
Age of mother	3.36	1.91-5.88	< 0.001
Occupation of mother	3.32	1.55-7.10	< 0.001
Mother's education	2.17	1.67-2.04	< 0.001
Type of pregnancy	2.26	1.91-4.88	< 0.001
Birth spacing	3.36	1.91-5.88	< 0.001
Pre-delivery weight	3.81	2.53-8.15	< 0.001
Pregnancy weight gain	4.98	2.64-9.39	< 0.001
Antenatal care	5.98	3.64-9.39	< 0.001
Maternal hypertension	1.11	0/60-2.00	0. 06
Low economic status	2.27	1.81-4.91	< 0.001

4. Discussion

As observed in the present study, there was a significant association between low birth weight and some maternal risk factors, and the association between the infants' weight and mothers' age was significant. In other words, the likelihood of giving birth to the infants with the weight of < 2500 g increased for the mothers under 18 years old and over 35 (P < 0.001). However, the association of another determinant of development, i.e., the infants' weight, with mothers' age was not significant as determined by chi-square test. Whereas, in Tootoonchi's study in Tehran, the mothers' age of under 20 and over 35 was documented to be the risk factor for LBW (15). Based on the findings of Malik et al., the rate of LBW infants was higher in the women over 35 than those over 18 years of age (16). A significant association was also observed between the mothers' occupation and education, and low birth weight, which has been confirmed by other studies (17-19). In the present study, it has been well demonstrated that if Birth spacing increases, the likelihood of declined low birth weight will increase, and this is a result confirmed by Klufio et al. (18). It should also be noted that in the current study, no significant association was documented between maternal hypertension and decreased birth weight (p=0.06). Several studies in the literature had indicated that the satisfactory prenatal healthcare program could affect the fetal health remarkably (18-19). In line with these background studies, a significant association was also found in the current study between low economic and socioeconomic status and low birth weight (18-23). Typically, low socioeconomic status and low educational status leads to low health consciousness, lower nutritional status, and low antenatal attendance, leading to the increased risk of LBW babies. Additionally, in this study, consistent with certain other studies (24-25), a significant relationship was observed between the antenatal care and low birth weight. It should also be noted that the findings of this study were in line with the results of some other studies in that there was a significant relationship between pregnancy weight gain, pre-delivery weight, and pregnancy type (planned or unplanned), and birth weight (17,20,25).

The results of the current research also showed that educational healthcare centers should study the risk factors during pregnancy more seriously. It is then hoped that further attention to be paid to general and regional risk factors which influence the fetal development initiated by these centers. Thus, the findings of this study emphasized the need for improving the quality and utilizing antenatal care, providing nutritional education to improve weight gain during pregnancy, spacing, and preventing and managing properly the risk factors.

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***Conflict of interest*:** The authors declare that they have no conflict of interest.

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