

*Original Article***Maternal risk factors associated with low birth weight**Victoria Momenabadi¹ Mohammad Hossein Kaveh² Seyed Masoud Mousavi³ **Somayeh Alizadeh***⁴

1. PhD Candidate, Department of Health Education and Health Promotion, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran.
2. Associate Professor, Research Center for Health Sciences, Institute of Health, Shiraz University of Medical Sciences, Shiraz, Iran.
3. MPH student in the elderly Health, MD, Kerman University of Medical Sciences.
4. PhD Candidate, Department of Health Education and Health Promotion, School of Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

*Correspondence to: Somayeh Alizadeh
alizade2009@yahoo.com

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 Factors; Shiraz

Citation: Momenabadi V, Hossein Kaveh M, Mousavi SM, **Alizadeh S***. Maternal risk factors associated with low birth weight 2017; 5 (3):58-64.

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

Acknowledgement

The authors of this study are thankful to all personnel of Zeynabeh Hospital for their cordial collaboration.

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

References

1. Black, R. E., Allen, L. H., Bhutta, Z. A., Caulfield, L. E., de Onis, M., Ezzati, M., Rivera, J. Maternal and child undernutrition: global and regional exposures and health consequences. *The Lancet* 2008; 371(9608): 243-260. DOI: 10.1016/S0140-6736(07)61690-0.
2. Mumbare SS, Maindarkar G, Darade R, Yenge S, Tolani MK, Patole K. Maternal risk factors associated with term low birth weight

- neonates: a matched-pair case control study. *Indian Pediatr* 2012; 49(1): 25-8. Doi:10.1007/s13312-012-0010-z.
3. Singh CG, Chouhan CR, Sidhu MK. Maternal factors for low birth weight babies. *Med J Armed Forces India* 2009; 65: 10-2. Doi: 10.1016/S0377-1237.
 4. Metgud CS, Naik VA, Mallapur MD. Factors affecting birth weight of a newborn- a community based study in rural Karnataka, India. *PLoS One* 2012; 7(7): e40040. Doi: 10.1371/journal.pone.0040040.
 5. Valero De BJ, Soriano T, Albaladejo R, Juarranz M, Calle ME, Martinez D, et al. Risk factors for low birth weight: a review. *Eur J Obstet Gynecol Reprod Biol* 2004; 116(1): 3-15. Doi:10.1016/j.ejogrb.2004.03.007
 6. Karimi M, Fallah R, Dehghanpoor A, Mirzaei M. Developmental status of 5-year-old moderate low birth weight children. *Brain Dev* 2011; 33(8): 651-5. Doi:10.1016/j.braindev.2010.10.022
 7. Kuo CP, Lee SH, Wu WY, Liao WC, Lin SJ, Lee MC. Birth outcomes and risk factors in adolescent pregnancies: results of a Taiwanese national survey. *Pediatr Int* 2010; 52(3): 447-52. Doi:10.1111/j.1442-200X.2009.02979.x
 8. Jaakkola JJ, Jaakkola N, Zahlsen K. Fetal growth and length of gestation in relation to prenatal exposure to environmental tobacco smoke assessed by hair nicotine concentration. *Environ Health Perspect* 2001; 109(6): 557-61. PMID:11445507 PMID: PMC1240335
 9. Patra J, Bakker R, Irving H, Jaddoe VW, Malini S, Rehm J. Dose-response relationship between alcohol consumption before and during pregnancy and the risks of low birthweight, preterm birth and small for gestational age (SGA)-a systematic review and meta-analyses. *BJOG* 2011; 118(12): 1411-21. Doi: 10.1111/j.1471-0528.2011.03050.x
 10. Bian Y, Zhang Z, Liu Q, Wu D, Wang S. Maternal risk factors for low birth weight for term births in a developed region in China: a hospital-based study of 55,633 pregnancies. *J Biomed Res* 2013; 27(1): 14-22. Doi: 10.7555/JBR.27.20120046
 11. The United Nations International Children's Emergency Fund, World Health Organization (WHO). Low birthweight: country, regional and global estimates [Online]. [cited 2011 Aug 12]; Available from: URL: http://www.unicef.org/publications/index_24840.html
 12. Karimian S, Mollamohammadi M, Jandaghi GhR. Prevalence of low birth weight infants and its related factors in Qom delivery units, 2000. *Feyz* 2003; 7(3): 76-80. [In Persian]
 13. Abdeyazdan Z, Ehsanpour S, Hemmati E. Developmental milestones in children with normal, low, and very low birth weights. *J Urmia Nurs Midwifery Fac* 2013; 11(8): 570-7. [In Persian]
 14. Elhassan EM, Abbaker AO, Haggaz AD, Trotnow S, Bregulla K, Flugel K et al. Studies on Anaemia and low the birth-weight and the size of the new-born birth weight in Medani, Hospital Sudan. *BMC Res Notes* 2010; 3: 181. Doi: 10.1186/1756-0500-3-181
 15. Tootoonchi P. Low birth weight among newborn infants at Tehran hospitals. *Iran J Pediatr* 2007; 17 (Suppl 2): 186-192. [In Persian]
 16. Biernacka JB, Hanke W. The effect of occupational and non-occupational psychological stress on the course of pregnancy and its outcome. *Med pr.* 2006; 57 (3):281-90. PMID: 17125035
 17. Maddah M, Karandish M, Mohammadpour-Ahranjani B, Neyestani TR, Vafa R, Rashidi A. Social factors and pregnancy weight gain in relation to infant birth weight: a study in public health centers in Rasht, Iran. *Eur J Clin Nutr.* 2005; 59 (10):1208-12. PMID: 16132060 DOI:10.1038/sj.ejcn.1602239
 18. Klufio CA, Kariwiga G, MacDonald R. Normal birthweight at Port Moresby General Hospital: a retrospective survey of normal term births to determine birthweight distribution. *Papua and New Guinea Medical Journal* 1992; 35(1):10-16. PMID:1566603.
 19. Kaneshi T, Yoshida T, Ohshiro T, Nagasaki H, Asato Y, Oh ta T. Birth weight and risk factors for cardiovascular diseases in Japanese school children. *Pediatr Int.* 2007;49(2):138-43. PMID: 17445028 DOI: 10.1111/j.1442-200X.2007.02333.x
 20. Gunderson E, Abrams B, Scivin S. Does the patten of postpartum weight change differ according to pregravid body size? *Int J Obs Metab Disord.* 2001;25(6):853-62. PMID: 11439300 DOI: 10.1038/sj.jjo.0801631

21. International Institute of Population Sciences, National Family Health Survey, India. 2005-06 (NFHS-3, Vol. 1) 2007:225.
22. Jafari F, Eftekhari H, Pourreza A, Mousavi J. Socioeconomic and medical determinants of low birth weight in Iran: 20 years after establishment of a primary healthcare network. *Public Health*. 2010; 124(3):153-8. Doi: 10.1016/j.puhe.2010.02.003
23. Viengsakhone L, Yoshida Y, Harun-Or-Rashid M, Sakamoto J. Factors affecting low birth weight at four central hospitals in Vientiane, Lao PDR. *Nagoya J Med Sci*. 2010; 72:51-8. PMID:20229703
24. Shapiro C, Sulija V, Bush J. Effect of maternal weight gain on infant weight. *J perinat Med*. 2000; 28 (6):428-31. PMID: 11155426 DOI: 10.1515/JPM. 2000.056
25. Hogan DP, Park JM. Family factors and social support in the developmental outcomes of very low birth weight children. *Clin Perinatol* 2000; 27 (2): 433–59. PMID: 10863659