
Original Article

The neglected sociobehavioral risk factors of low birth weight

Mohsen Momeni¹, Rudabeh Esfandyarpour², Mina Danaei³

¹ Assistant Professor of Community Medicine, Social Determinants of Health Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

² General Physician, Health Services Management Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

³ Assistant Professor of Community Medicine, Medical Informatics Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

Corresponding author and reprints: Mina Danaei. Medical Informatics Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

Email: m.danaei@kmu.ac.ir

Accepted for publication: 22 July 2015

Abstract

Background: Low Birth Weight (LBW) is one of the most important health indicators in the world. It has certain known and unknown causes. The present study was designed to evaluate the role of socio-behavioral factors on neonatal birth weight.

Methods: The current case-control study was conducted on 300 eligible neonates (150 LBW infants as cases and 150 normal body weight infants as controls) in 2015. The national pregnancy care forms of the neonates kept in health care centers in Kerman were used. The data was analyzed running Independent samples t-test, Chi square test, and Fisher's Exact test in SPSS. The significance level was set as 0.05.

Results: Preterm birth ($P < 0.001$), number of primary care during pregnancy ($P = 0.001$), mother's age ($P = 0.049$), consumption of supplements during pregnancy ($P = 0.03$), and history of substance abuse in mothers ($P = 0.03$) were found to have significant roles in having LBW neonate.

Conclusion: Identifying the sociobehavioral risk factors of Preterm labor and modifying them to prevent preterm birth are essential approaches to prevent LBW. Governments should pay special attention to nutritional status of teenage and young girls to have healthy mothers and babies in the future. Women of childbearing age should be screened and educated about risky behaviors. Pregnancy care and support should be delivered to all pregnant women according to the standard methods.

Keywords: Low Birth Weight; Risk Factors; Behavior; Preterm Labor

Cite this article as: Momeni M, Esfandyarpour R, Danaei M. The Neglected Sociobehavioral Risk Factors of Low Birth Weight. SDH. 2015;1(3):97-103..

Introduction

Low Birth Weight (LBW) is defined by the World Health Organization as the birth weight lower than 2500 grams and is one of the most important health indicators (1). The prevalence of LBW varies between different countries from 5-7% in the developed to 19% in the developing countries. In 2013, the prevalence of LBW was reported 7% in Iran according to a systematic review study (2).

Premature and LBW newborns are extremely at risk for growth retardation, infectious diseases, and perinatal mortality and morbidity during their infancy and childhood (3-6). The risk of degenerative diseases, including fatal and non fatal coronary diseases, stroke, hypertension, and diabetes, are higher in adults with the history of LBW (7), compared with those with normal weight at birth (4, 8, 9).

The results of different studies demonstrated several socioeconomic and maternal factors associated with LBW, including maternal age, mothers' educational level, ethnicity, Body Mass Index, inadequate nutritional practice, first child birth, medical risks before or during gestation, physical work, preterm labour, maternal lifestyles, and family income (10-15).

A meta-analysis demonstrated that maternal labor, having primary care in pregnancy period, and intake of certain vitamins and trace elements in pregnancy are important associated factors with birth weight, especially in the developing countries (16).

According to the health burden of LBW, the inconsistency of the results of different studies about the risk factors of LBW, and the increasing importance of behavioral and socioeconomic risk factors neglected in the past, the present case-control study was designed to evaluate the role of behavioral and socioeconomic factors on neonatal birth weight.

Methods

The present case-control study was conducted on 300 neonates between May and October 2015 in Baft primary health care centers, Kerman, Iran. A total of 150 LBW babies, delivered between March 21, 2013 and March 21, 2014, were selected as cases. For each LBW neonate, a baby with normal weight (2500-4000 grams), born in the same geographic area with a minimum time difference of birth from that of the LBW neonate, was investigated as a control to reduce the confounding effect of location and time of birth. Stillborn babies, twin or multiple pregnancies, and neonates weighing more than 4000 grams were excluded.

Sample size was calculated through comparison of proportions formula, considering type I and type II errors as 0.05 and 0.2, respectively. According to the similar studies, the prevalence of risk factors in cases and in control groups was considered as 7.7% and 1.1%, respectively (16).

After obtaining the permission from the Ethics Committee of Kerman Medical University (Ethic code: IR.KMU.REC.1394.85), data was extracted from the prenatal care forms in primary health care centers in Baft, Kerman. The primary health care system has been implemented throughout Islamic Republic of Iran since 1979. Primary health care is delivered in Health Houses and Rural Health Centers in rural areas and urban Health Centers in urban areas. Data collection and report keeping is one of the major tasks of these centers (17).

The data collection form was prepared by the authors. Information including mother's age, gestational age, number of pregnancies, mother's height and weight, neonate sex, interval between pregnancies, medical history of mother before and during pregnancy (coronary disease, epilepsy, diabetes, hypertension, renal diseases, asthma, tuberculosis, thyroid disease,

hepatitis, coagulation disorders, thalassemia, and breast cancer), history of smoking and substance abuse by mother during pregnancy, weight gain during pregnancy, consumption of supplements during pregnancy, and having primary care in pregnancy period was extracted from the forms.

The data was analyzed using IBM SPSS 20.0 software (IBM SPSS Inc. Chicago, IL, USA). Independent samples t-test, Chi-square test, and Fisher's exact-test were used. The risk estimation was calculated for each qualitative independent variable. The significance level was set at 0.05.

Results

A total of 150 LBW and 150 normal weight neonates were selected in each group. In LBW group, 8 participants (5.3%) were very low birth weight (birth weight<1500 grams) and 1 participant (0.7%) was extremely very low birth weight (birth weight<1000 grams). There was a significant difference ($P<0.001$) in the birth weight of cases (mean±SD: 2142.2±318.7 gram) and control groups (mean±SD: 3157.0±344.7 gram).

The results provided in Table 1 show that there was a significant association between the number of primary care during pregnancy and having the LBW newborn ($P<0.001$). In

average, the height of mothers who had a LBW neonate was approximately 1 centimeter lower than that of mothers with normal birth weight newborns. The difference was found to be statistically significant between two groups ($P=0.048$). It was observed that preterm neonates were 36.5 times more likely to be low birthweight than were term babies. There was a significant association between mothers' age and having LBW babies ($P=0.04$). Mothers under 18 and above 35 years old had more LBW neonates compared with other participants. Lack of taking supplements during pregnancy by mothers had a causal role in having LBW neonates ($P=0.03$). The prevalence of inadequate weight gain during pregnancy and the interval less than 3 years between pregnancies was higher in case than in control groups. However, no significant association was found between these factors and LBW (Table 2). Table 3 shows that the prevalence of the history of substance abuse was significantly higher in cases than controls (OR=2.04; 95%CI: 1.81-2.29, $P=0.030$). The prevalence of the history of smoking in mothers with LBW neonates was higher than that in mothers with normal weight infants, but this difference was not observed to be significant ($P=1$).

Table 1. Comparison of maternal factors between case and control groups using student t-test

Variables	Case (Mean±SD)	Control (Mean±SD)	P	95% Confidence Interval
Gestational age (Week)	36.48±2.6	38.94±1.4	<0.001	-2.93, -1.98
Pregnancy number	2.05±1.2	2.08±1.3	0.81	-0.32, 0.24
Mother height (Centimeter)	157.07±5.7	158.43±5.9	0.048	-2.69, -0.01
Mother weight (Kg)	58.96±11.8	60.22±11.9	0.36	-3.98, 1.46
Number of primary care during pregnancy	3.63±1.5	4.74±1.5	<0.001	-1.45, -0.78

Table 2. Comparison of maternal and neonatal factors between case and control groups using chi-square test

Independent variable	Case Frequency(%)	Control Frequency(%)	P	Odds Ratio	95% Confidence Interval
Neonate sex					
Female	80(53.3)	67(44.7)	0.133	1.42	0.89, 2.23
Male	70(46.7)	83(55.3)	-	-	-
Preterm Birth					
Yes	75(50)	4(2.7)	<0.001	36.5	12.85, 103.64
No	75(50)	146(97.3)	-	-	-
Mother age					
Less than 18 and above 35 years old	30(20)	17(11.3)	0.039	1.95	1.02,3.72
18-35 years old	120(80)	133(88.7)	-	-	-
Interval between pregnancies					
Less than 3 years	18(12)	9(6)	0.069	2.13	0.92, 4.93
More than 3 years	132(88)	141(94)	-	-	-
Weight gain during pregnancy					
Inadequate	41(28.9)	37(25)	0.457	1.22	0.724, 2.05
Adequate	101(71.1)	111(75)	-	-	-
History of chronic disease					
Yes	23(15.3)	17(11.3)	0.308	1.41	0.72,2.78
No	127(84.7)	133(88.7)	-	-	-
Intake of supplements during pregnancy					
No	9(6)	2(1.3)	0.032	4.72	1.00, 22.24
Yes	141(94)	148(98.7)	-	-	-

Table 3. Comparison of behavioral risk factors between case and control groups using Fisher exact test

Independent variable	Case Frequency(%)	Control Frequency(%)	Chi-value	P
History of smoking				
Yes	1(99.3)	0(0.0)	1.00	1.00
No	149(0.7)	150(100)		
History of substance abuse				
Yes	6(4)	0(0.0)	6.12	0.030
No	144(96)	150(100)		

Discussion

The results of the present study showed that using primary health care services was higher in mothers with normal weight babies than that in mothers with LBW babies. In a study carried out in Iran by Lotf Abadi et al., it was demonstrated that a significant positive correlation exists between newborns' weight and the number of pregnancy cares (18). Another study conducted in the United States demonstrated that the probability of LBW was higher in mothers with inadequate care compared with that in mothers who had adequate care services (13). The average numbers of mother's prenatal care in both groups were lower than those of the standard value, which shows the deficiency in health care system and pregnant women's lack of

proper access to primary health care services. In another study conducted in Mashhad, it was shown that only half of the babies were delivered by midwives and midwives performed the care correctly for their recipients (20).

The result of the current study showed that short stature mothers are at greater risk for LBW than normal stature mothers. The results of Sutan et al. study is similar to those of our study (21). These findings suggests that governments should pay special attention to nutritional status of childhood and adolescent girls to have healthy mothers and babies in the future.

Preterm labor was a powerful risk factor for LBW confirming the results of a longitudinal trend analysis study conducted by Shan et al.,

(22). Two other case control studies demonstrated that preterm labor increases the risk of LBW (11, 21). Identifying the risk factors of preterm labor and modifying them to prevent preterm birth is an essential approach to prevent LBW.

The frequency of LBW was higher in less than 18 and above 35 pregnant women. Another case control study demonstrated that less than twenty year-old mothers are more likely to have LBW than mothers of other ages (23). A matched case control study showed that younger maternal age is significantly associated with LBW (21). Couples should be trained about the risky ages for pregnancy. Family health experts and midwives should emphasize on family planning programs for women younger than 20 year-old and older than 40 year-old (24). Mothers who did not consume supplements during pregnancy were more likely to have LBW neonates. Another randomized controlled trial study showed that antenatal iron and folic acid supplements are essential to reduce the risk of LBW (25). Intake of vitamins and iron should be increased during pregnancy (10); therefore, midwives and family physicians should encourage pregnant women to consume supplements in this period.

Mothers with LBW babies reported substance abuse more than mothers with normal weight babies; a relationship that is confirmed by other studies (26, 27). Women should be asked about addiction prior to pregnancy and during perinatal care. Continuing community-based and high-risk and adolescence because they are future mothers. Women in childbearing age should be screened and educated about risky behaviors. Pregnancy care and support should be delivered for all pregnant women according to the standard methods. Avoiding preterm birth is a critical point to reduce the risk of LBW in children.

group educational programs for childbearing aged women could also be effective.

There was no significant relationship between LBW and factors including neonatal sex, number of pregnancies, history of chronic disease during pregnancy, mothers weight, weight gain during pregnancy, and the interval between pregnancies. The results of a case-control study in Morocco was consistent with these findings (28), but the results of a cohort study and a study about the correlation between infantile birth weight and gestational weight gain showed inconsistent findings (7, 29). LBW has different risk factors and researchers can evaluate only limited number of factors in each study; therefore, the variety of factors in each study is a determinative factor for the final results. Also, in different socioeconomic and geographical conditions the risk factors of LBW may be different. A systematic review and meta-analysis of risk factors of LBW in developing countries is essential.

The present study enjoyed some advantages. The study was a case-control, so we should estimate the causal relationships. It was designed to evaluate the effects of prenatal care and risky behaviors on birth weight. Using secondary data was a limitation of the present study. Further studies with specific questionnaires to measure prenatal care and risky behaviors should be designed.

There are some interventions and strategies to limit the risk of LBW. The developing countries should pay more attention to the nutritional status of the girls during childhood

Conflict of interest

There is no conflict of interest for the authors in the current project.

Acknowledgement

The present article is based on the thesis by Rudabeh Esfandyarpour and was financially supported by Kerman University of Medical Sciences (Grant No. 94/81).

References

1. Ramakrishnan U. Nutrition and low birth weight: from research to practice. *Am J Clin Nutr.* 2004;79(1):17-21.
2. Chaman R, Amiri M, Raei M, Ajami ME, Sadeghian A, Khosravi A. Low birth weight and its related risk factors in northeast Iran. *Iran J Pediatr.* 2013;23(6):701-4.
3. Rondo PH, Ferreira RF, Nogueira F, Ribeiro MC, Lobert H, Artes R. Maternal psychological stress and distress as predictors of low birth weight, prematurity and intrauterine growth retardation. *Eur J Clin Nutr.* 2003;57(2):266-72.
4. Shan X, Chen F, Wang W, Zhao J, Teng Y, Wu M, et al. Secular trends of low birthweight and macrosomia and related maternal factors in Beijing, China: a longitudinal trend analysis. *BMC pregnancy and childbirth.* 2014;14(1):1.
5. Amin MV, Arbar AI. AN AYURVEDIC PERSPECTIVE OF LOW BIRTH WEIGHT—A CONCEPTUAL STUDY. *Journal of Ayurveda and Holistic Medicine (JAHM).* 2014;2(4):49-59.
6. Vazirinejad R, Masoodpour N, Puyanfar A. Survival rate of low and very low birth weight neonates in an Iranian community. *Iran J Public Health.* 2012;41(2):87-93.
7. Deshmukh JS, Motghare DD, Zodpey SP, Wadhwa SK. Low birth weight and associated maternal factors in an urban area. *Indian Pediatr.* 1998;35(1):33-6.
8. Rich-Edwards JW, Stampfer MJ, Manson JE, Rosner B, Hankinson SE, Colditz GA, et al. Birth weight and risk of cardiovascular disease in a cohort of women followed up since 1976. *BMJ.* 1997;315(7105):396-400.
9. Dabelea D, Pettitt DJ, Hanson RL, Imperatore G, Bennett PH, Knowler WC. Birth weight, type 2 diabetes, and insulin resistance in Pima Indian children and young adults. *Diabetes care.* 1999;22(6):944-50.
10. 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(1-2):51-8.
11. Bener A, Saleh NM, Salameh KM, Basha B, Joseph S, Al Buz R. Socio-demographic and consanguinity risk factors associated with low birthweight. *J Pak Med Assoc.* 2013;63(5):598-603.
12. de Bernabé JV, Soriano T, Albaladejo R, Juarranz M, Calle ME, Martínez D, Domínguez-Rojas V. Risk factors for low birth weight: a review. *Eur J Obstet Gynecol Reprod Biol.* 2004;116(1):3-15.
13. Shi L, Macinko J, Starfield B, Xu J, Regan J, Politzer R, Wulu J. Primary care, infant mortality, and low birth weight in the states of the USA. *J Epidemiol Community Health.* 2004;58(5):374-80.
14. Sen J, Roy A, Mondal N. Association of maternal nutritional status, body composition and socio-economic variables with low birth weight in India. *J Trop Pediatr.* 2010;56(4):254-9.
15. Jalil A, Zakar R, Zakar MZ. A Secondary Analysis of Maternal Factors Determining Low Birth Weight in Pakistan. *Iran J Public Health.* 2015;44(1):136.
16. Kramer MS. Determinants of low birth weight: methodological assessment and meta-analysis. *Bull World Health Organ.* 1987;65(5):663-737.
17. Mehryar A. Primary health care and the rural poor in the Islamic Republic of Iran. Asia and Pacific Population Studies Centre, Ministry of Science and Technology: Tehran. 2004.
18. Abadi MN, Ghazinour M, Nygren L, Nojomi M, Richter J. Birth weight, domestic violence, coping, social support, and mental health of young Iranian mothers in Tehran. *J Nerv Ment Dis.* 2013;201(7):602-8.
19. Shirvani N, Ashrafi A, Motlagh M. Evaluation of the function of referral system in family physician program in Northern provinces of Iran: 2008. *Journal of Babol University of Medical Sciences.* 2010;11(6):46-52.
20. Farokhi F, Khadivzadeh T. Quality assessment of midwives performance in prenatal cares in urban health centers in Mashhad, Iran. 2008.
21. Sutan R, Mohtar M, Mahat AN, Tamil AM. Determinant of Low Birth Weight Infants: A Matched Case Control Study. *Open Journal of Preventive Medicine.* 2014.
22. Shan X, Chen F, Wang W, Zhao J, Teng Y, Wu M, et al. Secular trends of low birthweight and macrosomia and related maternal factors in Beijing, China: a longitudinal trend analysis. *BMC Pregnancy Childbirth.* 2014;14(1):1.
23. Kumar SG, Kumar HH, Jayaram S, Kotian MS. Determinants of low birth weight: a case control study in a district hospital in Karnataka. *Indian J Pediatr.* 2010;77(1):87-9.
24. Lasker JN, Coyle B, Li K, Ortynsky M. Assessment of risk factors for low birth weight deliveries. *Health Care Women Int.* 2005;26(3):262-80.
25. Christian P, Khatry SK, Katz J, Pradhan EK, LeClerq SC, Shrestha SR, et al. Effects of alternative maternal micronutrient supplements on low birth weight in rural Nepal: double blind randomised community trial. *BMJ.* 2003;326(7389):571.
26. Derakhshan R, Roodpeyma S, Balaei P, Bakhshi H. A Case-Control Study on Perinatal Outcomes of Opium-Addicted Pregnant Women and Their Offsprings in Rafsanjan, Iran. 2014;5(1).

27. Gargari SS, Fallahian M, Haghghi L, Hosseinezhad-Yazdi M, Dashti E, Dolan K. Maternal and neonatal complications of substance abuse in Iranian pregnant women. *Acta Med Iran.* 2012;50(6):411-6.
28. Noureddine E, Abdellatif B. Prevalence and determinants of low birth weight: a case-control study in marrakesh (morocco). *Iran J Public Health.* 2015;44(3):422-4.
29. Shrestha I, Sunuwar L, Bhandary S, Sharma P. Correlation between gestational weight gain and birth weight of the infants. *Nepal Med Coll J.* 2010;12(2):106-9.