Maternal Factors Associated with Low Birth Weight in Kashmar, Iran

Elham Manouchehri (MSc)[1], Tahereh Fathi Najafi (PhD)[2], Ali Vafaee najar (PhD)[3], Somayeh Alirezaei (MSc)[4], Mandana Molkizadeh (MSc)[5*], Mona Larki (MSc)[4]

[1] Lecturer, Department of midwifery, Mashhad Branch, Islamic Azad University, Mashhad, Iran
[2] Assistant Professor, Department of Midwifery, Medical University, Mashhad Branch, Islamic Azad University, Mashhad, Iran
[3] Professor, Social Determinants of Health Research Center, Mashhad University of Medical Sciences, Mashhad, Iran
[4] PhD Student in Reproductive Health, Student Research Committee, Mashhad University of Medical Sciences, Mashhad, Iran
[5] Graduated, Kashmar health and treatment center, Department of family health, Mashhad University of medical science, Kashmar, Iran

ARTICLE INFO	ABSTRACT
Article type: Original article	***Background & aim:*** Low birth weight is one of the most important reasons for neonatal mortality. Increased rate of low birth weight over the past five years in Kashmar has highlighted the importance of controlling and preventing this condition to reduce its incidence. This study was conducted to measure the frequency of some maternal factors affecting the incidence of neonatal low birth weight.
	Methods: This cross-sectional study was carried out on all mothers who gave birth to neonates weighing less than 2,500g from 2015 to 2016 in Kashmar (n=327). To collect the data a self-structured and valid and reliable questionnaire using closed-ended interview questions was employed. The collected data were analyzed in SPSS software (version 11) using descriptive and analytical statistics.
	Results: Based on the results, neonatal weight had a relationship with maternal factors including history of hypertension, preeclampsia, infertility, the use of assisted reproductive techniques, and self-medication (P<0.05). Moreover, the family income had a significant relationship with neonatal weight gain (P=0.01).
	Conclusion: It is recommended to adopt some measures to reduce the rate of low-birth-weight. Among such measures paying attention to the lower-income groups, providing pregnancy care packages, maternal training for not self-medicating, and devoting more concern to disease preventive behaviors, such as proper control of blood pressure during pregnancy is suggested.

Introduction

One of the most important neonatal problems at birth is the low birth weight (1). According to the World Health Organization (WHO), a low birth weight baby is defined as a baby who is born with less than 2,500 g (2). Due to their low birth weight, such newborns confront various problems, suffer from irreversible damages, and imposes additional expenditure on families and society (3).

The 40-fold higher mortality rate of such neonates compared to their counterparts with optimal weight emphasizes the importance of the risk (3). According to the reports provided by the United Nations Children's Fund, the prevalence of low birth weight neonates was about 15-20% in 2015, among which almost 95% of these cases were born in developing countries (4, 5). Due to the importance of neonatal health, this organization is planning to implement measures resulting in a 30% reduction of this global problem by 2025 (4). To this end, health authorities have considered a 3.9% annual decrease in its prevalence rate (5). The prevalence of low birth weight neonates has been reported to be 10% in the central and 11.8% in the southeastern parts of Iran (3). Therefore, the most important method that can be adopted to achieve the ultimate goal of the

* *Corresponding author:* Mandana Molkizadeh, Kashmar health and treatment center, Department of family health, Mashhad University of medical science, Kashmar, Iran. Tel: 00989163519526; Email: molkizadehm1@mums.ac.ir

WHO is to investigate the risk factors in different parts of Iran.

Birth weight is influenced by various factors, among which maternal, fetal, and placental factors are identified as the most important causes (6). Large body research has been conducted worldwide to identify the causes of low birth weight incidence. However, owing to the multiplicity of risk factors, some researchers have been inclined to perform systematic review studies to identify more comprehensive and general causes. According to the results of a systematic review conducted in Canada, the neonatal mortality rate was obtained as 5.8% in that country. It also revealed that the most important cause of this incidence was attributed to the physical and sexual abuse of mothers during pregnancy (7).

A systematic review conducted in Iran showed that maternal factors in pregnancy and neonatal factors are the most significant factors resulting in low birth weight (8). Various studies have been conducted in different regions of Iran, such as in central, southeastern, and western regions, to examine the risk factors for low birth weight. Most studies have investigated the prevalence and some risk factors; however, to the best of our knowledge, no study has been dedicated to examine the familial factors along with the maternal and infant ones. On the other hand, since the low birth weight rate in Kashmar, Razavi Khorasan Province, Iran, was observing an increasing trend from 6.48-8.08 within 2009-2017, the local health officials decided to carry out a study to investigate the maternal causes of low birth weight. Therefore, they could study the risk factors of low birth weight among women living in Kashmar (southeast of Mashhad) with a more comprehensive view. Moreover, the adoption of such a measure would make it possible to align the preventive factors of reducing underweight prevalence with the defined goals of the WHO to achieve the objectives of health programs in Iran. Furthermore, they could take steps to reduce the annual prevalence of low birth weight by 3.9%.

Materials and Methods

This cross-sectional study (n=327) was conducted on mothers who were residents of Kashmar and gave birth to neonates weighing less than 2,500 g. The exclusion criteria were being non-native and delivering multiple births. To gather the necessary data, the subjects completed a researcher-made questionnaire and participated in a face-to-face interview within 2015-2016 (based on the census). However, 7 questionnaires were removed due to their incomplete and distorted information; therefore, the analysis was performed on 320 questionnaires.

The data collection tool in this research was a researcher-made questionnaire, which was designed by reviewing reference texts and books. The questionnaire consisted of two parts, namely demographic information (15 items) and midwifery information (17 items). The demographic part consisted of such information as age, occupation, and place of residence, and the midwifery section consisted of such data as the number of pregnancies, gaining weight in pregnancy, and current pregnancy problems. In order to increase the content validity of the questionnaire, the opinions of ten professors and experts were used to conduct a more comprehensive review.

To evaluate the reliability of the questionnaire, it was distributed among 30 subjects of the study population and a Cronbach's alpha coefficient of 0.87 was obtained for the whole questionnaire. The required data were collected through interviewing and completing the questionnaire. Therefore, expert nurses conducted face-to-face interviews with each of the eligible mothers. The gathered data were analyzed in SPSS software (version 11) using descriptive statistics, including frequency and percentage tables, to describe the characteristics of the research units and examine the maternal and paternal factors, and Chi-square test to compare the low-birth-weight groups. A p-value of less than 0.05 was considered significant.

The present study was conducted due to the necessity assessment based on the Vital Horoscope system available in the health center of Kashmar. Furthermore, the official permission to perform the study was obtained from the Health Deputy of the Public Health Department in Kashmar. The subjects were explained about the research process prior to the interview, and after their consent and

approval were obtained, they were interviewed at the health center. The subjects were informed of the confidentiality of their personal information.

Results

The results of this study were indicative of 320 low birth weight occurrences in 15 investigated centers within the study period. Among this population, 168 and 152 cases were female and male, respectively. These subjects weighed 600-2,490 g with a mean score of 2,051.82±411.65 g (Table 1).

Table 1. Descriptive of the low birth weight categories

Low birth weight	Number (%)	Mean ± SD
Birth weight between 1500-2500gr (LBW)	289 (90.3%)	2163.799 ± 240.73
Birth weight between 1000-1500 gr (VLBW)	18 (5.6%)	1319.16 ± 126.69
Birth weight < 1000gr (ELBW)	13 (4.1%)	731.00 ± 75.00
Total	320 (100%)	2051.82 ± 411.65

It was also revealed that 70% of these newborns were preterm, while the rest were term neonates. The gestational ages ranged from 23-41 weeks with a mean of 35.55±2.95 weeks.

Table 2. Socio-demographic information of mothers

Variables	Paternal	Maternal	P value
Age			
>18 years	1(0.3%)	11(3.4%)	
35-18 years	254(79.4%)	267(83.4%)	0.31
>35 years	65(20.3%)	42(13.1%)	
Occupation			
Worker	104(32.5%)	1(0.3%)	
Employee	41(2.8%)	18(5.6%)	
Housewife	-	287(89.7%)	0.60
Self-employed	111(34.7%)	-	
Other	64(20%)	4(4.4%)	
Education			
Illiterate	13(4.1%)	6(1.9%)	
Primary school	68(21.3%)	70(21.9%)	
Middle school	96(30%)	71(22.2%)	0.47
High school	107(33.4%)	124(38.8%)	
Academic	36(11.3%)	49(15.3%)	
Body Mass Index			
Slim	48(15%)	52(16.3%)	
Normal	160(50%)	217(67.8%)	0.12
Overweight	68(21.3%)	33(10.3%)	
Obese	44(13.8%)	18(5.6%)	
Family income			
Low	49(15.3%)		
Sufficient	269(84.1%)		0.01
High	2(0.6%)		
Family form			
Nuclear	307(95.5%)		0.66
Extended	13(4.1%)		
Weight gain			
Ideal	219(68.4%)		
Excess	91(28.4%)		0.10
Unknown	10(3.2%)		

Table 2 tabulates some demographic characteristics of participated mothers. Accordingly, consanguineous marriage was found among 24.4% of mothers. All mothers received prenatal care, most cases (64.4%) were primiparous women, and 13.1% of the subjects were shorter than 150 cm. Among the participants, 15.6%, 18.8%, and 8.1% had diabetes, anemia, and a history of thyroid problems, respectively. Other maternal variables and their comparison in the three groups of low birth weight classification are summarized in Table 3.

Table 3. Maternal-fetal risk factors for low birth weight descriptives by low birth weight classification

Maternal conditions	LBW	VLBW	ELBW	Total	P value
	Number (percent)				
Maternal smoking	4(1.4%)	1(5.6%)	5(1.6%)	10(8.6%)	0.35
History of gestational hypertension	25(8.8%)	5(27.8%)	0	30(36.6%)	0.01
History of pre-eclampsia in pregnancy	18(6.4%)	6(33.3%)	0	24(39.7%)	0.00
History of gestational diabetes	42(14.8%)	4(22.2%)	0	46(37%)	0.21
History of pregnancy anemia	52(18.4%)	4(22.2%)	0	56(40.6%)	0.21
Self-medication during pregnancy	13(4.6%)	3(16.7%)	3(23.1%)	19(44.4%)	0.00
History of bleeding in pregnancy	14(4.9%)	3(16.7%)	4(30.8%)	21(52.4%)	0.00
Use of assisted reproductive techniques	10(3.5%)	3(16.7%)	3(23.1%)	16(43.3%)	0.00
History of infertility	5(1.7%)	2(11.1%)	0	7(12.8%)	0.02
Symptomatic infection of the vagina and vulva	14(4.8%)	2(11.1%)	1(7.7%)	17(23.6%)	0.47
Gum and tooth infection	7(2.4%)	1(5.6%)	0	8(8%)	0.59
Sexually transmitted diseases	5(1.7%)	0	1(7.7%)	6(9.4%)	0.25
Oligohydramnios	5(1.8%)	2(11.1%)	0	7(12.9%)	0.02
Polyhydramnios	13(4.5%)	0	1(7.7%)	14(12.2%)	0.55
Ultrasound report of fetal growth restriction or distress	21(7.3%)	1(5.6%)	0	22(12.9%)	0.58
Doppler ultrasound of abnormal placental vascular	10(3.5%)	1(5.6%)	0	11(9.1%)	0.70
Placental abruption	4(104%)	0	0	4(1.4%)	0.80
Placenta previa	6(2.1%)	1(5.6%)	1(7.7%)	8(15.4%)	0.31
Rh isoimmunization	26(9%)	2(11.1%)	0	28(20.1%)	0.49
Non-vertex fetal presentation	32(11.1%)	0	0	32(11.1%)	0.14
Rupture of the membranes and sexual intercourse	82(28.4%)	3(16.7%)	4(3.8%)	89(27.8%)	0.54
History of abdominal trauma	4(1.4%)	0	0	4(1.4%)	0.80

The mothers' medical records showed that anemia and urinary tract infections had the highest frequency, while the cardiovascular disease was the least frequent illness. Moreover, the prevalence of mental disorders was estimated at 5.6% among mothers. The results of mothers' current pregnancies indicated that the most common complication of low birth weight neonates was related to premature rupture of fetal membranes, rendering for 27.8% of cases. However, placental abruption and abdominal trauma were the lowest complications.

The paternal demographic information was obtained as follows: 1) 79.4%, 13.1%, and 3.0% aged 18-35, over 35, and under 18 years, respectively, 2) 32.5%, 12.8%, 34.7%, and 20% were workers, employees, self-employed, and in other occupations, respectively, 3) 4.1% and 11.3% were illiterate and had a university education, respectively, 4) 12.5% smoked, 5) more than 65% and less than 5.6% had a normal body mass index and were obese, respectively, and 6) and 3.1% had a mental disorder.

Based on the results, among demographic and social factors, only household income affected the fetus underweight (Table 2). It was also revealed that the three groups were distinct regarding the history of hypertension, pre-eclampsia, drug use during pregnancy, bleeding, use of assisted reproductive technology, and oligohydramnios (Table 3).

Discussion

This cross-sectional study aimed to investigate the frequency of some maternal and paternal variables affecting low birth weight in Kashmar, Razavi Khorasan Province, Iran. The findings of numerous studies conducted on various factors influencing low birth weight showed that the family's low socioeconomic status had the most important role in this regard. Rodri´guez et al. (1998) performed a case-control study on 240 cases and 374 control mothers and reported that low literacy and economic status, smoking, and maternal body mass index were influential in low birth weight (9). In the present study, it was found that among the various demographic factors, such as age, occupation, education level, and household income, the household income status was the most frequent factor causing low weight birth.

The results of another study conducted by Islam in Oman (2015) indicated that maternal low socioeconomic status was associated with an increase in low birth weight incidence (10). Moreover, it was reported that maternal job and age were ineffective in birth weight, which was consistent with the results of the current study (10). The results of a systematic review and meta-analysis carried out by Daliri et al. (2015) showed that maternal body mass index and weight gain during pregnancy had no effect on birth weight and only a history of previous low birth weight could affect the incidence of low birth weight in the next pregnancy. It should be noted that Daliri et al. conducted this meta-analysis on Iranian studies and a population of about 40,056 cases (8).

In some studies, maternal diet and her weight gain during pregnancy have been identified factors affecting the birth weight; however, in the present study, maternal weight gain during pregnancy did not affect the birth weight. Agbozo et al. reported that the type of diet and supplements in pregnant women were not influential on infant weight (11). The other demographic factor was the maternal age during pregnancy, which was obtained at a range of 18-35 years as the highest frequency in the present study. Based on the findings of a research performed by Rahman et al. in Bangladeshi women, maternal age was an independent factor from gaining weight influencing neonatal birth;

nevertheless, mothers at an early age were reported to be exceptions (17). Singh et al. showed in their cohort study that maternal age had no effect on neonatal low birth weight (18).

A history of the development of various diseases during pregnancy can also be considered an affecting factor on birth weight. In a retrospective study in 2009, Cederbaum et al. found that the most important factor for low birth weight incidence among adult women living in California was a history of internal disease and poor management of the disease during pregnancy (12). The present study also showed that the occurrence of low and very low birth weight was observed more frequently in case of pregnancy hypertension and maternal pre-eclampsia, diabetes, and anemia, compared to other cases.

Chronic diseases, most importantly high blood pressure, are the most important diseases affecting the weight of the baby (13). Kildea et al. reported that pre-eclampsia and hypertension were among the most important diseases affecting Australian women's underweight (14). The results of a study performed by Daza et al. (2009) in Colombia indicated that urinary tract infections and high blood pressure during pregnancy, along with low socioeconomic factors, contributed to low birth weight (15). The findings of a research conducted by Panaretto on non-Australian immigrant women were indicative of the influential role of gestational hypertension leading to low birth weight (16).

According to the results of meta-analysis research carried out by Figueiredo et al. (2018), maternal anemia was a risk factor for low birth weight. One of the most common complications of mothers during their current pregnancy was an increase in premature rupture of membranes and sexual activity in the third trimester (19). Gałązka et al. indicated that the couple's sexual intercourse was minimized due to the changes in the last trimester of pregnancy and fear of rupture of the bladder prevented proper sexual activity in pregnancy. Nevertheless, there is no evidence confirming that sexual contact in the last trimester could cause premature rupture of membranes (20).

One of the strengths of the present study was the large size of the participating population.

Furthermore, in this study face-to-face interviews were carried out to collect accurate data, although this method is considered time-consuming. However, the limitations of the study included failure to review the medical records of individuals and non-confirmation of expressed diseases by clinical examinations.

Conclusion

Among the various possible factors leading to the incidence of low birth weight in the study domain, the most important paternal cause was the economic conditions of the family. It was also revealed that the development of such diseases as pre-eclampsia, high blood pressure, and medication use during pregnancy was the most influential maternal factor in this regard. Therefore, it is recommended to pay attention to the lower-income groups, prevention and management of blood pressure and pre-eclampsia in pregnancy, and the necessity of training for self-medication to reduce the chances of low birth weight incidence in the study domain.

In order to reduce the number of Iranian low birth weight neonates and reach the figures determined by the World Health Organization by 2025, it is suggested to consider the results of this study and apply them use in health centers to improve neonatal health.

Acknowledgements

The authors would like to express their gratitude and appreciation to the Deputy Minister of Health of Kashmar, Dr. Mojtaba Ghaemi, and all participants who cooperated in this study.

Conflicts of interest

Authors declared no conflicts of interest.

References

1- Plianbangchang S, Horton R, Momen H, Sanders D, Baum F and et all. WHO South-East Asia Journal of Public Health. 2012. Available at: apps.who.int/ iris/ bitstream/1 0665/ 206122 /1/B4854.pdf

2- Clare LC, Eve M L, Tamala MM, Bardaj A, Chandrasekaran R and et all. Low birth weight: Case definition & guidelines for data collection, analysis, and presentation of maternal immunization safety data. Vaccine. 2017; 35(48): 6492–6500.

3- Roudbari M, Yaghmaei M, Soheili M. Prevalence and risk factors of low-birth-weight infants in Zahedan, Islamic Republic of Iran. Eastern Mediterranean Health Journal. 2007; 13(4): 838-45.

4- World Health Organization. Global Nutrition Targets 2025: Low birth weight policy brief. 2014 . Available at: apps.who.int.

5- Golestan M, Akhavan Karbasi S, Fallah R. Prevalence and risk factors for low birth weight in Yazd, Iran. Singapore medical journal .2011; 52(10): 730-3.

6- de Bernabe JV, Soriano T, Albaladejo R, Juarranz M, Calle ME and et all. Risk factors for low birth weight: a review. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2004; 116(1): 3-15.

7- Murphy CC, Schei B, Myhr TL, Du Mont J. Abuse: a risk factor for low birth weight? A systematic review and meta-analysis. Canadian Medical Association Journal. 2001; 164(11): 1567-72.

8- Daliri S, Karimi A, Sayehmiri K, Bazyar J, Sayehmiri F. Relationship between some maternal and neonatal factors during previous pregnancies and low birth weight in Iran: A Systematic Review and Meta- analysis. Iranina Journal of Obstetrics Gynecology and Infertility. 2016; 19(31): 23-32.

9- Delgado-Rodríguez M, Pérez-Iglesias R, Gómez-Olmedo M, Bueno-Cavanillas A, Gálvez-Vargas R. Risk Factors for Low Birth Weight: results from a Case-Control study in Southern Spain. American Journal of Physical Anthropology. 1998; 105(4): 419-24.

10- Islam MM, ElSayed MK. Pattern and determinants of birth weight in Oman. public health. 2015; 129(12): 1618-26.

11- Agbozo F, Abubakari A, Der J, Jahn A. Prevalence of low birth weight, macrosomia and stillbirth and their relationship to associated maternal risk factors in Hohoe Municipality, Ghana. Midwifery Journal. 2016; 40: 200-6.

12- Cederbaum J, Hornstein E, Gilbert K, Needel B. Infant birth weight and maltreatment of adolescent mothers. American Journal of Preventive Medicine .2013; 45(2): 197–201.

13- Valero De Bernabé J, Soriano T, Albaladejo R, Juarranz M, Calle ME and et all. Risk factors for low birth weight: a review. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2004; 116(1): 3-15.

14- Kildea SV, Gao Y, Rolfe M, Boyle J, Tracy S and et all. Risk factors for preterm, low birthweight and small for gestational age births among Aboriginal women from remote communities in Northern Australia. Women and Birth. 2017; 30(5): 398-405.

15- Daza, V ,Jurado W, Duarte D, Gich I, Sierra-Torres and et all. Low birth weight: Exploring of some risk factors at the San José teaching hospital in

.

Popayán, Colombia. Revista Colombiana de Obstetriciay Ginecologia. 2009; 60(2): 124-134.

16- Panaretto K, Lee H, Mitchell M, Larkins S, Manessis V and et all. Risk factors for preterm, low birth weight and small for gestational age birth in urban Aboriginal and Torres Strait Islander women in Townsville. Australian and New Zealand Journal of Public Health. 2006; 30(2): 163-70.

17- Rahman ML, Kile ML, Rodrigues EG, Valeri L, Raj A, Mazumdar M, Mostofa G, Quamruzzaman Q, Rahman M, Hauser R, Baccarelli A. Prenatal arsenic exposure, child marriage, and pregnancy weight gain: Associations with preterm birth in

Bangladesh. Environment international. 2018; 112: 23-32.

18- Singh G, Chouhan R, Sidhu K. Maternal factors for low birth weight babies. Medical Journal Armed Forces India. 2009; 65(1): 10-2.

19- Figueiredo AC, Gomes-Filho I S, Silva RB, Pereira PP, Da Mata FA, Lyrio A O, et all. Maternal anemia and low birth weight: a systematic review and meta-analysis. Nutrients.2018; 10(5): 601.

20- Gałązka I, Drosdzol-Cop A, Naworska B, Czajkowska M, Skrzypulec-Plinta V. Changes in the sexual function during pregnancy. The journal of sexual medicine. 2015; 12(2): 445-54.