Determinants of Low Birth Weight in Rural Areas of North West in Iran: 2013-2017 (A Case-Control Study)

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Abstract

Background Low birth weight (LBW) is one of the main causes of death in children and is an important factor related to the growth and development of children. LBW is associated with causes but some of the risk factors may be due to the country or geographical region. Aim of this study was conducted to investigate the risk factors associated with LBW in the villages of Oskou county, northwest of Iran. Methods This study is a population-based case-control study and all the cases of LBW, that have occurred during the five years 2013-2017 in all villages of Oskou county, East Azerbaijan Province, Iran. Controls were selevted based on systematic random sampling in that same village and year. Chi-square and fisher's exact test analysed and then a univariate and multivariate logistic regression model was used to investigate possible factors. Results In this study 242 cases and 242 control groups were analyzed. Base on multivariate logistic regression important risk factors were LBW history (OR=25.87), mothers who used natural methods of contraception (OR=29.54), twin's birth (OR=24.04) and gestational age less than 37 weeks (OR=3.89). Conclusion According to the result of the present study the most important risk factors of LBW are as follows: Contraception method using, having a history of previous LBW newborn, twin's birth, gestational age, fathers' occupation, mothers' education, maternal weight, maternal weight gain during pregnancy and number of of caring during pregnancy.

Background

Low birth weight (LBW) is defined by the World Health Organization (WHO), as a birth weight of an infant of 2500 g or less [1-4]. Since LBW increases the probability of mortality, it is considered an important health issue in the world's developing countries [1]. LBW is one of the main causes of death in children and is an important factor related to the growth and development of children [5, 6]. LBW is the result of premature birth, intrauterine growth restriction and is the most dangerous cause of fetus, infant, and even children [7]. Also, it is related to health problems in childhood such as neurological disorders and low-level cognitive skills [8]. There are many pieces of evidence attesting to the relationship [between low birth weight with a health problem at the birth time and even one year after the birth [9]. Also, LBW is an important indicator of the health of fertility and general health status of the population [10]. Each year almost 15% of newborn all over the world have LBW, and more than 95% of them are born in developing countries, with 72% of it being in Asia [10-12]. According to the report of WHO, in the year 2008, LBW prevalence had a range of 7% in high-income countries to 22% in countries with low income [10]. Almost 11.6% of newborns in the U.S.A are born premature and 8% of them have LBW [10]. Also, almost 17% of newborns in Eastern Mediterranean Region (EMRO) and 7% of them In Islamic Republic of Iran have LBW [10]. Since children are the most vulnerable group of the society and form an important part of population in developing countries, the quality of their growth is of special importance therefore the best and most suitable method for analysis of the health of children is the measurement of indicators of physical growth [4]. LBW is an important health indicator for each country, since it is one of the important factors for the growth and development and even survival of newborns and infants [4]. LBW is associated with causes such as: pregnancy after a short interval, Weight and height of mother, lack of

cares during pregnancy, medicines, side effects of abortion, genetic factors, relaxation, conditions of fighting stress [1, 2], pregnancy In low or higher ages, low age while marriage, weight before pregnancy [11], different diseases such as: Hypertension during pregnancy, thyroid diseases, tooth and mouth diseases of mother, history of bleeding in pregnancy [6], smoking [7], lower socio-economic status and lack of enough income [8], Iron deficiency anemia [13] and malnutrition [14]. But some of the risk factors may be due to the country or geographical region, therefore studies conducted in certain regions may be indicative of risk factors related to those regions [11]. Regarding this issue and considering the fact that few regional studies in the northwestern part of Iran about the risk factors affecting LBW, this study was conducted to investigate the risk factors associated with LBW in the villages of Oskou county, northwest of Iran.

Methods

This study is a population-based case-control study and all the cases of LBW, that have occurred during the five years 2012-2016 in all the villages of Oskou county have been included in case study group. Oskou is a city in the capital of Oskou County, East Azerbaijan Province, Iran. This city's distance from Tabriz is 20 Km (Figure 1). The city has 40 villages with a population of 41370 according to the census of 2017. The crude birth rate (CBR) in the total of these villages in the year 2017 is 17.76 per thousand person.

The cases are comprised of newborns with weights lower that 2500 grams, and controls were comprised of infants born with weights equal to 2500 grams or more, in that same village and year. In order to choose the controls sampling frame was obtained from all the infants who met the criteria to be included in the control group and after that based on systematic random sampling control groups were included in the study. Inclusion criterias in the study were lack of a folder for the family in the health house due to lack of certain documents or any other reasons. While filling any questionnaire, in case the related folder did not exist in a health house, the folder number of the next family was chosen and its data was collected.

The data of the study were collected through a questionnaire with 25 questions based on the folders of each infant and with the help of three expert people working in health centers who were accustomed with such matters. These data were comprised of following factors: factors related to the newborns, factors related to the pregnancy and delivery of the mother, and other factors related to parents.

Two approaches were used to study the factors affecting LBW. First, the relationship between the qualitative probabilistic factor and the outcome was studied using Chi-square statistical analysis or Fisher's exact test. Then a logistic regression model was used to investigate possible factors. At this part, all independent variables were analyzed using Univariate analysis and then the variable that had P-value of lower than 0.2 were put into multivariate logistic regression model. All analysis of the studied relationships was performed with a 95% confidence Interval, and therefore all P-values less than 0.05

represent a statistically significant relationship between the two independent and dependent variables. All statistical analyzes were performed using Stata 12 and SPSS 20 software.

Results

In this study 242 cases and 242 control groups were analyzed. 45% of cases and 48.8 % of the control group were males (P=0.46). The mean birth weight in cases at the time of birth was, was 2053.37±33 grams in cases and 3224.75±41 in controls. The mean height of newborns at the time of birth in cases was 44.49±3.5 cm and 49.25± 2.45 cm in control group (P=0.000). The mean age of mothers of newborns in cases was 26.43±6.2 and 26.04±6.2 in control group (P=0.48). The mean weight of mothers at the time of delivery in cases was 64.81±12.35 and in control group 67.26±10.45 Kg (P=0.019). Mothers of any of the cases and controls have no history of smoking.

Using contraceptive pills was the most prevalent reliable method of contraception in mothers of neonates in cases (13.6%) and controls (19.8%). The percentage of natural methods users in mothers of neonates in cases was 14.9% and in controls it was 1.7%. (Table 1).

According to the unadjusted univariate analysis, considerable causes related with LBW were as follows:

Maternal low weight before pregnancy, gestational age less than 37 weeks, low maternal weigt gain, long gestational interval, twin's birth, lower caring of mother at the time of pregnancy, using pills and IUD as a method of contraception in mothers, maternal education is more than 12 years, abortion history, having LBW newborn history, non familial marriage, employee being the father of the newborn.

According to the results of adjusted multi-variate analysis the risk factor related to LBW after adjusting the effects of different variables on each other, were as follows: maternal low weight before pregnancy, gestational age less than 37 weeks, low maternal weigt gain twin's birth, lower caring of mother at the time of pregnancy, using condoms as a reliable method of contraception, and natural method of contraception in mothers, maternal education is more than 12 years, having LBW newborn history, worker being the father of the newborn.

The chance of a newborn being with LBW from mothers who have a history of LBW newborn is more than 25 times that of mothers who did not have a history of LBW newborn in previous pregnancy(OR=25.87). The chance of a newborn being with LBW in mothers who used natural methods of contraception was 29 times more than those who used no method(OR=29.54). Also, the chance of a newborn being with LBW was 24 times more in mothers who had twin's birth, compared to those who had not (OR=24.04). Others important risk factors for birth of newborns with LBW were gestational age less than 37 weeks (OR=3.89), using oral pills (OR=2.22) and condoms as a contraception method (OR 2.62) and worker being the father of the newborn (OR=2.22), (Table number 2). Also, the variable of maternal education is less than 12 years (OR=0.95), the heavy weight of mother at the time of delivery (OR=0.95), increase in weight of mother at the tie of pregnancy (OR=0.92) and more pregnancy period cares were considered as protective variables (Table 2).

Discussion

The odds of death in newborns with LBW is 20 times more than newborns with weight more than 2500 grams. Incidence of LBW in developing countries[4] and in rural regions and underprivileged areas[15] is more than developed countries and urban areas. Some studies have shown the effects of risk factors on LBW are different in rural and urban areas [6, 11]. This study was implemented with the purpose of determining the risk factors that have an effect on LBW of newborns at the time of birth in Oskou between 2011 and 2016.

The results of current study indicate that the most important moderated risk factors relating to LBW are respectively as follows: natural methods of contraception, having history of giving LBW newborn, twin's birth, gestational age less than 37 weeks, using condom as method of contraception, worker father in contrast to farmer and rancher.

Contraception methods are categorized as certain and uncertain. The natural method is an uncertain method. Since mothers who use natural method of contraception get pregnant unwantedly[16] due to lack of preparedness for spiritual and physical hardships of pregnancy[17, 18], not paying attention to proper interval between pregnancies, lack of any attendance to health cares provider centers or health house to receive pregnancy carings and therefore lack of any consumption of necessary multivitamins and supplements like folic acid, face a newborn with LBW at the time of birth[19, 20]. Also, spouses of women who used condoms as a contraception method, due to the high frequency of the possible failures of this method compared to other certain methods such as IUD and oral pills, experienced more unintended pregnancies [21]. As previously mentioned in unintended pregnancies the chances for a newborn with LBW are high.

Having a previous history of LBW newborn was a strong risk factor for having newborn with LBW in this study, so much so that moderated chance of having a newborn with LBW in mothers with a history of LBW, was 25 times more than the ones who had no newborn with LBW. These results are completely conformed to studies conducted in other cities of Iran such as Tehran and Zahedan [22, 23].

The chances for the newborn to be LBW from mothers who had twins' birth, were 20 times more than the mothers who gave birth to one child. In the same vein in other country scale and international studies, the relation between giving birth to multiple newborn and LBW and VLBW is well documented[22, 24]. Also studies have shown chances of giving twins' birth in mothers with lower age are higher compared to the older ones [25]. Also different studies have shown gestational age of lower than 37 weeks (due to lack of fetus's growth) is a riskfactor for LBW, it also increases the probability of mortality of newborns[26-30].

Different studies have shown lower socio-economic status and socio-economic underprivileged are important risk factors for LBW[8, 9, 31-33]. The present study also showed the work status of father as a worker to be a risk factor compared to being a rancher or farmer. In this study in the village the welfare state of farmers and ranchers were much better than those families with worker father.

In the present study, the mean maternal weight of mothers with LBW newborn is significantly lower than the mothers without LBW newborn. So that each kilogram of maternal birth weight reduces the chance of LBW newborn by about 5%. In other words each 10 Kg of mothers' weight reduces the chance of LBW newborn by 40 percent. Also, the increase in each kg of maternal weight during pregnancy, regardless of other factors, reduces the chance of having LBW newborn by about 8%.

The chances of a newborn being born with LBW, regardless of other factors, decreases with increasing maternal care during pregnancy. Often those mothers with more number of care during pregnancy, have a higher socio-economic level and are more concerned about their own health and the fetus and may also have a healthier lifestyle than mothers who are not cared for or have fewer care during pregnancy.

Abbreviations

LBW: Low Birth Weight

EMRO: Eastern Mediterranean Region

CBR: Crude Birth Rate

IUD: Intrauterine Device

VLBW: Very Low Birth Weight

Declarations

Ethics approval and consent to participate

This research was reviewed and approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences.

Consent for publication

N/A.

Availability of data and materials

The datasets used during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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No fund was received for this research.

Authors' contributions

Concept and designed the study: HR, SRHA, AS, and, SC. Collection of data: HR, AS, and AZ. Analysis and interpretation of data: HR, AZ, and HS. Wrote the manuscript: HR, SRHA, and SC. Revision of the paper: HR, and AZ. All authors reviewed and approved the paper.

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Tables

Table1. The mean (SD) of probabilistic risk factors for low birth weight in cases and controls

	Groups		
	Case (n=242) Mean±SD	Control (n=242) Mean±SD	P-Value
Birth weight	2053.37±33	3244.75±41	
Birth height	44.49±3.5	49.25±2.45	0.001*
Maternal age	26.43±6.2	26.04±6.2	0.489
Maternal weight (at time of delivery)	64.81±12.35	67.26±10.45	0.019*
Maternal height	156.85±6.3	156.9±8.6	0.928
Gestational age	36.55±3.18	38.53±2.11	0.001*
Weight gain	8.9±3.42	10.07±3.54	0.021*
Gestational interval	3.08±4.1	3.9±4.2	0.001*
Birth order	1.65±0.64	1.76±0.91	0.039*
Number of births per delivery	1.18±0.38	1.02±0.14	0.001*
Number of care (during pregnancy period)	6.73±4.35	8±3.78	0.001*
Number of family member	3.4±1.26	3.56±1.15	0.001*

*Statistical significant in $\alpha<0.05$, SD: Standard deviation

Table2. Frequency (%) of probabilistic risk factors for low birth weight in cases and controls

	Groups		
	Case (n=242)	Control (n=242)	P-Value
Sex			
Male	109 (45.0)	118 (48.8)	0.466
Female	133 (55.0)	124 (51.2)	
Gestational age (week)			
< 37	124 (51.2)	39 (16.1)	0.001*
>=37	118 (48.8)	203 (83.9)	
Contraceptive method			
Ampoule	8 (3.3)	6 (2.5)	0.001*
IUD	16 (6.6)	43 (17.8)	
Condom	22 (9.1)	20 (8.2)	
Oral pills	33 (13.6)	48 (19.8)	
Natural	36 (14.9)	4 (1.7)	
Non	127 (52.5)	121 (50.0)	
Maternal education			
< 12 grade	170 (70.2)	205 (84.7)	0.001*
>=12 grade	72 (29.8)	37 (15.3)	
Paternal education			
< 12 grade	192 (79.3)	200 (82.6)	0.354
>=12 grade	50 (20.7)	42 (17.4)	
Paternal job			
Farmer & rancher	26 (10.7)	62 (25.6)	0.001*
Worker	134 (55.4)	122 (50.4)	
Employed	16 (6.6)	9 (3.7)	
Other	66 (27.3)	49 (20.2)	
Positive Abortion history	43 (17.8)	22 (9.1)	0.005*
Stillbirth history	8 (3.3)	2 (0.8)	0.055
LBW history	13 (5.4)	1 (0.4)	0.001*

Disease history	5 (2.1)	7 (2.9)	0.559
Consanguineous marriage	18 (7.4)	33 (13.6)	0.026*
Mother employment	2 (0.8)	1 (0.4)	0.562
Drugs using history	6 (2.5)	3 (1.2)	0.313

*Statistical significant in $\alpha<0.05$,

Table3. Univariate and multivariate logistic regression model for probabilistic risk factors for low birth weight in cases and controls

	Univariate		Multivariate	
	OR (95% CI)	P-Value	OR (95% CI)	P-Value
Sex				
Male	0.861 (0.602 to 1.23)	0.412		
Female	1			
Gestational age (week)				
< 37	5.47 (3.58 to 8.37)	0.001*	3.89 (2.29 to 6.62)	0.001*
>=37	1		1	
Contraceptive method				
Ampoule	1.27 (0.428 to 3.77)	0.666	1.22 (0.301 to 4.90)	0.785
IUD	0.355 (0.190 to 0.663)	0.001*	0.777 (0.306 to 1.97)	0.595
Condom	1.05 (0.545 to 2.02)	0.888	2.62 (1.09 to 6.30)	0.031*
Oral pills	8.58 (2.96 to 24.81)	0.001*	2.22 (0.977 to 5.05)	0.057
Natural	0.655 (0.394 to 1.09)	0.103	29.54 (6.97 to 125.21)	0.001*
Non	1		1	
Maternal education				
< 12 grade	0.426 (0.273 to 0.665)	0.001*	0.959 (0.445 to 2.07)	0.015*
>=12 grade	1		1	
Paternal education				
< 12 grade	0.806 (0.511 to 1.27)	0.355		
>=12 grade	1			
Paternal job (Farmer & rancher)				

Worker	2.62 (1.56 to 4.40)	0.001*	2.22 (1.18 to 4.18)	0.014*
Staff	4.24 (1.66 to 10.81)	0.002*	2.16 (0.537 to 8.68)	0.279
Other	3.21 (1.78 to 5.79)	0.001*	1.71 (0.772 to 3.80)	0.185
Farmer & rancher	1		1	
Positive abortion history	2.16 (1.25 to 3.74)	0.006*	1.48 (0.655 to 3.33)	0.347
Stillbirth history	4.10 (0.86 to 19.52)	0.076	1.94 (0.261 to 14.46)	0.517
LBW history	13.68 (1.78 to 105.43)	0.012*	25.87 (2.85 to 235.00)	0.004*
Disease history	0.71 (0.22 to 2.26)	0.561		
Consanguineous marriage	0.51 (0.28 to 0.93)	0.029*	0.811 (0.391 to 1.69)	0.575
Mother employment	2.01 (0.18 to 22.30)	0.570		
Drugs using history	2.03 (0.50 to 8.19)	0.322		
Maternal age (year)	1.01 (0.98 to 1.04)	0.488		
Maternal weight (kg)	0.98 (0.97 to 0.99)	0.020*	0.958 (0.935 to 0.981)	0.001*
Maternal height (cm)	1.00 (0.98 to 1.02)	0.928		
Mother weight gain (kg)	0.91 (0.87 to 0.96)	0.001*	0.921 (0.853 to 0.995)	0.038*
Gestational interval (year)	0.96 (0.92 to 0.99)	0.035*	0.955 (0.878 to 1.04)	0.289
Birth order	0.88 (0.72 to 1.7)	0.189	0.957 (0.645 to 1.42)	0.829
twin's birth	10.24 (3.98 to 26.35)	0.001*	24.04 (7.40 to 78.11)	0.001*
Number of care (during pregnancy period)	0.92 (0.88 to 0.97)	0.001*	0.904 (0.847 to 0.965)	0.003*
Number of family member	0.90 (0.78 to 1.05)	0.166	0.845 (0.638 to	0.241

1.12)

*Statistical significant in α<0.05, OR: Odds ratio, CI: Confidence interval

Figures

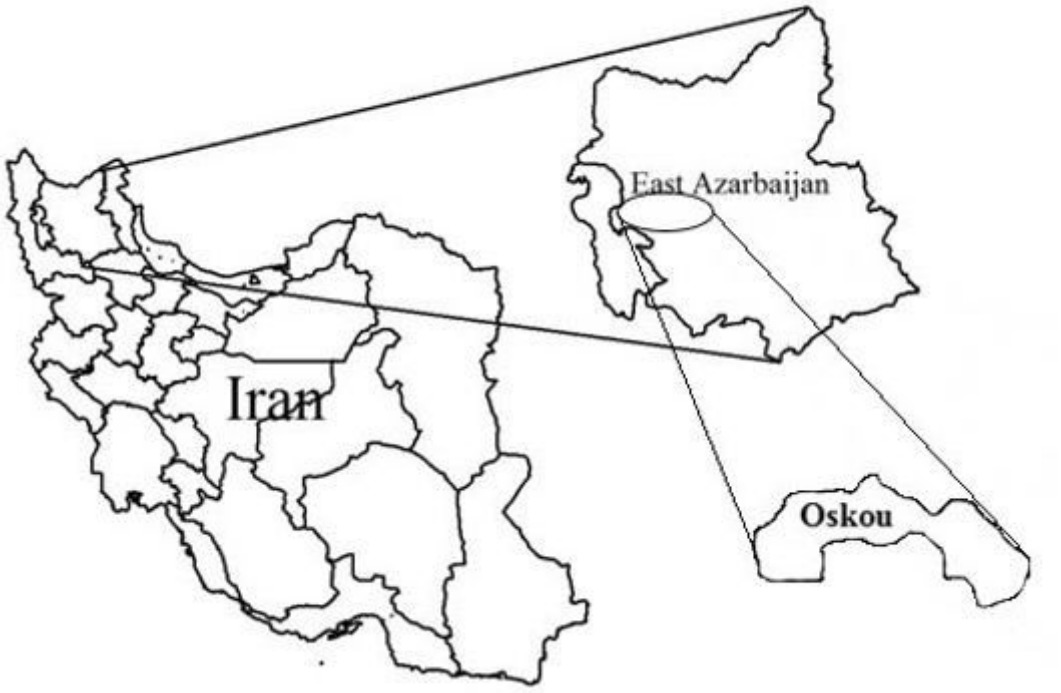

Figure 1

Geographic situtation of Oskou, East Azarbayjan, Iran.