Original Article

Prevalence and Risk Factors of Low Birth Weight in Rafsanjan, Iran; 2017: A cross-sectional study

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Abstract

***Background*:** Low birth weight is an effective factor in neonatal mortality and morbidity. Growth retardation and subsequent chronic diseases are other complications of LBW. The goal of the present study was to determine the prevalence and related factors of LBW in Rafsanjan city in 2016.

***Methods*:** This cross-sectional study investigated existing data of all live births born in Niknafas Rafsanjan Maternity Hospital, the main maternity hospital in the city, and other delivery centers, from March 2016 to 2017. The information was analyzed in two stages using univariable, and multivariable logistic regression model, to control the effect of confounding variables.

***Results*:** The prevalence of LBW was 9.7% in Iranian population of which 4.5% had a gestational age of 37 weeks and more. In non-Iranian population (Afghan), the prevalence of LBW was 13.8%, and the percent of gestational age of 37 and more with weight under 2500 gram was 6.7. The main risk factor was gestational age under 37(OR= 38.38). Other important variables in this study that had significant effects after controlling for the confounding were age over 35 years (OR= 1.485), addiction (OR= 4.057), Abortion history (OR= 1.2), Place of living (Village vs. city) (OR=0.93), Maternal educational Level (OR= 1.85), infant's gender (Boy vs. girl) (OR= 0.74), and delivery type (OR=1.39)

***Conclusion*:** Despite the provided health services, there was found a high prevalence of LBW, so delivering quality healthcare for all pregnant women and screening for high-risk pregnancies, such as, prevention of premature delivery, educational interventions, and quality healthcare for high risk groups and beside, more research on the recognition of other risk factors can have important role in LBW prevention.

***Keywords*:** Low Birth Weight; Prevalence; Risk Factor

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1. Introduction

Neonatal mortality is one of the serious concerns in developing and developed countries. Despite the fact that mortality rate of children under the age of one year is gradually decreasing in the world, changes in neonatal mortality rates are much slower. The common causes of neonatal mortality in the world include preterm labor (PTL) and low birth weight (LBW) (1, 2). LBW (birth weight less than 2500 grams) is significantly associated with neonatal survival rate and disability after birth (3), and is one of the main causes of children's mortality, accounting for about 40% of all mortality in children under the age of 5, occurring in infancy (4). The mortality rate in LBW neonates is approximately twenty folds the normal babies. In total, about 15.5% of neonates born worldwide are LBW, while 95.6% of them occur in developing countries. In addition, the incidence of LBW in low-income countries is twice more than middle-income countries (3, 5). Developmental disorder and subsequent chronic diseases during life are other complications of LBW. The risk of some diseases, such as coronary artery disease, stroke, hypertension, and diabetes is higher in adults with a history of LBW than normal weight (NBW) (6). Birth weight is the first weight of a fetus or neonate obtained immediately after birth that should be measured during the first hours of life in order to prevent weight loss after delivery (7). NBW is considered 2500-3000 grams, and the amount less than this is considered LBW and higher is high birth weight or macrosomia (2). LBW is defined by WHO as weighing less than 2500 grams at birth (8), and its prevalence varies from 5-7% in developing countries to 19% in developed countries (9). According to a review study, the prevalence of LBW is 7% in Iran and its trend has been increasing from 1991 to 2010 (2). There are various risk factors for LBW, including factors related to demographic, anthropometric, medical and behavioral factors of the mother, parental factors, environmental factors, nutritional factors, and deficiencies during pregnancy and prenatal care. In addition, social health determinants, such as income, educational level, housing, addiction, and place of residence (urban/rural) play an important role in LBW (10). While factors related to LBW have been well studied in developed countries, there is insufficient evidence in developing countries and in this context. In Iran, based on the results of a systematic review, the prevalence of LBW was estimated to be 7%. Also, the incidence of LBW in Iran has been increasing from 1991 to 2010 (2). In recent years, some studies have been carried out in the field of low birth weight in Iran. According to the results of these studies, there were some categories of LBW risk factors, such as maternal factors (demographic, behavioral and anthropometric), paternal factors, fetal factors, as well as nutritional and environmental factors (10-12). According to a study, there is an increase in the trend of LBW in rural areaes of Iran (13). For this reason, it is essential to estimate LBW prevalence repeatedly, in every area to know the trend of LWD. As a public health priority and based on the importance of factors preventing LBW, the present study aimed to determine the precise prevalence and identify the risk factors associated with LBW neonates in Rafsanjan, a city in Iran. Since there were insufficient studies in this regard in Rafsanjan, and according to the Health Statistics Center's report, the prevalence of LBW was found to be higher

than the national level. Hence, the present study aimed to determine the one-year prevalence and assess the risk factors associated with LBW in Rafsanjan.

2. Materials and methods

This cross-sectional study investigated the existing data of all live births born in Niknafas Rafsanjan Maternity Hospital, the main maternity hospital in the city, and other specific delivery centers, from March 2016 to 2017, to determine the prevalence of LBW and assess the risk factors associated with it. Rafsanjan and Anar are cities of Kerman, one of the provinces of Iran, located in southeastern Iran, and it is considered the ninth most populous province in the country. These two cities are covered by Rafsanjan University of Medical Sciences and the main maternity hospital in this province with the greatest number of deliveries is Niknafas Rafsanjan Maternity Hospital. The required samples were collected through census method. Data were collected from the Iranian maternal and neonatal online system (Iman System), as one of the main sources of information for assessing the health status of Iranian mothers and neonates, designed by the Ministry of Health and Medical Education. This online system contains online information about Iranian mothers and neonates. There is a wide range of factors which affect fetal growth. Although these factors can be divided into several classes, in this study, they were divided into two groups. The first group included maternal factors, which include demographic information (mother's age, place of residence, nationality, educational level, consanguineous marriage, and number of children), pregnancy information (history of stillbirth, abortion rate, number of deliveries, number of pregnancies, type of pregnancy, preeclampsia, and gestational diabetes), and risk factors during pregnancy (cardiovascular diseases, chronic hypertension, thyroid disorder, non-pregnancy diabetes, genito-urinary infections, history of hepatitis C or other underlying diseases, and smoking during pregnancy).

The second group included neonatal factors, which include neonate's sex, birth sequence, gestational age, and birth weight. Exclusion criteria in the current study consisted of stillbirths and being born in other areas. The information was processed in STATA 14 and analyzed in two stages using uni-, and multi-variate logistic regression model, to control the effect of confounding variables. In multivariable analysis, variables with significant effect in univariate model entered into multivariable logistic regression model and the odds ratios were calculated after being adjusted. This research was approved by the Ethics Committee of the Rafsanjan University of Medical Sciences by the ethical code IR.RMU.REC. 96164.

3. Results

Out of 7279 cases in Iman System, 46 cases (0.6%) were stillbirths, and 258 (3.5%) were from other cities of Rafsanjan, who were excluded from the study. Of the remaining births in the study, 6294 cases were Iranian and 681 were non-Iranians (Afghan population). The number of boys born to Iranian and non-Iranian mothers were 3155 (50.1%) and 352 (51.7%), respectively, and that of girls were 3138 (49.9%) and 329 (48.3%). The prevalence of LBW in Iranian population was 9.7% (610 cases), of which 4.5% had a gestational age of >37 weeks, and that of

non-Iranian population was 13.8% (94 cases), of which 6.8% of births under 2500 grams had a gestational age of ≥37 weeks (Table 1).

Table 1. Frequency percentage of Sex, gestational age of <37week and low birth weight, by nationality

Variables		Iranian(n=6294)	Non Iranian(n=681)	P-Value
Sex	female	3138(49.9%)	329(48.3%)	0.7
	male	3155(50.1%)	352(51.7%)	
	Unclear	1	0	
gestational age	>=37week	5774(91.7%)	599(88%)	0.002
	<37week	520(8.3%)	82(12%)	
low birth weight	Weight ≥2500	5684(90.3%)	587(86.2%)	0.001
	Weight <2500	610(9.7%)	94(13.8%)	

As are shown in Tables 1 and 2, the comparison of variables showed a significant relationship between maternal age, gestational age, addiction, preeclampsia, thyroid disorders, education level, number of previous deliveries, neonate's sex, type of delivery, risk factors during pregnancy (history of chronic disease), history of abortion, mother's nationality and place of residence, neonate's sex, and LBW (Table 2). After controlling the confounding effect using multiple logistic regression model, there was found a significant relationship between age over 35 years (OR= 1.485, 95%CI:1.076-2.05), gestational age of ≥37 weeks (OR= 38.38, 95%CI:30.24-48.7, addiction (OR= 4.057,95%CI:1.43- 11.5), abortion history (OR= 1.2, 95%CI:1.015-1.41), place of living (village vs. city) (OR=0.93, 95%CI:0.7-0.87), maternal educational level, illiteracy: (OR=1.85, 95%CI:1.13-3.02), primary school (OR= 1.85, 95%CI:1.13-3.02), infant's gender (boy vs. girl) (OR= 0.74, 95%CI:0.59-0.92), delivery type (OR=1.39, 95%CI:1.09-1.77), and infant's LBW (Table 3).

The distribution of some of the characteristics and risk factors associated with low birth weight is shown in Table 2.

Table 2. The distribution of some risk factors of low birth weight

Variables		Weight ≥2500	Weight <2500	P-value
Maternal Age	18-35 years	5303(84.6%)	567(80.5%)	0.014
	<18 years	203(3.2%)	33(4.7%)	
	> 35 years	765(12.2%)	104(14.8%)	
infant's gender	boy	3189(50.9)	318(45.2%)	0.000
	girl	3082(49.1%)	385(54.7%)	
Nationality	Iranian	5684(90.6%)	610(86.6%)	0.001
	Non Iranian	587(9.4%)	94(13.4%)	
education	illiterate	461(7.4%)	79(11.2%)	0.000
	Elementary	413(6.6%)	64(9.1%)	
	Guidance	899(14.3%)	114(16.2%)	
	Secondary	2853(45.5%)	279(39.6%)	
	College	1645(26.2%)	168(23.9%)	
City / village	City	4864(77.6)	555(78.8%)	0.440
	village	1407(22.4%)	149(21.2%)	
high-risk pregnancy	No	5319(84.8%)	520(73.9%)	0.000
	Yes	952(15.2%)	184(26.1%)	
gestational age	>=37week	6070(96.8%)	303(43%)	0.000
	<37week	201(3.2%)	401(57%)	
delivery type	normal	3034(48.4%)	254(36.1%)	0.000
	Cesarean	3237(51.6%)	450(63.9%)	

Table 3. Results of multiple logistic regression method for risk factors of low birth weight

Variables		Multivariable OR(95%CI for OR)	P-Value
Maternal Age	18-35 years	1	
	<18 years	0.9642(0.47-1.99)	0.923
	> 35 years	1.485(1.076-2.05)	0.016
gestational age	>=37week	1	
	<37week	38.38(30.24-48.7)	0.000
Addiction	No	1	
	Yes	4.057(1.43-11.5)	0.008
Preeclampsia	No	1	
	Yes	1.87(0.81-4.34)	0.144
Thyroid disorders	No	1	
	Yes	1.29(.68-2.42)	0.440
Chronic hypertension	No	1	
	Yes	1.66(0.762-3.60)	0.200
Gestational Diabetes	No	1	
	Yes	0.84(0.443-1.61)	0.210
high-risk pregnancy	No	1	
	Yes	0.98(0.56-1.73)	0.951
Abortion history	No	1	
	Yes	1.2(1.015-1.41)	0.033
City / village	City	1	
	village	0.93(0.7-0.87)	0.000
Education	illiterate	2.06(1.03-4.09)	0.040
	Elementary	1.85(1.13-3.02)	0.015
	Guidance	1.33(0.92-1.93)	0.131
	Secondary	1.04(0.78-1.39)	0.791
	College	1	
Nationality	Iranian	1	
	Non Iranian	1.05(0.58-1.89)	0.161
infant's gender	Girl	1	
	boy	0.74(0.59-0.92)	0.008
delivery type	normal	1	
	Cesarean	1.39(1.09-1.77)	0.008

4. Discussion

Based on the results of the present study, male-to-female ratio in Iranian population was 1.005, and it was 1.07 in non-Iranian population. The prevalence of LBW and preterm delivery was also found to be 9.7% and 8%, respectively, in Iranian population, and 13.8% and 12% in non-Iranian population, respectively. The prevalence of LBW in this study was higher than some other studies. Based on the results of studies, prevalence of LBW was estimated to be 9.9% in Pakistan (14), 7.4% in Japan (15), 6.3% in Ardebil (3), 7.2% in Shahrud (16), 4.5% in Garmsar (8), and 11.8% in Zahedan (12). A systematic review estimated the prevalence of LBW at 7% in Iran. The incidence of LBW in Iran has been increasing from 1991 to 2010 (2). The results of studies indicate that the prevalence of LBW is high in Iran and requires changing care during pregnancy to gain weight during this period to reduce the incidence of LBW(2). This study also showed that LBW is still a major health problem, and seems to be rising in Rafsanjan, compared to the 7% prevalence in 2011 (7.6% in Iranians and 7.12% in non-Iranians)(17). The prevalence of preterm delivery is also rising, compared to the 5.7% prevalence in 2011 (1.7% in Iranian births and 5.4% in non-Iranians)(17), which is one of the important reasons for increasing LBW in this province. In this study, there was found a strong correlation between LBW and Preterm labor, which was consistent with the results of certain other studies (5, 16, 18, 19). Low gestational age is also a risk factor for LBW. This variable plays a very important role in neonate's birth weight. Premature neonates (<37 weeks) are at increased risk of LBW than those with normal gestational age (≥37 weeks). WHO estimated PTL as a reason for one-third of LBWs. One of the reasons for persistence and increased prevalence of LBW, compared to years ago, is advancement of medical technology that has increased the prevalence of premature neonates who survive, which has then increased LBW rate (7). Therefore, identifying and managing risk factors associated with the birth of a premature baby is very important for prevention. Rafsanjan is the largest pistachio producer in the world, and most of the residents of this city are occupied in pistachio farming, either as their main or second jobs. Approximately 88,000 hectares of this province's land cultivate pistachio gardens. About 700 tons of pistachio pesticide are annually used in this city (95% of these pesticides include organophosphorus group)(20). The results of various studies have shown that maternal exposure during pregnancy increased the risk of stillbirth and spontaneous abortion. Since, according to the results of this study (21, 22), PTL and LBW had a high prevalence in this province with an increasing trend, more studies are required to investigate the effect of agricultural pesticides on these outcomes. Other important variables related to LBW in this study included: age >35, drug addiction, history of abortion, mother's place of residence and education level, type of delivery, and neonate's sex. The odds of LBW in mothers >35 years old was 1.485 times greater than mothers aged 19-34 years. Some other studies also confirmed this conclusion (23). In a study conducted by Pasha et al., the odds of mothers >35 years was 2.3 times greater than mothers aged 19-34 years (23). A large number of epidemiological studies have shown that the prevalence of LBW was higher in the age group <19 and >35 years, although

there were observed some controversies in this regard; for example, some researchers suggested that the risk observed between maternal age and LBW was due to chronic diseases, such as hypertension and diabetes (16). In this study, it was shown that after eliminating the effect of these variables, there was a significant relationship between age over 35 and LBW. It was also found that there was a relationship between mother's low educational level and risk of LBW. Other national and international studies also confirm this (10, 24, 25), thus one of the reasons for lower risk in educated mothers may be their information about health services and their socioeconomic status.

Another risk factor was the type of delivery in this study. Babies born through cesarean section were at increased risk of LBW, compared with babies born through vaginal birth, which was significantly correlated, even after omission of confounding factors. In a study in Kerman, the type of delivery was reported as a risk factor similarly (10). However, this correlation should be interpreted with caution, as many mothers undergo cesarean section, because of some emergency situations, such as bleeding that threatens mother's health, although this information was not available in this study. Also, according to some other studies, the history of abortion and stillbirth were probable risk factors associated with LBW, which were also observed in this study.

There are many risk factors for LBW, including demographic, anthropometric, medical and behavioral factors of mother, parental factors, environmental factors, nutritional factors and their deficiency during pregnancy, and prenatal care. Additionally, social health determinants, such as income, educational level, housing, addiction, and place of residence (urban/rural) play an important role in LBW. The current study confirmed the relationship between addiction and LBW. Although the results of this study confirmed the results of other studies regarding the prevalence of LBW and its risk factors, prospective studies are recommended to confirm the risk factors of LBW. Meanwhile, since reducing the rate of LBW to less than one-third between 2000 and 2010 was one of the UN's main goals for children in 2002, reducing LBW is important for achieving Millennium Development Goals (MDGs) to reduce children's mortality rate (7). Activities to achieve MDGs for reducing birth weight should ensure beginning a healthy life for children through a healthy pregnancy and healthy nutrition in women, so birth weight is an important index to monitor advancement towards this international agreement. One of the strengths of this study was its high sample size and population-based nature of the study, and the limitations of this study included unavailability of some important information due to using secondary data. For this reason, the researchers failed to examine some risk factors associated with LBW, such as access to healthcare systems, lifestyle, nutritional factors, environmental factors, and some factors associated with pregnancy. In the end, more population-based prospective studies with a sufficient sample size should measure these variables and social determinants, in order to identify LBW and preventive measures, for reducing neonatal mortality rate and diseases associated with LBW.

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