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ORIGINAL ARTICLE

RISK FACTORS FOR LOW BIRTH WEIGHT IN EL JADIDA PROVINCE, MOROCCO. CASE-CONTROL STUDY

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ABSTRACT

Background. Low birth weight (LBW) is considered to be one of the most important indicators of a newborn's chances of survival, and a major risk of medium- and long-term morbidity.

Objective. To identify risk factors associated with low birth weight newborns among pregnant women during childbirth in Moroccan hospital environment with a view to proposing avenues of intervention for its prevention.

Material and methods. Data concerning the weight of newborns at birth, nutritional education, pregnancy monitoring and other risk factors, etc. were collected from 312 pregnant women who gave birth in the maternity ward of El-Jadida Provincial Hospital in Morocco.

Results. The study identified 156 cases of newborns with LBW and 156 controls of normal-weight newborns. After adjustment for the variables included in the analysis, the determined factors associated with LBW are nutritional education [OR: 6.22 (2.60-14.87), P<0.001], illiterate women [OR: 8.74 (1.65-46.08), P=0.011], insufficient pregnancy monitoring [OR: 5.69 (2.74-11.83),P<0.001], pregnant women with a normal weight [OR: 3.84 (1.73-8.52), P=0.001], lack of psychological support [OR: 3.23 (1.72-6.08), P<0.001] and tiring domestic activity [OR: 2.13 (1.14-3.99), P=0.017].

Conclusion. Promotion of nutrition for pregnant women, proper implementation of maternal health programs and improvement of their social condition are the modifiable factors that should help reduce LBW risk.

Key words: *low birth weight, risk factors, pregnancy, newborn*

INTRODUCTION

Low birth weight (LBW) is defined as a birth weight less than 2,500 grams, regardless of gestational age [1]. It is a major health problem responsible for neonatal mortality and morbidity such as diabetes, obesity and cardiovascular disease in adulthood [2]. In the medium term, babies with LBW are more likely to experience health and developmental problems, including impaired cognitive and physical development with learning difficulties, hearing and visual impairments [3]. Globally, low birth weight contributes 60 to 80% of all neonatal deaths. During 2017, nearly 20.5 million children were registered with low birth weight [4], 96.5% of whom were born in developing countries [4]. In 2015, Morocco recorded a proportion of births with an estimated low weight of 17.3%. A rate that appears very far from that of Sweden (2.5%), higher than that of Algeria (7.3%) and Tunisia (7.5%) and closer to that of Senegal (18.5%) [4]. Millennium Development Goal 4 aims to reduce the death rate of children aged 0 to 5 by two thirds and, more specifically, to reduce underweight children in this age group [5]. However, the care of newborns with a growth deficit by the health system in developing countries is very expensive and, in general, remains insufficient or inadequate[6].

In 2018, Morocco recorded a neonatal mortality rate of 13.56 per 1,000 live births, of which low birth weight is one of the main causes. However, despite the efforts made for the prevention and the advancement of knowledge concerning the risk factors of LBW, inequities in access to obstetric and neonatal care persist between urban / rural areas, between regions and between socio-economic levels, raising questions about the quality of care for these newborns [7]. It

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should be noted that the two mechanisms most cited in the literature that determine low birth weight are prematurity and intrauterine growth retardation. Indeed, the causes and consequences of LBW are complex and intervene in the life cycle of individuals including their intrauterine nutritional environment, which remains the ultimate determinant of subsequent growth and state of health and from individual to individual adulthood [8].

In the present study, the objective was to determine the factors associated with low birth weight in a Moroccan hospital environment with a view to proposing avenues of intervention for its prevention.

MATERIAL AND METHOD

The study took place at the maternity ward of El-Jadida Provincial Hospital over a period from January 1 to December 31, 2018. This hospital represents a 2nd level public health structure with a high influx of the rural population.

Sample

This cross-sectional case-control study was conducted on mothers and their newborns of normal weight (n = 156) or low birth weight (n = 156) at the time of delivery. A low birth weight child (LBW) is defined as any newborn whose birth weight is less than 2500g regardless of the term of pregnancy. A normal weight child (NW) is defined as any newborn whose birth weight between 2,500 and 4,000 grams.

Inclusion and exclusion criteria

Inclusion and exclusion criteria: Included in this study are all children born alive and their mothers. Stillbirths and fetal deaths in utero are excluded from the study.

Information collected

The information was collected using an established questionnaire, making it possible to collect data on socio-demographic, gestational and nutritional factors.

Collection of anthropometric data at childbirth

In women: The anthropometric parameters of the parturient were measured according to the procedures recommended by the WHO. Pregnant women were weighed before delivery on electronic bathroom scales with an accuracy of 100 grams. The height was measured to the nearest millimeter using a wall chart.

The Body Mass Index (BMI) was calculated by dividing an individual's weight in kilograms by the square of their height in meters. An individual is said to be lean when BMI is strictly less than 18.5 kg / m², normal if BMI is in the range ≥18.5-25 <, overweight if BMI is in the range ≥25-30 <and obese if they have a BMI greater than or equal to 30 kg / m² [9].

In the newborn: At delivery, the weight was measured with an accuracy of 10 grams using a mechanical baby scale of the SECA® type.

Statistical analyzes

Statistical analyses are performed using SPSS version 23 software. Univariate and multivariate analysis was performed using chi-square test to separately study the independent variables associated with the dependent variable (LBW). The percentages of low birth weight were compared in the different modalities of the independent variables collected. Multivariate analysis was performed using binary logistic regression to identify the factors associated with low birth weight of newborns. The *Hosmer* and *Lemeshow* test was used to study the fit of the results to the data. The 5% significance level was used in all analyzes, both univariate and multivariate.

Ethical considerations

The investigation obtained the approval of the regional directorate of the Moroccan Ministry of Health in greater Casablanca. Participation in the survey was subject to the free and informed consent of the selected women. After receiving a detailed explanation of the survey process and conditions, the female respondents were informed that they were free to decline or withdraw from the survey at any time.

RESULTS

Table 1 illustrates the distribution of birth weight according to the characteristics of the mother and the newborn. According to the mothers characteristics, the table shows that the proportions of LBW are higher among mothers aged 18 to 34 years old (76.3%), illiterate parturient (71.2%), those with low socioeconomic level (73.3%), in first-time mothers (67.9%), parturient who have a pregnancy follow-up <4 ANC: antenatal consultation (87.8%), those who did not receive nutritional advice during gestation (91.7%),those who were not psychologically supported during pregnancy (57.1%) and those with overweight (50.60%).

Table 2 reports the results of univariate and multivariate analysis by binary logistic regression. The factors significantly associated with the risk of low birth weight were in descending order: illiterate women[OR: 8.74 (1.65-46.08), P=0.011]and women with an average level of education[OR: 11.94 (1.89-75.50), P=0.008]; women with poor follow-up of prenatal consultation [OR: 5.69 (2.74-11.83),P<0.001]; women who are of normal weight during pregnancy [OR: 3.84 (1.73-8.52), P=0.001] and those who are

Table 1. LBW risk factors according to maternal and pregnancy characteristics

Maternal characteristics	Newborn LBW	Newborn NW	*P*
	N (%)	N (%)	
Mother's age			
<18 years	20 (12.8)	5 (3.2)	0.006
18-34 years	119 (76.3)	128 (82.1)	
> 35 years	17 (10.9)	23 (14.7)	
Study level			
Illiterate	111 (71.2)	79 (50.6)	0.001
Primary	19 (12.7)	42 (26.9)	
Middle School	23 (14.7)	26 (16.7)	
high school	3 (1.9)	9 (5.8)	
Socio-economic level			
Low	115 (73.3)	92 (59)	0.011
Medium	37 (23.7)	52 (33.3)	
High	4 (2.6)	12 (7.7)	
Parity			
Primiparous	106 (67.9)	77 (49.5)	0.001
Multiparous	50 (32.1)	79 (50.6)	
Monitoring of ANC			
<4 ANC	137 (87.8)	85 (54.5)	<0.001
≥4 ANC	19 (12.2)	71 (45.5)	
BMI classes			
<18.5 lean	0	1 (0.6)	<0.001
≥18.5; 25 <Normal weight	15 (9.6)	58 (37.2)	
≥25; 30 <overweight	79 (50.6)	89 (51.1)	
≥ 30 obese	62 (39.7)	8 (5.1)	
Nutrition education			
Yes	13 (8.3)	48 (30.7)	<0.001
No	143 (91.7)	108 (69.3)	
Newborn sex			
Female	94 (60.3)	106 (67.9)	0.097
Male	62 (39.7)	50 (32.1)	
Tiring domestic activity			
Yes	70 (44.9)	95 (60.9)	0.003
No	86 (55.1)	61 (39.1)	
Psychological support			
Yes	67 (42.9)	107 (68.6)	<0.001
No	89 (57.1)	49 (31.4)	
Passive smoking			
Yes	71 (45.5)	83 (53.2)	0.106
No	85 (54.4)	73 (46.7)	

LBW: Low birth weight; NW: normal weight; ANC: Antenatal consultation; BMI: body mass index

Table 2: Crude ORs of low birth weight as a function of maternal and newborn characteristics (univariate and multivariate analysis).

Maternal characteristics	Univariate analysis			Multivariate analysis		
	OR	CI (95%)	*P*	OR	CI (95%)	*P*
Mother's age						
< 18 years	5.41	[1.69-17.32]	0.004	2.29	[0.64-8.11]	0.198
18-35 years	1	1	1	1	1	1
>35 years	1.25	[0.64-2.47]	0.505	1.40	[0.54-3.67]	0.483
Study level						
Illiterate	4.21	[1.10-16.06]	0.035	8.74	[1.65-46.08]	0.011
Primary	1.35	[0.33-5.58]	0.672	4.83	[0.79-29.53]	0.088
Middle School	2.65	[0.64-11]	0.179	11.94	[1.89-75.50]	0.008
high school	1	1	1	1	1	1
Socio-economic level						
Low	3.75	[1.17-12.01]	0.026	2.38	[0.59-9.60]	0.222
Medium	2.13	[0.63-7.14]	0.218	1.50	[0.34-6.53]	0.589
High	1	1	1	1	1	1
Parity						
Primiparous	2.17	[1.37-3.44]	0.001	1.72	[0.91-3.27]	0.093
Multipara	1	1	1	1	1	1
Prenatal consultation follow-up						
<4 ANC	6.02	[3.39-10.69]	< 0.001	5.69	[2.74-11.83]	<0.001
≥4 ANC	1	1	1	1	1	1
BMI classes						
≥18.5; 25 <Normal weight	3.49	[1.83-6.83]	< 0.001	3.84	[1.73-8.52]	0.001
≥25; 30 <overweight	1	1	1	1	1	1
≥ 30 obese	0.11	[0.05-0.25]	< 0.001	0.13	[0.05-0.35]	<0.001
Nutrition education						
Yes	1	1	1	1	1	1
No	0.2	[0.10-0.396]	< 0.001	6.22	[2.60-14.87]	<0.001
Tiring domestic activity						
Yes	1.91	[1.21-3]	0.005	2.13	[1.14-3.99]	0.017
No	1	1	1	1	1	1
Psychological support						
Yes	1	1	1	1	1	1
No	2.90	[1.82-4.61]	< 0.001	3.23	[1.72-6.08]	<0.001

OR: odds ratio; CI: confidence interval; ANC: Antenatal consultation; BMI: body mass index

obese [OR: 0.13 (0.05-0.35), P <0.001]; those who have not received nutrition education [OR: 6.22 (2.60-14.87), P<0.001]; women tiring household activity during pregnancy [OR: 2.13 (1.14-3.99), P=0.017] and those with poor psychological support from family and friends [OR: 3.23 (1.72-6.08), P<0.001].

DISCUSSION

Fetal weight is a marker of fetal well-being, it not only makes it possible to estimate - a posteriori - harmonious growth in utero, but it is also a determining marker of risk of disease in adulthood [10]. In our study, the prevalence of LBW is undefined, and although it would exist, it would be uncertain as there is an under-reporting of the weight of newborns in the birth registry. The mean weight of NW newborns in our study was 3374.04±214.66 and 1955.77±439.94 for LBW newborns, with gestational age of controls being 38.10±0.96 versus 31.66±2.99 for cases. The determinants of the LBW are multiple and intertwined. In this study, several potential risk factors for LBW lost their statistical significance in

multivariate analysis. However, our results showed, after multivariate analysis.

Data from the present study reveal the proportions of infants who are underweight. The frequency of the LBW problem reported by several authors was higher in women with a low education level [11, 19]. Illiterate parturient in the present study ran 8.74 times the risk of giving birth to infants with underweight. Our study also revealed that women with a medium level of education also ran a risk of 11.94. Indeed, many mechanisms can explain the association between the level of education and low birth weight such as the mother's diet, genital infections, the frequency and quality of prenatal care, the mother's stress as well as other psychosocial factors that can influence the successful course of pregnancy [12, 13]. Regarding the follow-up of the antenatal consultation, the results of this study show that parturient who did not follow up or who had insufficient follow-up of ANC were more predisposed to deliver newborns with LBW and that the risk in these women was evaluated at 5.69. This finding is consistent with that reported by other authors who demonstrate that poor pregnancy monitoring hinders the possibility of taking systematic preventive measures against anemia or other nutritional deficiencies and of acting on the curable medical causes of low birth weight [8, 14, 15]. In addition, WHO recommends that nutritional and preventive advice be renewed at each antenatal consultation [16]. However, lack of nutrition education and insufficient ANC during pregnancy were found to be variables strongly associated with low birth weight in this study. Indeed, nutritional status is considered to be a condition resulting from the balance between the ingestion of food and its use by the body. In addition, the multivariate analyzes of this study report a significant association between the BMI of parturient and LBW. This observation confirms the data in the existing literature on BMI and the risk of low birth weight [17, 18]. In the social register, the experience of motherhood is inseparable from the family and community experience. In fact, poor psychological support for the mother by her family and those around her would influence the course of the pregnancy and present a risk of low birth weight in the newborn at birth [19]. In the present study, a strong association was found between psychological support and low birth weight. Another factor examined in this study concerns strenuous household activity during pregnancy. The study by *Traore* et al. [20] and *Dageville* [21] reported that intensive and strenuous work during pregnancy, a large family load with young children are the main determinants of LBW in developing countries. In this study, a significant association between strenuous household activity and low birth weight is well established.

CONCLUSION

The present work reports a link of low birth weight with a combination of factors including the study level, ANC monitoring, BMI classes, nutrition education, strenuous household activity, and poor psychological support. Knowledge of these modifiable factors would allow better organized prenatal follow-up coupled with better health and nutritional education to significantly contribute to reducing the frequency of low birth weight.

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Conflicts of interest

The authors declare no conflict of interest.

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