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Passive Smoking and Other Principal Risk Factors Associated with Low Birth Weight

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Abstract

Background: Neonatal morbidity and mortality is one of the most public health problems in the world. A lot of neonatal deaths occur in foetus with low birth weight (LBW). Several risk factors of LBW have been described in the literature such as maternal age, chronic and gestational hypertension infection and anémia. Smoking is one of the most important preventable risk factor of LBW in developed and developing countries. Aims: In this study, we evaluated the incidence and the impact of passive smoking and some other principle risk factors of LBW. Material & Methods: This case control study was conducted in the department of obstetrics and gynecology of Marrakesh university hospital in Morocco. During a period of 3 years, all LBW babies were included in the study. Data analysis was performed by SPSS software. The association between LBW and each variable was studied by the chi square test comparing cases and controls groups. Logistic regression analysis was performed after including all variables found to have significant differences on univariate analysis. Results: 288 cases of LBW have been identified representing 2.19% of all births. The study of the categories showed that 84.3% of babies were moderate LBW (1500 - 2500 g), including 49 babies from twin pregnancies. 15.7% were very LBW (<1500 g). Several risk factors have been identified in LBW. Passive smoking was significantly associated with LBW [(OR 1.77; CI: 1.22 - 2.25)]. Conclusion: A number of risk factors are related to low birth weight, which is one of the main predictors of infant mortality. This study shows that passive smoking is one of those risk factors and it is a preventable one.

Keywords

Low Birth Weight, Passive Smoking, Epidemiology, Risk Factors

1. Introduction

Neonatal morbidity and mortality is one of the major public health problems in the world. Neonatal deaths occur in

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babies with low birth weight (LBW) 4.5‰ in developed countries and 45‰ in developing countries. Several risk factors of LBW have been described in the literature such as maternal age, chronic and gestational hypertension, renal diseases, chronic cardiorespiratory disease and other disorders that involve hypoxemia, autoimmune diseases and inherited or acquired thrombophilia and genitourinary anomalies.

Smoking is one of the most important preventable risk factors of LBW in developed countries.

In developing countries and especially in arabo-musulman countries, women's smoking is considered to be less frequent and thus to have a little impact on women's and child's health. However, passive smoking has been demonstrated to have similar but less severe effects on pregnancies outcome. Passive smoking corresponds at the inhaling of cigarette, cigar, or pipe smoke of others, especially by a nonsmoker in an enclosed area.

In this study, beside of some principal risk factors, we also evaluated the incidence and the impact of passive smoking as risk factor of LBW.

2. Patients and Methods

This case control study was conducted in the department of obstetrics and gynecology of Marrakesh university hospital in Morocco. During a period of 3 years from January 1st 2009 to December 31st 2011, all LBW babies were included in the study. They were 288 cases of LBW. Cases were defined as babies with birth weight less than 2500 g whatever the delivery term. For each case, control group was defined as baby born immediately after the case with a birth weight more than 2500 g. So the number of the newborns was the same.

Data was collected retrospectively from clinical records using a specially designed questionnary. Studied variables included maternal age, medical and obstetrical history, maternal occupation, socio-economic status, cigarette smoking and exposure during pregnancy, pregnancy characteristics (term, range, mode of delivery) and neonatal outcome (apgar score, neonatal intensive care unit transfer, neonatal deaths). Data analysis was performed by SPSS software. The association between LBW and each variable was studied by the chi square test comparing cases and controls groups. The difference was considered significant if $P < 0.05$. In a second time, we performed a logistic regression analysis by adopting the backward procedure to the final selected model and based on Wald test for statistical significance at the 5% level. The risk of LBW identified by the univariate analysis has been evaluated in logistic regression analysis.

3. Results

During the three years of our study, 288 cases of LBW have been identified representing 2.19% of all births. Severe LBW (<1500 g) concerns 45 babies (15.6%) and moderate LBW (1500 - 2500 g) was identified in 84.3% of all.

The mean term in the study was 36.26 +/− 2.22 weeks, with extremes ranging from 30 to 40 weeks, versus a mean of 38.44 +/− 0.78 weeks in controls with extremes ranging from 37 to 42 weeks.

Concerning gestational age, 205 newborns (71.2%) were small for gestational age, and 83 were premature (28.8%).

Maternal age under 18 years was a significant factor for LBW ($P = 0.01$). LBW was more common among low socioeconomic level mothers and housewives. Primiparity was a significant factor of LBW as well as history of LBW and still born. Hypertension was common with a significant risk in women who had LBW, that it is chronic (14.5% with $P = 0.01$) or gestational. The other diseases during pregnancy were also significant factors: anemia, fetal membranes premature rupture. Maternal characteristics and pregnancy outcomes associated to LBW are detailed in **Table 1**.

We identified in a first step the factors associated with occurrence of LBW, and then we performed a multiple logistic regression (**Table 2**). Variable kept model were maternal age, passive smoking, primiparity, LBW history, hypertension, maternal diseases during pregnancy. The twin pregnancy was associated with a very low birth weight ($P < 0.06$), while the history of still birth was not associated. We found that maternal age, passive smoking, primiparity, history of the LBW, hypertension, diseases during pregnancy in mothers were associated with LBW.

4. Discussion

Low birth weight (LBW) is an important determinant of neonatal mortality and morbidity and is considered a

Table 1. Maternal characteristics and pregnancy outcomes in relation to low birth weight.

Risk factors	Cases n (%)	Controls n (%)	OR- 95% CI*	P value**
Age (mean +/−)	24.9	26	1.9 [1.67 - 3.98]	0.01
History LBW***	105 (36.45)	57 (19.79)	2.34 [1.58 - 3.47]	0.00
History of still born	49 (17.01)	31 (10.76)	1.71 [1.03 - 2.85]	0.03
History of hypertension	42 (14.5)	31 (10.76)	2.58 [2.55 - 3.16]	0.01
Primiparity	137 (47.56)	46 (15.9)	2.23 [1.37 - 3.63]	0.01
Gestational hypertension	69 (23.95)	35 (12.15)	2.29 [1.44 - 3.67]	0.00
Infection	26 (9.02)	12 (4.16)	2.3 [1.09 - 4.94]	0.019
POMC	91 (31.59)	46 (15.95)	2.45 [1.61 - 3.73]	0.00
Twin pregnancy	49 (17)	19 (6.65)	2.25 [1.37 - 3.73]	0.018
Anemia	77 (26.73)	51 (17.7)	1.72 [1.13 - 2.61]	0.009

*: odds ratio-95% confidence interval, **probability, ***low birth weight.

Table 2. Logistic regression analysis for low birth weight and its risk factors.

Risk factors	a OR-95% CI*	a P**
Age	1.9 [1 - 3]	0.05
Passive smoking	1.770 [1.222 - 2.256]	0.03
History of LBW***	2.225 [1.454 -3.403]	0.00
History of still birth	2.230 [0.792 - 2.387]	O.2 (NS)
History of hypertension	3.01 [1.93 - 3.02]	0.01
Primiparity	2.23 [1.37 - 3.63]	0.01
Gestational hypertension	3.458 [2.118 - 5.646]	0.00
Infection	3.480 [1.621 - 7.473]	0.001
Premature membrane rupture	3.113 [2.001 - 4.844]	0.00
Twin pregnancy	1.3 [0.93 - 5.9]	0.056
Anemia	2.627 [1.680 - 4.106]	0.00

*: adjusted odds ratio-95% confidence interval, **: adjusted P value, ***low birth weight.

surrogate measure of the health status of any society. Among African women, LBW is a relatively common complication of pregnancy, with incidence rates ranging from 8.3% to 18.1% [1].

In our study, LBW represented 2.19% of all 13,151 live births in the Department of obstetrics and gynecology Marrakesh university hospital in Morocco. A wide National accounted for 12% according to the UNICEF report from 2007 to 2008 with a rate of mortality estimated at 36‰ [2]. While in Tunisia, LBW was only 7% with a mortality rate estimated at 20‰ [2]. By cons, in Mali and Sierra Leone the LBW was almost double [2].

Maternal age is often linked to LBW, with a higher risk among teen and women aged over 35 years [3]. In our study, maternal age under 18 years was a significant risk factor. According to Mabialathis is due to psychological and biological immaturity [3]. By cons, J. Valero found no relationship between maternal age and fetal growth [4]. Maternal obstetric history, primiparity and great multiparity are risk factors for LBW occurrence, as it was reported by several authors [3] [5] [6]. Our study noted that the history of LBW was significantly associated with the LBW occurrence. The history of still born wasn't associated to LBW after logistic regression analysis. The history of abortion despite its frequency was not included among risk factors with a p not significant as reported Camara

[5]. Twin pregnancy was associated with LBW but lower, in contrast to studies of Etuk who reported that multiple pregnancy is a factor influencing LBW [6].

Chronic hypertension and gestational hypertension as risk factors for LBW agree with the results of a lot of authors [4] [7] [8], who reported that children of women with hypertension had a lower birth weight. Materno-fetal Bacterial infection is a risk factor for LBW, without distinguishing between genital and urinary tract to reduce the number of variable and facilitate statistical analysis. Dabbagh [9] showed that association between urinary tract infection and LBW was significant. For Kayastha [10] urinary tract infection was a major cause of LBW. Khader and Ta'ani [11] concluded that periodontitis in pregnant women significantly increases the risk of low birth weight, but without convincing evidence that treatment of periodontal disease will reduce the risk of LBW. Premature rupture of membranes, but it is a risk factor for LBW in our study that joined the study Coutinho [12] [13].

In developing countries and especially in arabo-musulman countries, women's smoking is considered to be less frequent and so that to have a little impact on women's and child's health. However, passive smoking has been demonstrated to have similar but less severe effects on pregnancies outcomes [14].

In addition, very few women actually knew the differences between active and passive smoking, though most women believed that smoking was harmful to the developing foetus. Moreover, the couples did not take any preventive steps to avoid exposure to smoke. These differences could be related to the socio-economic and educational factors that influence smoking habits.

Passive smoking is a combination of side-stream smoke that is emitted from the burning end of a cigarette and the mainstream smoke exhaled by the smoker. Side-stream smoke constitutes about 85% of the smoke present in the room and contains many potentially toxic gases in higher concentrations than in the mainstream smoke [15].

In our study passive smoking, is considered as a significant risk factor of low weight born and constitutes about 69.4% ($P = 0.03$). Many authors [16]-[21] had also showed that maternal passive smoking during pregnancy is a risk factor for LBW.

Several epidemiological studies have shown similar effects. A meta-analysis of studies conducted before mid-1995 reported an overall RR of 1.2 (95% CI: 1.1 to 1.3) for LBW among the infants born to mothers with passive smoking during pregnancy [22]. Another recent meta-analysis done in 2010 showed the same results with RR of 1.16 (95%CI: 0.99 to 1.36) [23]. A new small, case-control study found an association of LBW with detectable nicotine level in mother's hair samples. With passive smoking women, the detection of high nicotine level in mother's hair samples has been significantly associated with risk of LBW. (OR: 3.4; 95% CI: 1.3 to 8.6) [24]. The reported results were not adjusted for confounders, although the authors stated that several potential confounders had no effect. Other studies found that urinary nicotine is more significantly correlated with the risk of LBW in mothers with passive smoking [25] [26].

Passive smoking is found to be one of the most preventable factors of LBW [27] [28]. The study also provides further strong evidences that exhibit the urgent need to stop passive smoking in enclosed areas. Some countries have introduced, some yet are considering to make a legislation preventing smoking in enclosed areas and public spaces, with this regulation, the expected result is a positive increase in the average weight of newborns [14] [27] [29]. Unfortunately, this kind of legislation is not taken seriously and has yet to see the light in some countries such as Morocco. As passive smoking from domestic sources has a significant impact on birth weight, any similar legislation introduced newly should be accompanied by an appropriate educational program to put an emphasis on the fetal harm that may occur as a consequence of both active and passive smoking in the pregnant women surrounding such as her household.

The limitations of this study are: the accidental sample, the low number of cases and the difficulty to quantify smoking.

5. Conclusion

A number of risk factors are related to low birth weight which is one of the main predictors of infant mortality. This study shows also that passive smoking is a preventable risk factor of LBW. That's why, an additional prospective study in general population would still be necessary to guide better the actions of sensitization, for better health Women of childbearing age and fate of their newborns.

Competing Interests

The authors declare that they have no competing interests.

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