

Low Birth Weight at Term: Risk Factors and Perinatal Prognosis in the Teaching Hospital Yalgado Ouédraogo, Burkina Faso

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Abstract

Objective: The objective of our study was to study the risk factors of low birth weight at term in the Teaching Hospital Yalgado (CHU-YO) Ouédraogo. **Patients and Methods:** This dealt with a comparative and analytical control case study. The group of cases was made up of female patients who gave birth to newborns with low birth weight at term and that of control cases included female patients who delivered a normal-weighted newborn at term. **Results:** The frequency of low birth weight at term was therefore estimated at 4.4%. The average age of the parturients was 25 ± 6.36 years. Female patients living in a marital setting accounted for 93.1% of cases and 64.4% of them had no income-generating activities. A maternal underweight, a height below 155 cm, passive smoking, and malaria during pregnancy have been identified as the factors associated with a low birth weight. **Conclusion:** Quality prenatal care could reduce the incidence of low birth weight at term.

Keywords

Low Birth Weight, Risk Factors, Prognosis, Burkina Faso

1. Introduction

Low birth weight is a global health issue which affects both developed and developing countries. According to data from WHO and UNICEF published in 2004, the global percentage of low birth weight was estimated at 15.5%, corresponding to more than 20 million children [1].

Low birth weight is due to a preterm delivery, to intra uterine growth retardation or to a combination of both. In developed countries, prematurity is the

main etiology of low birth weight while in developing countries, it is intra uterine growth retardation [2] [3].

Low birth weight contributes to about 60% - 80% of the overall neonatal deaths [4]. It is also associated with childhood stunting, to delayed cognitive development, and chronic diseases [1] [5] [6].

Considering the importance of the low birth weight issue, the following question is relevant: What are the low birth weight determinants at full term?

In Burkina Faso, a case-control study implemented in 2004 within eight maternities in Ouagadougou had pointed out the nutritional status of the mother [7] as a major determinant. This study has admitted premature infants or used morphological criteria to determine the gestational age.

This study brings inputs to the knowledge of the determining factors related to low birth weight at term, and more particularly the intra uterine growth retardation among the newborns at full term, as several methods have been used. Indeed, the newborns with low birth weight and at term (based on the existence of dated ultrasound) were selected in order to eliminate the prematurity effects on birth weight.

2. Patients and Methods

This deals with an analytical and comparative control case study. The group of cases included female patients who gave birth to a newborn with low birth weight at term and that of control group, those who gave birth to a newborn with normal weight at term. The ratio was 1/1. Cases and control cases were recruited during the period 11/1/2015 to 03/06/2016.

The population of study involved all the parturients admitted in the department of Gynecology and Obstetrics of CHU-YO during the concerned period.

The following formula was used to determine our sample size:

$$N = P \times (1 - P) \times Z\alpha / i^2$$

P means the proportion of newborns with a low birth weight at term. According to EDS IV (Demographic and Health Survey), low birth weight in Burkina Faso is estimated at 14% among which 1/5 occurs among the newborns with a low birth weight at term. Therefore, the proportion of newborns with a low birth weight is estimated at 2.8% [8].

$$P = 2.8\%$$

$$Z\alpha = 1.96 \text{ the value of } Z \text{ for a risk of error } \alpha, \alpha = 0.05$$

$$i, \text{ desired precision} = 5\%$$

$$N = 0.028 \times (1 - 0.028) \times 1.96^2 / 0.05^2 = 41.82$$

The minimal size of our sample is at least 42 cases and 42 control cases.

Female parturients meeting the following criteria and admitted in the site of the study during the period of the survey were included in the group of cases: single pregnancy, theoretical term of 37 weeks of amenorrhea evidenced by the first quarter ultrasound, having given birth to a newborn whose weight is below

2500 g, verbal agreement to take part to the study. The control cases had the same criteria except for the birth weight which was equal or higher than 2500 g.

The control group was formed by matching the cases. The maternal age was the matching criteria. Then, any parturient of a given age in the group of cases was systematically matched with another one of the same age who gave birth to a newborn with a normal weight.

The variables studied were the following: socio-demographic characteristics of patients and the pregnancy follow-up elements.

As for the socio-economic level: we have developed a socio-economic score level based on that of WHO.

Presence of running water (yes = 1, no = 0), of electricity (yes = 1, no = 0), occupation of the person taking care of the woman (civil servant category A/B/C, tradesman = 3; civil servant category D/E, small merchant, craft worker = 2; farmer, street vendor, no activity = 1), woman's occupation (civil servant category A/B/C, tradeswoman = 3; civil servant category D/E, small merchant, craft worker = 2, farmer, street vendor, no activity = 1). The total score is estimated at 8.

Score < 3 = low socio-economic level

Score 3 - 7 = average socio-economic level

Score > 7 = high socio-economic level

As for the stress level: we have developed an inspired score using the physical signs of stress at the burnout phase. The parturients with the following characteristics (yes = 1 + 2 + 3) were considered as stressed:

- 1) Persisting tiredness after a night sleep, irritability, nervousness, tension, anger
- 2) Anxiety (events that are not distressing in normal times);
- 3) Depression (lack of motivation), insomnia, pessimism.

Intense physical works were assessed according to the following characteristics (yes = 1 or 2 or 3):

- 1) Professional activity requiring physical effort (farmer, tradeswoman making many trips) or prolonged standing position (in teaching);
- 2) Long distanced travelled every day by foot or bicycle
- 3) Tiring household chores (fetching water, breaking wood, pounding, daily clothes washing)

The information was collected through the baby delivery record, the admission register, the patients' medical records, the parturients' prenatal consultations handbook and questions asked to them.

EPIDATA ANALYSIS was the software used to analyze the data. The odds ratio and p value were calculated and compared through the chi-square test. The significance threshold selected in the analyses reached 5%.

3. Results

3.1. Frequency

1975 live births were reported during the period of study among which we have

noted 87 cases of low birth weight. The frequency of low birth weight was therefore estimated at 4.4%.

3.2. Description of Female Patients Who Gave Birth to a Newborn with a Low Birth Weight at Term

- **Socio-demographic characteristics**

The average age of the parturients was 25 ± 6.36 years with extremes of 15 and 42 years. Patients living in a marital setting accounted for 93.1% of cases and 64.4% of cases had no income-generating activities. 71.3 % of cases had a low socio-economic status and 44.8% of them have not attended school. Alcohol consumption during pregnancy and passive smoking were found in respectively 6.9% and 18.4% of cases. Primiparous women accounted for 50.6% of cases.

- **Prenatal follow-up**

Prenatal follow-up was normal in terms of the number of prenatal consultations performed, of anti-malaria and anti-anemia chemoprophylaxis. The pathological episodes during pregnancy were represented by severe vomiting, episodes of malaria and a pre-eclampsia in respectively 11.5%, 33.3% and 9.2% of cases.

- **Anthropometric data**

31% of patients had a height below 155 cm and 9.7% of them were thin in their pregnancy beginning (a body mass index inferior to 18 kg/m^2).

3.3. Study of Risk Factors Associated to Low Birth Weight at Term

The risk factors are outlined in the **Tables 1-3**.

We had searched risk factors associated to low birth weight at term among socio-demographic characteristics of patient and among prenatal follow-up. We had found that severe low weight (body mass index less than 18 kg/m^2), number of prenatal follow-up less than 3, height less than 155 cm, high level of stress, passive smoking, malaria during the pregnancy, were associated to low birth weight at term.

3.4. Perinatal Prognosis

14.9% of the newborns with a low birth weight had an Apgar score below 7 at the first minute. The newborns transferred in neonatology department accounted for 19.5% of cases.

Unfortunately, one neonatal death has been reported.

4. Discussion

4.1. Frequency

We limited the study to low birth weight at term to eliminate low birth weight cases related to prematurity. The low birth weight frequency found at the maternity of CHU/YO was 12.86%. This figure is slightly below the one reported by the Demographic and Health Survey (EDS) estimated at 14% for the whole

country [8] and below that of Nikièma's study conducted in 2005 in Ouagadougou which reached 14.6% [7]. This difference could be explained by the fact that the study carried out through the EDS has concerned the whole country while Nikièma has only collected data in eight maternities. However, this frequency is close to that of a study conducted in Bobo Dioulasso in 1993, which found a proportion of 12.94% [9].

Table 1. Risk factors related to socio-demographic characteristics (n = 87; n' = 87).

Socio-demographic characteristics	Cases (%)	Control-cases (%)	OR (IC 95%)	P global value
Marital status				
Unmarried	6 (6.89)	5 (5.74)	1.47 (0.37 - 5.47)	0.690
Married	81 (93.1)	82 (94.25)	1.37 (0.67 - 2.57)	
Occupation				
No activity	56 (64.36)	48 (55.17)	1.46 (0.79 - 2.69)	0.586
Activity	31 (35.63)	39 (44.82)		
Economic status				
Low	62 (71.26)	66 (75.85)	0.78 (0.40 - 1.55)	0.462
Average	23 (26.43)	20 (22.98)		
High	2 (2.29)	1 (1.14)		
Educational level				
Did not attend school	39 (44.82)	35 (40.22)	1.20 (0.66 - 2.24)	0.665
Attended school	48 (55.17)	52 (59.97)		
Stress level				
High	16 (18.39)	6 (6.89)	3.36 (1.22 - 9.21)	0.043
average	21 (24.41)	18 (20.68)	1.47 (0.70 - 3.05)	
Low	50 (57.47)	63 (72.41)		
Physical works				
Yes	32 (36.78)	23 (26.43)	1.67 (0.84 - 3.08)	0.103
No	35 (40.22)	64 (73.56)		
Alcohol consumption				
Yes	6 (6.89)	5 (5.74)	1.21 (0.36 - 4.14)	0.755
No	81 (93.1)	82 (94.25)		
Passive smoking				
Yes	16 (18.39)	7 (8.04)	2.57 (1.002 - 6.01)	0.04
No	71 (81.6)	80 (91.95)		

Table 2. Risk factors related to prenatal follow-up (n = 87; n' = 87).

Prenatal follow-up	Cases n (%)	Control cases n' (%)	OR IC (95%)	P value
Number of PC (prenatal consultations)				
<3	23 (26.43)	6 (6.89)	4.96 (1.81 - 13.53)	0.002
≥3	64 (73.56)	81 (93.1)		
antimalarial chemoprophylaxis				
Yes	81 (46.6)	87 (100)	0 (inf - inf)	
No	6 (3.4)	0 (100)		
anti-anemia chemoprophylaxis				
Yes	82 (47.1)	87 (100)	0 (inf - inf)	
No	5 (2.9)	0 (0)		
Significant severe vomiting				
Yes	10 (11.49)	3 (3.44)	3.64 (0.96 - 13.7)	0.043
No	77 (88.50)	84 (96.55)		
Malaria				
Yes	29 (33.33)	16 (18.39)	2.22 (1.10 - 4.48)	0.024
No	58 (66.67)	71 (81.60)		
Pre-eclampsia				
Yes	8 (9.19)	6 (6.89)	1.37 (0.45 - 4.12)	0.577
No	79 (90.80)	81 (93.10)		
IMC (body mass index)				
<18 kg/m ²	6 (9.67)	0 (0)	< 8.81 (1.02 - 7.52)	0.0044
>18 kg/m ²	56 (90.32)	75 (90.96)		
Total	62 (100)	75 (100)		
Height				
<155 cm	27 (31.03)	8 (9.19)	4.44 (1.89 - 10.47)	0.0003
≥155 cm	60 (68.96)	79 (90.80)		

Table 3. Risk factors of low birth weight at term.

Risk factors	OR	P value
Severe low weight during the first quarter Body mass index < 18 kg/m ²	<8.81	0.0044
Number of prenatal follow-up < 3	4.96	0.002
Height < 155 cm	4.44	0.0003
High level of stress	3.36	0.043
Passive smoking	2.57	0.040
Malaria during the pregnancy	2.22	0.024

4.2. Risk Factors of Low Birth Weight at Term

Socio-economic level

Parturients with no schooling and with no professional activity were slightly but not significantly associated with low birth weight while those having a low economic level were not associated. Nikièma [7] and Tambwe [10] go in the same trend; however, the low economic level was slightly but significantly associated with low birth weight in their studies. The matching we made has probably reduced the differences between the cases and control cases, which may explain the fact that the low economic level has not been identified as a risk factor for low birth weight at term in our study.

- **Social environment**

Among the social environment characteristics, the level of stress has been identified as a risk factor for a low birth weight at term. This matches with literature data. The patients subject to a high stress level were typically anorexic because of health and social problems encountered during their pregnancy.

Passive smoking during pregnancy also increases by almost twice the risk of low birth weight. This significant relation is found in the studies of Hortal B L *et al.* [11] and Fourn L. [12] where passive smoking and smoking increase the risk of low birth weight. Nikièma et Kaboré [7] [13] have not identified this type of relation. Tobacco and nicotine bring about a decrease in the placental uterine flow which causes insufficient nutritional intake for fetal growth. There is a dose-response effect regarding smoking and low birth weight [11]. Only passive smoking was taken into account in our analysis because none of our patients consume tobacco.

Prenatal follow-up

- **Maternal body weight**

We notice that the risk of giving birth to a child of low weight is about eight times higher when the body mass index is inferior to 18 kg/m². The risk is four times higher when such index is between 18 and 19.99 kg/m². Several studies such as those of Nikèma [7], Somé [9], Tambwe [10], Mafina-Mienandi *et al.* [14], Ronnenberg and al [15] have established this significant relation between low body mass index during pregnancy and low birth weight. Thus, maternal nutritional intake during pregnancy contributes to meeting the mother's energy needs as well as the fetus' growth and energy needs. An intake below 1 500 cal/day and a low weight gain during the third trimester is more likely to result in a fetal weight reduction [15].

- **Height**

Parturients whose height is smaller than 155 cm are four times more likely to have babies with low birth weight. This situation can be observed in other studies [7] [9] [10]. Indeed, a small-heighted pregnant woman has a reduced or small volume of systolic cardiac ejection that leads to a decrease in utero placental perfusion with deficient transfer of nutrients from the pregnant woman to the fetus, thus causing intrauterine growth retardation.

- **The number of prenatal cares**

A number of prenatal cares below three increases by almost five times the risk of giving birth to a baby with a low birth weight. Other studies [7] [14] and [16] have also found this correlation. Prenatal consultation enables to identify and treat the pathologies which may occur during the pregnancy and to improve both mother' and fetus' wellbeing.

- **Pathologies during the pregnancy**

A history of malaria during pregnancy increases by twice the risk of low birth weight. This significant association is found in the studies of Tambwe [10], Matteelli A *et al.* [17], and Allen SJ *et al.* [18]. Malaria infection causes the destruction of the red blood corpuscles responsible for anemia and the fetus nutritional defect. In addition, Sullivan AD *et al.* [19] have found an increase of TNF-alpha or IL-8 expression in the placenta which was associated with intrauterine growth retardation. These results suggest that malaria infections induce a potentially harmful pro-inflammatory response in the placenta [3] [19].

5. Conclusion

This study identified risk factors associated to low birth weight at term. We must take action to reduce the impact of these factors. Quality prenatal care is likely to reduce the incidence of low birth weight at term.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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