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Original Research Article

Low birth weight in newborns: epidemiological aspects and neonatal prognosis within Bogodogo teaching hospital, Burkina Faso

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ABSTRACT

Background: Low birthweight is one of the main causes of neonatal death, after asphyxia and infections. This study purpose is to determine the epidemiological aspects and prognosis of this condition.

Methods: This was a descriptive and analytical cross-sectional study. Data were collected prospectively from July 1st to September 30th, 2021 within Bogodogo Teaching Hospital. The study population included the overall newborns and their mothers.

Results: The low birthweight frequency was estimated at 17.26% of live births. The average age was 26.06±5.8 years. Housewives accounted for 68.6% of cases against 78.9% for mothers in union. Unschooled mothers accounted for 38.3%. Mothers having medium socio-economic status accounted for 83.1% of cases. The average number of gesture was 2.60±1.62 and average parity was 2.72±1.76. Premature newborns accounted for 51.1% of cases. Females represented 55.6% of cases, giving a sex ratio of 0.80. The average weight was 1970.64±375.21 g with extremes of 900g and 2450g. The neonatal mortality rate was estimated at 9.4%. Occupation (p=0.003), marital status (p=0.001), place of residence (p=0.011), socioeconomic level (p=0.000), body mass index (p=0.001) and multiple pregnancy (p=0.01) were statically associated with low birthweight at term.

Conclusions: At the end of this study, it appears that further action is still needed to reduce low birthweight frequency, which implies improving the socio-economic conditions of the population.

Keywords: Burkina Faso, Low birthweight, Newborn, Prognosis

INTRODUCTION

Birthweight is an indicator of perinatal health. Indeed, a low birthweight newborn (LBW) both reflects the mother's health condition and the quality of health services.¹ LBW corresponds to a birth weight which is strictly less than 2,500g. The World Health Organization (WHO) in 2015 estimated that low birthweight newborns accounted for 14.6% of all live births worldwide, which is 20.5 million children.² According to the same organization's data, more than 80% of the 2.5 million annual perinatal deaths

worldwide could be related to low birthweight. In Africa, LBW is one of the main causes of neonatal death which comes in third place behind asphyxia and infections.³ In the fight against this scourge, WHO has set the goal to reduce by 30% the number of children born with a weigh below 2,500 g by 2025.² In this regard, Burkina Faso has set up a certain number of strategies including free healthcare for pregnant women and children under 5, subsidies for prenatal consultations, nutrition education for undernourished populations, anti-malaria and anti-anemia chemoprophylaxis, and capacity building for health

workers through continuous trainings.^{4,5} This study aims at determining the epidemiological aspects and prognosis of this category of newborns within Bogodogo Teaching Hospital, in order to better target health interventions.

METHODS

The study took place within the obstetrics gynecological and medicine of reproduction department of Bogodogo Teaching Hospital in Ouagadougou. This was a descriptive and analytical cross-sectional study. Data were prospectively collected from July 1st to September 30th, 2021. The analytical study was a case-control study which consisted in searching risk factors associated with low birthweight at term. The study population included the overall newborns and their mothers. To comply with ethical considerations, we worked to obtain informed consent from patients before filling out the individual survey form. Patient confidentiality and anonymity were kept.

The minimum number of low birthweight newborns required for the study was determined by applying the Schwarz formula. Based on EDS 2010, low birthweight represents 14% of births in the general population of Burkina Faso.⁶ The sample minimum size was 185 newborns. Sampling was exhaustive, and based on mothers' consent, the sample was progressively constituted by taking into account all low birthweight newborns meeting the inclusion criteria. Any live-born newborns whose birth weight was strictly below 2500g were included in the study.

Data sources included the following: pregnancy care and follow-up booklets, delivery and operative registers, medical records and direct or telephone interviews with mothers. The variables studied were mothers' socio-demographic characteristics, newborns' clinical aspects and prognostic aspects.

Statistical analysis

Data entry and analysis were performed on a microcomputer using Epi-info software version 7.2.3.0. The chi-square test or Fischer's exact test enabled to compare the proportions of the qualitative variables. The value p was significant when being below 0.2 in univariate and 0.05 in multivariate logistic regression. Odds ratios and their 95% confidence intervals were calculated to measure the strength of this association.

RESULTS

Frequency

Total 2,398 live births were recorded among which 414 cases of LBW. The frequency of LBW was estimated at 17.26% of live births. 403 cases out of the 414 of low birthweight were included in our study. 360 mothers gave birth to these 403 newborns included in our study.

Socio-demographic characteristics of LBW mothers

The average age was 26.06±5.8 years, with extremes of 15 and 44 years. Housewives accounted for 68.6% of cases against 78.9% for mothers in union. Unschooled mothers accounted for 38.3% of cases. Mothers with an average socio-economic level represented 83.1% of cases. The average number of gestations was 2.60±1.62, with extremes of 1 and 9 pregnancies. Average parity was estimated at 2.72±1.76 with extremes of 1 and 8 deliveries. Mothers were distributed according to the age range presented in Table 1.

Table 1: Distribution of mothers according to their age range (n=360).

Age (years)	Numbers (n)	Percentage (%)
15-19	45	12.5
20-24	93	25.8
25-29	99	27.5
30-34	60	16.7
35-39	53	14.7
40-44	10	2.8
Total	360	100

Low birthweight newborns' characteristics

Total 51.1% of cases were premature newborns. Females accounted for 55.6% of cases, giving a sex ratio of 0.80. The Table 2 contains the anthropometric birth parameters of low birthweight newborns. The average weight was 1970.64±375.21 g, with extremes of 900g and 2450g.

Table 2: Summary of anthropometric parameters of low birthweight newborns (n=403).

Variables	Frequency (n)	Percentage (%)
Weight (g)		
<1000	3	0.8
1000-1500	46	11.4
1500-2500	354	87.8
Size (cm)		
≤ 35	11	2.7
35-40	67	16.7
40-45	142	35.2
> 45	183	45.4
Head circumference (cm)		
≤ 25	13	3.2
25-29	127	31.5
29-33	245	60.8
>33	18	4.5
Chest circumference (cm)		
≤ 25	78	19.3
25-29	216	53.6
29-33	108	26.8
>33	1	0.3
Total	403	100

Neonatal prognosis of low birthweight newborns**Immediate prognosis**

Immediate cry: 89.6% of newborns cried immediately after birth.

Apgar score: 10.9%, 4.2% and 2.5% of newborns had their Apgar score below 7 respectively at 1 minute; 5 minutes and 10 minutes.

Silverman score and cyanosis: After birth, 15.6% of newborns had respiratory distress while 13.7% had cutaneous cyanosis.

Resuscitation status: 14.1% of newborns were resuscitated after birth with an average resuscitation time of 4.62 ± 2.83 minutes with extremes of 1 min and 10 min.

Transfer to neonatology: 45.2% of newborns were transferred to neonatology. Prematurity was the major reason for transferring 54.4% of them in this unit.

Prognosis at day 28

Total 365 newborns out of the 403 were alive at Day28, corresponding to 90.6% of cases. Among these 365 newborns alive, 53 were diagnosed with a pathology, corresponding to 14.5% of morbidity. Neonatal suffering accounted for 52.9% of diagnosed pathologies. The neonatal mortality rate reached 9.4%. Neonatal distress accounted for 26.3% among the causes of death identified.

Factors associated with low birthweight at term

Total 176 mothers gave birth to full-term LBW newborns.

Risk factors associated with low birthweight at term

We looked for risk factors associated with the occurrence of low birthweight at term. The results of the multivariate analysis are presented in Table 3. Factors whose p-value was less than 0.05 were statistically associated with the occurrence of low birthweight at term.

Table 3: Analysis of risk factors associated with low birthweight at term (n=176, n'=380).

Risk factors	Cases (%)	Witnesses (%)	OR	[IC 95%]	P-Value
Occupation					
Not housewife	61 (14.9)	164 (85.1)	1		
Housewife	115 (34.7)	216 (65.3)	3.02	[2.12 – 4.31]	0.0031
Marital situation					
Married	132 (28.4)	333 (71.6)	1		
Single	44 (48.4)	47 (51.6)	2.36	[1.49 – 3.73]	0,0012
Residence					
Non rural	135 (28.7)	335 (71.3)	1		
Rural	41 (47.7)	45 (52.3)	2.26	[1.41 – 3.61]	0.0114
Socio-economic level					
Not low	156 (29.7)	370 (70.3)	1		
Low	20 (66.7)	10 (33.3)	4.74	[2.17 – 10.36]	0.0002
Body mass index					
≥ 18.5	140 (29.2)	340 (70.8)	1		
< 18.5	36 (47.4)	40 (52.6)	2.18	[1.33 – 3.57]	< 0.001
Number of fetuses					
1	150 (29.1)	365 (70.9)	1		
> 1	26 (63.4)	15 (36.6)	4.21	[2.17 – 8.18]	0.0106
Alcohol					
No	168 (30.9)	375 (69.1)	1		
Yes	8 (61.5)	5 (38.5)	3.57	[1.15 – 11.07]	0.2107
Passive smoking					
No	170 (31.1)	376 (68.9)	1		
Yes	6 (60.0)	4 (40.0)	3.31	[0.92 – 11.90]	0.9987
Blood pressure					
No	135 (28.3)	342 (71.7)	1		
Yes	41 (51.9)	38 (48.1)	2.73	[1.68 – 4.43]	0.0025
Anemia					
No	146 (29.0)	358 (71.0)	1		
Yes	30 (57.7)	22 (42.3)	3.34	[1.86 – 5.98]	0.0256

Table 4: Prognostic factors associated with LBW at term (n=197, n'=394).

Prognostic factors	Cases (%)	Witnesses (%)	OR	[IC 95%]	P-Value
Immediate cry					
Yes	176 (32)	374 (68)	1		
No	21 (51.2)	20 (48.8)	2.23	[1.17 – 4.22]	0.0191
APGAR at 1st minute					
≥7	178 (31.8)	381 (68.2)	1		
<7	19 (59.4)	13 (40.6)	3.12	[1.51 – 6.47]	0.0264
Silverman score					
<3	180 (32.1)	381 (67.9)	1		
≥3	17 (56.7)	13 (43.3)	2.76	[1.31 – 5.82]	0.0275
Cyanosis					
No	177 (32.0)	375 (68.0)	1		
Yes	20 (51.3)	19 (48.7)	2.23	[1.16 – 4.28]	0.3049
Resuscitation					
No	175 (31.9)	374 (68.1)	1		
Yes	22 (52.4)	20 (47.6)	2.35	[1.25 – 4.42]	0.0199
Transfer to neonatology					
No	151 (29.0)	370 (71.0)	1		
Yes	46 (65.7)	24 (34.3)	4.69	[2.76 – 7.96]	<0.001
Alive at day 28					
Yes	186 (32.5)	386 (67.5)	1		
No	11 (57.9)	8 (42.1)	2.86	[1.12 – 7.21]	0.0276
If alive					
Pathology no	142 (28.5)	356 (71.5)	1		
Pathology yes	44 (59.5)	30 (40.5)	3.67	[2.22 – 6.08]	0.0403

Prognostic factors associated with LBW at term

We have searched prognostic factors associated with low birthweight at term. Table 4 contains the results of the multivariate analysis. Factors whose p-value was less than 0.05 were statistically associated with the prognosis of low birthweight at term.

DISCUSSION

Frequency

It was estimated at 17.26%. Faye in Senegal found a frequency of 14.8%.⁷ The frequency in our study was largely below that of Ouédraogo/Yugbare who found a frequency of 64.8% in the whole city of Ouagadougou (3 neonatal units), and that of Nagalo, who found a prevalence of 24.9% at CHU-P (Teaching and Pediatric Hospital) Charles De Gaulle, Burkina Faso.^{8,9} These differences could be explained by the fact that Ouédraogo/Yugbare 's and Nagalo's works were carried out within neonatal units.

Mothers and newborns socio-demographic characteristics

The average age was 26.06±5.8 years. This is close to that of Ouédraogo/Yugbare, who found an average of 25.8

years.⁸ The results of Yao in Côte d'Ivoire, of Awoleké in Nigeria and of HASSOUNE in Morocco had concluded that low birthweight newborn birth was more frequent at the extremes of reproductive life (<19 years and >35 years).¹⁰⁻¹²

There are 51.1% of LBW newborns in our study were premature. This result is similar to those of Kaboré in Burkina Faso and Chiabi in Cameroon, who found a predominance of premature newborns respectively 69.7% and 79.6%.^{13,14} Prematurity as the first cause of LBW could explain this predominance.

Risk factors associated with LBW at term

Occupation was significantly associated with LBW at term P=0.0031, with a 3.02 times higher risk for housewives to give birth to a LBW newborn at term. Traoré' study in Mali has observed this predominance by finding 64.2%.¹⁵

Marital status was significantly associated with low birthweight at term with P=0.0012. We have noted that single mothers have a 2.36 times higher risk to give birth to a low birthweight newborn. This result is similar to that of Siza in Tanzania, who found in his works that single mothers have a double risk of having a LBW newborn at term compared with married mothers.¹⁶ These results

could be explained by the fact that single mothers are more affected by stress and low economic status.

Socioeconomic level was significantly associated with LBW at term, with $P=0.0002$; mothers with a low socioeconomic level had a 4.74 times higher risk of having a LBW newborn at term. Nikiéma in Burkina Faso and Tambwe in the Democratic Republic of Congo also found a low socio-economic status in their studies.^{17,18} In fact, the lack of education combined with the absence of income-generating activities constitute obstacles to the use of health services during pregnancy, with the consequent failure to identify the morbid factors responsible for low birthweight.

Body mass index was significantly associated with LBW at term $P<0.0001$, with a 2.18 times higher risk of having a high LBW newborn if the mother has poor nutritional condition. This result is similar to that of Kain in Burkina Faso, who found that 22% of mothers had a BMI <18.5 kg/m² and that the risk of giving birth to a low birthweight newborn is around 8 times higher when body mass index is below 18 kg/m².¹⁹ Tambwe in the Democratic Republic of Congo has developed a significant link between low maternal body mass index and low birthweight.¹⁸ In fact, maternal nutritional intake helps to meet the mother's energy requirements, as well as the fetus growth and energy needs. Maternal malnutrition leads to placental insufficiency which disrupts exchanges between mother and fetus, resulting into hypoxia and a reduced supply of nutrients to the fetus.

In our series, 28.6% of LBW newborns were born from a multiple pregnancy (twin or triplet). The number of fetuses was significantly associated with LBW at term with $P=0.010$. Parturients with multiple pregnancies had a 4.21 times higher risk of having low birthweight newborns. This rate is higher than that of Kaboré in Burkina Faso, who found 21.9% twin pregnancies, and Letaief 's in Tunisia, who found 22% of multiple pregnancies.^{13,20} Indeed, the fetal development is relatively slower in multiple pregnancies, making multiple pregnancies one of the causes of LBW, hence this result.

High blood pressure during pregnancy was significantly associated with LBW at term ($P=0.0025$), hypertensive women during pregnancy have a 2.73 times higher risk to deliver a LBW newborn. These results are in line with those of Yao in Côte d'Ivoire and MABIALA in Congo Brazzaville.^{10,21} Indeed, the mechanism involved is that gestational hypertension leads to a reduction in placental blood flow, and therefore a reduction in the exchange of nutrients and oxygen between mother and fetus, which will result into slower fetal growth and in the end a low birthweight.²²

Anemia in pregnancy was a factor significantly associated with LBW at term, with $P=0.0256$ and anemic woman during pregnancy have 3.34 times higher risk to deliver a low birthweight newborn. This finding joins that of Xiong

in China.²² In sub-Saharan Africa, anemia in association with malaria remain the main causes of unfavorable pregnancy outcomes, which could explain these different results.

CONCLUSION

At the end of this study, it appears that further action is still needed to reduce the frequency of low birthweight newborn, which implies improving the socio-economic conditions of the population. However, a study on the long-term future of these newborns would be necessary to better understand the issue related to low birthweight in Burkina Faso in order to guide action.

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Conflict of interest: None declared

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