



Low Birth Weight Newborns: Epidemiological Aspects and Neonatal Prognosis within Yalgado Ouédraogo Teaching Hospital, Burkina Faso

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Abstract

Introduction: In Burkina Faso, frequency of low birth weight has remained significant hence the interest of our study in order to assess the epidemiological aspects and neonatal prognosis of low birth weight to better target health actions.

Methodology: This was a descriptive and analytical cross-sectional study carried out from July 1st to December 31, 2021 in the gynecology obstetrics department. The analytical side consisted in studying factors associated with low birth weight at term. For this purpose, we conducted a case-control study with a ratio of 1/1. The study involved all newborns and their mothers.

Results: Hospital frequency of low birth newborns was 13.6%. The average age of women was estimated at 26.89 ± 6.21 years, with extremes of 16 and 45 years. Premature newborns accounted for 59.9% of cases. Vaginal delivery occurred in 57.9% of cases. The average weight was 1962.70 ± 692.30 grams. In multivariate analysis, the factors independently associated with low birthweight were: Residence, maternal age, occupation, socioeconomic level, number of prenatal consultations, type of pregnancy, newborn sex, Apgar score below 7 at the first minute and transfer to neonatology.

Conclusion: Reducing low birth weight frequency mainly implies improving the population's economic status and informing women on the benefits of antenatal care. However, a multi-center study in rural and urban areas, with a close follow-up of women during pregnancy, will enable to significantly assess the factors risks for better prevention.



Introduction

Birth weight is a good indicator not only for the mother's health and nutritional status, but also for the newborn's future survival including his /her growth, his/her long-term health and psychosocial development [1]. The World Health Organization estimates that 20.5 million babies worldwide are born weighing less than 2,500 grams (g), which corresponds to a prevalence of 14.6%. In Africa, neonatal mortality is mainly due to low birth weight related to prematurity [2]. Maternal pathologies such as anemia, high blood pressure, genital hemorrhage and malaria are also responsible for low birth weight [3]. Quality antenatal care is key to early detection and management of these conditions. In 2006, Burkina Faso government has introduced a subsidy for Emergency Obstetric and Neonatal Care (SONU) whose purpose was to reduce medical expenses for families and enhance the use of healthcare services. Considering the inadequate quality and use of care despite the subsidy, the Council of Ministers has adopted the free care policy for pregnant women [4] in 2016. Despite the implementation of all these measures, the frequency of low birth weight has remained significant hence the interest of our study in order to assess the epidemiological aspects and neonatal prognosis of low birth weight to better target health actions.

Patients and Methods

This was a descriptive and analytical cross-sectional study carried out from July 1st to December 31, 2021 in the gynecology obstetrics department of Yalgado Ouédraogo Teaching Hospital. Data was collected prospectively. The analytical side consisted in studying factors associated with low birth weight at term. For this purpose, we conducted a case-control study with a ratio of 1/1. The study involved all newborns and their mothers. The sample size was calculated using Schwartz's formula: $n = \frac{\epsilon^2 pq}{i^2}$ n = sample size, ϵ = standard deviation chosen at a value of 1.96 (corresponding to a confidence interval of 95%), i = margin of error estimated at 0.05, p = prevalence of low birth-weight in Burkina Faso which was estimated at 14% and $q = 1-p = 86\%$ by the Demographic and Health Survey [5].

Applying the formula, we obtain a minimum necessary size **n=185**.

As for the descriptive study, all live newborns weighting below 2500 g and having a gestational age of at least 22 weeks of amenorrhea were concerned. To identify factors associated with low birthweight, control groups were established and met the same criteria, except for birth weight which was above or equal to 2500 g. The control was the immediate newborn following a case of low birth weight on the delivery register.

Information was collected from patients' clinical records, admission registers, delivery registers, operative report registers, medical records, pregnancy follow-up booklets, and direct and telephone interviews with parents through the questionnaire. Data collection was made through a paper questionnaire used as an individual form.

The socio-demographic characteristics of the women who gave birth were studied as well as the pregnancy follow-up data including newborn characteristics at birth and neonatal prognosis.

A microcomputer was used for data entry and analysis through Epi-info software version 7.1.2. Text, tables and graphs were drafted with Microsoft Word 2013 software.

The descriptive study was made by determining percentages, averages and standard deviations. As for the analytical side, Student's t-test was used to compare averages when variances were homogeneous. The chi2 test or Fisher's exact test enabled to compare the proportions of qualitative variables. Odds ratio and 95% confidence interval were calculated to establish an association between a dependent variable and a presumed risk factor. Statistical tests giving values of $p < 0.2$ were considered significant in univariate analysis. As for multivariate analysis, variables with $p < 0.05$ values were considered significant.

The authorization to collect data was obtained from the General Director of Yalgado Ouédraogo Teaching Hospital. Patient anonymity and confidentiality were kept. In the end, we obtained parents' informed consent during our study.

Results

Frequency

During the study period, 3,723 deliveries were recorded among which 3,451 live births, of which 469 were low birth weight babies, corresponding to a hospital frequency of 13.6%. Only 451 newborns from 365 mothers were included in our study.

Socio-demographic characteristics of women giving birth

The average age of women who gave birth was estimated at 26.89 ± 6.21 years, with extremes of 16 and 45 years. The 20-29 age range group accounted for 54.5% of cases. The women who gave birth were housewives and traders in respectively 59.4% and 20.3% of cases. 36.7% and 35.1% of their spouses were respectively informal sector workers and traders. Mothers with a maximum of primary school level education accounted for 51.5% of cases. Those who were married accounted for 71.5% of cases and 63.8% of cases were living in urban areas. Pauci gestures (history of 2 to 3 previous pregnancies) accounted for 41.6% of cases against 41.9% of Pauci pare (history of 2 to 3 previous deliveries).

Characteristics of low birth weight newborns

Newborns distribution according to pregnancy term is indicated in table 1.

Table 1: Newborns distribution according to pregnancy term.

Term	Numbers	Percentage (%)
22 WA - 28 WA	17	3.8
29 WA - 33 WA	52	11.5
34 WA - 36WA	201	44.6
≥37 WA	181	40.1
Total	451	100

WA: week of amenorrhea

Premature newborns accounted for 59.9% of cases. Vaginal delivery occurred in 57.9% of cases. The average weight was 1962.70 ± 692.30 grams, with extremes of 950g and 2,450g. Newborns weighting between 1,500 and 2,450g accounted for 77.2% of cases. The average height was 45.96 cm (+/-5.31) with extremes of 33 cm and 51 cm. The average head circumference (HC) was 30.96 (+/-4.37) with extremes of 21 and 33 cm. The 25-29 cm range accounted for 57% of cases. The average thoracic circumference (TC) was 29.25 cm (+/-3.84) with extremes of 18 and 33 cm. The 25-29 cm range accounted for 53.9% of cases. Neonatal malformations were present in 3.8% of cases.

Table 2: Newborns distribution according to immediate prognosis.

Immediate prognosis	Numbers	Percentage
Apgar in the 1st minute		
< 7	89	19.7
≥ 7	362	80.3
Resuscitation		
Yes	44	9.7
No	407	90.3
Neonatal suffering		
Yes	49	10.9
No	402	89.1
Transfer to neonatology		
Yes	192	42.6
No	259	57.4

Table 3: Risks factors associated with low birth weight at term included in multivariate analysis.

Factors	Cases	Control	OR	IC to 95%	P-value
Maternal age					
20-39	155	150	1		
< 20	17	13	1.19	0.12-3.15	< 0.001
≥ 40	9	18	1.95	1.02-3.68	0.645
Occupation					
Salaried person	123	107	1		
Housewife	58	74	8.76	4.13-74.12	0.046
Residence					
Urban area	151	172	1		
Rural area	30	9	1.44	0.16-2,95	0.042
Socio-economic level					
High	35	41	1		
Medium	125	130	0.16	0.11-7.36	0.013
Low	21	10	2.17	0.01-2.18	0.022
Number of antenatal contact					
≥3	63	167	1		
<3	118	14	2.29	1.07-4.9	0.031
Pregnancy type					
Oncofetal	69	176	1		
Twins	105	5	6.03	2.21-16.52	< 0.001
Multiple	7	0	9.71	3.79-24.82	0.342
Newborn's gender					
Male	88	106	1		
Female	93	75	1.58	0.81-6.17	< 0.001
Apgar at the 1st min					
≥ 7	131	174	1		
<7	50	7	8.91	4.28-18.53	0.025
Transfer to neonatology					
No	157	178	1		
Yes	24	3	2.42	1,74-43,12	0.003

Neonatal prognosis

Table 2 indicates newborns distribution according to immediate neonatal prognostic aspects.

At 7 days of life, 10 newborns died, corresponding to a mortality rate of 2.3%.

At 28 days of life, 40 newborns died, corresponding to a mortality rate of 9.2%.

Factors associated with a low birth weight at term

In multivariate analysis, the factors independently associated with low birthweight were: residence, maternal age, occupation, socioeconomic level, number of prenatal consultations, type of pregnancy, newborn sex, Apgar score below 7 at the first minute and transfer to neonatology.

Discussion

Frequency: Low birth weight frequency was estimated at 13.6%, a rate close to the one reported by the Burkina Faso 's Demographic and Health Survey [5] in 2010 estimated at 14% and to the one reported by Awoleke [6] in Nigeria in 2012 who found 14.1%. On the other hand, this rate is above the one reported in Kain' study [7] on low birth weight at term in 2018 who found 4.4%. This frequency is below the one reported by Nagalo [8] in 2021 at the Pediatric Teaching Hospital Charles De Gaulle (CHUP-CDG), who found 24.9%. This significant difference with Nagalo's results could be explained by the fact that CHUP-CDG is one of Burkina Faso's main referral centers where newborns, especially low birthweight babies are evacuated.

Socio-demographic characteristics of women giving birth

In our sample, the average age of women giving birth was estimated at 26.9 years with the 20-29 age range being the most represented group. Studies of Beddek [9] and Badshah [10] have also found a predominance of the 20-29 age range group. Our results could be explained by the fact that this age range corresponds to the period of full sexual activity. Moreover, this is the age group with the highest fertility rate in urban areas [5] in Burkina Faso. However, some authors such as Hassoune [11] and Awoleke [6] have concluded in their studies that low birth weight newborn is more frequent at the extremes of reproductive life (under 19 and over 35).

59.4% of the mothers in our study were housewives. This predominance was also found in the studies of Chiabi [12] in Cameroon who found an unemployment rate of 54.3%. The study of Ouédraogo [13] in Burkina and Gueye in Senegal revealed the same predominance respectively with rate of 77.6% of housewives, and 77% of unemployed mothers [14]. This result can be explained by the fact that the female population in Burkina Faso is mainly made up of housewives [5].

The majority of women who gave birth in our study were married corresponding to 71.5%, a rate close to Kain's [7] and Ngbale's [15]. However, based on the literature, several authors argue that unmarried women are at greater risk of having low birth weight newborns [11,16]. The high rate of married women in our study could be due to religious beliefs, where conceiving a child is only permitted in marriage.

The socio-economic level of the majority of households was medium, corresponding to a rate of 76.7%. This result differs from the one found by Kain [7], who reported a predominant low socioeconomic level. This difference could be justified by

the fact that in our study the majority of parents were living in urban areas, and almost all spouses had a source of income.

Characteristics of low birth weight newborns

Most of the low birth weight newborns in our study were premature (59.9%). There was also a predominance of premature babies in the study led by Chiabi in Cameroon, by Patel in Congo and Beddek in Alger, corresponding to respectively to 85.6%, 50.9% and 67.9% [12,17,9]. This predominance of premature babies could be explained by the fact that prematurity is the main cause of low birth weight.

Birth weight in our study ranged from 950 to 2,450 grams, with an average weight of 1962.70 g \pm 692.30 g. 77.2% of newborns had a weight between 1,500g-2,450g. Our result is above that of Lima in Brazil [18] in 2014, who found an average weight of 1,113g (+/- 267).

Neonatal prognosis

As for immediate prognosis, 80.3% of newborns had a first-minute Apgar score \geq 7. These results differ from those of Fethi [19] in Tunisia who found a lower rate estimated at 30.8%. This difference could be explained by the low prevalence of premature babies in our study.

As for long-term prognosis (28 days), morbidity was estimated at 7.6% and mortality rate at 9.2%. This low mortality rate can be explained by the improved management of newborns in the delivery room and neonatal care.

Factors associated with low birth weight at term

Mothers' age was significantly associated with low birth weight at term in our study ($p < 0.001$). Mothers of newborns under 20 years were 1.19 times more likely to have low birth-weight babies.

Occupation was significantly associated with low birth weight at term ($p = 0.046$). Housewives were 8 times more likely to have low birth weight babies. This could be explained by the fact that the lack of an income-generating activity constitutes an obstacle to the use of health services during pregnancy, with the consequent failure to identify the morbid factors causing hypotrophy.

The place of residence was significantly associated with low birth weight ($p = 0.042$). Women living in rural areas were 1.44 times more likely to have an LBW child.

Socioeconomic status was significantly associated with low birth weight at term ($p = 0.022$). Mothers with low socioeconomic level were 2.17 times more likely to have low birth weight babies. Moyambe [20] found the same association. On the other hand, medium socio-economic status was a protecting factor of low birthweight OR= 0.16.

The low number of ANC significantly increases the risk of having low birth weight newborns ($p = 0.031$). In Rakotazanany' study [21], 35.5% of pregnancies with less than 3 ANC resulted into low birth weight babies, a risk estimated at 2.29 times in our study. Prenatal consultation enables early identification and treatment of pathologies likely to occur during pregnancy and to cause hypotrophy.

Pregnancy type was significantly associated with low birth weight ($p < 0.001$). Children from twin pregnancies were 6 times more likely to be born with low birth weight. This is explained

by the fact that utero-placental flow is reduced in twin pregnancies by uterine over-distension and early placental degeneration leading to low birth weight.

The newborn's gender was a factor significantly associated with low birth weight at term ($p < 0.001$), with a risk of 1.58 times for females. Other studies, such as those of Bwana [22] in Congo and Hassoune [11] in Morocco, found the same exposure of female sex.

An Apgar score less than 7 at the first minute was significantly associated with low birth weight at term ($p = 0.025$), with an idem situation for transfer to neonatology ($p = 0.003$). Morbidity was therefore less favorable for low birthweight newborns. According to Chiabi [12], an Apgar score less than 7 at the first and fifth minute was also identified as a prognostic factor for mortality.

Conclusion

The frequency of low birth weight was high and most of the newborns were premature who were predominantly female. Parents were mostly living in urban areas with a medium socio-economic status and with young mothers. Factors significantly associated with low birth weight were identified.

Further action is therefore still needed. Reducing low birth weight frequency mainly implies improving the population's economic status and informing women on the benefits of antenatal care. However, a multi-center study in rural and urban areas, with a close follow-up of women during pregnancy, will enable to significantly assess the factors risks for better prevention.

Ethics approval and consent to participate

The authorization to collect data was obtained from the General Director of Yalgado Ouédraogo Teaching Hospital. Patient anonymity and confidentiality were kept. In the end, we obtained parents' informed consent during our study.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare that they have no competing interests in this section.

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This research did not receive any specific grant from funding agencies.

Authors' contribution

All Authors conceptualized, designed the study, collected, analyzed, and interpreted the data, and also drafted the manuscript. Data analysis, drafting of the manuscript, and advising

the whole research paper and also involved in the interpretation of the data and contributed to manuscript preparation. All authors read and approved the final manuscript.

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