



## ORIGINAL ARTICLE

## Risk Factors for Death in Premature Newborns at the Ouahigouya Regional Teaching Hospital in Burkina Faso

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### Abstract

**Introduction:** Prematurity is a real public health problem in developing countries. The objective of this study was to investigate the risk factors for death in premature newborns in a pediatric ward.

**Methods:** This was a retrospective cross-sectional study with descriptive and analytical aims that took place over a period of 12 months. It involved all hospitalized newborns. The data were entered and analyzed using Epi info 7.2.3.1 2019 software and exported to Excel 2016.

**Results:** The hospital prevalence of prematurity was 20.75%. The average age of the mothers was 24 years (range 15-41). 89.59% of the mothers were housewives. 253 women (94.05%) had at least one prenatal consultation during the pregnancy.

The mortality rate was 44.37%. Among deceased newborns, mortality was significantly related to gestational age, birth weight, score, and the presence of a complication.

There was a statistically significant relationship between neonatal mortality and certain maternal characteristics: pregnancy monitoring, place and mode of delivery.

**Conclusion:** Improving the management of prematurity should be based on better consideration of the risk factors associated with mortality.

### Keywords

Newborn, Prematurity, Mortality, Burkina Faso

worldwide, and more than one million will die due to complications related to prematurity [1].

The morbidity and mortality rate associated with prematurity is said to be very alarming in many countries around the world. Every 30 seconds, a newborn dies worldwide due to prematurity. This mortality rate is even higher in low-income countries where premature newborns have only a 10% chance of survival [1].

Sub-Saharan Africa and Asia alone accounted for 60% of premature births worldwide. According to a study published in 2019, these two regions accounted for 81.1% of premature births [1].

In Burkina Faso, prematurity accounted for 10.9% of live births. According to statistics from the Burkinabe Ministry of Health, the national prematurity rate was 2.3%. Prematurity is the second leading cause of death among children under 5 years of age [2].

In the pediatric unit of Ouahigouya Regional Teaching Hospital, prematurity is one of the leading causes of death among children under one year of age, with an estimated proportion of 8.5% [3]. This study aimed to research the factors of death of premature newborns in the department in order to contribute to improving their care.

### Methods

This was a cross-sectional study with a descriptive and analytical design, with retrospective data collection

### Introduction

According to the World Health Organization (WHO), each year, nearly 15 million babies are born prematurely

over a one-year period (January 1 to December 31, 2022).

Our study included all newborns hospitalized during the study period in the pediatric unit of Ouahigouya Regional Teaching Hospital.

The sampling was exhaustive and included all patients meeting the study inclusion criteria. All newborns with a gestational age strictly less than 37 completed weeks of amenorrhea and greater than 22 weeks of amenorrhea, hospitalized in the pediatric department for any reason, with a complete clinical record, were included in the study.

The study did not include premature infants who died upon arrival, or those admitted to the unit but not hospitalized.

Data were collected using an individual form based on admission forms, the newborns' hospitalization medical records, obstetrical and gynecological records, and information gathered during the interview.

Data were entered and analyzed using Epi info 7.2.3.1 2019 software and exported to Excel 2016. Mann-Whitney (quantitative variables), Pearsonchi-square, Fisher (qualitative variables) statistical tests were used for comparisons of proportions and means.

Comparisons were made using the Chi-square test at the 5% significance level and the calculation of odds ratios (OR) with their 95% confidence intervals (CI) for the association measures. The influence of the different relevant covariates was analyzed by univariate and multivariate logistic regression.

This study consisted of a retrospective collection of hospitalization data routinely collected in healthcare practice. Anonymity was maintained throughout the data collection, processing, and dissemination process. We obtained the consent of the relevant authorities to conduct this study.

## Results

### General data

During the study period, 1,455 newborns were hospitalized in the neonatology unit of the pediatrics department of the CHUR-OHG, including 302 premature babies, representing a hospital prevalence of 20.75%.

The average age of the mothers was 24 years  $\pm$  06 years with extremes of 15 years and 41 years. The mothers were housewives in 89.59%. The pregnancy benefited from at least one pregnancy monitoring in 253 women or 94.05%. And 15 (5.57%) pregnancies did not benefit from any pregnancy monitoring.

The average gestational age was 32 $\pm$ 2 weeks with extremes of 22 weeks and 36 weeks + 6 days. The evolution was marked by death in 134 premature babies, or 44.37%.

### Analytical study

In newborns who died, mortality was significantly related to gestational age, birth weight, APGAR score less than 7 in the first minute, and the presence of a complication. The presence of respiratory signs, particularly respiratory distress, is a significant risk factor, as is the presence of neurological signs (Table 1).

Furthermore, there is a statistically significant relationship between neonatal mortality and certain maternal characteristics: pregnancy monitoring, place and mode of delivery (Table 2).

When the pregnancy had benefited from less than 3 CPN, the prognosis of death was multiplied by 2.20 and 1.72 and when the delivery had taken place outside the CHUR of OHG. This link was very significant for the incorrect monitoring of CPN ( $p = 0.003$ ) and less significant for delivery outside the CHUR ( $p = 0.040$ ).

Vaginal delivery exposed the patient to a 1.15-fold risk of mortality. This factor was not significant for the prognosis of mortality ( $p = 0.14$ ) (Table 3).

Table 4 shows the mortality prognosis of premature newborns according to certain neonatal factors. The proportion of deaths was multiplied by 3.56 and 1.47 respectively when the birth weight was less than 1500 g and between 1500 and 1999 g.

APGAR score less than 7 increased the risk of death by 1.91 times. These factors were significant for mortality risk. There was no significant risk of mortality with gestational age less than 32 weeks and the presence of a complication.

## Discussions

In our series, we found a hospital prevalence of prematurity at 20.75%. This result is close to that of Kedy Koum, et al. [4] in Cameroon and Dainguy, et al. [5] in Ivory Coast who each reported a rate of 20%.

On the other hand, it is higher than that of Diouf, et al. [6] in Senegal (15%), Butalo, et al. [7] in Nigeria (16.8%) and Hounkponou, et al. [8] (17.89%) in Benin.

Sow, et al. in Senegal [9] and Minko [10] in Gabon had found rates of 28.1% and 50.30% respectively; higher than that of our study.

Similarly, the studies of Ouédraogo/Yugbaré [11] and Nagalo [12] in Burkina Faso noted higher prevalences than ours with 33.6% and 60.8% respectively.

The prevalence of prematurity varies according to the authors and the study setting. Overall, the rate of prematurity remains very high in Sub-Saharan Africa compared to Western and North African countries [13].

According to the World Health Organization (WHO), there are on average 12% premature births in poor countries compared to 9% in higher-income countries [14]. This high rate in sub-Saharan Africa could be

**Table 1:** Association of mortality risk factors and parameters of premature newborns.

Parameters	Effective	Lethality	P	OR	ICà95%
<b>Gestational Age</b>					
< 32WA*	193	107 (55.44%)	<b>0.0000</b>	3.77	2.25-6.35
33-36WA*	109	27 (24.77%)			
<b>Birth weight</b>					
< 1500 g	177	102 (57.63%)	<b>0.0000</b>	3.95	2.40-6.52
1500-1999 g	95	27 (28.42%)	<b>0.0001</b>	0.37	0.22-0.62
≥ 2000 g	30	5 (16.67%)	<b>0.0015</b>	0.22	0.08-0.60
<b>APGAR1<sup>st</sup> minute</b>					
< 7	88	50 (56.82%)	<b>0.0027</b>	2.20	1.31-3.72
7-10	174	65 (37.36%)			
<b>Sex</b>					
Male	147	70 (45.16%)	<b>0.77</b>	1.07	0.68-1.68
Female	155	64 (43.54%)			
<b>Respiratory distress</b>					
Yes	132	81 (61.36%)	<b>0.0000</b>	3.50	2.17-5.65
No	170	53 (31.18%)			
<b>Neurological signs</b>					
Yes	197	119 (60.41%)	<b>0.0000</b>	9.15	4.94-16.96
No	105	15 (14.29%)			
<b>Hyperthermia</b>					
Yes	28	12 (42.85%)	<b>0.86</b>	0.93	0.42-2.05
No	274	122 (44.52%)			
<b>Hypothermia</b>					
Yes	171	87 (50.87%)	<b>0.0093</b>	1.85	1.16- 2.95
No	131	47 (35.87%)			
<b>Complication</b>					
Yes	207	107 (51.69%)	<b>0.00015</b>	2.70	1.5980- 4.54
No	95	27 (28.42%)			

WA\*: Weeks of Amenorrhea

**Table 2:** Association of mortality risk factors and maternal obstetric characteristics.

Risk factors	Effective	Lethality	P	OR	ICà95%
<b>Maternal age</b>					
< 18 years	41	23 (56.10%)	<b>0.10</b>	1.73	0.90-3.35
18 -34 years	236	98 (41.53%)	<b>0.06</b>	0.59	0.34-1.02
≥ 35 years	25	13 (52%)	<b>0.42</b>	1.40	0.01- 3.17
<b>Mother's profession</b>					
Housewife	271	124 (45.75%)	<b>0.15</b>	1.77	0.80- 3.90
Others	31	10 (32.25%)			
<b>Mother's residence</b>					
Rural	246	114 (46.34%)	<b>0.15</b>	1.55	0.85- 2.83
Urban	56	20 (35.71%)			
<b>Pregnancy</b>					
Singleton	200	97 (48.50%)	<b>0.04</b>	1.65	1.01- 2.70
Multiples	102	37 (36.27%)			
<b>Pregnancy monitoring</b>					
Number < 3	159	85 (53.46%)	<b>0.0006</b>	2.20	1.40- 3.50
Number ≥ 3	143	49 (34.27%)			
<b>Pathological Pregnancy</b>					
Yes	51	21 (41.18%)	<b>0.36</b>	0.85	0.46- 1.57
No	251	113 (45.02%)			
<b>Place of delivery</b>					
OTH*	112	37 (33.03%)	<b>0.0023</b>	0.47	0.29- 0.76
Others	190	97 (51.05%)			
<b>Mode of delivery</b>					
Vaginal delivery	277	129 (64.57%)	<b>0.010</b>	0.28	0.10- 0.78
cesarean section	25	05 (20.00%)			

OTH\*: Ouahigouya Teaching Hospital

**Table 3:** Prognosis of mortality of premature newborns according to risk factors identified in the mother.

Maternal risk factors	P	OR	ICà95%
<b>Pregnancy monitoring</b>			
Number < 3	0.003	2.20	1.28-3.30
<b>Place of delivery</b>			
Out OTH*	0.040	1.72	1.02-2.91
<b>Mode of delivery</b>			
Vaginal delivery	0.14	2.23	0.76-6.54

OTH\*: Ouahigouya Teaching Hospital

**Table 4:** Mortality prognosis of premature newborns according to their risk factors.

Risk factors for mortality	P	OR	ICà95%
<b>Gestational age</b>			
< 32weeks of amenorrhea	0.06	1.82	0.97-3.43
<b>Birth weight</b>			
< 1500 g	0.03	3.56	1.09- 11.57
1500à1999 g	0.50	1.47	0.47-4.63
<b>APGAR at 1<sup>st</sup> minute</b>			
< 7	0.02	1.91	1.10-3.31
<b>Complication</b>	0.055	1.76	0.98-3.14

explained by insufficient monitoring of pregnant women.

This makes it difficult to prevent prematurity. In this region of the world, food insecurity could also be implicated in the occurrence of premature births. Indeed, the insufficiency or lack of a healthy and varied diet can negatively influence the development of a pregnancy until term.

We recorded a mortality rate of 44.37% in our series. This rate is lower than that of Minko (50.2%) [105] and Diouf (50.3%) [6].

However, it is significantly higher than that of Naja (7.5%) [109], Dainguy (25.6%) [5] and Njom Nlend (31.5%) [15].

Generally speaking, the mortality rate linked to prematurity is very alarming in Africa (especially in WestAfrica) [16]. This could be due to the conditions of care from childbirth to hospitalization in neonatology units. Indeed, many units lack efficient materials and equipment. Similarly, failure to maintain the heat chain and poor environmental hygiene are thought to increase morbidity and mortality.

Furthermore, the lack or inadequacy of qualified personnel to care for premature babies (pediatricians, neonatologists, nurses, midwives) is thought to hamper the adequate care of these highly vulnerable newborns.

In our study, the risk factors significantly associated with neonatal death identified were:

- For the mother: poor pregnancy monitoring, delivery outside the university hospital, and vaginal delivery.

The risk of mortality was significantly associated with poor pregnancy monitoring ( $p = 0.003$  and  $OR = 2.20$ )

and delivery outside the university hospital ( $p = 0.040$  and  $OR = 1.72$ ).

- In premature babies: GA less than 32 weeks ( $p = 0.000$ ), birth weight less than 1500 g ( $p = 0.000$ ), an APGAR score < 7 at the 1<sup>st</sup> minute ( $p = 0.0027$ ), the occurrence of a complication during hospitalization ( $p = 0.000$ ), the presence of respiratory distress ( $p = 0.000$ ), neurological signs ( $p = 0.000$ ) and hypothermia ( $p = 0.009$ ) on admission.

However, the mortality prognosis was only significant for birth weight less than 1500 g ( $p = 0.03$  and  $OR = 3.56$ ) and an APGAR score less than 7 at the 1<sup>st</sup> minute ( $p = 0.02$  and  $OR = 1.91$ ).

Prematurity thus appears to be a nightmare for families and medical staff. In addition to the organic, physiological, and immune immaturity they present, they are subject to numerous pathologies, causing death and serious disabilities, particularly at the limit of viability.

## Conclusion

Prematurity is a major concern at the Ouahigouya Teaching Hospital, and mortality is relatively high. The risk of death was primarily related to gestational age, birth weight, APGAR score, and the presence of a complication.

A multifactorial approach that takes into account the mother-child couple is essential to improve their care and reduce the mortality rate. This involves the implementation of a preventive policy focused on family planning, education for adolescent girls on sexual and reproductive health, and rigorous and high-quality monitoring of high-risk pregnancies in our region.

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