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Epidemiological Aspects and Short-Term Prognosis of Prematurity at the Issaka Gazoby Maternity Hospital in Niamey in 2024

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Abstract

Introduction: Prematurity remains a global public health problem in low-income countries. The objective of this study was to examine the epidemiological, diagnostic, therapeutic, and short-term prognostic aspects of prematurity at the Issaka Gazoby Maternity Hospital of Niamey. **Patients and Methods:** This was a cross-sectional study conducted from January to June 2024 in the Neonatology Department of the Issaka Gazoby Maternity Hospital of Niamey. The study involved premature newborns. The variables are related to the characteristics of mothers, pregnancies, and newborns. The data were processed and analyzed using Epi-Info software version 7.2.4.0. **Results:** The frequency of premature birth was 10.2%. Most newborns were from singleton pregnancies (74.8%). In 71.8% of cases, the prematurity was moderate. The average birth weight was 1786 ± 647.2 g [520 - 3430 g] and the average birth length was 42.2 ± 6.2 cm [35 - 50 cm]. The sex ratio was 1.3. The main signs on admission were respiratory distress (52.8%) and poor neurological behavior (20.8%). Associated pathologies were neonatal asphyxia (38%), neonatal infection (35.8%), and congenital malaria (16.5%). Kangaroo Mother Care was provided to 22.5% of newborns. One hundred and seventy-one (171) deaths were reported (42.8%). Factors associated with death included birth before 33 weeks of amenorrhea and neonatal infection ($p < 0.01$). **Conclusion:** Prematurity remains a real public health problem due to its frequency and the asso-

ciated morbidity and mortality. The main associated comorbidities were neonatal infection and neonatal asphyxia, which were significantly associated with death.

Keywords

Prematurity, Newborn, Niger

1. Introduction

Prematurity remains a global public health problem in low-income countries. According to the World Health Organization (WHO), premature births are one of the leading causes of infant mortality, accounting for more than one in five child deaths [1] [2]. Survivors face an increased likelihood of disability and developmental delays [3] [4]. In Niger, prematurity is one of the leading causes of neonatal death despite significant progress [5]. The objective of this study was to examine the epidemiological, diagnostic, therapeutic, and short-term prognostic aspects of prematurity at the Issaka Gazoby maternity hospital in Niamey.

2. Patients and Methods

2.1. Type and Period of Study and Study Setting

This was a descriptive and analytical cross-sectional study conducted from January to June 2024 (6 months). It was carried out in the Neonatology Department of the Issaka Gazoby Maternity Hospital in Niamey, one of the level 3 referral centers in the country's healthcare system.

2.2. Study Population

The study involved premature newborns cared for in the department during the study period.

2.2.1. Inclusion Criteria

All premature newborns with usable medical records, *i.e.*, with the fewest missing variables, were included.

2.2.2. Non-Inclusion Criteria

Newborns who had not completed their treatment in the department (discharged against medical advice, absconded) were not included.

2.2.3. Sampling

All newborns meeting the inclusion criteria during the study period were recruited.

2.3. Variables Studied

The variables related to the sociodemographic characteristics of the mothers (age,

origin, level of education), their medical history, and pregnancy follow-up (number of prenatal consultations, type of pregnancy, use or non-use of intermittent preventive treatment for malaria with sulfadoxine-pyrimethamine, iron and folic acid supplementation). The characteristics of the newborn were also studied (gestational age, route and mode of delivery, sex, measurements at birth, physical and paraclinical examination data, and associated comorbidities). Finally, therapeutic and evolutionary aspects (medical care, evolution, and causes of death) were explored.

2.4. Definition of Variables

Prematurity was defined as birth before 37 weeks of amenorrhea (WA). It was considered moderate for a gestational age between 32 WA and 36 WA + 6 days, very high between 28 WA and 31 WA + 6 days, and extreme between 22 WA and 27 WA + 6 days. Gestational age was determined based on the date of the last menstrual period and/or early ultrasound. It was then supplemented, if necessary, by the Farr score or the Ballard score. Hypotrophy was defined as a weight < 10th percentile relative to weight on gestational age curves, eutrophy between the 10th and 90th percentile, and macrosomia above the 90th percentile. Birth asphyxia was defined as an APGAR score < 7 at 5 minutes. The diagnosis of neonatal infection was made based on the 2002 ANAES diagnostic criteria [6]. Congenital malaria diagnosis is based on clinical signs (fever, respiratory distress, neurological disorders, etc.) with a positive thick smear in the newborn and the mother. Hypoglycemia was defined as a blood glucose level < 0.25 g/L (1.4 mmol/L) during the first three days of life and < 0.30 g/L (1.6 mmol/L) thereafter. Anemia was defined as a hemoglobin (Hb) level ≤ −2 SD (standard deviations) from the mean hemoglobin level for age. Hypothermia was defined as a temperature below 36.5˚C.

2.5. Data Entry and Statistical Analysis

Data processing and analysis were performed using Epi-Info version 7.2.4.0 and Microsoft Excel 2016. For the descriptive part, numbers and percentages were calculated. Pearson's Chi-square test or Fischer's exact test were used to investigate the relationship between qualitative variables (occurrence of deaths), with a significance threshold of 5% ($p < 0.05$). The odds ratio (OR) and its confidence interval (CI) were calculated to measure the association. Variables with a p-value < 0.05 were then selected for multivariate regression. In multivariate analysis, multiple logistic regression was performed to test the link between the explanatory variables and the central variable (occurrence of deaths). For the adjustment strategy, a step-down approach was used. The results were expressed as adjusted OR (aOR) with their 95% CI. Variables for which the aOR were different from 1 and statistically significant were considered factors associated with occurrence of deaths in premature newborns.

2.6. Ethical Aspects

The study was conducted after approval was obtained from the Issaka maternity

hospital authorities and the head of the neonatal department. The data collected will remain anonymous, and confidentiality and medical secrecy have been respected.

3. Results

3.1. Epidemiological Aspects and Characteristics of Mothers

During the study period, 3908 newborns were admitted to the department, including 400 premature newborns, representing a frequency of 10.2%. The average age of mothers was 27.36 ± 6.62 [15 - 53 years]. In 66% of cases, they had no income-generating activity, and 65.75% had no education. A history of premature birth was found in 10% of mothers. The average number of antenatal care visits was 3 ± 1 [0 - 7]. Sulfadoxine-pyrimethamine intermittent preventive treatment for malaria and iron and folic acid supplementation were administered to 91.5% and 90% of mothers, respectively. Four cases (1.00%) of maternal death due to immediate postpartum complications were reported.

3.2. Perinatal and Neonatal Characteristics

Table 1 shows the distribution of newborns according to type of pregnancy, prematurity, and trophicity. Most newborns were from singleton pregnancies (74.8%). Prematurity was moderate in 71.8% of cases. The average birth weight was 1786 ± 647.2 g [520 - 3430 g], with hypotrophy in 14% of newborns. The average birth length was 42.2 ± 6.2 cm [35 - 50 cm]. The average head circumference at birth was 29.9 ± 3.6 cm [17 - 37 cm]. Newborns were less than 24 hours old at the time of admission in 98.5% of cases [0 - 7 days]. The sex ratio was 1.3. The APGAR score was below 7 at five minutes in 32.5% of cases, and resuscitation was reported in 24.3%. The main clinical signs on admission were respiratory distress (52.8%), hypothermia (19.3%), and poor neurological behavior (20.8%). Anemia and hypoglycemia were found in 29% and 5.3% of newborns, respectively. Thick drop was positive in 26.5% of cases. Associated pathologies were neonatal asphyxia (38%), neonatal infection (35.8%), and congenital malaria (16.5%).

Table 1. Type of pregnancy, prematurity, and trophicity.

Variables	Number (N)	Percent (%)
Type of pregnancy		
Monofetal	299	74.8
Multiple	101	25.2
Type of prematurity		
Moderate	287	71.8
Very hight	73	18.2
Extreme	40	10.0
Trophicity		
Hypotrophy	56	14.0
Eutrophy	335	83.8
Macrosomia	9	2.2

3.3. Therapeutic and Evolutionary Aspects

Antibiotic therapy was administered to 97.8% of newborns, as well as artesunate-based antimalarial treatment in cases of congenital malaria (16.5%). Care in a kangaroo mother care unit was provided to 22.5% of newborns. The average length of hospital stay was 2 days [1-38 days]. Most newborns (75.5%) stayed in the ward for less than 5 days. One hundred and seventy-one (171) deaths were reported (42.75%). The main causes of death, often associated with the same newborn, were neonatal infection (74.27%), perinatal asphyxia (43.27%), and anemia (11.11%). Deaths occurred between 0 and 3 days after birth in 69.59% of cases.

3.4. Factors Associated with Death

The bivariate analysis of factors associated with death are shown in Table 2. Deaths were more common among newborns born before 33 WA (79.5%) and less than 24 hours old at admission (96.5%), with a statistically significant relationship ($p < 0.01$). Deaths were also more common among male newborns (53.7%) and newborns from singleton pregnancies (73.7%), but without a statistically significant link ($p > 0.05$). Newborns referred from other health centers were twice as likely to die as those admitted directly (OR = 2.21 [1.46 - 3.32]; $p < 0.01$). Newborns with asphyxia at birth and neonatal infection were 8 times and 7 times more likely to die, respectively ($p < 0.01$). In multivariate analysis (Table 3), the associated factors of death were gestational age under 33 WA, the reference, neonatal asphyxia and neonatal infection (aOR > 1; $p < 0.01$).

Table 2. Bivariate analysis of associated factors to death.

Variable	Death		OR [CI]	p
	Yes N (%)	No N (%)		
Gestational age				
<33 WA	136 (79.5)	39 (17.1)		
≥33 WA	35 (20.5)	190 (82.9)	18.97 [11.40 - 31.42]	<0.01
Age on death				
<24 hours	165 (96.5)	229 (100)		
≥24 hours	6 (3.5)	0 (0)	-	<0.01
Sex				
Female	70 (40.9)	106 (46.3)		
Male	101 (59.1)	123 (53.7)	0.80 [0.53 - 1.20]	0.30
Type of pregnancy				
Monofetal	126 (73.7)	173 (75.6)		
Multiple	45 (26.3)	56 (24.4)	1.10 [0.70 - 1.74]	0.67

Continued

Admission mode				
Reference	86 (50.3)	72 (31.4)		
Direct	85 (49.7)	157 (68.6)	2.21 [1.46 - 3.32]	<0.01
Birth asphyxia				
Yes	94 (61.8)	36 (16.1)		
No	58 (38.2)	188 (83.9)	8.46 [5.21 - 13.73]	<0.01
Neonatal infection				
Yes	149 (87.1)	109 (47.6)		
No	22 (12.9)	120 (52.4)	7.46 [4.44 - 12.51]	<0.01

Table 3. Multivariate analysis of associated factors of death.

Variable	aOR [IC]	p
Gestational age	4.99 [3.64 - 6.84]	<0.01
Admission mode	2.20 [1.46 - 3.32]	<0.01
Birth asphyxia	3.06 [2.39 - 3.93]	<0.01
Neonatal infection	3.72 [2.50 - 5.55]	<0.01

4. Discussion

The relatively high frequency of prematurity in this study reflects its morbidity and severity in our context. The mothers of the newborns were relatively young, as reported by Dangbemey *et al.* and Ly *et al.*, with a mean age of 28.3 ± 6.1 [14 - 44 years] and 27.8 ± 6.82 [18 - 35 years], respectively [7] [8]. The young age of the mother has been reported as a risk factor associated with preterm birth [9] [10] [11]. Indeed, it has been suggested that the inexperience of young mothers exposes them to practices that are less conducive to pregnancy management. Level of education and income-generating activities are also associated with premature birth. The high proportion of mothers without income-generating activities, *i.e.*, with a low socioeconomic status, has been reported as a risk factor for premature birth [12]. Furthermore, educated women are better able to understand reproductive health issues and risks and are often more aware of them than uneducated women [13].

Pregnancy monitoring is an important opportunity to detect and manage certain obstetric conditions that may lead to premature birth. Although the average number of prenatal visits in this study was 3 ± 1, most mothers had fewer than four (4) prenatal visits. Low attendance at health services for prenatal monitoring has been reported as a risk factor associated with premature birth and even death [14]-[16]. The factors limiting the use of prenatal care services reported by the authors were low socioeconomic status, accessibility, and insufficient education and awareness on the subject [15] [17]. During prenatal care visits, in addition to screening and treatment for high-risk maternal conditions, prophylaxis for ane-

mia (iron and folic acid supplementation) and malaria (sulfadoxine-pyrimethamine) is also provided. These prophylactic treatments reduce the risk of anemia and malaria in pregnant women, which are two major causes of preterm birth in resource-limited countries [18] [19].

Males were most represented, as reported by Ouedraogo *et al.* [20], but without a statistically significant correlation. Most newborns were admitted within 24 hours of birth, reflecting the frequency of in-born cases or the easy accessibility of the Issaka Gazoby Maternity Hospital for patients referred from other peripheral centers. In terms of gestational age, premature birth was more common among newborns. Most newborns were admitted with an average Farr score correlating with the type of prematurity. This result was also reported by other authors with a gestational age between 31.6 WA and 33.4 WA [8] [21]. The high proportion of newborns with a gestational age of less than 33 weeks partly explains the high mortality rates. Indeed, the lower the gestational age, the more frequent the associated complications. Many authors, as in this study, have found this to be a risk factor significantly associated with mortality [9] [17] [22]. In the present study, most premature births were from singleton pregnancies, as found by Cissouma A *et al.* [23]. The maternal pathologies classically described as being associated with the occurrence of pre-term delivery were pre-eclampsia and retroplacental hematoma, which have been reported in other studies with varying frequencies. Most newborns had hypotrophy, which is a common comorbidity in premature newborns [22].

Kangaroo Mother Care was used in less than a quarter of patients, unlike other authors [7]. This method has been recommended by the WHO in countries with limited resources, as conventional care for premature newborns is very expensive and financially inaccessible to many families. This strategy has significantly reduced associated morbidity and mortality [24]. The low uptake of this method in our context is due to a shortage of dedicated beds in the department. Most premature newborns are followed up on an outpatient basis in the absence of major comorbidities. The evolution of newborns was marked by the occurrence of associated complications, dominated by neonatal infection and perinatal asphyxia. These complications were reported differently depending on the authors. In the study by Boiro *et al.* a higher frequency of neonatal infection and respiratory distress was reported [22]. Kouakou *et al.* reported associated complications such as metabolic disorders (60.8%), neonatal infection (45.1%), hematological disorders (18.8%), and respiratory distress (9.5%) [25]. These comorbidities were found to be associated with death in most premature newborns. Mortality is high in resource-limited settings, with rates ranging from 20% to over 50% [7] [8] [19] [26]. Most deaths occurred within the first 72 hours of hospitalization, reflecting the limited technical capabilities for managing associated complications. Comorbidities such as hyaline membrane disease and neurological disorders require equipment that most centers do not have. Among the causes of death in this study, neonatal infection and neonatal asphyxia were the most common pathologies, as

has also been reported by some authors [19] [21].

The high proportion of neonatal infections reflects, on the one hand, the problem of screening and treating maternal infections during the last trimester of pregnancy, but also the lack of asepsis during childbirth and often poor hospital hygiene. As for neonatal asphyxia, it reveals the inadequacy of neonatal resuscitation practices, either due to the poor technical facilities for post-resuscitation care or the relatively high frequency of home births.

5. Conclusion

Prematurity remains a real public health problem due to its frequency and the associated morbidity and mortality. Admissions were made within 24 hours of birth, reflecting the high frequency of newborns being born. In most cases, the babies were moderately premature and suffered from hypotrophy. The main associated comorbidities were neonatal infection and neonatal asphyxia, which were significantly associated with death. The fight against premature birth must continue, through proper monitoring of pregnancy, which will enable the detection and correct management of high-risk conditions. In addition, it is important to improve care by strengthening technical facilities, creating newborn corners in peripheral maternity wards, and introducing the Kangaroo Mother Care method.

Conflicts of Interest

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

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