

Neonatal Morbidity and Mortality from 2010 to 2016 in the Neonatal Care Unit of the University Teaching Hospital of Parakou/Benin

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Abstract

Introduction: Neonatal mortality accounts for 44% of deaths among children. This study aimed to investigate neonatal morbidity and mortality in the neonatal care unit of the University Teaching Hospital of Parakou (CHU-P) from 2010 to 2016. **Patients and Methods:** This research was a retrospective, descriptive and analytical study that covered the period from January 1, 2010 to December 31, 2016. It focused on the medical records of newborns hospitalized in the said unit during the period mentioned above. Study variables were sociodemographic, clinical, paraclinical and outcome. **Findings:** During the time span of the study, 6204 newborns were registered. Sex ratio was 1.32. Mean age for newborns was 6.01 ± 5.39 days. Clinically obvious neonatal infection (54.1%), prematurity and low birth weight (34.8%) and perinatal asphyxia (30%) were the main diseases of newborns recorded in the unit during the study period. Mortality rate was 16.8% including 77.9% occurred in the first week of life and 62.1% in the first 24 hours of life. **Conclusion:** More than one in six newborns died and three out of five deaths occurred in the first 24 hours of life. Therefore, it seems wise to carry out a case-control study with multivariate analysis in order to identify the main risk factors for that mortality.

Keywords

Benin, Morbidity, Mortality, Newborns, Parakou

1. Introduction

Neonatal mortality accounts for 44% of deaths among under-five year children [1]. If the higher number of deaths of newborns is recorded in South Asia, the higher mortality rates are noted in Sub-Saharan Africa [2]. In Benin, according to the 4th Benin Population and Health Survey (EDSB-IV), neonatal mortality was estimated at 20‰ between 2008 and 2012 for child mortality of 36‰ in the Borgou region [3]. In the CHU-P neonatal care unit where a similar study had already been carried out between 2002 and 2009, intra-hospital neonatal mortality was estimated at 21.1% [4]. This research work was initiated in order to measure the progression of trends in neonatal mortality within the hospital during the next seven years. Its objective was to investigate neonatal morbidity and mortality in CHU-P neonatal care unit from 2010 to 2016.

2. Patients and Methods

This research was a retrospective, descriptive and analytical study carried out in the neonatal care unit of the CHU-P pediatric ward in the North of Benin. It covered the period running from January 1, 2010, to December 31, 2016, *i.e.* seven (07) years and involved all the newborns hospitalized in the neonatal care unit during the study period. To be included, the newborns should be admitted alive during the study period with a medical bearing the diagnosis and type of discharge. The study excluded all the newborns admitted alive, dead on admission within fifteen minutes, who had no usable medical record (including neither diagnosis nor type of discharge). The cases were recruited through an exhaustive census including systematically all the medical records of patients meeting inclusion criteria. The main variables were morbidity expressed with frequencies of diagnosed diseases and then mortality expressed using death rates. The other variables were sociodemographic (mothers' age and occupation), clinical (gestational age, birth weight, neonatal morbidity), and outcome (neonatal mortality). The different diagnoses were considered as recorded in the medical records. The data were entered and processed using the software EPI INFO version 7.2. The measures of central tendency and dispersion (Mode, Median, Standard deviation) were used to describe the quantitative variables. Ratios or proportions were used to describe qualitative variables. Khi test was used to compare ratios and proportions and difference was considered as significant if $p\text{-value} < 0.05$.

Ethical and Professional Considerations

The performance of this study has been authorized in writing by the CHU-P Di-

rector; the processing of medical records has been authorized by the Head of the Pediatric Ward. Data anonymity and confidentiality were guaranteed and maintained.

3. Findings

3.1. Population Description

In the whole pediatric ward of CHU-P, 24,597 children were admitted during the study period, including 6238 newborns. Among the latter, 6224 had a medical record. Among those 6224 medical records, 20 did not get information on exclusion modalities. In total, the study focused on 6204 newborns who were live babies admitted to the unit and with usable medical records. Newborns thus accounted for 25.2 % of admissions in the ward.

The mean age for mothers was 26.3 ± 9.1 years. Mothers aged 20 to 35 years were the predominant age group (81.1%). Among the mothers, 3641 were housewives (58.7%). Among all the newborns, 3530 were boys (56.9%) and 2674 were girls (43.1%) *i.e.* a sex ratio of 1.32. Mean age for newborns on admission was 6.01 ± 5.39 days. The newborns admitted were aged 24 hours and younger in 73.0% of cases. Four thousand three hundred and four (4304) newborns were born in CHU-P maternity *i.e.* a frequency of 69.4 % and 4238 (68.3%) had a presumed date of childbirth between 37 and 41 weeks of amenorrhea. Mean birth weight of newborns was 2608.85 ± 727.67 g. **Table 1** shows the distribution of newborns admitted from 2010 to 2016 to the CHU-P neonatal care unit according to sociodemographic, obstetrical and fetal characteristics.

3.2. Chronological Evolution of Admissions and Deaths per Year

We note an overall trend of increase in admissions over the years until 2013; it was followed by a decline. **Figure 1** illustrates the chronological trends in admissions and deaths during the study period.

3.3. Neonatal Morbidity

As regards diseases and syndromes concerning all the newborns, 3357 had a clinically obvious neonatal-infection (54.1%), 2158 were premature (34.8%), and 1863 had perinatal asphyxia (30.0%). **Table 2** shows the distribution of newborns admitted from 2010 to 2016 to the CHU-P neonatal care unit according to diseases and syndromes.

3.4. Overall and Annual Trends in Mortality

Among the 6204 newborns admitted to the CHU-P neonatal care unit from 2010 to 2016, 1045 died *i.e.* gross mortality of 16.8%. Over the years, the following death rates were recorded: 18.4%, 21.2%, 21.3%, 13.6%, 13.9%, 16.8% and 15.1% respectively in 2010, 2011, 2012, 2013, 2014, 2015 and 2016. **Table 3** indicates the trends in admissions, deaths and death rates in the CHU-P neonatal care unit from 2010 to 2016.

Table 1. Distribution of newborns admitted from 2010 to 2016 to the CHU-P neonatal care unit according to sociodemographic, fetal and obstetrical characteristics (N = 6204).

	Population size	Ratios (%)
Mothers' age		
<20	723	11.6
20 - 35	5030	81.1
>35	451	7.3
Mother's occupation		
Housewife	3641	58.7
Craftswoman	1233	19,9
Civil servant	754	12.2
High school /University student	576	9.3
Sex		
Male	3530	56.9
Female	2674	43.1
Newborns' age		
≤1 day	4529	73.0
2 - 7 days	1110	17.9
>7 days	565	9.1
Place of birth		
In Born	4304	69.4
Out Born	1900	30.6
Presumed date of childbirth (Weeks of Amenorrhea)		
<28	120	1.9
28 - 31	390	6.3
32 - 34	598	9.6
35 - 36	747	12.1
37 - 41	4238	68.3
>41	111	1.8
Birth weight		
Very low weight (<1500 g)	492	7.9
Low weight (1500 - 2499 g)	1724	27.8
Normal weight (2500 - 3999 g)	3795	61.1
Macrosomia (≥4000 g)	193	3.1

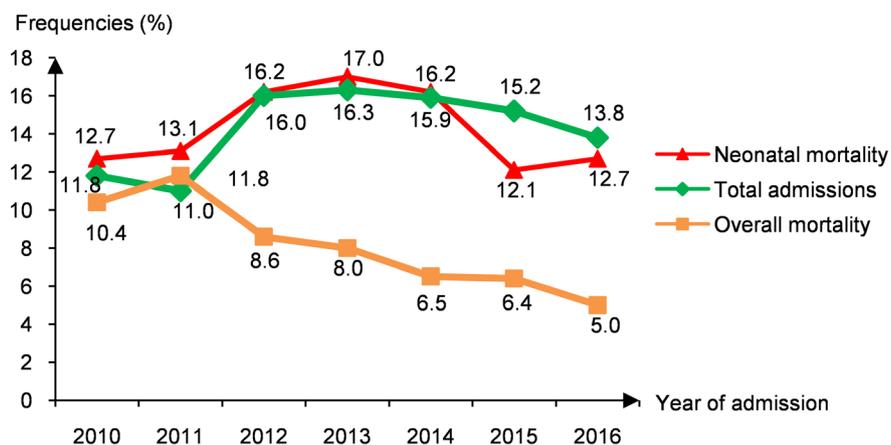


Figure 1. Evolution of annual ratios of newborn admission and deaths from 2010 to 2016 to the CHU-P neonatal care unit (N = 6204).

Table 2. Distribution of newborns admitted from 2010 to 2016 to the CHU-P neonatal care unit according to diseases and syndromes (N = 6204).

	Population size	Ratios (%)
Obvious neonatal infection	3357	54.1
Prematurity and Low birth weight	2158	34.8
Perinatal asphyxia	1863	30.0
Neonatal respiratory distresses	1412	22.8
Pathological neonatal jaundice	1172	19.0
Neonatal malaria	1053	17.0
Neonatal hypoglycemia	676	10.9
Birth traumas	396	6.38
Congenital malformations	358	5.8
Other diseases	258	4.16

Table 3. Trends in admissions, deaths and death rates in the CHU-P neonatal care unit from 2010 to 2016 (N = 6204).

Years	Number of admissions	Number of deaths	Mortality rates (%)
2010	789	143	18.1
2011	816	171	21.0
2012	1004	211	21.0
2013	1052	141	13.4
2014	1008	138	13.7
2015	748	124	16.6
2016	787	117	14.9
Total	6204	1045	16.9

Deaths occurred in 62.1% of cases in the first 24 hours of life. **Figure 2** shows the distribution of newborns deaths in the unit according to their age.

3.5. Factors Associated with Death

As presented in the **Table 4**, the factors associated with neonatal death, were the mothers' age (<20 years), the mothers' occupation (housewife, /craftswoman), the newborn sex (male), the newborns' age (>1 day), the gestational age (<37 weeks), and the birth weight (<2500 g).

Table 4. Factors associated with deaths in the CHU-P neonatal care unit from 2010 to 2016 (N = 6204).

	Death					<i>P</i>
	Total (N)	n	%	RR	IC _{95%}	
Mothers' age						0.0001
<20	723	182	25.2	1.6	[1.4 - 1.8]	
≥20*	5481	863	15.7	1		
Mother's occupation						0.0001
Housewife/Craftswoman	4874	887	18.2	1.53	[1.4 - 1.9]	
Civil servant/High school/ University student*	1330	158	11.9	1		
Sex						0.0264
Male	3530	627	17.8	1.16	[1.1 - 1.3]	
Female*	2674	418	15.6	1		
Newborns' age						0.0001
≤1 day*	4529	649	14.3	1		
>1 day	1675	396	23.6	1.6	[1.5 - 1.8]	
Place of birth						0.0001
In born*	4304	617	14.34	1		
Out born	1900	428	22.53	1.7	[1.5 - 1.9]	
Presumed date of childbirth (Weeks of amenorrhea)						0.0001
<37	1855	518	27.92	2.81	[2.45 - 3.22]	
≥37*	4349	527	12.11	1		
Birth weight						0.0001
Weight (<2500 g)	2216	581	26.22	2.69	[2.35 - 3.09]	
Weight (≥2500 g)*	3988	464	11.63	1		

*Reference terms.

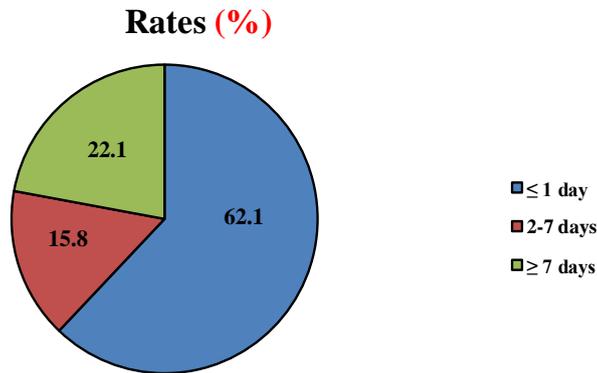


Figure 2. Distribution of newborns deaths in the CHU-P neonatal care unit from 2010 to 2016 according to their age (N = 6204).

4. Discussion

This cross-sectional study based on a retrospective and analytical collection of data was carried out in the CHU-P neonatal care unit over a seven-year period. It thus has the merit of taking stock of admissions and mortality cases in the neonatal care unit since 2010. This may help make organizational and therapeutic decisions to improve the provision of care for newborns in the future. Despite its retrospective nature, source of possible missing data, it has the particular advantage of addressing a health issue in that area of the country.

4.1. Neonatal Morbidity

During the study period, intra-hospital-based neonatal morbidity accounted for 25.2% of general morbidity in the pediatric ward. This rate indicates the importance of neonatal care unit in that second referral ward. It points out the level of demands of neonatal care by the beneficiary population. This rate is higher than the one found out by Noudamadjo *et al.* in a similar study carried out from 2002 to 2009 in the same ward which was estimated at 17.8% [4]. Therefore, there is an upward trend in neonatal care needs expressed by the population.

The most common diseases were respectively neonatal infections (54.1%), prematurity and low birth weight (34.8%) and perinatal asphyxia (30%). Neonatal infections were the most common disease, with 54.1% of admissions. This frequency of neonatal infections may be due either to the poor follow-up of pregnancy and lack of asepsis during childbirth or to manipulations during neonatal sepsis. For instance, in addition to classical maternal and fetal infections, the traditional practices which consist in having the umbilical cord fall down before the 72nd hour of life, would predispose those newborns to get infections which start from the umbilical cord. These findings are identical to the ones reported by Noudamadjo *et al.* between 2002 and 2009 in a study conducted in the same unit which showed that 57.8% of the hospitalizations were decided for neonatal infections [4]. The predominance of neonatal infections among newborn diseases has been reported by several African authors with rates of 62% according to Kedy Koum *et al.* and 63.7% according to Thomson *et al.*

[5] [6]. Other authors reported lower rates. Those authors were Nagalo *et al.* who found 23.5% and Akaffou *et al.* 30.3% [7] [8]. Prematurity and low birth weights were the second cause of hospitalization. This part of prematurity in the structure of diseases raises many problems such as content and quality of care inputs ranging from health staff to consumables through equipment. That equipment is particularly insufficient and even non-existent in our context, thus predisposing the extremely premature newborns to a very high risk for death. This result is similar to the one of Kedy Koum *et al.* in Douala (28.9%), the one reported by Azoumath *et al.* in Togo (22.2 %), and also similar to the one reported by Bobossi in the Central African Republic (37.1%) [5] [9] [10]. Noudamadjo *et al.* (27.57%) found a rate close to the one of this study [4]. In contrast, Nagalo *et al.* in Burkina Faso found a lower rate (17.8%) [7]. Perinatal asphyxia was also a common cause of admission to the unit. It was the third cause of hospitalization. For instance, 30% of admissions were decided for perinatal asphyxia. This high rate of perinatal asphyxia raises the problem of the quality of perinatal medicine in Benin. In fact, the prevention of asphyxia depends on the good follow-up of pregnancy, particularly in the last quarter, a systematic and proper actual use of the partograph in the management of labor and on good neonatal resuscitation according to the concept of Help Babies Breathe (HBB) if necessary. Nagalo *et al.* reported a rate lower than the one of this study (20.9%) [7], as well as Thomson *et al.* in South Sudan (4.7%) [6]. As regards Kedy Koum *et al.*, they reported a rate close to the one of this study (27.4%) [5], whereas Noudamadjo *et al.* reported a higher ratio (42%) [4].

4.2. Neonatal Mortality

During the study period, the gross rate of neonatal mortality in the CHU-P was 16.8%. This high rate may be due to the method of recruitment of newborns. This rate is lower than the one found by Noudamadjo *et al.* (21.1 %) [4]. Kouéta *et al.* had found a neonatal mortality rate close to the one of this study (15.3%) [11]. Nagalo *et al.* in Burkina Faso (13.1%) as well as Noria *et al.* in Algeria (5.3%) reported rates lower than the one of this study [7] [12]. In the West African sub-region, in Nigeria for example, Omoigberale *et al.* reported in 2010 a neonatal mortality of 20.3%; Mabilia-Babela *et al.* reported in 2009 in Congo neonatal mortality of 36.8% [13] [14]. The death rate has gradually declined from 21.3% to 13.6% during the seven years of the study. The two extremes were observed in 2012 with the highest death rate (21.3%) and in 2013 with the lowest rate (13.6%). That gradual decline of the death rate during the study may be due to the sustained and continued efforts of the medical staff to improve care provision. Actually, hygiene was improved within the unit since 2009 through the systematization of the use of disposable diapers for any newborn who was therein admitted. In addition, the training of inmate trainees and maternities' staffs in emergency obstetrical and neonatal care (EmONC) contributed to reducing that neonatal mortality rate. Within the CHU-P neonatal care unit, 77.9% of neonatal

deaths were recorded during the first week of life. Deaths in the first 24 hours of life accounted for 62.1% of cases. This result is higher than the one reported by Noudamadjo *et al.* who had found 75% of neonatal mortality occurred in the first week of life and 48.3% in the first 24 hours of life [4]. Kouéta *et al.* in Ouagadougou in 2007, Noria *et al.* in Algeria in 2015 and Sylla *et al.* in Mali in 2009 reported neonatal mortalities in the first week of life respectively estimated at 97.3%, 96.85% and 91.10% [11] [12] [15]. These results give rise to many reflections. At first sight, one would think that newborns were admitted in a very precarious health condition; this raises the issue of management of pregnant women, labor, and newborns within the community before admission; each of those three components should be improved to reduce neonatal mortality. Then, despite the precarious health condition of newborns on their admission, if the installations, the medical and technical equipment, the consumables, the drugs, and staff professional skills were at a high level, a certain number of dead newborns could have recovered. This raises once again the issue of financing of neonatal care units in Sub-Saharan Africa in general and especially in Benin.

4.3. Factors Associated with Death

This study shows that the following factors were associated with death: the age of the mother (less than 20 years), the mother occupation (poorly paid), the male gender of the newborn, the newborns' age less than a day, the place of birth outside the reference hospital (out born), low birth weight and prematurity. These factors related to death are those described in the literature [4] [7] [9] [13] [15]. It is by acting on these factors that we can reduce the still high death rate in our unit.

5. Conclusion

This study points out that newborn admissions accounted for more than a quarter of admissions to the pediatric ward. The most common diseases were neonatal infection, prematurity and low birth weight and perinatal asphyxia. More than one out of six newborns died and three out of five deaths occurred in the first 24 hours of life. This high mortality suggests conducting a prospective study on the real factors associated with deaths.

Conflicts of Interest

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

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