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Audit of Neonatal Deaths at the Teaching Hospital of Parakou and in the Health Districts of the Departmental Health Directorate of Borgou from 2020 to 2025

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Abstract

Introduction: The objective of this study was to describe the systematic audits of neonatal deaths at the Parakou University Hospital Center and in the health districts of the Borgou department from 2020 to 2025. **Materials and Methods:** This study was conducted in two phases. A prospective phase covering the period from 1st January to 31 May 2020, marked by a systematic analysis of neonatal deaths, and a retrospective phase that took into account the activities of the neonatal death monitoring committees of the four health districts of the Borgou Departmental Health Directorate from 1st June 2020 to 30 June

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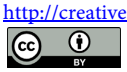

2025. It focused on newborns who died in the first phase and the work of the neonatal death surveillance committees in the health districts in the second phase. **Results:** In the first phase, 588 newborns were admitted from 1st January to 31 May 2020. Among them, 74 newborns died, representing a mortality rate of 12.58%. The main causes of death were neonatal infection (59.46%), prematurity (56.76%) and perinatal asphyxia (41.89%). The main problems identified in the community were delayed access to care (45.95%), poor pregnancy monitoring (35.14%) and home or on the way deliveries (13.51%). At the peripheral centers, delays in referral (35.14%), inadequate or non-existent pre-referral care (13.51%) and non-medical referral (12.16%) were identified. The main dysfunctions observed at the referral center were inadequate emergency treatment (47.30%), poorly completed medical records (37.84%) and inadequate treatment of complications (27.03%). In the second phase of the response, 55 audit committee members were trained in the strategy. The audit completion rate in the health department from 1st July 2020 to 30 June 2025 was 62.71%. **Conclusion:** The neonatal death audit proved to be a relevant tool for assessing the quality of care.

Keywords

Audit, Mortality, Newborn, Parakou, Benin

1. Introduction

Infant and child mortality is the best indicator of the health status of a population. It has declined significantly in recent decades due to the implementation of several programmes and strategies for children. However, it remains high due to the stagnation of neonatal mortality over several years [1]. To this end, progress in reducing the number of newborn deaths has been less significant, as there are still 2.7 million newborn deaths each year during their first month of life, representing approximately 7000 newborn deaths per day. More than two-thirds of neonatal deaths occur in the first week of life, and approximately one million newborns die within 24 hours [2]. In Benin, it was estimated at 30 per 1000 births in 2018 [1]. This mortality rate is far from the Sustainable Development Goals (SDGs) for 2030, which aim to reduce the mortality rate to 12 per 1000 of live births [3]. The direct causes are dominated by neonatal bacterial infections, perinatal asphyxia and prematurity [4]. In addition to these causes, there are factors associated with the therapeutic pathway of the mother during pregnancy and the newborn after birth. These factors, which concern the health system, the community and healthcare personnel, could impact the quality of care provided to newborns [5]. Medical audits are an excellent way of investigating these factors. Medical audits were institutionalised by the Ministry of Health of the Republic of Benin in 2013. These medical audits can be conducted using several approaches, including patient-centered case reviews. In the Borgou department, there had been no previous studies on medical audits in newborns. This is the rationale behind this study,

the objective of which was to describe the systematic audits of neonatal deaths at the Parakou University Hospital Center and in the health districts of the Borgou department from 2020 to 2025.

2. Patients and Methods

The study was conducted in the neonatal unit of the Parakou Departmental University Hospital Center (CHUD) and in the health districts of the Borgou Departmental Health Directorate. The Borgou department is located in the north-east of Benin. This study was conducted in two phases as follows: A prospective pilot phase in the neonatal unit of the Borgou Departmental University Hospital Center located in Parakou, covering the period from 1st January to 31 May 2020. This phase was marked by a systematic analysis of neonatal deaths. A second phase extending the strategy to the four health districts of the Borgou Departmental Health Directorate from 1st June 2020 to 30 June 2025. It focused on newborns who died in the first phase and the activities of the neonatal death surveillance committees in the health districts in the second phase. This study included all newborns (aged 0 to 28 days) hospitalised in neonatal units during the first phase and who died during hospitalisation. In the second phase, the activity reports of the neonatal death surveillance committees in the health districts were used as the basis for data collection. In utero deaths were not included in this study. An exhaustive census of all newborns meeting the above criteria was carried out. The main variable of the study was the occurrence of neonatal death. The secondary variables were sociodemographic, anamnestic, clinical, diagnostic, dysfunction-related, and corrective action-related. The data collection periods ran from 1st January to 31 May 2020 for the first phase and from 1st June 2020 to 30 June 2025 for the second phase. The variables collected were recorded on specific collection forms such as the clinical summary grid, the social survey grid, the death analysis grid and the audit report template.

In the first phase, the audit activities consisted of three stages: the preparatory stage, which was devoted to recording newborn deaths, writing a clinical summary of each case, conducting a social survey in the community where the parents of the newborns came from, and scheduling the session.

The second stage was devoted to the meeting itself. This session was held by an audit committee composed of managers and staff from the gynaecology-obstetrics and paediatrics departments, the head of the mother and child health department of the Borgou Departmental Health Directorate, a representative of the hospital administration, and staff involved in the care of the mother and newborn. Each session was led by a presidium composed of four members: a moderator, a co-moderator, a rapporteur and an observer. The sessions began with a review of the principles and charter of the audit. This was followed by the presentation of the clinical summary and the social investigation report, respectively, followed by discussions. The committee then identified the dysfunctions from the community to the referral center, the causes of these dysfunctions, and made recommendations.

The third stage was devoted to the response, which consisted of implementing

the corrective actions identified during the sessions. This response was carried out through interventions targeting the community, medical staff involved in newborn care, and the health system.

The second phase of the study focused on implementing the neonatal death audit strategy in the health districts of the Borgou Departmental Health Directorate. Interventions were carried out with the neonatal death audit committees of the department's four health districts. Training reports and neonatal death audit reports were used as data collection tools during this phase.

The data collected were recorded and processed using Epi Info (version 7.2) and SPSS (Statistical Package for Social Sciences) version 21 software. Microsoft Office 2010 was used to enter the text of the report and Excel 2010 to organise the data into tables and graphs. Quantitative variables were expressed as means with standard deviations; qualitative variables were expressed as simple counts and percentages.

Ethical Considerations

Authorisation from the departmental authorities, health districts and department heads were obtained prior to data collection. Anonymity and confidentiality were guaranteed at all stages concerning the identity of newborns and their parents on the one hand, and on the other hand for the healthcare staff involved in the care of the mother and newborn.

3. Results

3.1. 1st Phase: In-Hospital Mortality Rate

From 1st January to 31 May 2020, 74 newborns died out of 588 admissions, representing an in-hospital mortality rate of 12.58%. Of these, 57 (77.03%) deaths occurred during the first week of life, representing an early neonatal in-hospital mortality rate of 9.69%, and 17 (22.97%) occurred after the first week, representing a late neonatal in-hospital mortality rate of 2.89%. The direct causes of death were infection (47.30%), prematurity (33.78%), hyaline membrane disease (28.38%), perinatal asphyxia (27.03%), respiratory distress (12.16%), congenital malformations (9.46%), neonatal jaundice (6.76%), hypoglycaemia and disseminated intravascular coagulation (DIVC) (5.41%), neonatal anaemia (4.05%), hypothermia (2.70%), hypotrophy, heart disease, septicaemia and haemorrhagic syndrome in 1.35% of cases each.

3.2. Socio-Demographic Characteristics and Circumstances of Admission

Male newborns accounted for 47% and female newborns for 52.30%, giving a sex ratio of 0.89. Among the latter, 59.46% were born outside the hospital and 40.54% in the hospital's maternity ward. Referred newborns were transported by motorbike (51.62%), non-medical vehicle (12.90%) and ambulance (35.48%). Referrals were made by general practitioners (44.83%), midwives (31.03%), nurses (9%),

nursing assistants, paediatricians and others in 3.45% of cases.

3.3. Dysfunctions Relating to the Community

The main dysfunctions identified in the community were delayed access to care (45.95%), poorly monitored pregnancies (35.14%) and home births (13.51%). The distribution of newborns according to community dysfunctions is presented in Table 1.

Table 1. Distribution of newborn deaths from 1 January to 31 May 2020 in the neonatal unit of the teaching hospital of Parakou according to community dysfunctions (N = 74).

	Number	%
Community dysfunction		
Delayed access to care	34	45.95
Poorly monitored pregnancy	26	35.14
Home birth or birth en route	10	13.51
Discharge against medical advice	2	2.70
Self-medication	1	1.35
Medical prescriptions/unpaid bills	1	1.35
Obstetric ultrasound not performed	1	1.35
Delivery en route	1	1.35
Ignorance of danger signs in newborns	1	1
Abortive maneuver	1	1.35

3.4. Dysfunctions Relating to Peripheral Health Centers

The main dysfunctions noted in peripheral centers were delays in referral (35.14%), inadequate pre-referral care (13.51%), and non-medical referral (12.16%). The distribution of newborns according to dysfunctions at the peripheral center is shown in Table 2.

Table 2. Distribution of newborn deaths from January 1 to May 31, 2020, in neonatal unit of the teaching hospital of Parakou according to malfunctions at the peripheral center (N = 74).

	Number	%
Peripheral center dysfunctions		
Delay in referral	26	35.14
Inadequate pre-referral care	10	13.51
Non-medical referral	9	12.16
Absence of pulmonary maturation	8	10.81
Systematic examination of newborn not performed	6	8.11
Poorly monitored pregnancy	5	6.76

Continued

Inadequate neonatal resuscitation	5	6.76
Lack of screening for infections during pregnancy	5	6.76
CRAP not evaluated	4	5.41
Care at last prenatal visit inadequate	3	4.05
Inadequate maternal-fetal monitoring	3	4
Inadequate antibiotics	2	2.70
Reference center not alerted	2	2.70
Inadequate emergency treatment	2	2.70
No HIV monitoring and screening for other infections	1	1.35
Unclean and unsafe delivery	1	1.35

3.5. Dysfunctions Related to the Referral Center

The main dysfunctions noted at the referral hospital were inadequate emergency treatment (47.30%), poorly completed medical records (37.84%), and inadequate treatment of complications (27.03%). The distribution of newborns according to dysfunctions at the referral center is shown in Table 3.

Table 3. Distribution of newborn deaths from January 1 to May 31, 2020, in the neonatal unit of the teaching hospital of Parakou according to malfunctions at the referral center (N = 74).

	Number	%
Dysfunctions at the referral center		
Inadequate emergency treatment	35	47.30
Incomplete medical records	28	37.84
Inadequate treatment of complications	20	27.03
Inadequate caregiver-patient relationship	9	12.16
Inadequate monitoring	7	9.46
Lack of lung maturation	6	8.11
Inadequate neonatal resuscitation	6	8.11
Incomplete diagnosis	5	6.76
Transfusion not performed or delayed	5	6.76
Long transfer time to neonatal unit	4	5
Surgical treatment not performed or delayed	4	5.41
Inadequate antibiotic therapy in the mother	4	5.14
Absence/delay in performing a cesarean section	3	4
Incomplete neonatal care	2	2.70
Delayed antibiotic therapy in newborns	2	2.70
Inadequate transfer conditions for newborns	1	1.35

3.6. Corrective Actions Formulated Following Audits

In the community, awareness-raising was mainly recommended as a corrective measure. At the peripheral center, this involved feedback meetings (50%) and working sessions (10.81%). At the referral center, the proposed actions were feedback (63.51%), advocacy with the hospital administration (27.03%), and feedback to the neonatology team (27.03%). The distribution of corrective actions formulated for the referral center is shown in Table 4.

Table 4. Distribution of newborn deaths from January 1 to May 31, 2020, in the neonatal unit of the teaching hospital of Parakou according to the corrective actions developed for the reference center (N = 74).

	Number	%
Corrective actions at the reference center		
Feedback to staff	47	63.51
Advocacy with the administration	20	27.03
Feedback to the neonatal team	20	27.03
Feedback to the maternity ward	17	22.97
Recycling of service providers	9	12.16
Return to surgery, radiology, and laboratory departments	4	5.40
Review the treatment protocol	2	2.70

3.7. Response in Health Districts from June 1st 2020, to June 30, 2025

After completing the first phase of the audit, it became necessary to organize the response at the departmental level in order to extend the systematic review of newborn deaths in the health districts of the Borgou department. The terms of reference were developed with a view to seeking funding to train the neonatal death surveillance committees of the four health districts of the Borgou Departmental Health Directorate in the different methods of neonatal death audit. This training took place from June 1st to 30, 2020. This enabled the capacity building of 55 members of neonatal death surveillance committees throughout the Borgou department. These committees were responsible for conducting maternal and neonatal death audits at the operational level. Starting in 1st July 2020, these committees regularly conducted neonatal death audits under the supervision of the Borgou Departmental Health Directorate authorities. The distribution of committee members trained from June 1st to 30, 2020, is presented in Table 5. In view of the extent of the dysfunctions related to the referral of mothers and newborn and under the aegis of the authorities of the Borgou Departmental Health Directorate, a reorganization of referrals and counter-referrals was carried out: in May 2025, a forum for the management of referrals and counter-referrals of mother-child pairs was created. A monthly schedule of pediatricians and obstetrician-gynecologists is drawn up at the beginning of each month. Referrals are reviewed by both ex-

perts, according to their field, as they are made. Feedback is provided to the health workers involved in the referral. A referral and counter-referral committee has also been set up in the referral hospital to manage counter-referrals to peripheral health centers.

Table 5. Distribution of members of the audit committee trained in neonatal death auditing in the Borgou department from June 1st to June 30, 2020, according to health districts.

	Doctors	Nurses	Midwives	Biologists	Technicians Social workers	Administrators
Parakou Ndali	6	3	2	1	1	1
Nikki Kalalé Pèrèrè	6	3	2	1	1	0
Tchaourou	7	3	2	1	1	0
Bemberekè Sinendé	6	3	2	1	1	1
Total	25	12	8	4	4	2

After reviewing the work of the audit committees of the four health districts from July 1st, 2020, to June 30, 2025, we arrived at the following results: of the 1,427 neonatal deaths recorded in the Borgou Departmental Health Directorate, 895 were audited, representing an audit completion rate of 62.71%.

The distribution of death audit completion rates in the Borgou Departmental Health Directorate from July 1st 2020, to June 30, 2025, by health district is presented in Table 6.

Table 6. Distribution of death audit completion rates in the Borgou Departmental Health Directorate from July 1st, 2020 to June 30, 2025, by health districts.

	2020	2021	2022	2023	2024	2025	Total
Parakou Ndali	12/24	12/54	40/45	75/75	49/55	20/27	208/280 (74.28%)
Nikki Kalalé Pèrèrè	15/98	45/115	51/99	77/101	70/103	24/49	282/565 (49.91%)
Tchaourou	13/33	5/19	09/32	27/36	16/40	24/35	94/195 (48.20%)
Bembèrèkè Sinendé	22/29	40/71	78/78	58/69	66/68	47/72	311/387 (80.36%)

4. Discussion

This study addresses the neonatal death audit, which is an integral part of strategies for improving the quality of newborn care and, consequently, reducing neonatal mortality. The materials used are validated by the national strategy for monitoring neonatal maternal deaths and response (SDMR). The committee that conducted the audit sessions was composed of multidisciplinary stakeholders with strong involvement of the departmental health authority. This helped minimize

biases that could occur in the search for dysfunctions. The poorly completed files at 37.84% did not have a direct negative impact on the quality of the neonatal death audit since this was taken into account in the dysfunctions related to the documentation of acts and care provided to newborns.

4.1. In-Hospital Mortality Rate

In-hospital mortality according to this study was 12.58%. A hospital study conducted in a leading university hospital in the Somali region of Ethiopia found a mortality rate of 130 per thousand live births; birth asphyxia, prematurity, sepsis and congenital anomalies were the main causes of admission and death [6]. Another study conducted in 35 hospitals in Tanzania noted a neonatal mortality rate of 11.3%. The main causes of early neonatal death were birth asphyxia (22.3%) and respiratory distress (20.8%), while those of late neonatal death were sepsis (29.1%) and respiratory distress (20.0%) [7]. In a provincial hospital in Botswana, neonatal mortality was 227 per 1000 live births. Univariate analysis revealed that sepsis, extremely low birth weight, hypoxic ischemic encephalopathy, critical illness, and infants born at home were associated with an increased risk of all-cause mortality [8]. This rate is below the 20.3% found in Douala hospital at Cameroon [9]. In a study conducted in a university hospital in Burkina Faso, the neonatal mortality rate was 19.72%. The main causes of death were neonatal infections 37.68%, prematurity 22%, asphyxia 53.62%, respiratory distress 68% [10]. Another study in another university hospital in the same country noted that the main causes of death were prematurity (42.84%), neonatal infection (NNI) (25.42%), neonatal distress (NNS) (20.81%) and malformation (3.80%) [11]. In Ghana, the same causes were found in two different health and demographic surveillance systems [12].

4.2. Dysfunctions

Neonatal mortality remains high despite efforts to positively impact this indicator. This slows down the reduction of infant and child mortality. The direct causes of neonatal deaths are known and preventable in most cases. However, many factors contribute to their occurrence. These factors are linked to risky behaviors in the community with regard to healthcare, healthcare professionals, and the organization of care. Other African authors have also noted similar dysfunctions in studies conducted on the audit. According to a study conducted in Côte d'Ivoire in 2016, the three delays identified were: delayed decision-making (84.2%), delayed access to health services (20.2%), and delayed receipt of appropriate care (15.7%) [13].

In another study in Somalia, those whose mothers did not attend prenatal care visits were at greater risk of death [14]. In Papua New Guinea, patient-related factors included failure to respond to reduced fetal movements and delays in seeking care during labor. Factors associated with healthcare personnel included poor intrapartum care, late diagnosis of breech presentation, and a prolonged second stage without intervention [5]. In a study conducted in Haiti and the United

States, infant mortality rates were generally higher for births outside hospitals than for births in hospitals [15] [16].

Systematic audits of neonatal deaths are a strategy for improving the quality of care [17]. Indeed, systematic death audits and clinical mentoring have led to a downward trajectory in all perinatal mortality indicators in Bangladesh, Ghana, and Tanzania through improved quality of care [18]. The 100% completion rate set by the ministerial decree that institutionalized neonatal death audits has not been achieved. Some authors have cited the availability of resources to support audits as a factor that either promotes or hinders the regularity of audits [19] [20].

5. Conclusion

More than one in ten newborns admitted to the neonatal unit of the Parakou University Hospital Center between January 1st and May 31, 2020, died. Among these, three out of four deaths occurred during the first week of life. The dysfunctions noted were delayed access to care, lack of pregnancy monitoring, and home delivery. At the peripheral centers, the problems were delays in referral, inadequate pre-referral care, and non-medical referral. At the referral center, the main problems were inadequate treatment of emergencies and complications. At the departmental level, training for members of the audit committee was provided. More than six out of ten newborns who died had undergone a systematic audit. It seems necessary to continue raising awareness in the community, strengthening the capacity of peripheral health center staff in essential newborn care, and reorganizing procedures for caring for newborns in life-threatening situations so that first aid does not depend on their parents' financial means.

Conflicts of Interest

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

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