Scientific Research Publishing

Open Journal of Pediatrics, 2025, 15(4), 591-600
https://www.scirp.org/journal/ojped
ISSN Online: 2160-8776
ISSN Print: 2160-8741

Status of the Management of Perinatal Asphyxia in Newborns Born in the Neonatal Units of Three Area Hospitals in the Department of Borgou in 2019

Medetinme Gerard Kpanidja*, Falilatou Agbeille Mohamed, Senami Lydie Ruth Gbegnito, Alphonse Noudamadjo, Julien Didier Adedemy, Joseph Agossou

Department of Mother and Child Faculty of Medicine, University of Parakou, Parakou, Benin
Email: *m.kpanidja@yahoo.ca, fmagbeille@yahoo.fr, lydiegbegnito@gmail.com, alphonse_ndama@yahoo.com, agossoujoseph@gmail.com, kofadier@yahoo.fr

How to cite this paper: Kpanidja, M.G., Mohamed, F.A., Gbegnito, S.L.R., Noudamadjo, A., Adedemy, J.D. and Agossou, J. (2025) Status of the Management of Perinatal Asphyxia in Newborns Born in the Neonatal Units of Three Area Hospitals in the Department of Borgou in 2019. *Open Journal of Pediatrics*, **15**, 591-600.
https://doi.org/10.4236/ojped.2025.154056

Received: June 21, 2025
Accepted: July 21, 2025
Published: July 24, 2025

Abstract

Introduction: there were no studies conducted on perinatal asphyxia in peripheral hospitals in the Borgou department. The objective of this work was to study perinatal asphyxia in the Borgou area hospitals. Patients and methods: this was a multicenter, descriptive cross-sectional study, whose data collection was done from May 1, 2019 to July 31, 2019 in three area hospitals: the Sounon Sero Hospital in Nikki, the Evangelical Hospital in Bembèrèrkè and the Saint Jean de Dieu Hospital in Boko. Results: Three hundred and fifty (350) newborns were included in the study. The frequency of the PNA was 49.71%. The sex ratio was 1.31. The mean age at admission was 45 minutes. Newborns were in-born in 91.71%. According to the Sarnat classification, 55.17% were classified as grade I; 32.19% grade II and 12.64% grade III. They had received magnesium sulphate (16.57%), phenobarbital (37.71%), oxygen (54.29%) as treatment. The average stay was 03 days. Factors that were significantly associated with APN were parity (primiparity p = 0.002 OR 2.37 [1.38 - 4.04]), number of ANCs (<4) p = 0.005 OR 2.54 [1.32 - 4.86] and mode of delivery (vaginal obstructed p = 0.009 OR 2.39 [1.23 - 4.61]). Conclusion: perinatal asphyxia is a reality in the peripheral hospitals of Borgou.

Keywords

Asphyxia, Perinatal, Borgou, Benin

1. Introduction

Perinatal asphyxia (PNA) is defined by the World Health Organization (WHO)

as the inability to initiate and maintain normal breathing at birth [1]. Improved obstetric care and advances in perinatal medicine in developed countries have reduced the incidence of perinatal asphyxia. In France, according to Wayenberg *et al.*, perinatal asphyxia represents 1% of full-term deliveries [2]. In Mali, according to a study by Ouattara *et al.*, in 2020, the frequency was 20.9% [3]. Asphyxia, if it occurs, has as a corollary a multi-organ failure that can lead to Anoxo-Ischemic Encephalopathy (AIE), which has serious consequences in the neonatal period [4]. IAE is the most serious complication of PNA and the neurological sequelae are often persistent, including cerebral palsy in 15% to 20% of cases [5]. While the management of asphyxia is often done in hospitals at the top of the health pyramid, peripheral hospitals are at the forefront of the treatment process. Faced with the lack of work on this theme in the said hospitals, it seemed appropriate to us to carry out this work, the objective of which was to study perinatal asphyxia in the three zone hospitals with a neonatology unit in the Borgou department in 2019.

2. Materials and Methods

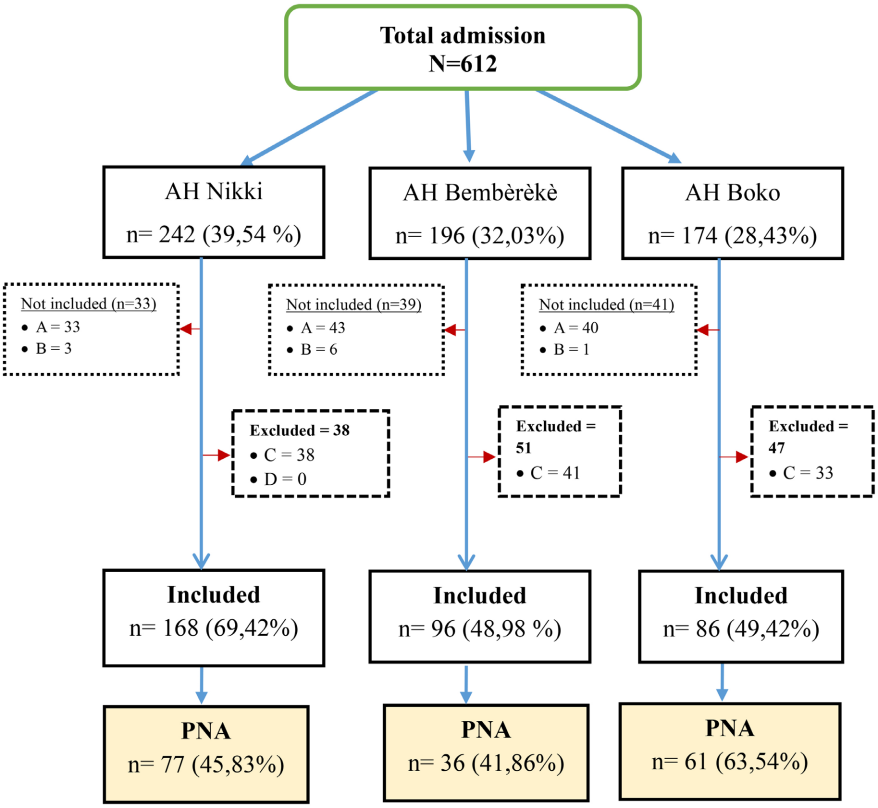
This was a multicenter, prospective and descriptive study. It took place in the neonatology units of three primary care hospitals in the Borgou Department: The Sounon Séro Hospital in Nikki, the Evangelical Hospital in Bembèrèrkè and the Saint Jean de Dieu Hospital in Boko. The study population consisted of term newborns. The minimum size of the sample calculated using the Schwartz formula was 254. To reduce the influence of missing values and keep the power of the sample an increase of 10% has been made. This brings the size of the sample to 279. Newborns who had experienced perinatal asphyxia during the study period and were admitted to the three neonatal units were included. Those who had congenital malformations or who were born before 36 weeks of amenorrhea were not included. The dependent variable was perinatal asphyxia: it was evoked in the presence of acute fetal distress (the presence of an abnormality of the Fetal Heart Rate and meconium/tinted amniotic fluid), an APGAR score of less than 7 at the fifth minute, a notion of resuscitation at birth until ventilation or the existence of clinical signs of early encephalopathy [6]. The secondary variables were related to sociodemographic, anamnestic, clinical, therapeutic and evolutionary aspects. Magnesium sulfate was administered when the newborn was classified Sarnat two or three. Phenobarbital was administered in front of seizure and Antibiotics in front of an infectious gestational anamnesis, clinical anomalies and biological inflammation with CRP positive hyperleucocytosis or leucopenia. Data collection was done from May 1st to July 31, 2019. Sampling was non-probabilistic. The data were collected on a survey sheet. The data collected was recorded and processed using the Epi Data 3.1 software and the Microsoft WORD and EXCEL application software version 2013. They were then analysed using the Stata 14 software. The identification of factors associated with PNA was done by a top-down step-by-step logistic regression model based on p-value.

The research protocol was submitted for approval to the Ethics Committee of

the University of Parakou, which gave a favourable opinion under the number 0184/CLERB-UP/P/SP/R/SA. In addition, authorizations from the Departmental Directorate of Health of Borgou and the administrative authorities of the Area Hospitals have been obtained. The anonymity of the newborns included in the study as well as the confidentiality of the data were ensured.

3. Results

A total of 350 newborns were included in this study. The hospital frequency of perinatal asphyxia was 49.71% (174/350). Of these, 55.17% were classified in Grade I of the Sarnat Classification, 32.19% in Grade II and 12.64% in Grade III. The distribution of newborns included by hospital is shown in Figure 1.



AH: Area Hospital, PNA: Perinatal Asphyxia.

Figure 1. Flow diagram of newborns admitted to the three neonatology units of the Area Hospitals of Borgou in 2019.

The average age of mothers was 24.43 years ± 5.89 years. Of these, 68.29% were housewives. The median pregnancy was 2 and 36.29% were primigeste. The mothers had followed their pregnancy in 64% of cases. Of these, 30.80% had at least 4 ANCs. Pathologies during pregnancy were noted in 13.88% of mothers (n = 39). These were malaria in 82.05% (n = 32) and hypertension in 23.08% (n = 9). The median parity was 2 and 40.86% of mothers were primiparous. The distribution of mothers of newborns according to gestational history is presented in Table 1.

Table 1. Distribution of mothers of newborns admitted to the Nikki, Bembèrèkè and Boko Area Hospitals in 2019 according to gestational history.

	Workforce (n=)	Percentage %
Level of education		
Uneducated	251	71.71
Primary	56	16.00
Secondary	24	6.86
Academic	19	5.43
Mother's occupation		
Housewife	239	68.29
Merchant	41	11.71
Artisan	30	8.57
Official	19	5.43
Student	10	2.86
Farmer	7	2.00
Other	4	1.14
Gesturity		
Primitest	127	36.29
Paucigeste	127	36.29
Multi-gesture	96	27.42
Parity		
Primiparous	143	40.86
Paucipare	126	36.00
Multiparous	81	23.14
Pregnancy follow-up		
Yes	224	64.00
No	126	36.00
Number of ANCs (n = 224)		
<4	155	69.20
≥4	69	30.80
Pathologies in pregnancy		
Yes	39	13.88
No	242	86.12

The median age of newborns at admission was 45 minutes. The sex ratio was 1.31. Furthermore.

An abnormality in the sounds of the fetal heart was observed in 44.86% of cases. Amniotic fluid was meconium in 40% of cases and premature rupture of membranes was noted in 10.57% of cases. Regarding the mode of delivery, 41.14% of the mothers had given birth by caesarean section and 19.14% by the dystocic vaginal route.

At the 5th minute 13 (3.71%) newborns had an APGAR score ≤3, 145 (41.43%) had a score between [3; 7] and 192 (54.86%) had a score ≥7. The number of newborns resuscitated at birth was 162 (46.55%). Of these, 25.31% had reacted after drying, 35.19% after stimulation, 25.30% after unblocking, 12.35% after ventilation and 1.85% after external cardiac massage. The distribution of newborns according to the conditions of delivery is shown in Table 2.

Table 2. Distribution of newborns admitted for perinatal asphyxia in hospitals in Nikki, Bembèrèkè and Boko Area Hospitals in 2019 according to delivery conditions.

	Workforce (n=)	Percentage %
OCD Anomaly		
Yes	157	44.86
No	193	55.14
Appearance of amniotic fluid		
Meconial	140	40.00
Tinted	23	6.57
Clear	152	43.43
Pea puree	26	7.43
Fetid	2	0.57
Other (Hematic)	7	2.00
Acute fetal distress		
Yes	152	43.43
No	198	56.57
Premature rupture of membranes		
Yes	37	10.57
No	313	89.43
Mode of delivery		
Eutocic spontaneous vaginal route	139	39.71
Dystocic vaginal tract	67	19.15
Caesarean section	144	41.14

The main clinical signs presented on admission were, respiratory distress (38.86%), hypothermia (19.20%), low birth weight (18.86%) and seizures (18%). The distribution of newborns according to clinical characteristics is presented in Table 3.

Table 3. Distribution of newborns with APN admitted to Borgou Area Hospitals in 2019 by clinical characteristics at birth (n = 350).

	Workforce (n=)	Percentage %
Weight (in grams)		
≤2499	66	18.86
2500 - 3499	245	70.00
3500	39	11.14
Hypothermia		
Yes	67	19.20
No	282	80.80
Tachycardia		
Yes	118	33.71
No	232	66.29
Respiratory distress		
Yes	136	38.86
No	214	61.14
Cyanosis		
Yes	84	24.00
No	266	76.00
State of consciousness		
Good	243	69.43
Hyperexcitable	6	1.71
Lethargic	95	27.15
Comatose	6	1.71
Convulsions		
Yes	63	18.00
No	287	82.00
Tonicity		
Normal	239	68.29
Hypotonia	109	31.14
Hypertonia	2	0.57

Continued

Archaic reflexes		
Present	180	51.43
Weak or disturbed	144	41.14
Absent	26	7.43

Hypoglycaemia was noted in 20 (11.83%), hypocalcaemia in 28 (11.97%) and positive thick drop in 19 (5.43%) newborns. Magnesium sulfate was administered in 16.57% of cases. Phenobarbital in 37.71%. Oxygen therapy was done in 54.29% of cases. In addition, antibiotics were administered in 94.29% of cases, antimalarials in 5.43% of cases. Fifteen (15) deaths were recorded in the neonatology units, i.e. a neonatal mortality of 4.29%.

Three factors were identified as being associated with APN: primiparity ($p = 0.002$), absence of maternal ANC ($p = 0.005$), and obstructed vaginal delivery ($p = 0.009$). In addition, grade III of the Sarnat classification was significantly associated with death ($p < 0.001$). The factors associated with the occurrence of perinatal asphyxia in multivariate analysis are presented in Table 4.

Table 4. Factors associated with the occurrence of perinatal asphyxia in newborns admitted to the Borgou Area Hospitals in 2019 in multivariate analysis.

	Adjusted OR [95% CI]	P value
Pick-up location		
Nikki's HZ	1	
HZ of Boko	1.33 [0.70 - 2.54]	0.374
HZ of Bembèrèkè	2.01 [1.13 - 3.57]	0.016
Parity		
Primiparous	2.37 [1.38 - 4.04]	0.002
Paucipare	1	
Multiparous	1.37 [0.74 - 2.52]	0.311
Number of ANCs		
0	2.54 [1.32 - 4.86]	0.005
1 - 3	0.99 [0.53 - 1.84]	0.980
≥ 4	1	
Mode of delivery		
Eutocic spontaneous vaginal route	1.86 [1.10 – 3.14]	0.019
Dystocic vaginal tract	2.39 [1.23 – 4.61]	0.009
Caesarean section	1	

4. Discussion

This work was carried out in Area Hospitals in the Borgou department, in order to evaluate practices in the management of perinatal asphyxia. This allowed us to measure the share of perinatal asphyxia in neonatal emergencies at the level of primary care hospitals. We have noted that these hospitals are also confronted with perinatal asphyxia, like the departmental university reference hospital. This is evidenced by the hospital frequency, which was 49.71%. According to the severity, newborns were classified as Sarnat II and III in 32.19% and 12.64% of cases, respectively. According to another author, Hypoxic Ischaemic Encephalopathy staging was moderate in 87.1% and severe in 12.9% [7], another author in the study noted that 30% newborns was classified mild and 69% with moderate to severe [8]. Comorbidity with neonatal infection was noted in 55.14% of cases below the 11.6% found by an author [7]. The main clinical manifestations presented on admission were respiratory distress (38.86%), convulsions (18%). Indeed, this preponderance of respiratory distress in the clinical manifestations of perinatal asphyxia could be explained by the metabolic acidosis it causes. This leads to the activation of compensation mechanisms, including hyperventilation. Biologically, hypoglycemia was noted in 11.83% of cases and hyperglycemia (11.83%). These same symptoms and biological disorder were described by other authors are due to organ anoxia [9] [10]. Magnesium sulfate was administered in 16.57% of cases. Indeed, late neuronal death, responsible for the neurodevelopmental sequelae related to severe perinatal asphyxia, occurs from the 6th hour of life and is limited with the administration of the 1st dose of magnesium sulfate before the 6th hour of life [11] [12]. In view of the beneficial contribution of magnesium sulphate in the prognosis of perinatal asphyxia, it is important to popularize its use in these hospitals for a harmonization of the protocol for the management of perinatal asphyxia in the department of Borgou on the one hand but also in the other departments of the northern part of Benin. Fifteen (15) deaths were recorded in the neonatology units with neonatal mortality of 4.29%. This mortality rate was lower than that reported by other authors found 8.4%, 29% [7; 8]. Similarly, the average length of hospital stay of 3 days was shorter than that reported by another author in the country, which was 7 days [13]. This difference in mortality could be explained by the fact that severe cases admitted to these hospitals could be referred to the referral hospital at the departmental level, which is located within a radius of 100 km from the hospitals of Nikki and Bembèrèkè and 15 km from the Boko zone hospital.

5. Conclusion

Perinatal asphyxia is common in Area Hospitals in the department of Borgou. It represents nearly one in two cases of admission. The main comorbidity was represented by neonatal infection. According to this study, one in 20 of the newborns admitted had died. Sarnat Grade III was significantly associated with death. The use of magnesium sulphate in the management of this condition was not system-

atic in newborns who should benefit from it. It is important to popularize the protocol for the use of magnesium sulphate in the management of perinatal asphyxia in the Department of Borgou and in all the other departments of the north.

Conflicts of Interest

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

References

[1] Lawn, J.E., Cousens, S. and Zupan, J. (2005) 4 Million Neonatal Deaths: When? Where? Why? *The Lancet*, **365**, 891-900. https://doi.org/10.1016/s0140-6736(05)71048-5

[2] Wayenberg, J., Vermeylen, D. and Damis, E. (1998) Definition of Birth Asphyxia and Incidence of Neurological and Systemic Complications in Term Newborns. *Archives de Pédiatrie*, **5**, 1065-1071. https://doi.org/10.1016/s0929-693x(99)80002-5

[3] Ouattara, A., Kassogue, D., Maiga, B., Coulibaly, O., Santara, B., Traoré, K., *et al.* (2020) Epidemiological and Clinical Aspects of Perinatal Asphyxia of the Term Newborn in the Neonatology Unit of the Department of Pediatrics at the Sominé DOLO Hospital in Mopti. *Jaccr Africa*, **4**, 449-459.

[4] Halloran, D.R., McClure, E., Chakraborty, H., Chomba, E., Wright, L.L. and Carlo, W.A. (2008) Birth Asphyxia Survivors in a Developing Country. *Journal of Perinatology*, **29**, 243-249. https://doi.org/10.1038/jp.2008.192

[5] Simunek, V.Z. (2010) Perinatal Asphyxia at Term: Diagnosis, Prognosis, Neuroprotective Elements. *Pediatric Archives*, **17**, 578-582. https://doi.org/10.1016/j.arcped.2010.02.001

[6] Sarnat, H.B. and Sarnat, M.S. (1976) Neonatal Encephalopathy Following Fetal Distress. *Archives of Neurology*, **33**, 696-705. https://doi.org/10.1001/archneur.1976.00500100030012

[7] Mascarenhas, D., Goyal, M., Nanavati, R., Kirthana, S.B. and Subhadarsini, S. (2022) Short-Term Outcome and Complications of Therapeutic Hypothermia in Neonates with Moderate-to-Severe Hypoxic Ischaemic Encephalopathy: A Single-Centre Retrospective Observational Study in a Hospital in Mumbai, India. *Paediatrics and International Child Health*, **42**, 117-126. https://doi.org/10.1080/20469047.2023.2171762

[8] Nakwa, F.L., Sepeng, L., van Kwawegen, A., Thomas, R., Seake, K., Mogajane, T., *et al.* (2023) Characteristics and Outcomes of Neonates with Intrapartum Asphyxia Managed with Therapeutic Hypothermia in a Public Tertiary Hospital in South Africa. *BMC Pediatrics*, **23**, Article No. 51. https://doi.org/10.1186/s12887-023-03852-2

[9] Mota-Rojas, D., Villanueva-García, D., Solimano, A., Muns, R., Ibarra-Ríos, D. and Mota-Reyes, A. (2022) Pathophysiology of Perinatal Asphyxia in Humans and Animal Models. *Biomedicines*, **10**, Article No. 347. https://doi.org/10.3390/biomedicines10020347

[10] Sameshima, H., Ota, A. and Ikenoue, T. (1999) Pretreatment with Magnesium Sulfate Protects against Hypoxic-Ischemic Brain Injury but Postasphyxial Treatment Worsens Brain Damage in Seven-Day-Old Rats. *American Journal of Obstetrics and Gynecology*, **180**, 725-730. https://doi.org/10.1016/s0002-9378(99)70279-6

[11] Gillam-Krakauer, M., Shah, M. and Gowen Jr., C.W. (2025) Birth Asphyxia. StatPearls Publishing.

[12] Kumar, C., Adhisivam, B., Bobby, Z. and Bhat, B.V. (2022) Magnesium Sulfate as an Adjunct to Therapeutic Hypothermia in the Management of Term Infants with Hypoxic-Ischemic Encephalopathy: A Randomized, Parallel-Group, Controlled Trial. *Indian Journal of Pediatrics*, **90**, 886-892. https://doi.org/10.1007/s12098-022-04289-8

[13] Almeida, M., Lalya, F., Bagnan, L., Djidita Hagre, Y., Adedemy, J.D. and Ayivi, B. (2017) Perinatal Asphyxia of the Newborn at Term: Risk Factors and Prognosis at the National Hospital and University Center (CNHU-HKM) of Cotonou. *Journal Africain de Pédiatrie et de Génétique Médicale*, **1**, 10-15.