

Neonatal Seizures: Epidemiological, Diagnostic Aspects and Short-Term Outcome at Issaka Gazoby Maternity Hospital of Niamey, Niger

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Abstract

Introduction: Neonatal seizures are one of the most challenging situations for paediatricians. The objective of this work was to study the epidemiological and diagnostic aspects and short-term outcomes of neonatal seizures at Issaka Gazoby Maternity Hospital in Niamey. **Patients and Methods:** This was a prospective study from November 2020 to April 2021 in the neonatology department of Issaka Gazoby Maternity Hospital. All newborns aged 0 to 28 days hospitalized for seizures and/or having convulsions during hospitalization were included. Neonatal characteristics, diagnostic aspects, and their outcomes were studied. Data were analyzed using SPSS version 20 software. **Results:** Of the 3.068 newborns admitted, 69 cases of neonatal seizures were recorded (2.24%). The sex ratio was 1.22, and 94.2% of neonates were born at term. Generalized crises were found in 50.7%. The main etiologies were perinatal asphyxia (46.4%) and early-onset neonatal infection (40.6%). The death rate was 20.3%. Neonates died between one (1) and three (3) days of age in 42.9%. The main death causes were perinatal asphyxia (50%) and early-onset neonatal infection (21.4%). **Conclusion:** Neonatal seizures are uncommon frequent, with a semiology dominated by generalized seizures. Mortality is high. The reinforcement of preventive measures is necessary.

Keywords

Seizures, Neonatal, Perinatal Asphyxia, Niger

1. Introduction

Neonatal seizures are one of the most emergencies in paediatric practice and represent a non-specific sign of cerebral damage [1]. The prevalence varies, ranging from 1.5% to 15% of live-born infants [2] [3] [4] [5]. They require urgent treatment, as seizures are associated with a high risk of cerebral palsy, epilepsy, and even death. The overall prognosis remains grave [6]. Despite their high frequency and diagnostic difficulties, as well as the neurological and/or vital risk, very few studies have been carried out in our context. The objective of this work was to study the epidemiological, and diagnostic aspects and short-term outcomes of neonatal seizures at Issaka Gazoby Maternity Hospital in Niamey.

2. Patients and Methods

2.1. Type, Period and Study Setting

This was a prospective descriptive study from November 2020 to April 2021 in the neonatology department of Issaka Gazoby maternity hospital in Niamey, a national referral center.

2.2. Study Population and Patient Inclusion

The study focused on newborns aged 0 to 28 days hospitalized in the department for seizures, or those who had convulsed during hospitalization. Polymalformed newborns were not included. Parental consent was a prerequisite for inclusion in the study. The diagnostic criteria of the World Health Organization (WHO) were used for perinatal asphyxia (Apgar score less than 7 at 5 minutes after birth), and those of the “Agence Nationale d’Accréditation et d’Evaluation en Santé (ANAES, 2000)” for the diagnosis of maternal-fetal infection (such as chorioamnionitis, maternal fever at delivery or premature rupture of membrane) [5] [7].

2.3. Variables Studied and Data Processing and Analysis

The socio-demographic characteristics of the mothers and the maternal risk of neonatal infection during pregnancy were studied first. Next, the characteristics of the newborns were explored (gestational age, Apgar score, notion of resuscitation at birth, sex and birth weight). Clinical aspects (age of onset of first seizure, admission mode, temperature, seizure semiology), biological examinations, etiologies and evolution of the newborns were then studied. Data processing and analysis were done using SPSS version 20 software.

3. Results

During the study period, 3.068 newborns were admitted to the department, including 69 cases of neonatal seizures representing a prevalence of 2.24%.

3.1. Socio-Demographic Characteristics of Mothers

The average age of the mothers of the newborns was 25.3 years [16 - 41 years]. The majority (95.7%) had not medical or surgical history. Maternal fever was the

most common neonatal infectious risk, accounting with 46.4% of cases. Most pregnancies (84.1%) were well monitored.

3.2. Characteristics of Newborns

The **Table 1** shows the characteristics of the newborns. The majority were born at term (94.2%). The Apgar score at 5 minutes after birth was less than 7 in 53.6% of cases, and all these newborns benefited from resuscitation. Birth weight was between 2.500 g and 3.999 g in 72.5% of cases. Males were more represented with 55.1% of cases, for a sex ratio of 1.22.

3.3. Diagnostic Aspects

Newborns were referred from other health facilities in 72.5% of cases. The first attack occurred between birth and 3 days in 89.9% of newborns. Temperature was normal, between 36.5°C and 37.5°C in 76.8%. Neurological examination was also normal in 98.6% of cases post-critically. Seizures were repeated in 68.1% of newborns. Convulsions lasted less than 5 minutes per seizure in 97.1% of cases. The distribution of seizure types is shown in **Table 2**. Generalized crises occurred in 50.7% of newborns.

Respiratory distress was the sign most frequently associated with convulsions, found in 41.7% of newborns. On the biological level, more than eight out of ten newborns (85.5%) had a leukocytosis greater than 25.000 elements/mm³. C-reactive protein was positive (greater than 6 mg/L) in 27.5% of cases, as was thick and thin smear in 13.04% of newborns. Etiologies are shown in **Table 3**. Congenital malaria was isolated in 7.2% of newborns. As for metabolic disorders, hypoglycemia was found in 33.3% of cases, hypocalcemia in 17.2% and hyponatremia in 21.4%. These were isolated in 5.8% of newborns. Perinatal

Table 1. Characteristics of the newborns.

Characteristics of newborns	Effectif	Percent (%)
Delivery term		
At term	65	94.2
Preterm	4	5.8
Apgar score 5 minutes after birth		
<7	37	53.6
≥7	32	46.4
Birth weight (g)		
<2.500	16	23.2
2.500 - 3.999	50	72.5
≥4.000	3	4.3
Total	69	100

Table 2. Semiology of crises.

Type of seizure	Effectif	Percent (%)
Generalized crises	35	50.7
Myclonia	21	33.5
Tonic	4	5.8
Pedaling movements	3	4.3
Boxing	2	2.9
Ocular revulsion	1	1.4
Gaze fixation	1	1.4
Total	69	100

Table 3. Etiologies of seizures.

Etiologies	Effectif	Percent (%)
Perinatal asphyxia	32	46.4
Early-onset neonatal infection	28	40.6
Isolated metabolic disorders	5	7.2
Isolated metabolic disorders*	4	5.8
Total	69	100

* Hypoglycemia, hypocalcemia and et hyponatremia.

asphyxia and early-onset neonatal infection were the most common pathologies, accounting for 46.4% and 40.6% of cases respectively.

3.4. Prognosis of Newborns

More than four out of ten newborns (43.5%) had spent between one (1) and five (5) days in the department. Newborns were discharged without clinical sequelae in 79.7% of cases. The case fatality rate was 20.3%. Death occurred between one (1) and three (3) days of life in 42.9% of cases. The main causes of death were perinatal asphyxia (50%) and maternal-fetal infection (21.4%).

4. Discussion

Neonatal seizures are an important cause of morbidity and mortality. The limitations of this study were mainly the failure to perform certain more extensive complementary examinations, notably brain imaging, and electroencephalogram. Indeed, many of the cases presenting with adaptation disorders at birth could be related to arterial or venous vascular accidents, or neurovascular malformations. The metabolic disorders observed could also be secondary to inborn errors of metabolism, the exploration of which is not feasible in our context [5] [7] [8] [9] [10]. Nevertheless, the study has provided us with epidemiological

aspects, some diagnostic aspects, and the immediate prognosis of newborns with seizures.

4.1. Epidemiological Aspects

The prevalence of neonatal seizures has been variously reported in the literature, fluctuating between 1.5% and 14% [11]-[16]. The low rate found in our context may be due to diagnostic difficulties, many seizures going clinically undetected, and others having only an isolated electrical translation. The decline in incidence of this condition worldwide could be explained by advances in resuscitation methods [5] [17] [18]. In our context, this involved training health workers in emergency obstetric and neonatal care in peripheral health centers.

4.2. Diagnostic Aspects

The majority of seizures cases were observed in full-term infants (84.1%), as reported by Kojmane *et al.* [12] and Ghanshyambhai *et al.* [14], with 84% and 94% of cases respectively. In the present study, neonates presented with their first seizure within the first three days after birth in 89.9%. Neonatal seizures generally occur during the first few days of life, notably the first week of life in 80% of cases [1] [12] [19]. Seizures in newborns are highly polymorphic. In this series, generalized crises accounted for 50.7% and partial seizures for 49.3%. Clinical manifestations have been variously reported in the literature. In the study by Haque S and *et al.* a predominance of partial seizures was reported in 53.3% of cases, generalized seizures in 10%, and no cases of myoclonic seizures [19].

Neonatal seizures are a non-specific manifestation of many neurological and biochemical disorders. It was often difficult to define a precise etiology of seizures when several factors were simultaneously involved. The etiological profile of neonatal seizures has changed in recent decades [19] [20]. In this study, perinatal asphyxia represented the most frequent cause of seizures, as reported in other series [1] [19] [20]. In our context, and in developing countries in general, this situation could be explained by inadequate or absent monitoring of pregnancies and poor delivery conditions [5]. Early-onset neonatal infection, the second most common cause, could be explained by poor hygiene conditions in health facilities [5] [18]. Metabolic disorders, notably hypoglycemia, have also been described as an important cause of seizures in the neonatal period [1] [7] [8] [9] [10] [12] [19]. In this study, the low rate of hypoglycemia found could be linked to the systematic administration of glucose to any newborn presenting with adaptation disorders or neurological signs.

4.3. Prognosis of Newborns

The prognosis of neonatal seizures remains severe, as not only the mortality rate but also the neurological sequelae must be considered [1] [4] [21]. In this study, the mortality rate was 20.3%, with perinatal asphyxia as the main cause of death. A similar mortality was reported by Haque S *et al.* with 20% [19]. In addition to

its high case-fatality rate, perinatal asphyxia is one of the most frequent causes of neurodevelopmental sequelae in children [1] [17] [19] [22]. Those reported in the literature were cerebral palsy, mental retardation and epilepsy. This situation could be explained by the limits of diagnostic, therapeutic and monitoring resources in our context. Prevention therefore remains essential. It requires well-followed prenatal consultations, adequate fetal monitoring, early management and mastery of resuscitation techniques in the delivery room.

5. Conclusion

The frequency of neonatal seizures is relatively low. The semiology of crises was dominated by generalized forms. Etiologies were dominated by perinatal asphyxia and maternal-fetal infection, reflecting inadequate monitoring of pregnancies, poor delivery conditions and defective hygiene in our health centers. Case-fatality rates are high. There is therefore an urgent need to reinforce preventive measures, such as screening and appropriate treatment of maternal infections during pregnancy, and rigorous asepsis at the time of delivery. Staff training in emergency obstetric and neonatal care, including resuscitation of the newborn in the delivery room, also needs to be stepped up.

Conflicts of Interest

There are no conflicts of interest.

References

- [1] Kaminiów, K., Kozak, S. and Paprocka, J. (2021) Neonatal Seizures Revisited. *Children*, **8**, Article No. 155. <https://doi.org/10.3390/children8020155>
- [2] Zafari, A., Pajouhandeh, F. and Ahmadi, M.A. (2019) Etiology of the Neonatal Seizures: An Epidemiological Study. *International Clinical Neuroscience Journal*, **6**, 129-132. <https://doi.org/10.15171/icnj.2019.24>
- [3] Martindale, J.L., Goldstein, J.N. and Pallin, D.J. (2011) Emergency Department Seizure Epidemiology. *Emergency Medicine Clinics of North America*, **29**, 15-27. <https://doi.org/10.1016/j.emc.2010.08.002>
- [4] Yildiz, E.P., Tatli, B., Ekici, B., Eraslan, E., Aydinli, N., Caliskan, M., *et al.* (2012) Evaluation of Etiologic and Prognostic Factors in Neonatal Convulsions. *Pediatric Neurology*, **47**, 186-192. <https://doi.org/10.1016/j.pediatrneurol.2012.05.015>
- [5] World Health Organisation (WHO) (2015) Memento de soins hospitaliers pédiatriques: Prise en charge des affections courantes de l'enfance. 2ème Edition, WHO, Geneva.
- [6] Kaminska, A., Mourdie, J., Barnerias, C., Bahi-Buisson, N., Plouin, P. and Huon, C. (2007) Conduite à tenir en cas de convulsions néonatales. *Archives de Pédiatrie*, **14**, 1137-1151. <https://doi.org/10.1016/j.arcped.2007.05.004>
- [7] Agence Nationale d'Accréditation et d'Evaluation en Santé (ANAES) (2003) Diagnostic et traitement curatif de l'infection bactérienne précoce du nouveau-né. Recommandations pour la pratique. ANAES, Paris. https://www.has-sante.fr/upload/docs/application/pdf/recos_inn_mel_2006.pdf
- [8] Mukherjee, D., Kalita, D., Das, D., Kumar, T. and Kundu, R. (2021) Clinico-Epi-

- demiological Profile, Etiology, and Imaging in Neonatal Stroke: An Observational Study from Eastern India. *Neurology India*, **69**, 62-65.
<https://www.neurologyindia.com/text.asp?2021/69/1/62/310081>
<https://doi.org/10.4103/0028-3886.310081>
- [9] Chalard, F., Garel, C. and Pointe, H.D.L. (2013) Imagerie de l'ischémie périnatale. *MT Pédiatrie*, **16**, 203-211.
- [10] Chabrier, S., Kossorotoff, M., Chevin, M. and Fluss, J. (2021) Accident Vasculaire cérébral périnatal: Nosographie, présentation clinique, pathogénie, facteurs de risque et génétique. *Bulletin de l'Académie Nationale de Médecine*, **205**, 490-498.
<https://doi.org/10.1016/j.banm.2020.12.025>
- [11] Saliba, R., Annegers, F., Waller, D., Tyson, J. and Mizrahi, E. (2001) Risk Factors for Neonatal Seizures: A Population-Based Study, Harris County, Texas, 1992-1994. *American Journal of Epidemiology*, **154**, 14-20. <https://doi.org/10.1093/aje/154.1.14>
- [12] Kojmane, W., Hmami, F. and Atmani, S. (2019) Convulsions néonatales (à propos de 96 cas). *Journal de Pédiatrie et de Puériculture*, **32**, 259-261.
<https://doi.org/10.1016/j.jpp.2019.06.008>
- [13] Vegda, H., Krishnan, V., Variane, G., Bagayi, V., Ivain, P. and Pressler, R.M. (2022) Neonatal Seizures-Perspective in Low- and Middle-Income Countries. *Indian Journal of Pediatrics*, **89**, 245-253. <https://doi.org/10.1007/s12098-021-04039-2>
- [14] Ghanshyambhai, P., Sharma, D., Patel, A. and Shastri, S. (2016) To Study the Incidence, Etiology and EEG Profile of Neonatal Seizures: A Prospective Observational Study from India. *The Journal of Maternal-Fetal & Neonatal Medicine*, **29**, 554-558.
<https://doi.org/10.3109/14767058.2015.1010199>
- [15] Ronen, G.M., Penney, S. and Andrews, W. (1999) The Epidemiology of Clinical Neonatal Seizures in Newfoundland: A Population-Based Study. *The Journal of Pediatrics*, **134**, 71-75. [https://doi.org/10.1016/S0022-3476\(99\)70374-4](https://doi.org/10.1016/S0022-3476(99)70374-4)
- [16] Alves-Leon, S.V., Bravo, I.L.P., Pontes, A.M., Figueira, G.M., Meira, I.A., et al. (2009) Neonatal Epileptic Seizures: Descriptive Analysis in a Hospital Population. *Revista Paulista de Pediatria*, **27**, 173-178.
<https://doi.org/10.1590/S0103-05822009000200009>
- [17] Pisani, F., Piccolo, B., Cantalupo, G., Copioli, C., Fusco, C., Pelosi, A., et al. (2012) Neonatal Seizures and Postneonatal Epilepsy: A 7-y Follow-Up Study. *Pediatric Research*, **72**, 186-193. <https://doi.org/10.1038/pr.2012.66>
- [18] Verma, T., Prashant, S., Shree Naidu, S., Dixit, A. and Dadhich, A. (2019) An Observational Study of Various Clinical Presentations of Neonatal Seizures with Their Relative Frequency and Their Correlation with Etiology. *International Journal of Medical and Biomedical Studies*, **3**, 233-236.
<https://doi.org/10.32553/ijmbs.v3i8.506>
- [19] Haque, S., Hossain, S., Datta, M. and Maruf-Ul-Quader, M. (2020) Etiology and Immediate Outcome of Neonatal Convulsions: A Hospital Based Study. *Chattogram Maa-O-Shishu Hospital Medical College Journal*, **19**, 8-14.
<http://www.banglajol.info/index.php/CMOSHMCJ>
<https://doi.org/10.3329/cmoshmcj.v19i1.48795>
- [20] Tekgul, H., Gauvreau, K., Soul, J., Murphy, L., Robertson, R., Stewart, J., et al. (2006) The Current Etiologic Profile and Neurodevelopmental Outcome of Seizures in Term Newborn Infants. *Pediatrics*, **117**, 1270-1280.
<https://doi.org/10.1542/peds.2005-1178>
- [21] Lemmon, M.E., Bonifacio, S.L., Shellhaas, R.A., Wusthoff, C.J. and Greenberg, R.G. (2020) Characterization of Death in Infants with Neonatal Seizures. *Pediatric Neu-*

rology, **113**, 21-25. <https://doi.org/10.1016/j.pediatrneurol.2020.08.002>

- [22] Kedy Koum, D., Essomba, N., Penda, C.I., Engome, C.B., Doumbe, J., Endale Mangamba, L.M., *et al.* (2018) Evolution des nouveau-nés à terme et près du terme hospitalisés pour asphyxie néonatale à l'Hôpital de District de Bonassama. *Health Sciences and Diseases*, **19**, 50-55. <http://www.hsd-fmsb.org/>