

Original Research Article

Clinical and biochemical profile of neonatal seizures admitted in neonatal intensive care unit of a tertiary care hospital

Mohanram V.^{1*}, Arulraj Russelian¹, Palpandi V.²

¹Shri Sathya Sai Medical College and Research Institute Ammapettai, Kancheepuram, Nellikuppam, Tamil Nadu, India

²ESIC Medical College and PGIMSR, Chennai, Tamil Nadu, India

Received: 26 April 2021

Revised: 25 May 2021

Accepted: 26 May 2021

*Correspondence:

Dr. Mohanram V.,

E-mail: mohanram@me.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Several factors contribute to seizures among neonates. To avoid complications from under recognition of clinical seizures and the adverse effects of medications administered, the diagnosis and management of neonatal seizures necessitate an interprofessional approach. Present study was done to study the clinical and biochemical profile of neonates with seizures admitted to a tertiary care hospital, Chennai.

Methods: A cross sectional study was conducted where all the neonates from birth to 28 days of life who got admitted in the neonatal intensive care unit (NICU) of a tertiary care hospital-Shri Sathya Sai medical college and research institute were included in the study. Baseline characteristics of all the babies were noted on the prescribed proforma. Thorough physical examination was done and seizures were diagnosed by clinical observation. Clinical details of each seizure episode were recorded like age at onset of seizures, duration of seizure, number and type of seizure.

Results: In the present study, 50 neonates satisfying the inclusion and exclusion criteria were included in the study. The main mode of delivery was normal vaginal delivery (50%) followed by LSCS (40%) and assisted delivery (10%). 54% were male and 46% were female and majority of babies were delivered at term i.e., 72% and 28% were pre term babies. The mean day of onset of seizures in the present study was 3.18 ± 2.09 . Based on day of onset of seizures, with in 24 hrs (28%), 24 hrs to 72 hrs (46%), 4th day to 1 week (22%), more than 1 week (4%). Based on type of seizure 64% had subtle type, 26% had tonic type and 10% had clonic type of seizures. In this study, 24% had hypoglycemia, and 10 (20%) had hypocalcemia, 14% in the present study had hyponatremia, and 2 (4%) had hypomagnesemia, 2 (4%) had hypernatremia, 6% had combination of hypocalcemia and hypoglycemia.

Conclusions: Hypocalcemia, hypoglycemia, hyponatremia were the common biochemical abnormalities observed in our study. Subtle seizures were the common type of seizures observed among both pre term and term infants.

Keywords: Neonatal seizures, Intensive care unit, Hypocalcemia

INTRODUCTION

Neonatal seizures are a frequently encountered neurologic condition among neonates.¹⁻³ They are defined as the occurrence of a sudden, paroxysmal, abnormal alteration of the electrographic activity at any given point from birth to end of the neonatal period.³

The incidence of neonatal seizures was reported between 1 to 5.5 per 1000 live births among term infants, and incidence is higher among preterm infants.⁴⁻⁷

Because of its immaturity, the neonatal brain is more prone to seizures due to an imbalance of neuronal excitation over inhibition.¹ Numerous factors cause this

discrepancy. The primary factor is the neonatal neuron in its developmental. Other factors include the development of excitatory synapses before inhibitory synapses and early maturation of voltage-gated ion channels specific to depolarization.⁸

The clinician should immediately rule out hypoglycemia, hyponatremia, hypomagnesemia, hypocalcemia sepsis/meningitis/encephalitis.⁹

To avoid complications from under recognition of clinical seizures and the adverse effects of medications administered, the diagnosis and management of neonatal seizures necessitate an interprofessional approach. The present research was done to study the clinical and biochemical profile of neonates with seizures admitted to a tertiary care hospital, Chennai.

METHODS

Study population

All the neonates from birth to 28 days of life satisfying the inclusion and exclusion criteria who got admitted in the NICU of a Shri Sathya Sai medical college and research institute.

Study design

The study design used was a cross sectional study.

Study period

Study conducted from November 2019 to March 2020.

Sample size

Number of participants involved in the study were 50.

Inclusion criteria

All term and preterm babies presenting with seizures including both intramural and extramural neonates were enrolled in the study.

Exclusion criteria

Babies already on anticonvulsant therapy and mothers or caregivers not giving consent for the study were excluded from the study.

Method of data collection

An informed consent was taken from the parents/Care givers before the enrolment of the study participant into the study.

Detailed antenatal history like, maternal age, medical history, parity, gestational age, history of illness during

pregnancy, drug history during pregnancy, intra-natal history like, evidence of fetal distress, Apgar score, type of delivery, and medication given to mother during delivery and perinatal history were recorded.

Baseline characteristics of all the babies were noted on the prescribed proforma which includes name, age, sex, address weight, length, head circumference, gestational age, which is determined from mother by last menstrual period or ultrasound study of foetus before birth or by new Ballard scoring of the neonate. Thorough physical examination was done and seizures were diagnosed by clinical observation. Clinical details of each seizure episode were recorded like age at onset of seizures, duration of seizure, number and type of seizure. Seizure was classified into subtle, focal clonic, multifocal clonic, tonic, and myoclonic as per criteria by Volpe.

Before instituting specific treatment, 3 ml of blood will be collected by sterile technique in a sterile test tube for following investigations like blood glucose, total serum calcium levels, serum sodium and serum magnesium levels apart from capillary blood glucose estimation by glucostrix method.

Statistical analysis

Data entry and tabulation was done using Microsoft excel 2013 and analysis using SPSS 16. For quantitative data, Mean±SD was calculated. For qualitative data, frequency and percentages were estimated. Chi-square test was used to find the significant association between study groups. $p < 0.05$ was considered to be statistically significant.

RESULTS

In the present study, 50 neonates satisfying the inclusion and exclusion criteria who got admitted in NICU of Shri Sathya Sai medical college and research institute were included in the study. demographic profile of the study population (Table 1).

Table 1: Demographic profile of study participants.

| Variables | Frequency (%) |
|-------------------------------|--------------------------|
| Mode of delivery | Normal vaginal 25 (50) |
| | LSCS 20 (40) |
| | Assisted delivery 5 (10) |
| Gender | Male 27 (54) |
| | Female 23 (46) |
| GA at delivery | Term 36 (72) |
| | Pre-term 14 (28) |
| Delivery | Inborn 38 (76) |
| | Out born 12 (24) |
| Mean birth weight | 2.67±0.74 kg |
| Mean day of onset of seizures | 3.18±2.09 days |

Based on day of onset of seizures, with in 24 hrs (28%), 24 hrs to 72 hrs (46%), 4th day to 1 week (22%), more than 1 week (4%).

Based on type of seizure 64% had subtle type, 26% had tonic type and 10% had clonic type of seizures.

In this study, 24% had hypoglycemia, and 10 (20%) had hypocalcemia, 14% in the present study had hyponatremia, and 2 (4%) had hypomagnesemia, 2 (4%) had hypernatremia, 6% had combination of hypocalcemia and hypoglycemia (Table 2).

The 2% had combination of hypocalcemia and hypomagnesemia.

Among pre term 5 (35.71%) had hypoglycemia, and among term babies 19.44% had hypoglycemia (p>0.05).

Among pre term 42.86% had hypocalcemia and among term 22.22% had hypocalcemia (p<0.05) (Table 3).

Among term babies 11.11% had hyponatremia and 21.43% had hyponatremia among pre term (p>0.05) 14.29% had hypomagnesemia, and none presented with hypomagnesemia among term babies (p<0.05).

The 5.56% of term babies had hypernatremia (p>0.05). 21.43% of preterm babies had both hypoglycemia and hypocalcemia (p<0.05).

Among preterm babies, 64.29% had subtle seizures, 21.43% with tonic, 14.29% had clonic seizures. Among term babies, 63.89% had subtle seizures, 27.78% with tonic and 8.33% had clonic seizures (p>0.05) (Figure 1).

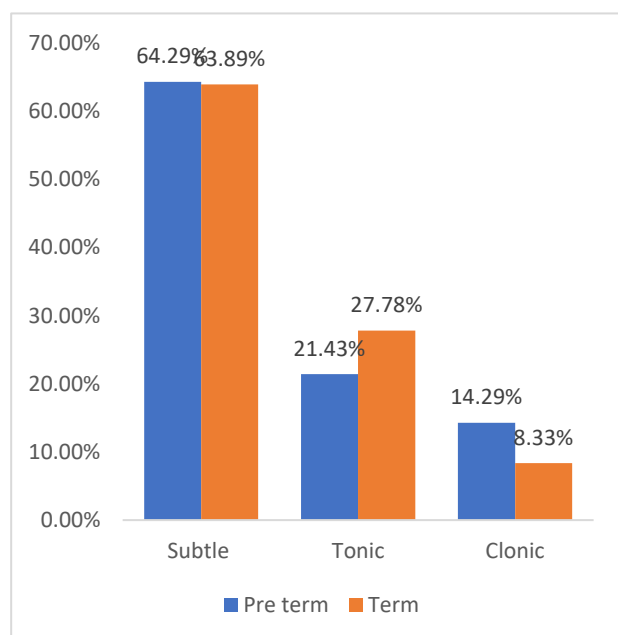


Figure 1: Distribution of type of seizures based on gestational age at birth.

Table 2: Summary of various biochemical abnormalities in study population.

| Variables | Frequency (n) | Percent (%) |
|----------------|---------------|-------------|
| Hypoglycemia | 12 | 24 |
| Hypocalcemia | 10 | 20 |
| Hyponatremia | 7 | 14 |
| Hypomagnesimia | 2 | 4 |
| Hypernatremia | 2 | 4 |

Table 3: Hypocalcaemia in the study population.

| Hypocalcemia | Pre term (%) | Term (%) |
|--------------|--------------|------------|
| Yes | 6 (42.86) | 4 (22.22) |
| No | 8 (57.14) | 32 (88.89) |
| Total | 14 (100) | 36 (100) |

Chi-square value-6.35, p=0.01* (statistically significant).

DISCUSSION

Seizures are the common neurological disorders among newborn. In our study, out of 50 neonates with seizures, majority of babies were delivered at term i.e. 72% and 28% were pre term babies. Among the study population, the SGA was 12 (24%), AGA was 36 (72%), and LGA was 2 (4%). Similarly, in a study conducted by Moayed and Zakeri, term AGA babies accounted for 83.6 percent, preterm AGA babies accounted for 12.7 percent, and post-term AGA babies accounted for 3.6%.¹⁰

In our study, neonatal seizures were common among males i.e., 54%. In our study. The mean birth weight was 2.67±0.74 kg. Majority i.e., 58% were normal weight at birth and 42% were low birth weight. Moayed and Zakeri's study revealed a similar result of 73.6%>2.5 kg and 22.7% in <2.5 kg.¹⁰

In our study, the majority of neonates with seizures were delivered via normal vaginal delivery (50%) followed by LSCS (40%) and Assisted delivery (5%) (10%). In a study of neonatal seizures conducted by Mahaveer et al, 68.7 percent were delivered vaginally, 28.1% via lower segment caesarean section, and 3.1 percent via forceps delivery.¹¹

The mean day of onset of seizures in the present study was 3.18±2.09. Based on day of onset of seizures, with in 24 hrs (28%), 24 hrs to 72 hrs (46%), 4th day to 1 week (22%), more than 1 week (4%). This presentation is consistent with earlier studies.^{2,12,13}

Based on type of seizure 64% had subtle type, 26% had tonic type and 10% had clonic type of seizures. Aziz et al reported clonic convulsions are more common while Taksande et al reported subtle seizures are the most common among 50% cases.^{14,15} In a study of neonatal seizures by Kumar and Gupta, 46.55% were subtle seizures and 21.55% were generalized tonic seizures.¹² In a study of neonatal seizures by Philip et al, subtle seizures were the most common occurring in 51% (27 of

53), followed by focal clonic (42%), multifocal clonic (30%) and GTS (23%).¹⁶

In this study, 24% had hypoglycemia, and 10 (20%) had hypocalcemia, 14% in the present study had hyponatremia, and 2 (4%) had hypomagnesemia, 2 (4%) had hypernatremia, 6% had combination of hypocalcemia and hypoglycemia. 2% had combination of hypocalcemia and hypomagnesemia.

In a study done on 100 neonates by Estan and Hope, HIE accounted for 37%, intracranial hemorrhage 7%, meningitis 5%, and hypoglycemia 3%.¹⁷ Goldberg in a 10-year review of 81 cases had HIE (16%), ICH (6%), hypoglycemia (6%), hypocalcemia (2%), and meningitis (8%), and remaining were due to congenital abnormalities.¹⁸ Nelson et al in 2006 observed that 10-20% of cases were due to hypocalcemia and hypomagnesemia.¹⁹

Limitations

Electroencephalography and Neuroimaging were not done for all patients.

CONCLUSION

Hypocalcemia, hypoglycemia, hyponatremia were the common biochemical abnormalities observed in our study. Subtle seizures were the common type of seizures observed among both pre term and term infants.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

- Glass HC. Neonatal seizures: advances in mechanisms and management. Clin Perinatol. 2014;41(1):177-90.
- Plouin P, Kaminska A. Neonatal seizures. Handb Clin Neurol. 2013;111:467-476.
- Abend NS, Wusthoff CJ. Neonatal seizures and status epilepticus. J Clin Neurophysiol. 2012;29(5):441-8.
- Vasudevan C, Levene M. Epidemiology and aetiology of neonatal seizures. Semin Fetal Neonatal Med. 2013;18(4):185-91.
- Orivoli S, Facini C, Pisani F. Paroxysmal nonepileptic motor phenomena in newborn. Brain Dev. 2015;37(9):833-9.
- Ronen GM, Penney S, Andrews W. The epidemiology of clinical neonatal seizures in Newfoundland: a population-based study. J Pediatr. 1999;134(1):71-5.
- Lanska MJ, Lanska DJ, Baumann RJ, Kryscio RJ. A population-based study of neonatal seizures in Fayette County, Kentucky. Neurology. 1995;45(4):724-32.
- Jensen FE. Neonatal seizures: an update on mechanisms and management. Clin Perinatol. 2009;36(4):881-900.
- Nardone R, Brigo F, Trinka E. Acute Symptomatic Seizures Caused by Electrolyte Disturbances. J Clin Neurol. 2016;12(1):21-33.
- Moayed AR, Zakeri S. Neonatal seizure: Etiology and type. J Child Neurol. 2007;2:23-6.
- Lakhra, Pushpa C. Clinico-biochemical profile of neonatal seizures in a rural medical college. National neonatol forum. 2003.
- Kumar A, Gupta A, Talukdar B. Clinico-etiological and EEG profile of neonatal seizures. Indian J Pediatr. 2007;74(1):33-7.
- Rabindran, Parakh H, Ramesh JK, Reddy P. Phenobarbitone for the Management of Neonatal Seizures - A Single Center Study. Int J Med Res Rev. 2015;3(1):63-71.
- Aziz A, Gattoo I, Aziz M, Rasool G. Clinical and etiological profile of neonatal seizures: a tertiary care hospital-based study. Int J Res Med Sci. 2015;3:2198-2203.
- Taksande AM, Krishna V, Jain M, Mahaveer L. Clinico-biochemical profile of neonatal seizures. Paed Oncall J. 2005;2(10).
- Brunquell PJ, Glennon CM, DiMario FJ Jr, Lerer T, Eisenfeld L. Prediction of outcome based on clinical seizure type in newborn infants. J Pediatr. 2002;140(6):707-12.
- Estan J, Hope P. Unilateral neonatal cerebral infarction in full term infants. Arch Dis Child Fetal Neonatal Ed. 1997;76(2):F88-93.
- Goldberg HJ. Neonatal convulsions: a ten years review. Arch Dis Childhood. 1982;57:633-5.
- Kliegman RM, Behrman RE, Jenson HB, Stanton BF. In: Kliegman RM, Behrman RE, Jenson HB, Stanton BF, editors. Nelson Textbook of Pediatrics, 18th ed. Saunders; 2007; 471.

Cite this article as: Mohanram V, Russelian A, Palpandi V. Clinical and biochemical profile of neonatal seizures admitted in neonatal intensive care unit of a tertiary care hospital. Int J Contemp Pediatr 2021;8:1147-50.