

## A Hospital-Based Assessment of the Clinical and Biochemical Profile of Neonates with Seizures

Ruby Kumari<sup>1</sup>, Satya Gupta<sup>2</sup>, Kishore Kumar Sinha<sup>3</sup>

<sup>1</sup>Senior Resident, Department of Pediatrics, Jawahar Lal Nehru Medical College and Hospital, Bhagalpur, Bihar, India

<sup>2</sup>Senior Resident, Department of Pediatrics, Jawahar Lal Nehru Medical College and Hospital, Bhagalpur, Bihar, India

<sup>3</sup>Associate Professor and HOD, Department of Pediatrics, Jawahar Lal Nehru Medical College and Hospital, Bhagalpur, Bihar, India

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Corresponding Author: Dr. Satya Gupta

Conflict of interest: Nil

### Abstract:

**Aim:** The aim of the present study was to assess the clinical and biochemical profile of neonates with seizures admitted to a tertiary care hospital, Bihar region.

**Material & Methods:** A cross sectional study was conducted in all the neonates from birth to 28 days of life satisfying the inclusion and exclusion criteria who got admitted in the NICU of Department of Pediatrics, Jawahar Lal Nehru medical College and Hospital, Bhagalpur, Bihar, India in between the duration of 6 months. 100 patients were included in the study. Common presentation at the time of admission was abnormal body movements or abnormal posturing (fits), refusal to feed, fever or hypothermia, cyanosis and icterus.

**Results:** In the present study, 56% were male and 44% were females. 52% children were delivered normally and 38% were delivered by LSCS. 75% new borns were full term and 25% were pre-term. In our study, the percentage of patients who experienced their first seizure within 24 hours was 26, followed by 24 to 72 hours (days 1 to 3), 4 days to 1 week (days 4 to 7), and more than 1 week (more than 7 days), with percentages of 44, 22 and 8 respectively. In this study, there were 100 participants, and 23 (23%) of them were found to have hypoglycemia. 18 neonates (18%) out of the study's 100 new-borns showed hypocalcemia. Out of 100 subjects, hyponatremia was reported in 12 neonates (12%). 5 (5%) of the 100 new-borns exhibited hypomagnesemia. Out of 100 new-borns in my research, 3 (3%) had hypernatremia.

**Conclusion:** Hypocalcemia, hypoglycemia and 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.

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### Introduction

Neonatal seizures are a frequently encountered neurologic condition among neonates. Neonatal seizures are one of the most common and distinctive clinical manifestations of dysfunction of neurological system. [1,2] Neonatal seizures 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] It represent non-specific responses of the immature nervous system to varied insults and result in considerable neonatal mortality and long term morbidity including motor and cognitive disabilities in the childhood. [4,5] Neonatal seizures cause significant neonatal mortality and long-term morbidity, including motor and cognitive deficits in infancy. [4,5] This may be due to

excitatory synapses developing earlier than inhibitory ones during the early stages of growth.<sup>5</sup>

Neonatal seizures frequently indicate a dangerous neurological disease, most frequently hypoxia-ischemia. Stroke, intraventricular haemorrhage, intraparenchymal haemorrhage, meningitis, sepsis, and metabolic abnormalities are some of the more frequent causes of neonatal seizures. [6] Understanding the cause is frequently beneficial for prognosis and treatment. However, in clinical practice at neonatal intensive care units (ICU) in developing countries where synchronized video-EEG monitoring is non-existent, clinical observation becomes the key to the diagnosis. The clinician should immediately rule out hypoglycemia, hyponatremia, hypomagnesemia,

hypocalcemia sepsis/meningitis/encephalitis. [7] Studies suggest that neonatal seizures and their etiology significantly impact the developing brain. [8]

Seizures in neonatal period can be subtle, focal clonic, multi focal clonic, tonic spasm and myoclonic. Spasm, focal clonic or tonic and generalized myoclonic seizures are associated with electrographic discharges, whereas the subtle, generalized tonic and other myoclonic seizures are not associated with EEG discharges. [9] Common causes of convulsions in newborn are hypoxic ischemic encephalopathy, cerebral infarction and stroke, intra cranial hemorrhage, intra cranial infections metabolic disturbances and undetermined, etc. Tonic seizure and myoclonic seizures were associated with unfavourable outcome and found in infants with hypoxic ischemic encephalopathy and intra cranial hemorrhage. Most common Biochemical abnormality associated with neonatal convulsion is hypocalcemia, hypoglycaemia, hypomagnesemia and hyponatremia. Hypoglycaemia in 50% cases associated with unfavourable outcome. [10]

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 NICU of a tertiary care hospital, Bihar.

**Material & Methods**

A cross sectional study was conducted in all the neonates from birth to 28 days of life satisfying the inclusion and exclusion criteria who got admitted in the NICU of Department of Pediatrics, Jawahar Lal Nehru medical College and Hospital, Bhagalpur, Bihar, India in between the duration of 6 months. 100 patients were included in the study.

**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 glucostix 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**

**Table 1: Demographic profile of study participants**

| Variables        |                   | N (%)   |
|------------------|-------------------|---------|
| Mode of delivery | Normal vaginal    | 52 (52) |
|                  | LSCS              | 38 (38) |
|                  | Assisted delivery | 10 (10) |
| Gender           | Male              | 56 (56) |
|                  | Female            | 44 (44) |
| GA at delivery   | Term              | 75 (75) |
|                  | Pre-term          | 25 (25) |
| Delivery         | Inborn            | 72 (72) |
|                  | Out born          | 28 (28) |

|                                      |                |  |
|--------------------------------------|----------------|--|
| <b>Mean birth weight</b>             | 2.48±0.76 kg   |  |
| <b>Mean day of onset of seizures</b> | 3.14±2.12 days |  |

In the present study, 56% were male and 44% were females. 52% children were delivered normally and 38% were delivered by LSCS. 75% new borns were full term and 25% were pre-term.

**Table 2: Clinical characteristics**

| <b>Clinical characteristics</b>        | <b>N%</b> |
|--|-----------|
| Convulsions                            | 100 (100) |
| Refusal to feed/ difficulty in feeding | 55 (55)   |
| Fever or hypothermia                   | 42 (42)   |
| Cyanosis                               | 35 (35)   |
| Icterus                                | 23 (23)   |
| <b>Onset</b>                           |           |
| Within 24 hours                        | 26 (26)   |
| 24-72 hours                            | 44 (44)   |
| 4 <sup>th</sup> day to 1 week          | 22 (22)   |
| More than 1 week                       | 8 (8)     |

Common presentation at the time of admission was abnormal body movements or abnormal posturing (fits), refusal to feed, fever or hypothermia, cyanosis and icterus. In our study, the percentage of patients who experienced their first seizure within 24 hours was 26, followed by 24 to 72 hours (days 1 to 3), 4 days to 1 week (days 4 to 7), and more than 1 week (more than 7 days), with percentages of 44, 22 and 8 respectively.

**Table 3: Summary of various biochemical abnormalities in study population**

| <b>Variables</b>       | <b>Frequency (n)</b> | <b>Percent (%)</b> |
|------------------------|----------------------|--------------------|
| <b>Hypoglycemia</b>    | 23                   | 23                 |
| <b>Hypocalcemia</b>    | 18                   | 18                 |
| <b>Hyponatremia</b>    | 12                   | 12                 |
| <b>Hypomagnesimnia</b> | 5                    | 5                  |
| <b>Hypernatremia</b>   | 3                    | 3                  |

In this study, there were 100 participants, and 23 (23%) of them were found to have hypoglycemia. 18 neonates (18%) out of the study's 100 new-borns showed hypocalcemia. Out of 100 subjects, hyponatremia was reported in 12 neonates (12%). 5 (5%) of the 100 new-borns exhibited hypomagnesemia. Out of 100 new-borns in my research, 3 (3%) had hypernatremia.

### Discussion

Seizures in neonatal period are more common than any other age because of immature brain functions and improper myelination, even more common in preterm babies than term babies. Seizures incidence is ranges from 2.8/1000 in term appropriate for gestational age to 57.5/1000 in pre term very low birth weight babies (VLBW). A seizure is defined as paroxysmal electrical discharge from brain which may manifest as motor, sensory, behavioural or autonomic dysfunctions. [9] It results from excessive synchronous electrical discharge, due to depolarization of neurons because of inward movement of sodium ions and instead of hyperpolarization, depolarization of neuron on inward movement of chloride ion in immature newborn. [11] Most seizures in the newborn are symptomatic of a specific aetiology and with diagnostic advances, aetiology is easily identifiable. Neonatal seizures are different in

manifestation as well as response to treatment due to immature development state of newborn brain and different etiologies.

In the present study, 56% were male and 44% were females. 52% children were delivered normally and 38% were delivered by LSCS. 75% new borns were full term and 25% were pre-term. In other studies, (male 62.6%, females 37.4%) also showed that neonatal seizures are more common in males than females. 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%. [12] In our study, the percentage of patients who experienced their first seizure within 24 hours was 26, followed by 24 to 72 hours (days 1 to 3), 4 days to 1 week (days 4 to 7), and more than 1 week (more than 7 days), with percentages of 44, 22 and 8 respectively. Common presentation at the time of admission was abnormal body movements or abnormal posturing (fits), refusal to feed, fever or hypothermia, cyanosis and icterus. This presentation is consistent with earlier studies. [14-16]

In this study, there were 100 participants, and 23 (23%) of them were found to have hypoglycemia. 18 neonates (18%) out of the study's 100 new-borns showed hypocalcemia. Out of 100 subjects,

hyponatremia was reported in 12 neonates (12%). 5 (5%) of the 100 new-borns exhibited hypomagnesemia. Out of 100 new-borns in my research, 3 (3%) had hypernatremia. In other studies, hypoglycemia and hypocalcemia were the most common, with 39 (43.8%) and 28 (35.4%) cases, respectively. [17] Whereas another study found hypocalcemia followed by hypoglycemia to be the common biochemical abnormalities. Lastly, Pre-term new-borns were more likely to have hypoglycemia in a study that supports our study. [13] Thus, these studies point to the significance of performing a biochemical workup in new-born convulsions, particularly in light of the higher prevalence of blood glucose and calcium levels. Correcting these temporary biochemical abnormalities is related to a favourable prognosis and result. A study showed hypoglycemia and hypocalcemia combination in 9% and hypocalcemia hypomagnesemia combination in 7.9% of cases. [18]

### Conclusion

Hypocalcemia, hypoglycemia and 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. One of the most prevalent neurological conditions in new-borns is neonatal seizures. Additionally, biochemical anomalies could either be a secondary issue or be linked to other aetiologies. These transitory abnormalities are easily treated when detected early, with a good prognosis. Therefore, a biochemical workup should be performed on every new-born who exhibits seizure activity, and it should always be the initial line of investigation. Early treatment of these metabolic imbalances aids in reducing the frequency of seizures and the overuse of anticonvulsants, which may not always be essential.

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