P-ISSN: 2664-3685
E-ISSN: 2664-3693
www.paediatricjournal.com
IJPG 2023; 6(1): 07-10
Received: 05-11-2022
Accepted: 11-12-2022

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Study of clinical and biochemical profile of neonatal seizures

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DOI: https://doi.org/10.33545/26643685.2023.v6.i1a.190

Abstract
Introduction: Neonatal Seizure is defined as a paroxysmal involuntary disturbance of cerebral function. Neonatal seizures are a common problem. Common etiology of neonatal seizures is brain disorders, hypoxic-ischemic encephalopathy, central nervous system (CNS) infections, CNS bleeds, and structural anomalies of the brain or secondary to metabolic problems, for example, hypoglycemia, hyponatremia, and other electrolyte disturbances.
Objective: To study Clinical and Biochemical abnormalities associated with neonatal seizures.
Material and Methods: An observational study was conducted in ninety newborns with seizures admitted in neonatal intensive care unit (NICU). After taking a complete history and appropriate physical examination, blood sample was collected for detecting metabolic abnormalities before instituting specific therapy.
Results: Total ninety neonates presented with seizures were enrolled in this study. Among them, male was 52 (57.78%), and female was 38 (42.22%). In present study, majority of neonates 30% had the onset of seizures within 24 hr. In ninety neonates, the number of neonates with subtle seizures was 62 (68.89%), tonic seizure was 11 (12.22%), and clonic was 10 (11.11%).In ninety neonates, hypoglycemia was reported in 32.22% of neonates, followed by birth asphyxia 25.56%, hypocalcemia in 24.44% neonates, hyponatremia in 13.33% of neonates, hypomagnesemia in 4.44% of neonates.
Conclusion: Early identification and management of biochemical abnormalities are essential for satisfactory long-term outcome. The common metabolic causes for neonatal seizures in India include hypoglycemia, hypocalcemia, birth asphyxia, hyponatremia, and hypomagnesemia.

Keywords: Neonatal seizure, convulsion, metabolism

Introduction
Neonatal Seizure is defined as a paroxysmal involuntary disturbance of cerebral function. It may manifest as impairment or loss of consciousness, abnormal motor activity, behavioral abnormality, sensory disturbance, or autonomic dysfunction [1]. Any abnormal, repetitive, and stereotypic behavior in neonates should be evaluated as a possible seizure. Neonatal seizures, by definition, occur within the first 4 weeks of life in a full-term infant and up to 44 weeks from conception for a premature infant and are frequent during the first 10 days of life [2, 3].

Neonatal seizures are a common problem with an incidence of 0.5–3/1000 term infants to 1-13% in preterm infants with very low birth weight [3]. The etiology of neonatal seizures is variable and can be primarily related to brain disorders, for example., hypoxic-ischemic encephalopathy, central nervous system (CNS) infections, CNS bleeds, and structural anomalies of the brain or secondary to metabolic problems, for example, hypoglycemia, hyponatremia, and other electrolyte disturbances or cryptogenic. In addition, metabolic disturbances are often identified in neonatal seizures as an underlying cause or associated abnormality [4, 5]. Early identification of metabolic or biochemical abnormality and timely correction can be rewarding. Neonatal seizures can be controlled by treating the specific metabolic defect, preventing long term CNS sequelae.

Objective
To study Clinical and Biochemical abnormalities associated with neonatal seizures.

Material and Methods

An observational study was conducted in the Pediatric Department. All neonates with seizures admitted to the neonatal intensive care unit (NICU). Detailed antenatal, natal, and postnatal history was taken. Baseline characteristics of convulsing neonates, including sex, gestational age, birth weight, head circumference, and length, were recorded. Clinical details were recorded, i.e. age at onset of seizures, duration of seizure, number, and type of seizure. Clinical details of each seizure episode were recorded, such as age at onset of seizures, duration of seizure, number, and type of seizure. As per Volpe criteria, seizure was classified into subtle, tonic, focal or multifocal clonic type.

All newborns were subjected to the following investigations - Complete blood count, blood glucose, serum calcium, serum magnesium, serum sodium, serum potassium, were done when indicated. Data were collected and analyzed by standard statistical formulas.

Result

Total 90 neonates presented with seizures were enrolled in this study. Among them, male was 52 (57.78%), and female was 38 (42.22%).

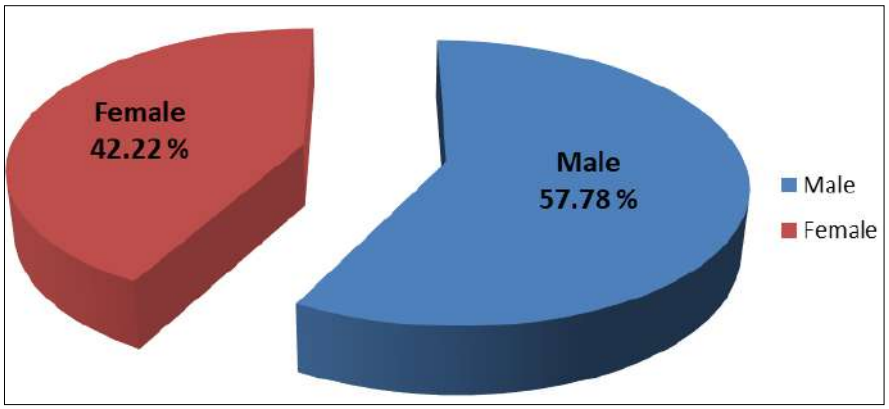

Fig 1: Gender Distribution

Table 1: Gestational Age

Gestational Age	Total No. of Neonates Presented with Seizure	Percentage (%)
less than 34 weeks	23	25.55%
more than 34 weeks	67	74.44%

In ninety neonates, 23 (25.55%) were less than 34 weeks of gestational age and 67 (74.44%) were more than 34 weeks of gestational age.

Table 2: Birth Weight

Birth Weight	Total No. of Neonates Presented with Seizure	Percentage (%)
less than 2.5 kg	35	38.89%
more than 2.5 kg	55	61.11%

In 90 neonates, babies with low birth weight (<2.5 kg) were 35 (38.89%), and with normal birth weight (>2.5 kg) were 55 (61.11%).

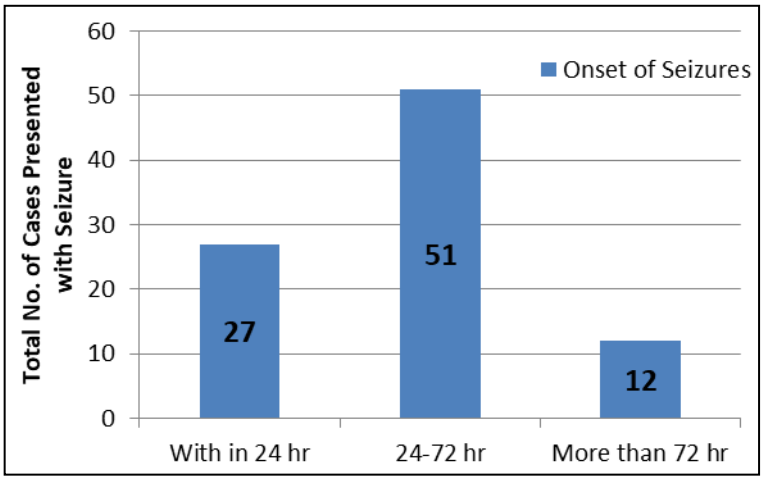

Fig 2: Onset of Seizure

In present study, number of neonates had the onset of seizures within 24 hr was 27 (30%), 24-72 hr was 51 (56.67%), >72 hr was 12 (13.33%).

Table 3: Type of Seizure

Type of Seizure	Total No. of Neonates Presented with Seizure	Percentage (%)
Subtle	62	68.89%
Tonic	11	12.22%
Clonic	10	11.11%
Other	07	7.78%

In ninety neonates, the number of neonates with subtle seizures was 62 (68.89%), tonic seizure was 11 (12.22%), and clonic was 10 (11.11%).

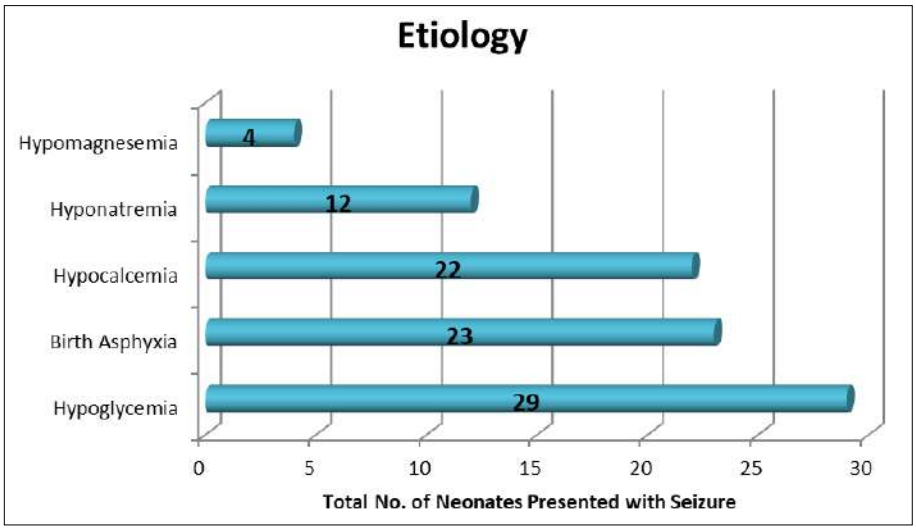

Fig 3: Etiology of Seizure

In ninety neonates, hypoglycemia was reported in 32.22% of neonates, followed by birth asphyxia 25.56%, hypocalcemia in 24.44% neonates, hyponatremia in 13.33% of neonates, hypomagnesemia in 4.44% of neonates.

Discussion

A neonatal seizure is not a disease but rather a sign of CNS disturbance resulting from various local or systemic causes. In the newborn, seizures are often the signal of an underlying disease process that may possibly produce irreversible cerebral damage. Therefore, it is important to diagnose early and treat the underlying cause to prevent long term sequelae [5]. The majority of neonates with seizures in present study were full-term neonates. A similar observation was seen in Aziz *et al*., [6]. Where term babies constitute 65% and preterm 35%. Park *et al*. [7] and Das and Debbarma [8] reported a much higher incidence in term babies compared to preterm neonates. In a study by Al Marzoki 93.1% were weighting >2500 g, 2.3% were very low birth weight. In our study, 61.11% of neonates were weighing >2500 g. [9].

In a study by Aziz *et al*., 83 neonates (83%) presented with seizures within the first 72 h of life [6]. Rose and Lombroso also found early-onset seizures in 75 (50.33%) babies, whereas Coen *et al*. found that 81% of babies had early-onset seizures, similar to the present study [10, 11]. In our study, 86.67% of neonates presented with seizures with the first 72 h.

Sudia *et al*. where subtle seizures occurred in 63.33% followed by generalized tonic in 19.33% and multifocal clonic in 10% of neonates [12]. Das and Debbarma in their studies on neonatal seizures, also observed subtle seizures to be the most common type contributing about 42.6%, followed by tonic in 33.9%, and clonic in 15.7% of neonates [8]. Various studies by Yadav *et al*., [13] Park *et al*., [7] and Nawab and Lakshmipathy [14] also reported subtle seizures to be the most common type observed in their studies which were comparable with present study.

In our study, hypoglycemia was reported in 32.22% of neonates, followed by birth asphyxia 25.56%, hypocalcemia in 24.44% neonates, hyponatremia in 13.33% of neonates, hypomagnesemia in 4.44% of neonates. Which is similar with the findings published by Kumar *et al*., Sood *et al*., Arunkumar *et al*., Madhusudhan *et al*. and Yadav *et al*. [15-19].

Conclusion

Early identification and management of biochemical abnormalities are essential for satisfactory long-term outcome. The common metabolic causes for neonatal seizures in India include hypoglycemia, hypocalcemia, birth asphyxia, hyponatremia, and hypomagnesemia.

Conflict of Interest

Not available

Financial Support

Not available

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How to Cite This Article
Nikhileshwar BA, Bhatt D, Vagadoda H, Prajapati Y. Study of clinical and biochemical profile of neonatal seizures. International Journal of Paediatrics and Geriatrics. 2023;6(1):07-10.