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Original Research Article

STUDY ON CLINICO- BIOCHEMICAL PROFILE OF PATIETNS WITH NEONATAL SEIZURES AT A TERTIARY CARE CENTRE

M. N. Sekar[1], Partha Saradhi Manyam[2], Madhavi Basini[3]

[1]*Associate Professor, Department of Pediatrics, Sri Balaji Medical College Hospital and Research Institute, Tirupati, Andhra Pradesh, India.*
[2]*Assistant professor, Department of Paediatrics, Anna Gowri Medical College and Hospital, Parameshwara Mangalam, Puttur, Tirupati district, Andhra Pradesh, India.*
[3]*Assistant Professor, Department of Pediatrics, Sri Balaji Medical College Hospital and Research Institute, Tirupati, Andra Pradesh, India.*

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Corresponding Author:
Dr. Madhavi Basini,
Assistant Professor, Department of Pediatrics, Sri Balaji Medical College Hospital and Research Institute, Tirupati, Andra Pradesh, India.
Email: basinimadhavi@gmail.com

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ABSTRACT

Background: Neonatal seizures, characterized by abnormal electrical activity in the brain, represent a prevalent and distinctly identifiable clinical manifestation indicative of dysfunction within the central nervous system of newborns. The primary objective of this comprehensive study is to employ rigorous and standardized clinical criteria to accurately diagnose neonatal convulsions. Additionally, this study aims to meticulously evaluate the concomitant presence of any underlying biochemical abnormalities that may contribute to or result from the seizure activity.
Materials and Methods: This prospective study was conducted over a one-year period, including 75 neonates who presented with seizures to the casualty.
Results: In present study, males were predominantly affected. Most of the patients had institutional delivery. Term gestation and normal vaginal delivery were most common. Majority of the babies were appropriate for gestational age and weighed >2.5kg. Tonic seizures were the most common type followed by clonic seizures. Hypoglycaemia was the most common metabolic abnormality.
Conclusion: Biochemical abnormalities are frequently observed in neonates presenting with seizures, contributing to the underlying etiology in a significant number of cases. These abnormalities include electrolyte imbalances, hypoglycemia, and metabolic disorders. Early identification and management of these biochemical disturbances are crucial for improving the prognosis and preventing long-term neurological sequelae.
Keywords: neonatal seizures, hypoglycaemia, tonic clonic, hyponatremia, and hypocalcemia.

INTRODUCTION

Neonatal seizures represent a prevalent and distinctive clinical manifestation indicative of an imbalance within the neurological system. The prevalence of neonatal seizures is 1.5 - 14/1,000 neonates.[1,2] These seizures in neonates contribute significantly to neonatal mortality and enduring health complications, such as motor and cognitive impairments during infancy. They are nonspecific responses of the developing nervous system to various stressors. The occurrence of seizures is higher during the neonatal period than at any other stage of life, underscoring the heightened vulnerability of the immature brain to such events.[3]
The heightened incidence of neonatal seizures can be primarily attributed to the precocious development of excitatory synapses relative to inhibitory synapses during the initial phases of neural maturation. Neonatal seizures are often indicative of severe neurological pathologies, with hypoxia-ischemia being the most prevalent underlying condition. Other common etiologies include perinatal stroke, intraventricular hemorrhage, intraparenchymal hemorrhage, meningitis, sepsis, and a variety of metabolic disorders.[4,5]
The clinical presentation of neonatal convulsions is often characterized by subtle symptoms. This

subtlety is due to the incomplete development of regional interconnectivity within the neonatal brain, including pathways such as the interhemispheric and corticospinal tracts, which is a consequence of the insufficient myelination of white matter pathways.[6] Elucidating the underlying etiology is critical for prognostication and for guiding the administration of appropriate therapeutic interventions. However, in neonatal intensive care units (NICUs) situated in resource-limited settings, where sophisticated diagnostic tools such as synchronized video-EEG monitoring are unavailable, the reliance on astute clinical observation becomes paramount for diagnosis. Research substantiates that neonatal seizures, along with their underlying causes, have a profound impact on the developing brain. The identification of these seizures can be particularly challenging due to the phenomenon of electro-clinical dissociation, wherein electrographic seizures frequently occur without corresponding clinical manifestations.[7]

The objective of this study is to detect neonatal seizures utilizing stringent clinical criteria and to meticulously investigate the biochemical anomalies associated with these convulsions. This study was conducted at our medical center, which operates without the benefit of continuous video-EEG monitoring capabilities.

MATERIAL AND METHODS

This prospective, hospital-based study was conducted in the Department of Pediatrics at Sri balaji medical college hospital and research institute, Tirupati over a one-year period, from April 2023 to March 2024. All neonates, both term and pre-term, who presented with seizure activity to the casualty department during the study period were included in the research. Neonates who were already on anticonvulsant therapy or whose guardians did not provide consent for participation were excluded.

A comprehensive history was obtained, with particular emphasis on birth history, mode of delivery, and any antepartum or peripartum fetomaternal complications. Additionally, the history of maternal infections, endocrine abnormalities, biochemical anomalies, and any significant familial medical history were meticulously recorded. A thorough general and systemic examination was performed on all patients.

All patients underwent a series of routine investigations, including a complete blood count (CBC), renal function tests, liver function tests, serum electrolytes, and a thyroid profile. Approval for the study was obtained from the Institutional Ethics Committee. Written informed consent was secured from all parents or guardians. The collected data were systematically entered into Microsoft Excel and subsequently analyzed.

RESULTS

A total of 75 newborns experiencing seizures were hospitalized to the neonatal ICU. Out of 75 neonates, 46 were males and the rest 24 were females.

Normal vaginal delivery was the most common mode (46.7%), followed by LSCS (40%). 93.3% of the births were conducted in the institution while the remaining ones were home deliveries. 48% of the children were born at term, while 33.3% of the children were pre-term. [Table 1]

Majority of the patients were appropriate for gestational age (60%). 48% of the children had birth weight >2.5Kg. 5.3% had extremely low birth weight. Most of the seizures presented within 24 hours after delivery (41.3%). Majority of the patients had tonic seizures (34.6%). [Table 2]

Hypoglycemia was the most common biochemical abnormality, followed by hypocalcemia (28%). [Table 3]

Table 1: A Patient characteristics

Parameters		No. of patients
Mode of delivery	Normal vaginal delivery	35 (46.7%)
	LSCS	30 (40%)
	Assisted vaginal delivery	10 (13.3%)
Place of delivery	Institutional	70 (93.3%)
	Outside	5 (6.7%)
Time of delivery	Pre-term	25 (33.3%)
	Term	36 (48%)
	Post-term	14 (18.6%)

Table 2: Neonatal characteristics

Characteristic		No. of patients
Gestational age	Small for gestational age	25 (33.3%)
	Appropriate for gestational age	45 (60%)
	Large for gestational age	5 (6.7%)
Birth weight	>2.5kg	36 (48%)
	1.5-2.5 kg	20 (26.7%)
	1-1.5 kg	10 (13.3%)
	<1kg	4 (5.3%)
Onset of seizures	Within 24 hours after delivery	31 (41.3%)
	24-48 ours after delivery	19 (25.3%)

	>48 hours after delivery	20 (26.7%)
Type of seizure	Tonic	26 (34.6%)
	Clonic	19 (25.3%)
	Focal	13 (17.3%)
	Generalized tonic –clonic	12 (16%)

Table 3: Biochemical abnormalities

Biochemical abnormality	No. of patients
Hypoglycemia	19 (25.3%)
Hypocalcemia	21 (28%)
Hypomagnesaemia	12 (16%)
Hypomagnesemia + hypocalcemia	4 (5.3%)
Hyponatremia	15 (20%)
hypernatremia	4 (5.3%)

DISCUSSION

Neonatal seizures are a significant neurological condition characterized by abnormal electrical activity in the brain, often presenting as subtle motor phenomena such as repetitive facial movements, limb jerking, or apnea. These seizures can result from various etiologies, including hypoxic-ischemic encephalopathy, intracranial hemorrhage, metabolic disturbances, and infections. Prompt diagnosis and treatment are crucial, as neonatal seizures can lead to long-term neurodevelopmental impairments if left unmanaged.

In this study, 75 patients with neonatal seizures were included. The male to female ratio is 1.9:1. Tekgul et al,[8] found a male to female ratio of 1.15:1 and Sudia et al,[9] reported a male to female ratio of 1.73:1, which is in accordance to findings of present study. This suggests that males are more prone to develop seizures than females.

In present study, 48% of the neonates were term delivery. Unlike present study, Das et al1 observed that 91% of the neonates had term delivery. Aziz et al.3 found that term newborns accounted for 65% of the population, whereas preterm babies accounted for 35%.

46.7% of the patients were born by normal vaginal delivery in present study. In a study by Aziz et al,[3] normal vaginal deliveries accounted for 48% of all deliveries, which is similar to present study.

In present study, 60% of the neonates were appropriate for gestational age. In study by Moayedi and Zakeri et al,[10] AGA babies were 83.6%.

In present study, 48% of the neonates weighed >2.5kg. This is similar to study by Das et al,[1] who stated that babies weighing more than 2.5 kg accounted for 65% of the population, while those weighing less than 2.5 kg accounted for 35%.

In present study, 41.3% of the patients had seizures within 24 hours of delivery. Das et al,[1] and Nawab et al,[11] also reported similar results to present study.

In present study, tonic seizires were the most common type followed by clonic seizures.

Sudia et al.9observed that 63% of neonates in their study had mild seizures.

In present study, hypoglycaemia was the most common biochemical abnormality, followed by hypocalcemia. In a study conducted by Sood et al., it was found that 48.27% of 59 neonates had hypoglycemia, 48.27% had hypocalcemia, 17.25% had hyponatremia, and 17.24% had hypomagnesemia. Kumar et al,[12] also report hypoglycemia, followed by hypocalcemia, was the most common metabolic disturbance.

CONCLUSION

Neonatal seizures are among the most prevalent neurological conditions in newborns, originating from various etiologies that influence the disease's progression, long-term neurological outcomes, mortality, and morbidity. Prompt evaluation, accurate diagnosis, and vigorous management tailored to the underlying etiology are imperative to mitigate these adverse effects. Metabolic abnormalities, either primary or secondary, are frequently associated with neonatal seizures and require thorough biochemical workup as the initial line of inquiry in all cases. Early detection and treatment of these transient metabolic anomalies typically result in a favorable prognosis and can prevent recurrent seizures, thereby reducing the unnecessary use of anticonvulsants. Timely correction of metabolic disturbances not only improves the immediate prognosis but also helps prevent long-term neurological sequelae. Continuous video EEG monitoring should be utilized whenever feasible to accurately assess the severity of the seizures and guide prompt, targeted treatment. Through early intervention and meticulous management, the prognosis and neurological outcomes for affected neonates can be significantly improved.

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