Original Article

Incidence of Neonatal Seizures and Its Clinico-Etiological Profile Among the Neonates Admitted in Government Medical College Hospital of South Kashmir, India

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Abstract

Background: A seizure is defined as a paroxysmal electrical discharge from the brain, which may manifest as motor, sensory, behavioral, or autonomic dysfunctions. This study was conducted to determine the incidence of neonatal seizures (NS) and to evaluate the clinical and etiological profiles, as well as the outcomes, of NS. **Material and Methods:** This one-year hospital-based observational study was conducted in the neonatal care unit of the Department of Pediatrics at the Government Medical College (GMC) and its associated hospitals in Anantnag from April 2021 to March 2022. Neonates admitted with a seizure history or having seizure events during the hospital stay were included in the study. A detailed history and thorough general physical and systemic examination were conducted, and the neonates were closely monitored for outcome. **Results:** A total of 3158 newborns were admitted during the study period. Out of these, 512 newborns had seizures (16.2%). The common type of seizure documented was subtle (44.53). Most of the neonates had their first seizure (58.78%) within the first 24 hours. Birth asphyxia (n=230, 44.9%) was the common cause, followed by hypoglycemia (n=152,29.6%) and meningitis (n=90, 17.57%). **Conclusion:** Incidence of neonatal seizures was found to be 16.21% in the study area, with subtle seizures being the common type. Most of the NS are likely to occur within 24 hours of birth. Birth asphyxia is the main cause of NS, followed by hypoglycemia.

Keywords: Epileptic Fits: Neonatal seizures; Neurological disorders.

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Introduction

Seizures in newborns are paroxysmal, stereotypical, repeating events brought on by aberrant brain electrical activity, primarily from ischemic or hemorrhagic insults. Seizures, in accordance with the International League Against Epilepsy (ILAE), are defined as anomalous developing electrical signals with an identifiable beginning and offset. They should last long enough to identify changes in signal frequency, morphology, and resolution, although not necessarily 10 seconds.[1,2] This electrographic event's duration is still up for debate because the American Clinical Neurophysiology Society defines neonatal seizures as an abnormal repetitive evolving (in frequency, voltage, and morphology) electrographic pattern that lasts for at least 10 seconds.[3] Short rhythmic discharges that last less than 10 seconds are particularly concerning because they have worse outcomes than electrographic events.[4] Seizures are therefore defined by the International League Against Epilepsy (ILAE) as anomalous developing electrical signals with identifiable beginning and offset; they should last long enough to identify changes in signal frequency, shape, and resolution, but not necessarily 10 seconds.[2]

In infants, seizures are a frequent and serious neurological condition.The incidence of seizures ranges from 1 to 5 per 1,000 live births according to population-based studies. In comparison, studies conducted on neonates admitted to the neonatal intensive care unit (NICU) have reported an incidence of 8.6 per 1000 live births.[5] Overall, the majority of the 80% of NS occur in the first week of life.[5] In India, reported incidence rates of NS range from 1.5 to 5.5 per 1000 neonates. However, the reported frequency of NS varies across studies. Conflicting diagnostic criteria cause this variability, the sometimes mild clinical signs of NS, and the possibility that these indications might be mistaken for non-epileptic newborn behaviors.[6]

Neonatal seizures may be linked to a variety of infant medical problems. Despite this, hypoxia-ischemia has long been thought to be the most frequent cause of seizures in newborns.[2,3] The second most prevalent cause of newborn seizures in normally healthy, full-term babies without prior risk factors is cerebral infarction and stroke. One well-known cause of seizures in newborns is hypoglycemia. Hypoglycemia in infants with sepsis

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and meningitis is common and may be caused by insufficient nutrition, elevated metabolic rate, and impaired glucose metabolism. Total serum calcium values are known as hypocalcemia. Early recognition and prompt appropriate treatment of newborns with NS may improve the prognosis. Given these facts, the current investigation was conducted to assess the clinical and etiological profiles and outcomes of newborn seizures (NS), as well as to determine the incidence of NS.

Materials and Methods

This descriptive type of prospective observational study was conducted from April 2021 to April 2022 at the SNCU of the Department of Pediatrics, Maternal and Child Care Hospital (MCCH), an associated hospital of GMC, Anantnag, after obtaining ethical clearance from the institutional ethics committee. Both inborn and outborn neonates admitted to the special neonatal care unit (SNCU) of the hospital with complaints or history of seizure, clinically apparent seizure, or those who developed seizure during hospital stay were included in the study.

Before enrollment, parents of the children were informed about the nature of the study, and written informed consent was obtained before enrollment. A detailed antenatal, natal, postnatal, and family history was obtained. A history related to inborn errors of metabolism, consanguinity, and fetal or neonatal deaths was also taken. A relevant case-related investigation, including blood sugar levels, serum electrolytes, complete blood counts, blood cultures, ultrasonography of the cranium, CSF analysis, and neuroimaging, was conducted. Other investigations, such as serum ammonia and lactate, and Tandem Mass Spectrometry (TMS)/ Gas Chromatography-Mass Spectrometry (GC-MS), and congenital infections of toxoplasmosis, others (Syphilis, Hepatitis B), rubella, Cytomegalovirus (CMV), and herpes simplex (TORCH) profile, were also sent in suspected patients. A complete description of the seizure was obtained, including associated eye movements, episodes of passive limb flexion, color changes or autonomic phenomena, and the state of consciousness at the time of the seizure. The type of seizure was also described. Seizures were classified into subtle, multifocal clonic, focal clonic, tonic, and myoclonic seizures according to Volpe's classification of neonatal seizures.[7] All these details were noted on a predesigned and pretested proforma.

Statistical analysis: Data was entered in a Microsoft Excel sheet. Continuous variables were summarized as mean and standard deviation (SD). Categorical variables were summarized as percentages.

Results

During the study period, a total of 3158 neonates were admitted to the SNCU. Out of which, 512 neonates had one or more episodes of NS, comprising 16.21% of all SNCU admissions. Out of 512 newborns included in the study, 310 babies (60.54%) were outborn, referred from other hospitals, and 202 (39.45%) were inborn. Birth history revealed that 15 (2.92%) neonates were delivered at home, 42 (8.20%) had assisted delivery (forceps/ventouse), 208 (40.62%) babies were born by C-section, and 86 (16.79%) babies were preterm, and wight (1.56% were post-term babies. About birth weight, 85(16.60%) had low birth weight (LBW), 15(2.92%) were very low birth weight (VLBW), and 6(1.17%) had extremely low birth weight (ELBW) [Table 1]. Further, 86 (16.79%) babies cried after back stimulation, 33 (6.44%) neonates had bag and mask resuscitation, while 15 (2.92%) newborns required mechanical ventilator support. The majority of NS occurred within the first 48 hours of life [Table 2]. Among all the neonates, the common type of seizure documented was the subtle type [Table 3]. The causes of NS are shown in [Table 4]. The most prevalent cause of NS was hypoxia.

Table 1: Demographic profile of study population

Parameters	Subgroups	Distribution n, (%)
Mode of delivery	Vaginal delivery	262 (51.17)
	Caesarean section	208 (40.62)
	Assisted delivery	42 (8.20)
Place of delivery	Home	12 (2.34)
	Institutional	500 (97.65)
Gestation	Preterm	86 (16.79)
	term	418 (81.64)
	Post term	08 (1.56)
Gender	Male	270 (52.7)
	Female	242 (47.26)
Neonatal resuscitation	Not required	378 (73.82)
	back stimulation	86 (16.79)
	Bag and mask ventilation	33 (6.44)
	Bag and tube ventilation	15 (2.92)
Birth weight	Normal	406 (79.29)
	Low birth weight	85 (16.60)
	Very low birth weight	15 (2.92)
	Extremely low birth weight	6 (1.17)

Table 2: Distribution of neonates based on time of onset of seizure

Time of onset of seizure in days	n (%)
<24 hours	301(58.78)

24-48 hours	82 (16.01)
48-72 hours	28 (5.46)
4th – 7th day	35 (6.83)
8-28 days	66 (12.89)

Table 3: Type of neonatal seizures

Type of seizure	n (%)
Subtle	228 (44.53)
Focal clonic	95 (18.55)
Focal tonic	80 (15.62)
Myoclonic	39 (7.61)
Multifocal clonic	70 (13.67)

Table 4: Etiology of neonatal seizure

Etiology	n (%)
Perinatal asphyxia (HIE)	225 (43.94)
CNS infections (Meningitis)	90 (17.57)
Hypoglycemia	152 (29.68)
Hypocalcemia	32 (6.25)
Intracranial hemorrhages	04 (0.78)

Discussion

The present study found an incidence of NS of 16.21% among the children admitted to SNCU, which translates to six out of ten neonates admitted to SNCU having a risk of NS. This incidence was well within the range of NS incidence found in other studies.6 In this study, nearly half of the neonates were boys (52.7%) with a girl ratio of 1:1.11, suggesting a slight male preponderance. The slight male preponderance observed in this study was similar to the studies reported by Moayedi AR. et al (2007),[8]Eghbalian F. et al,[9] (2015) Pravin R. et al,[10] (2014). However, a study by Lanska MJ. et al,[11] (1995) showed no male preponderance in neonatal seizure babies.

In this study slightly more than half of the neonates (51.17%) were delivered by vaginal route, and 40.62% had undergone caesearean section and remaining 42 by assisted delivery (forceps/ventous), these results were found similar with study done by Das D and DebbarmaS,[12] (2016) The risk of experiencing perinatal hypoxia was higher for babies delivered vaginally.

In the present study, the majority of newborns (81.64%) were term neonates, followed by 16.79% preterm neonates, and 1.56% were post-term neonates. This corresponds with the results of Pravin R. et al (2014).[10]

In this study, the majority of neonates (79.29%) had normal birth weight, while 16.60% had LBW and 2.92% had VLBW, respectively, which corresponds with studies by Eghbalian F. et al (2015),[9]Digra SK. et al (2007).[13] However, in a study by Patel S. and Mehta N,[6] (2023) and Lanska MJ. et al,[11] (1995) reported that neonatal seizures were more common in premature neonates.

The majority of the neonates in the present research (58.78%) had seizures during the first 24 hours after birth, whereas 82 (16%) experienced seizures between 24 and 48 hours of life. Convulsions between 48 and 72 hours after delivery were seen in 28 (5.46%) neonates, and 35 (6.83%) neonates had seizures between the fourth and seventh day of life. Sixty-six (12.89%) newborns had seizures from the eighth day of life to the 28th day of life. The findings were similar to a study done by Digra SK et al (2007),[13] where seizures occurred more within < 24 hours.

In this research, prenatal asphyxia was the predominant cause of newborn seizures detected in 230 neonates (44.9%), aligning with the findings of investigations conducted by Najeeb S. et al. (2012) and Rehman Malik A. et al. (2013).

In our study, hypoglycemia was observed in slightly less than one-third of the neonates (29.6%). Of them, 17.18% neonates had hypoglycemia in association with other comorbidities like HIE, sepsis, and maternal history of gestational diabetes mellitus. Further, 6.83% of the newborns had symptomatic hypoglycemia without comorbidities. This was seen in concordance with the study done by Kumar A et al,[16] (2007) and Sahana G and Anjaiah B (2014).[17] Symptomatic hypoglycemia is thought to be due to depletion of glycogen stores and inadequate or faulty feeding in the early postnatal age group. In this study, 90 neonates had seizures secondary to neurological infections or meningitis. This was also observed in studies conducted by Pravin R. et al. (2014) and Najeeb S. et al (2012).[14] Other causes identified in this study included hypocalcemia (32), hyperbilirubinemia leading to kernicterus, and intracranial hemorrhages. Similar findings were also reported in studies conducted by Pravin R. et al. (2014) and Taksande AM. et al (2005),[18] and Najeeb S. et al (2012).[14]

Conclusion

According to the current research, the most frequent reason for neonatal seizures that occur within 72 hours after birth is perinatal asphyxia. Hypoglycemia, which may result from a delay in the postnatal age group's feeding beginning, comes in second, followed by seizures due to meningitis present after 72 hours of life.

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Conflicts of interest

There are no conflicts of interest.

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