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Research Article

Neonatal Seizures in Bangladesh: Etiology, Clinical Presentation, Management, and Hospital Outcomes

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Abstract: ***Background:*** Neonatal seizures are a common neurological issue in NICUs, often presenting as paroxysmal EEG activity with minimal clinical signs. They can be classified into acute symptomatic, provoked, and unprovoked seizures, with causes ranging from hypoxic-ischemic encephalopathy and infections to metabolic abnormalities and genetic factors. Phenobarbital remains the primary treatment despite limited advancements. Seizures can lead to increased mortality, prolonged hospital stays, and long-term neurodevelopmental disabilities. Accurate diagnosis is challenging, emphasizing the need for EEG monitoring and improved neonatal care resources. ***Aim of the study:*** This study aims to investigate the underlying causes and hospital outcomes of neonatal seizures within a hospital setting. ***Methods:*** This hospital-based retrospective observational study was conducted at the Department of Paediatrics, Medical College for Woman and Hospital, Dhaka, Bangladesh, between July 2011 to December 2012. Data were collected from medical records of neonates aged ≤28 days diagnosed with seizures during hospitalization, excluding those with incomplete records or post-discharge seizures. Demographic, maternal, perinatal, clinical, and seizure characteristics were documented, including gender, birth weight, gestational age, symptoms, seizure onset, and type. Etiologies and management strategies were assessed. ***Result:*** The study found a higher incidence of seizures in male neonates (62.22%). Normal birth weight was observed in 48.89% of cases, while 51.11% were born at term. Antenatal care was received by 77.78% of mothers, and C-section was the predominant delivery mode (55.56%). Lethargy (71.11%) was the most common clinical feature, and seizures most often occurred between 2-7 days (44.44%). Generalized seizures were most frequent (33.33%), with hypoxic-ischemic encephalopathy being the leading cause (31.11%). Anticonvulsants were the primary treatment (88.89%), and full recovery was noted in 55.56%, with a 15.56% mortality rate. ***Conclusion:*** Neonatal seizures in Bangladesh are primarily linked to hypoxic-ischemic encephalopathy, infections, and metabolic abnormalities, with a higher incidence in male neonates. Generalized seizures were most common, and anticonvulsant therapy was the primary treatment. Despite interventions, 17.78% had neurological deficits and 15.56% mortality, emphasizing the need for improved neonatal care.
Keywords: Neonatal Seizures, EFG and Etiology.

INTRODUCTION

Neonatal seizures are a manifestation of neurological dysfunction and represent one of the most frequent neurological signs observed in neonatal intensive care units (NICUs) [1]. These seizures are paroxysmal electroencephalographic (EEG) activities often associated with motor, autonomic, or behavioral manifestations, including effects on respiration, heart rate, and blood pressure [2]. Unlike seizures in older children and adults, tonic-clonic seizures are rarely observed in neonates, who frequently exhibit electro-clinical dissociation-seizure activity on EEG without observable clinical signs [3]. Neonatal seizures can be classified into acute symptomatic seizures, provoked seizures, and unprovoked seizures. Acute symptomatic seizures are often caused by acute brain injuries such as hypoxic-ischemic encephalopathy (HIE), stroke, or brain infections. In contrast, provoked seizures are typically due to transient and reversible metabolic or toxic insults [4]. Unprovoked seizures, though less common, occur in the absence of acute causative conditions and may be linked to structural or genetic abnormalities, such as malformations of cortical development or ion channel disorders [5]. Globally, neonatal seizures occur with an incidence of approximately 1 to 3.5 per 1,000 live births [6]. In resource-poor settings countries, this incidence is significantly higher due to factors such as increased rates of neonatal encephalopathy, sepsis, and preterm births [7]. Despite advancements in neonatal care, the treatment of neonatal seizures has seen little progress, with phenobarbital, introduced in 1914, remaining the drug of choice, especially in low-resource settings [8]. Other major causes seizures include central nervous system (CNS) infections, intracranial hemorrhage, and

metabolic abnormalities such as hypoglycemia and hypocalcemia [9]. The consequences of neonatal seizures can be severe, with significant implications for both short- and long-term outcomes. In the short term, seizures are associated with higher inpatient mortality and prolonged hospital stays [10]. In the long term, they are linked to an increased risk of neurodevelopmental disabilities, including epilepsy, cerebral palsy, and intellectual disability [11]. Even neonates without major neurological disorders may exhibit subtle neuropsychological deficits in later life [12]. Accurate diagnosis of neonatal seizures remains a clinical challenge. Distinguishing seizures from other conditions, such as irritability, jitteriness, or benign neonatal myoclonus, is essential, as these conditions require no treatment [13]. Moreover, the presentation of seizures can vary significantly, with different types often observed in the same infant over a few hours [2]. Electrographic-only seizures, which lack clinical manifestations, further complicate the diagnosis [9]. The high prevalence of acute symptomatic seizures highlights the need for a multidisciplinary approach to neonatal care [14]. Studies have also emphasized the importance of EEG monitoring for accurately detecting and managing neonatal seizures, particularly in resource-rich settings [15]. However, limited access to advanced diagnostic tools and therapeutic options in resource-poor settings underscores the urgent need for capacity building and research to address this critical health issue [8]. This study aims to investigate the underlying causes and hospital outcomes of neonatal seizures within a hospital setting.

METHODOLOGY & MATERIALS

This was a hospital-based retrospective observational study conducted at the Department of Paediatrics, Medical College for Woman and Hospital, Dhaka, Bangladesh, between July 2011 and June 2012 to assess the etiology and hospital outcomes of neonatal seizures.

Inclusion criteria:

- Neonates diagnosed with seizures during their hospital stay.
- Age ≤28 days at the time of admission.
- Availability of complete medical records.

Exclusion criteria:

- Neonates with incomplete medical records.
- Neonates with seizures caused by post-discharge events.

Data Collection:

Data were extracted from the hospital's medical records using a standardized data collection sheet. The study collected variables across multiple domains to comprehensively assess neonatal seizures. Demographic variables included gender, birth weight categorized into three groups (<1500g, 1500-2499g, ≥2500g), and gestational age classified as <32 weeks, 32-36 weeks, and ≥37 weeks. Maternal and perinatal history captured antenatal care status (Yes/No) and mode of delivery (Vaginal/C-Section). Clinical features encompassed symptoms such as lethargy, jaundice, fever/hypothermia, irritability, abdominal distension, umbilical discharge, pallor, skin pustules, grunting, and chest indrawing. Seizure characteristics were documented by onset (early, late, and very late onset) and type (focal, generalized, subtle, myoclonic, and tonic seizures). Etiology was investigated, identifying causes like hypoxic-ischemic encephalopathy, intracranial hemorrhage, metabolic abnormalities, infections, structural brain abnormalities, genetic/metabolic syndromes, and unknown factors. Management variables included anticonvulsants, ventilator support, intravenous fluids, and oxygen therapy. Hospital outcomes were categorized as full recovery, neurological deficits, recurrent seizures, and death.

Data Analysis:

Descriptive statistical analysis was performed using frequency and percentage calculations for all categorical variables. Tables were generated to summarize the distribution of demographic details, clinical features, seizure types, etiology, management strategies, and hospital outcomes. The data were analyzed using Statistical Package for Social Sciences (SPSS, V-26), and results were presented in frequency tables with percentages for clarity.

RESULT

The study found that a higher proportion of male neonates (62.22%) experienced seizures compared to females (37.78%). Nearly half of the neonates, 22(48.89%), had normal birth weight (≥2500 grams), while 15(33.33%) neonates had low birth weight (1500-2499 grams), and 17.78% were classified as having very low birth weight (<1500 grams). Most neonates (51.11%) were born at term (≥37 weeks), with a smaller proportion being late preterm (26.67%) and preterm (22.22%). Based on Table 2, antenatal care was received by 35(77.78%) mothers, while 10(22.22%) did not receive such care. The mode of delivery was predominantly C-section (55.56%) compared to vaginal delivery (44.44%). In Table 3, the most common clinical feature was lethargy/reduced spontaneous movements (71.11%), followed by jaundice (33.33%) and fever/hypothermia (28.89%). Less frequent features included irritability (8.89%), abdominal distension (8.89%), and umbilical discharge (6.67%). Seizure onset was most commonly observed between 2 and 7 days (44.44%), with 15(33.33%) neonates presenting within the first day and 10(22.22%) developing seizures after 7 days (Table 4). According to Table 5, generalized seizures were most frequent (33.33%), followed by focal seizures (26.67%). Subtle seizures occurred in 17.78% of cases, while myoclonic and tonic seizures were equally present (11.11% each). Under the etiology, the most common cause of seizures was hypoxic-ischemic encephalopathy (31.11%), followed by infections

(22.22%) and metabolic abnormalities (15.56%). Intracranial hemorrhage accounted for 11.11% of cases, while structural brain abnormalities (6.67%), genetic/metabolic syndromes (4.44%), and unknown causes (8.89%) were less frequent (Table 6). For the management approaches, anticonvulsants were the most used treatment (88.89%), followed by IV fluids (77.78%) and ventilator support (40%). Oxygen therapy was used in 22.22% of cases (Table 7). Table 8 shows the hospital outcomes of the study, where full recovery was observed in 25(55.56%) neonates, while 8(17.78%) had neurological deficits. Recurrent seizures occurred in 11.11%, and 7(15.56%) resulted in death.

Table 1: Distribution of Gender, Birth Weight, and Gestational Age among Neonates with Seizures (N=45).

Variables	Frequency	Percentage (%)
Gender		
Male	28	62.22
Female	17	37.78
Birth Weight (grams)		
<1500 (Very Low)	8	17.78
1500-2499 (Low)	15	33.33
≥2500 (Normal)	22	48.89
Gestational Age (Weeks)		
<32 (Preterm)	10	22.22
32-36 (Late Preterm)	12	26.67
≥37 (Term)	23	51.11

Table 2: Antenatal Care Status and Mode of Delivery among Neonates with Seizures

Variables	Frequency	Percentage (%)
Antenatal Care		
Yes	35	77.78
No	10	22.22
Mode of Delivery		
Vaginal	20	44.44
C-Section	25	55.56

Table 3: Distribution of Clinical Features Observed in Neonates with Seizure

Clinical Features	Frequency (n)	Percentage (%)
Lethargy/reduced spontaneous movements	32	71.11
Jaundice	15	33.33
Fever/hypothermia	13	28.89
Irritability/excessive cry	4	8.89
Abdominal distension	4	8.89
Umbilical discharge	3	6.67
Pallor	2	4.44
Skin pustules	2	4.44
Granting	2	4.44
Chest indrawing	2	4.44

Table 4: Distribution of Seizure Onset among Neonates with Seizures

Onset Range (Days)	Frequency	Percentage (%)
≤1 Day (Early)	15	33.33
2-7 Days (Late)	20	44.44
>7 Days (Very Late)	10	22.22

Table 5: Types of Seizures Observed in Neonates

Seizure Type	Frequency	Percentage (%)
Focal	12	26.67
Generalized	15	33.33
Subtle	8	17.78
Myoclonic	5	11.11
Tonic	5	11.11

Table 6: Etiology of Neonatal Seizures

Etiology	Frequency	Percentage (%)
Hypoxic-Ischemic Encephalopathy	14	31.11
Intracranial Hemorrhage	5	11.11
Metabolic Abnormalities	7	15.56
Infections (e.g., Meningitis)	10	22.22
Structural Brain Abnormalities	3	6.67
Genetic/Metabolic Syndromes	2	4.44
Unknown	4	8.89

Table 7: Management Approaches Used for Neonates with Seizures

Management Type	Frequency	Percentage (%)
Anticonvulsants	40	88.89
Ventilator Support	18	40.00
IV Fluids	35	77.78
Other (Oxygen Therapy)	10	22.22

Table 8: Hospital Outcomes of Neonates with Seizures

Outcome	Frequency	Percentage (%)
Full Recovery	25	55.56
Neurological Deficits	8	17.78
Recurrent Seizures	5	11.11
Death	7	15.56

DISCUSSION

Neonatal seizures are a major neurological emergency in newborns, often indicating underlying conditions such as hypoxic-ischemic encephalopathy (HIE), infections, and metabolic disturbances. In Bangladesh, these seizures contribute significantly to neonatal morbidity and mortality, exacerbated by limited access to antenatal care, diagnostic tools, and neonatal intensive care resources. Early identification and effective management are critical to improving outcomes, yet data on the etiology, clinical presentation, and hospital outcomes of neonatal seizures in this context remain limited. This study aims to investigate the causes, clinical features, management strategies, and outcomes of neonatal seizures in Bangladesh, improve neonatal care, and inform healthcare policies to reduce the burden of neonatal seizures in the country. Neonatal seizures were observed more frequently in male infants, aligning with existing evidence that suggests a higher vulnerability in males due to potential genetic and physiological factors [16]. Nearly half of the neonates (48.89%) had normal birth weight (≥2500 g) in our study, while the remainder were either low (33.33%) or very low birth weight (17.78%). In the study of Sarkar, 70% of the infants had a normal birth weight, a finding that closely aligns with the results of our study [17]. In this study, a significant proportion of cases (48.89%) involved preterm or late preterm neonates, emphasizing the role of prematurity and associated complications in seizure risk, which is similar to other reported studies [18]. Notably, 22.22% of neonates were born to mothers without antenatal care, reflecting systemic gaps in maternal healthcare access. Cesarean deliveries were more common (55.56%) among affected neonates, raising questions about its potential relationship with neonatal seizures. Our findings are comparable with the results of Haque et al. [19]. The clinical presentations of neonatal seizures were diverse but primarily featured lethargy and reduced spontaneous movements (71.11%), jaundice (33.33%), and fever or hypothermia (28.89%). These findings underscore the nonspecific nature of seizure manifestations, which can complicate early diagnosis and treatment. Other similar studies also find inconsistent clinical features [17,19]. According to our study, seizure onset was most common in the late-onset category (2–7 days, 44.44%), followed by early onset (≤1 day, 33.33%), indicating the need for vigilant monitoring during these critical periods, which supports [20]. Among seizure types, generalized seizures were the most prevalent (33.33%), followed by focal (26.67%) and subtle seizures (17.78%). Our results are inconsistent with similar studies that reported subtle as the most common type of seizure [21,22]. The etiological findings revealed that hypoxic-ischemic encephalopathy (HIE) was the leading cause of infections such as meningitis and metabolic abnormalities. Structural brain abnormalities and genetic/metabolic syndromes are less frequent reported HIE as the most common cause of neonatal seizures [23]. Management predominantly involved anticonvulsant therapy (88.89%), supplemented by ventilator support (40.00%) and intravenous fluids (77.78%), which indicates the reliance on resource-intensive interventions in neonatal care. These results are comparable with the results of another study [24]. Hospital outcomes were mixed, with 55.56% of neonates achieving full recovery, while 17.78% experienced neurological deficits, 11.11% had recurrent seizures, and 15.56% succumbed to their condition. These findings indicate the need for improved early interventions and post-hospital follow-up to address

long-term neurological complications. The study faced limitations such as the unavailability of EEG monitoring, possibly leading to the underdiagnosis of electrographic seizures. The six-month duration limited the capture of seasonal variations and broader trends. Additionally, long-term neurodevelopmental outcomes of neonates were not assessed due to the absence of post-discharge follow-up data.

CONCLUSION

The study concluded that neonatal seizures in Bangladesh are predominantly associated with hypoxic-ischemic encephalopathy, infections, and metabolic abnormalities, with a higher incidence in male neonates. Generalized seizures were the most common type observed, while anticonvulsant therapy remained the primary treatment. Despite management efforts, neonatal seizures were linked to significant neurological complications, with 17.78% of neonates experiencing deficits and 15.56% mortality. The findings highlight the need for improved antenatal care, early diagnosis, and access to advanced neonatal intensive care resources to reduce neonatal seizure burden and improve long-term outcomes in resource-limited settings.

REFERENCES

1. Volpe JJ. Neurology of the Newborn. 5th ed. Philadelphia: Elsevier Ltd; 2008.
2. Levene M. Recognition and management of neonatal seizures. Paediatrics and child Health. 2008 Apr 1;18(4):178-82.
3. Schmitt B, Wohlrab G, Sander T, Steinlein OK, Hajnal BL. Neonatal seizures with tonic clonic sequences and poor developmental outcome. Epilepsy research. 2005 Jul 1;65(3):161-8.
4. Shalak L, Perlman JM. Hypoxic–ischemic brain injury in the term infant-current concepts. Early human development. 2004 Nov 1;80(2):125-41.
5. Steinlein OK. Genetic mechanisms that underlie epilepsy. Nature Reviews Neuroscience. 2004 May 1;5(5):400-8.
6. Tharp BR. Neonatal seizures and syndromes. Epilepsia. 2002 Mar;43:2-10.
7. Lawn JE, Wilczynska-Ketende K, Cousens SN. Estimating the causes of 4 million neonatal deaths in the year 2000. International journal of epidemiology. 2006 Jun 1;35(3):706-18.
8. BOOK P. Hospital care for children. Chart. 2005;13:131.
9. Mastrangelo M, Van Lierde A, Bray M, Pastorino G, Marini A, Mosca F. Epileptic seizures, epilepsy and epileptic syndromes in newborns: a nosological approach to 94 new cases by the 2001 proposed diagnostic scheme for people with epileptic seizures and with epilepsy. Seizure. 2005 Jul 1;14(5):304-11.
10. Pisani F, Cerminara C, Fusco C, Sisti L. Neonatal status epilepticus vs recurrent neonatal seizures: clinical findings and outcome. Neurology. 2007 Dec 4;69(23):2177-85.
11. Pisani F, Piccolo B, Cantalupo G, Copioli C, Fusco C, Pelosi A, Tassinari CA, Seri S. Neonatal seizures and postneonatal epilepsy: a 7-y follow-up study. Pediatric research. 2012 Aug;72(2):186-93.
12. Temple CM, Dennis J, Carney R, Sharich J. Neonatal seizures: long-term outcome and cognitive development among 'normal'survivors. Developmental Medicine & Child Neurology. 1995 Feb;37(2):109-18.
13. Rennie JM, Boylan GB. Neonatal seizures and their treatment. Current opinion in neurology. 2003 Apr 1;16(2):177-81.
14. Murray DM, Ryan CA, Boylan GB, Fitzgerald AP, Connolly S. Prediction of seizures in asphyxiated neonates: correlation with continuous video-electroencephalographic monitoring. Pediatrics. 2006 Jul 1;118(1):41-6.
15. Silverstein FS, Jensen FE. Neonatal seizures. Annals of neurology. 2007 Aug;62(2):112-20.
16. Blackburn ST. Maternal, fetal, & neonatal physiology: A clinical perspective. Elsevier Health Sciences; 2007.
17. Sarkar SM. Neonatal convulsion-etiology and outcome dissertation. Dhaka Bangladesh College of Physicians and surgeons. 1995.
18. Da Silva LF, Nunes ML, Da Costa JC. Risk factors for developing epilepsy after neonatal seizures. Pediatric neurology. 2004 Apr 1;30(4):271-7.
19. Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. bmj. 2003 Sep 4;327(7414):557-60.
20. Van der Linde J. The sensory profile of children with speech and language disorders in London and the South of England. University of the Witwatersrand, Johannesburg (South Africa); 2008.
21. Scher MS, Aso K, Beggarly ME, Hamid MY, Steppe DA, Painter MJ. Electrographic seizures in preterm and full-term neonates: clinical correlates, associated brain lesions, and risk for neurologic sequelae. Pediatrics. 1993 Jan 1;91(1):128-34.
22. Clancy RR. Summary proceedings from the neurology group on neonatal seizures. Pediatrics. 2006 Mar 1;117(Supplement_1):S23-7.
23. Pascual JM. Metabolic diseases of the nervous system. InMolecular Neurology 2007 Jan 1 (pp. 149-161). Academic Press.
24. Glass HC, Kan J, Bonifacio SL, Ferriero DM. Neonatal seizures: treatment practices among term and preterm infants. Pediatric neurology. 2012 Feb 1;46(2):111-5.