

Study of clinico-etiological profile of neonatal seizures in term neonates at a tertiary care hospital

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Abstract

Background: Neonatal seizures represent non-specific responses of the immature nervous system to varied insults and result in considerable neonatal mortality and longterm morbidity including motor and cognitive disabilities in the childhood. Present study was aimed to evaluate the clinic-etiological profile of neonatal seizures in in term neonates admitted at the newborn unit of a tertiary care teaching hospital. **Material and Methods:** Present study was prospective, observational, hospital based study, conducted in term babies (confirmed by gestational age), with neonatal seizure (Clinically apparent convulsions, history of convulsions or who developed convulsions during hospitalization), admitted in NICU, parents willing to participate in present study. **Results:** During study period 74 neonates satisfying study criteria were evaluated. Majority of neonates were male (59.5 %), had birthweight less than 2.5 kg (40.5 %), delivered vaginally (63.5 %), delivered at outside hospital (62.2 %). Subtle seizures (48.6 %) was most common type of seizure observed in present study, followed by focal clonic (25.7 %), multifocal clonic (14.9 %), tonic (6.8 %) and myoclonic (4.1 %). Birth asphyxia (37.8 %) was most common etiology noted. Other causes were meningitis (14.9 %), hypoglycemia (9.5 %), hypocalcemia (6.8 %), kernikterus (6.8 %), ICH (5.4 %), stroke (4.1 %) and idiopathic (9.5 %). Mean hospital stay was 8.4 ± 2.7 days. Enteral feeds were started after 3.7 ± 3.4 days admission. In some patients ventilator support (18.9 %) and inotrope support (12.2 %) was required. Most patients were discharged uneventfully (83.8 %), 5.4 % took discharge against medical advice. Mortality was 10.8 %, most of them due to sepsis. **Conclusion:** In present study birth asphyxia, meningitis, hypoglycemia and hypocalcemia were major causes of neonatal seizures in term neonates.

Keywords: neonatal seizures, term neonates, birth asphyxia, meningitis, hypoglycemia, hypocalcemia.

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INTRODUCTION

Seizure is defined as paroxysmal electrical discharge from brain which may manifest as motor, sensory, behavioral or autonomic dysfunctions.¹ The immature brain seems more prone to seizures than the mature brain. The neonatal central nervous system is particularly susceptible to

seizures due to a combination of enhanced excitability and low levels of the inhibitory neurotransmitter gamma-aminobutyric acid.² Neonatal seizures represent non-specific responses of the immature nervous system to varied insults and result in considerable neonatal mortality and longterm morbidity including motor and cognitive disabilities in the childhood.³ There are various causes for neonatal seizures. the most common cause as per the recently published studies in India are hypoxic ischaemic encephalopathy, metabolic disturbances (hypoglycemia and hypocalcemia) and meningitis.^{4,5} The occurrence of seizure may be the first indication of a neurological disorder, and the time of onset of seizure has a relationship with the etiology of seizures and prognosis.⁶ Present study was aimed to evaluate the clinicoetiological profile of neonatal seizures in in term neonates admitted at the newborn unit of a tertiary care teaching hospital.

MATERIAL AND METHODS

Present study was prospective, observational, hospital based study, conducted in neonatal intensive care unit under Department of Peadiatrics, BKL Walawalkar Trust Rural Medical Collage, Sawarde, India. Present study duration was of 1 year (January 2020 to December 2020). Institutional ethical committee approval was obtained for this study.

Inclusion criteria

Term babies (confirmed by gestational age), with neonatal seizure (Clinically apparent convulsions, history of convulsions or who developed convulsions during hospitalization), admitted in NICU, parents willing to participate in present study.

Exclusion criteria:

- Preterm neonates,
- Seizures occurring after 1 month of age,
- Neonatal tetanus cases
- Neonates with obvious congenital malformation e.g., anencephaly, large occipital meningomyelocele, microcephaly, multiple

malformations, dysmorphic features with “syndromic appearance”, etc.

Detailed antenatal history (maternal age, past medical history, parity, gestational age, history of illness during pregnancy, medication during pregnancy), afterbirth events such as, any evidence of fetal distress, Apgar score, type of delivery and medication given to mother during delivery were noted. Baseline characteristics of convulsing neonate (sex, gestational age, arthropometry), clinical details of each seizure episode (age at onset of seizures, duration of seizure, number and type of seizure) were recorded. Seizure was classified into subtle, focal clonic, multifocal clonic, tonic, and myoclonic. Before instituting specific treatment, blood glucose, total serum calcium levels, Na⁺, K⁺, and magnesium were determined. In addition, complete blood counts, blood culture, USG cranium, MRI/CT, and CSF analysis were done as per the requirement in individual cases. Treatment details, clinical course and outcome was noted. Data was collected and compiled using Microsoft Excel and statistical analysis was done using descriptive statistics.

RESULTS

During study period 74 neonates satisfying study criteria were evaluated. Majority of neonates were male (59.5 %), had birthweight less than 2.5 kg (40.5 %), delivered vaginally (63.5 %), delivered at outside hospital (62.2 %).

Table 1: Baseline characteristics

Characteristics	Number of patients (N = 74)	Percentage
Gender		
Male	44	59.5
Female	30	40.5
Birth weight		
< 2.5 kg	30	40.5
2.5 - 4 kg	21	28.4
>4 kg	23	31.1
Mode of delivery		
Vaginal (vertex)	47	63.5
Vaginal (breech)	3	4.1
Lower segment caesarean section	24	32.4
Place of delivery		
Intramural hospital	26	35.1
Extramural hospital	46	62.2
Extramural home	2	2.7

Subtle seizures (48.6 %) was most common type of seizure observed in present study, followed by focal clonic (25.7 %), multifocal clonic (14.9 %), tonic (6.8 %) and myoclonic (4.1 %).

Table 2: Type of Seizures

Type of seizures	Number of patients (N = 74)	Percentage
Subtle	36	48.6
Focal clonic	19	25.7
Multifocal clonic	11	14.9
Tonic	5	6.8
Myoclonic	3	4.1

Birth asphyxia (37.8 %) was most common etiology noted. Other causes were meningitis (14.9 %), hypoglycemia (9.5 %), hypocalcemia (6.8 %), kernikterus (6.8 %), ICH (5.4 %), stroke (4.1 %) and idiopathic (9.5 %).

Table 3: Etiology wise distribution

Etiology	Number of patients (N = 74)	Percentage
Birth asphyxia	28	37.8
Meningitis	11	14.9
Hypoglycemia	7	9.5
Idiopathic	7	9.5
Hypocalcemia	5	6.8
Kernikterus	5	6.8
ICH	4	5.4
Stroke	3	4.1
Hypercalcemia	2	2.7
Hypomagnesemia	1	1.4
Hypermagnesemia	1	1.4

Mean hospital stay was 8.4 ± 2.7 days. Enteral feeds were started after 3.7 ± 3.4 days admission. In some patients ventilator support (18.9 %) and inotrope support (12.2 %) was required. Most patients were discharged uneventfully (83.8 %), 5.4 % took discharge against medical advice. Mortality was 10.8 %, most of them due to sepsis.

Table 4: Other characteristics

Characteristic	Number of patients (N = 74)	Percentage
Hospital stay (days)	8.4 ± 2.7	
Enteral feeds starting after admission (days)	3.7 ± 3.4	
Ventilator support	14	18.9
Inotrope support	9	12.2
Outcome		
Discharge	62	83.8
Mortality	8	10.8
Discharge against advice	4	5.4

DISCUSSION

The occurrence of seizure may be the first indication of neurological disorder and the time of onset of seizure has relationship with the etiology of seizures and prognosis. Seizures are a potentially life-threatening problem with a variety of causes. They require an immediate assessment to determine the underlying cause and necessary interventions, treat the underlying etiology, thereby reducing potential morbidity and mortality. Seizures are more common in the neonatal period than in any other stage of life affecting approximately 1% of all neonates.⁷ Factors that contribute to this high incidence include the neonate's brain being more prone to seizures due to maturational factors, late gestational and birth-related injuries.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.¹ In study by Venkatesh G *et al.*,⁹ incidence of seizures in late preterm and term neonates was 0.76%. Hypoxic ischemic encephalopathy (HIE) was the commonest etiology (50.4%) followed by sepsis (24.8%). Majority of HIE neonates presented within 12 hrs of life (89%). Hypoglycemia (21.2%) was the commonest primary metabolic abnormality followed by hypocalcemia (9.7%).

Clonic type was the commonest type (82.3%) of seizure followed by subtle (73.5%) seizure. Similar findings were noted in present study. Singh SD *et al.*,¹⁰ noted that 12.26% developed clinical seizures. The most common cause of neonatal seizure was hypoxic ischemic encephalopathy (59%), followed by infection (17.09%), and metabolic disturbances (13.7%). The outcomes were mortality (13.7%), post neonatal seizure (15.4%), developmental delay (26.5%), vision impairment (16.2%) and hearing impairment (22.2%). Low Apgar scores at one minute and five minutes, early onset seizure and more than one drug used for seizure control were early prognostic factors for adverse outcome. In the study by Sahay BP¹¹, out of 120 neonates 64 (53.33%) were males and 56 (46.67%) were females. 77 (64.17%) neonates were between 37 to 39 weeks of gestation, while 43 (35.83%) neonates were between 40 to 41 weeks of gestation. 66 neonates had vaginal delivery and 54 neonates were delivered by cesarean section. Onset of seizure was day 1 in 39 (32.5%), day 2 in 31 (25.83%), and day 3 of life in 13 (10.83%) neonates. The most common type of seizure seen was focal clonic type (34.17%); followed by subtle seizures (31.67%), myoclonic (20%), focal tonic (4.17%), multifocal (n=8, 6.67%), and generalized tonic clonic type (3.37%). Among the studied population, perinatal asphyxia was identified as the most common cause of neonatal seizure (35%), followed by septicemia (24.17%),

hypocalcemia (10.83%), hypoglycemia (8.33%), hyperbilirubinemia (6.67%), intracranial hemorrhage (3.33%) brain malformations (5%). Reddy KV *et al.*,¹² noted that, most neonates had focal clonic type (33.3%) followed by the subtle seizures (31.0%), myoclonic (17.9%), focal tonic (8.3%) and multifocal (6%). Also among the studied population, perinatal asphyxia was identified as the most common cause of neonatal seizure (33.3%), followed by septicemia (25 %), hypocalcemia (11.9%), hypoglycemia (9.5%), hyperbilirubinemia (6%), intracranial hemorrhage (4.7%) brain malformations (4.7%). Similar findings were noted in present study. Abhishek CK *et al.*, studied 81 neonates, male: female ratio was 1.25:1. Mean gestational age was 38.9±1.3 weeks and mean admission weight was 3.12 ±0.52 Kg. Perinatal asphyxia was the commonest risk factor (46.9%) followed by septicemia meningitis (32.1%) and metabolic disturbances (32.1%). Subtle seizure was the commonest seizure type (37.2%) followed by clonic seizures (36.1%). 66% of the events were reported before 72 hours of age. In neonates with seizure, mortality was 28.4% and mean duration of hospital stay was 8.4± 2.7 days. There was a significant increase in duration of hospital stay and delay in commencement of oral feeds without increase in mortality, need of ventilator support or inotrope support in such neonates as compared to term neonates without seizures. Neonatal seizures are associated with unfavorable short- and long-term outcomes. More than half the survivors have considerable disability across a range of developmental domains, most frequently cerebral palsy, postneonatal epilepsy, and/or intellectual disability requiring lifelong therapies and social and financial support.⁸ Early recognition and treatment of biochemical disturbances are essential for optimal management and satisfactory long-term outcome. Limitations of present study were small sample size, single center study, follow-up for 1 year only and EEG recording of seizures was not done.

CONCLUSION

In present study birth asphyxia, meningitis, hypoglycemia and hypocalcemia were major causes of neonatal seizures in term neonates. All are preventable by careful labour monitoring, proper asepsis and breastfeeding practices.

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