



STUDY OF CLINICOETIOLOGICAL PROFILE OF NEONATAL SEIZURES AT A TERTIARY CARE HOSPITAL

Paediatrics

Dr Sahaya Nirmala	Associate Professor, Department Of Pediatrics, Raja Rajeswari Medical College And Hospital Bangalore.
Dr Adarsh E	HOD And Professor, Department Of Pediatrics, Raja Rajeswari Medical College And Hospital Bangalore.
Dr Sahana Giliyaru	Professor, Department Of Pediatrics Raja Rajeswari Medical College And Hospital Bangalore.
Dr Ravali Polepaka*	Junior Resident, Department Of Pediatrics Raja Rajeswari Medical College And Hospital Bangalore. *Corresponding Author
Dr A Sharan Kumar	Junior Resident, Department Of Pediatrics Raja Rajeswari Medical College And Hospital Bangalore.

ABSTRACT

Background: Seizure is one of the most frequently observed clinical sign in neonatal period and may be the only sign of a central nervous system disorder. Its recognition is of paramount importance and a newborn with seizures is in a true medical emergency requiring prompt intervention. This study was aimed at providing a clear picture regarding the epidemiology, etiology, onset, types and mortality of neonatal convulsions in our hospital. This study was carried to assess the incidence, types of Neonatal convulsions, etiology, time of onset and its relationship with the etiology and to determine the mortality associated with neonatal convulsions. **Methods:** This study was carried out in Rajarajeswari medical college and Hospital in January 2019 – December 2021. The Study Population is Newborn babies born in our hospital and admitted in Neonatal Intensive Care Unit. Babies born in other hospitals or at home with neonatal convulsions were excluded from the study. A detailed history was elicited for all recruited babies and was thoroughly examined. The baby's clinical progression was closely monitored, and relevant investigations done. Data were entered in Microsoft Excel and analyzed in SPSS version 20. **Results:** Birth Asphyxia, i.e., hypoxic ischemic encephalopathy (HIE) was the most common cause of neonatal seizures (68%), followed by hypoglycaemia (16%). hypocalcemia was seen in 8 % and Intracranial haemorrhage in 6% cases. Subtle seizures were the most common type of seizures seen in 78% babies, followed by tonic clonic (20%), clonic (2%) type. Subtle seizures were commonly seen in cases of HIE. **Conclusion:** The recognition of clinicoetiology of neonatal seizures is often helpful with respect to prognosis and treatment. The most common etiology for neonatal seizure is sepsis. Onset of seizures during first 3 days of life has significant correlation with HIE as etiology. Subtle seizures are the most common type of clinical seizures, which is difficult to identify; therefore, careful observation of at-risk new-born's is necessary.

KEYWORDS

Neonatal Seizures, Hypoxic ischemic encephalopathy, Hypoglycaemia, Hypocalcaemia.

INTRODUCTION

Neonatal seizures occur more frequently in the neonatal period than at any other time of life. Estimates of the incidence of neonatal seizures vary according to case definition, method of ascertainment and definition of neonatal seizures, range from 1.5 to 3.0 per 1000 live births.^{1, 2} Neonatal seizures remain a clinical challenge due to ambiguous presentations and, therefore, sometimes the failure of immediate detection. The lack of evidence-based management protocols, and poor outcomes add to that challenge.³ Most neonatal seizures are symptomatic rather than idiopathic⁴, and 80–85% are predominantly accounted for by hypoxic–ischemic encephalopathy (HIE), haemorrhage, metabolic disturbances, and infections.^{5,6} The occurrence of neonatal seizures may be the first clinical indication of neurological disorder. Developmental immaturity influences many aspects of diagnosis, management, and prognosis of seizures in newborn.⁷ Several mechanisms are known to play a role in seizure initiation in the immature brain. Other factors reported with adverse outcome are type and onset of seizures, status epilepticus, gestational age, Apgar score, birth weight, need for resuscitation, neurological examination at onset of seizure, electroencephalogram (EEG) and radiological findings (MRI).⁸ Increasing evidence suggests that neonatal seizures are associated with adverse neurodevelopmental outcomes, including epilepsy, cerebral palsy, developmental delay, and psychomotor deficits.⁹⁻¹¹ The purpose of the present study was to study the etiology, clinical profile of neonatal seizures among neonates admitted in Rajarajeswari hospital.

METHODS

This is an Observational study of neonates with neonatal seizures delivered at our institute from January 2019 to December 2021.

Inclusion Criteria

After getting approval from institutional ethics committee and informed consent form the parents a total of 50 neonates with seizures admitted in NICU from first hour of life to 28 days of age were included

in the study.

Exclusion Criteria

Neonates of parents who refused to give consent were excluded from the study.

A predesigned proforma was used in the study to evaluate detailed demographic data, etiology, clinical history, antenatal and maternal risk factors. Data were collected regarding time of onset of seizure, type, duration and frequency of seizure, neurological examination at the onset of the seizure. Maternal and perinatal history including gestational age, type of delivery, birth weight, Apgar score at 1 and 5 min and need for and type of resuscitation at the time of birth were recorded. Detailed clinical examination was done and whenever required investigations like total blood count, CRP, RFT, electrolytes, LFT, serum Calcium, blood sugar level, blood culture, CSF study, screening for inborn error of metabolism, ultrasound cranium, and MRI brain was done. EEG was done in all the cases during the discharge time or during the follow up time.

Statistical Analysis:

Data was entered in excel spread sheet and analyzed by SPSS software version 20. The continuous data were expressed by means of mean±standard deviation and ordinal variables by median and range. Frequencies and proportions were also calculated. Appropriate test like t test, chi square test were used to determine significant association between various study variables and the outcome.

RESULTS:

This study included 50 neonates with seizures. In 50 cases, 62% (n=31) neonates with seizures were male and 38% (n=19) were female. Out of which 41 cases were term and 9 were preterm.

Majority of the babies (64 %) cases had normal weight, whereas 4 % had a very low birth weight (1-1.5kg).

Clinical characteristics of the neonates were presented in Table 2. In present study subtle 78% (n=39) were most common seizures followed by tonic clonic and clonic seizures (20% and 2%) respectively. About 66% cases had seizures within 24 hours of life. Whereas 24% (n=12) had seizures between 24 to 72 hours of life and remaining cases had seizures after 72 hour of life. Single episode of seizures was observed in about 28% (n=14), and 72% (n=36) had multiple episodes of seizures. 72% (n=36) cases required resuscitation.

Neuroimaging i.e., MRI brain was done in 90% (n=45) cases. Among them 64% (n=29) cases had abnormal findings. During postnatal period EEG had been done to the cases required. EEG done for 94% (n=47) cases, among them 22% (n=11) cases had abnormal EEG.

In this study most common etiological factor that contributed to neonatal seizures was HIE 68% (n=34), followed by metabolic causes. Which includes hypoglycemia 16% (n=8), hypocalcemia, 8% (n=4) other etiologies like IVH and IEM contributed to (6% and 2%) respectively. (Table 3)

Among 28% cases that had single episodes of seizures, no one had tone abnormalities and no mortality. Whereas 72% cases had multiple episodes of seizures, among them 33% had tone abnormalities and 5% mortality.

MRI brain was done in about 45 cases, in that 64% cases had abnormal study. Among them, 12 cases had tone abnormalities. Abnormal EEG was found in 11 cases, among these 9 cases had tone abnormalities and 1 case died. Among etiologies, HIE had most common neurological abnormalities (n=34) cases. Among them 8 cases had tone abnormalities compared to other etiologies.

Table 1: Demographic Characteristics Of Study Population.

Variables	Number (n=50)	Percentage
Sex		
Male	31	62
Female	19	38
Gestational age		
Term	41	82
Preterm	9	18
Birth weight (in kg)		
1-1.49	2	9
1.5-2.49	4	18
2.5-3.49	32	64
3.5-4	7	14

Table 2: Distribution Of Different Variables Of Study Population.

Variables	Number (n=50)	Percentage
Type of seizures		
Subtle	39	78
Tonic clonic	10	20
Clonic	1	2
Onset of seizures (in hours)		
<24	33	66
24-72	12	24
>72	5	20
Frequency of seizures		
Single	14	28
Multiple	36	72
Resuscitation required		
Yes	26	72
No	14	28
EEG		
Normal	36	76
Abnormal	11	22
Not done	3	6
MRI brain		
Not done	5	10
Normal	16	32
Abnormal	29	58

Table 3: Distribution Of Cases According To Etiology.

Etiology	Number (n=50)	Percentage
HIE	34	68
Hypoglycemia	8	16

Hypocalcaemia	4	8
Intra cranial hemorrhage	3	6
IEM	1	2

Table 5: Association Of Etiology With Neurological Outcome Of The Study.

Etiology	Developmental delay (n=20)	Developmental delay with tone abnormality (n=11)	Death (n=2)	Normal (n=26)
HIE	16	8	1	16
Hypoglycemia	1	0	0	5
Intra cranial hemorrhage	2	2	1	0
Hypocalcemia	0	0	0	4
IEM	1	1	0	0

DISCUSSION

The present study aimed to evaluate the clinic etiological profile of neonatal seizures in neonates admitted in the newborn care unit of a tertiary care hospital.

In present study, seizures most commonly occurred in 82% term babies with male preponderance of (62%). These findings were similar to the studies of Nair et al.¹² About 64% had normal birth weight. In the present study, out of 50 babies, 41 (82%) were full term, 9 (18%) babies were pre-term babies. Among these 41 full term neonates, 25 (60.9%) were normal birth weight i.e., ≥ 2500 gms, 16 (39%) were low birth weight i.e., ≤ 2500 gms. Majority of neonates with seizures in present study were full term babies (41 cases – 82%). HIE was the commonest cause (80%) of seizures in full term babies and is associated with perinatal complications like prolonged second stage of labour seen in 22 (53%), meconium-stained amniotic fluid (MSAF) in 5 (12%) followed by 9 (18%) preterm babies.

Similar observation was seen in study by Digra SK et al where term AGA babies were 84 (82.3%) out of 102 cases.¹³ and Nair et al neonatal seizure occurred more in term neonates than in preterm.

In present study, 21.2% were SGA babies, similar observation was seen in study of neonatal seizures by Digra SK et al SGA babies including preterm were 18 (17.6%) out of 102 cases.¹³

In present study, majority of neonates with seizures were born by normal vaginal delivery (60%) followed by caesarean section (22%) outlet forceps delivery (6%) and vacuum delivery (12%).

In a study of neonatal seizures by Amudhadevi S et al 60.6% were born by normal vaginal delivery, 28.8% by caesarean section and 10.6% by forceps delivery.¹⁴

Similar observation by Moyaedi AR, et al.¹⁵ 65.6% were born by vaginal delivery and 34.5% were by caesarean section which is comparable to our study.

In present study, 33 out of 50 neonates (66%) had onset within first 24 hours of life. Taksande AM et al stated that 71 (64.5%) out of 110 cases seizures occurred in the first 48 hrs of life.¹⁶ similar observations were seen in Nair et al.¹² In the present study, 5 (20%) neonates had convulsions from 7-28 days, the similar study done by Digra SK et al where the onset of convulsions from 7-28 days were 9 (8.8%; n=102).¹³

In the present study, subtle seizures are the commonest 39 (78%) type of seizures followed by multifocal tonic clonic 10 (20%) and generalized clonic 1 (2%). Similar results were seen in studies done by Philip BJ et al stated that subtle seizures were the commonest occurring in 51% (27 of 53),¹⁷ Holanda MRR et al¹⁸ were also stated that subtle seizures (59.6%) were the commonest type of seizures and Taksande AM et al stated that the subtle seizures were the commonest occurring 42.7% followed by focal clonic (23.6%) and tonic (20.9%).¹⁶ Nair et al study the predominant seizure pattern was subtle seizures both in term neonates (53.8%) and preterm neonates (39%)¹²

Shah et al. reported that subtle (39.6%) was the most common type of seizure followed by tonic (31.4%).¹⁹ According to most of the studies, birth asphyxia is the commonest cause of neonatal seizures followed by infectious or metabolic causes. Intra ventricular hemorrhage constitutes small percentage of seizures. In present study, neonatal seizures during the first 48 hours (66%) were mostly due to birth asphyxia. Similar study was seen in Taksande AM et al where the onset

of seizures in first 48 hours due to birth asphyxia was seen in 47 cases (41.8%; n=110).¹

Holanda and Melo have reported that HIE was the cause of seizures in 54% of the newborns and hypocalcemia was the most common metabolic abnormality (15%).¹⁸

Birth asphyxiated babies developed seizures within first 48 hours and more so within first 24 hours and babies with seizures within 24 hours have poor prognosis. Finer MM et al showed that 48% of infants having seizures within 24 hours were significantly handicapped compared to 2% whose seizures began after 24 hours.¹⁹ The risk factors for birth asphyxia are preventable if identified early and proper resuscitation of the baby after delivery could reduce the birth asphyxia significantly.

In our study hypoglycemia was the second most common cause of neonatal seizures. In Nair et al¹², in newborns with low birth weight, the most common cause of seizures was hypoglycemia followed by HIE and meningitis. Das et al. reported that hypoglycemia was more common in low-birth-weight babies (55%).²⁰ Kumar et al. reported that hypoglycemia was more common in low-birth-weight newborns.²¹ Bhatt et al. found that hypoglycemia was more frequent in low birth weight babies, most of them being small for gestational age.²² In a study of hypoglycemia by Lawrence LD et al, 41% of hypoglycemic neonates were SGA babies.²³ The diagnosis of hypoglycemia should not be delayed, as it can lead to brain damage.

In our study, Intra cranial bleed occurred more in preterm newborns, similar observations were seen in Nair et al¹². Vasudevan and Levene have reported that in preterm neonates, IC bleed and infections caused most of the seizures.²⁴

Tekgul et al. concluded that association between seizure etiology and the outcome remained strong, with cerebral dysgenesis and global hypoxia-ischemia associated with poor outcome.²⁵ Shah et al. have suggested that cases of HIE were associated with higher mortality as compared to cases with metabolic seizures.²⁶ The mortality rate in the cohort has been previously reported as 15%, with HIE being the most common cause.²⁷

CONCLUSION:

The present study concluded that the most common cause of neonatal seizure in both preterm and full-term newborns was HIE followed by metabolic causes. The most common metabolic cause was hypoglycemia. Intra cranial bleed was a major cause of seizures in preterm neonates. The most common type of seizure was subtle in both preterm and term neonates. The majority of the patients developed seizures within 24 h of life with HIE being the most common cause.

Since birth asphyxia is the commonest cause of neonatal convulsions, improvement in antenatal, perinatal care with early identification of high-risk mothers will reduce the incidence of birth asphyxia and thereby reduce the incidence of neonatal convulsions. Subtle seizures are the commonest type of clinical seizures, which is difficult to identify, therefore careful observation of at-risk newborns is necessary. Subtle seizures are the commonest type seizures, so paramedical staffs and mothers should be sensitized to identify subtle seizures.

Initiation of early and adequate feeding should be established to prevent hypoglycemic and hypo calcaemic seizures. In tertiary care hospitals, continuous aEEG monitoring facilities should be made available to identify non-clinical seizures and subtle seizures.

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