Clinico-Etiological Profile of Neonatal Seizures in a Tertiary Care Hospital, Kaski, Nepal

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ABSTRACT

Introduction: Neonatal seizure is the most frequent neurological symptom occurring during the neonatal period. The present study was done to determine the clinical types and the etiological factor of neonatal seizures.

Materials and Methods: This was a prospective, cross-sectional study done at Pokhara Academy of Health Sciences including 162 neonates admitted with a diagnosis of neonatal seizure inside the Neonatal Intensive Care Unit during a period of one year. The neonatal seizure was classified and the possible cause for the seizure was noted in proforma.

Results: The most common type of seizure was a generalized tonic-clonic seizure (38.27%) followed by subtle (35.18%). The common cause of neonatal seizure was hypoxic ischemic encephalopathy (50.61%) followed by sepsis (24.69%) and hypocalcemia (5.55%).

Conclusion: Hypoxic Ischemic Encephalopathy was the commonest cause of seizure in neonates followed by infection. Early detection of the risk factors causing perinatal asphyxia can lead to a decrease in the occurrence of neonatal seizures.

Keywords: Hypoxic Ischemic Encephalopathy, neonates, neonatal seizure

INTRODUCTION

Neonatal seizure is a paroxysmal alteration in neurological function like motor, behavior, and autonomic function occurring during the first 28 days of life.[1] Neonatal seizures are a common manifestation of neurological dysfunction in the neonatal period. The incidence of neonatal seizure is 2.8 per 1000 in infants with birth weights of more than 2500 grams. Its incidence is higher in preterm low birth weight neonates, as high as 57.5 per 1000 in very low birth weight infants. [2]

The neonatal brain is particularly susceptible to seizures due to a combination of the increased level of excitatory neurotransmitters and low levels of the inhibitory neurotransmitter gamma-aminobutyric acid (GABA).[3] Seizures occur as a brain's final common response to insult. The initial injury may be brief, but due to release of excitotoxic substances such as glutamate further epileptic activity can be triggered. Infants with neonatal seizures are at high risk of neonatal death, neurological impairment,

and epilepsy disorders later in life. Seizures occur in 1% to 5% of infants during the first month of life (the neonatal period), which is one of the highest-risk periods for seizures during the human life span.[4] There are four clinically recognized types of neonatal seizure: myoclonic, subtle, tonic, and clonic and each of them can be multifocal, focal, and generalized.[5] The common causes of neonatal seizures are perinatal asphyxia, metabolic abnormalities, infection, intracranial hemorrhage, and CNS developmental anomalies.[6,7] Inborn errors of metabolism are rare causes of neonatal seizures. Seizure occurring in the delivery room immediately after birth is rare and it is usually due to severe acute hypoxic-ischemic encephalopathy. Most neonatal seizures occur between 12 hours and 48 hours after birth due to hypoxic ischemic encephalopathy.[8] The causes of late-onset seizures are meningitis, benign familial seizures, or hypocalcaemia.[3] Prompt diagnosis, investigation, and treatment are vital as delayed recognition of a treatable cause can have a significant impact on the child's subsequent neurological outcome.

MATERIALS AND METHODS

The study was a hospital-based, prospective cross-sectional, conducted in the Neonatal Intensive Care Unit (NICU) of Pokhara Academy of Health Sciences. After obtaining the approval of the Institutional Ethical Committee with reference number (71/078), the study was conducted for one year period from 1st October 2021 to 30th September 2022. Parental consent was obtained for every neonate enrolled. The main aim of this study was to find out the etiologies and types of neonatal seizure. All term and preterm neonates with abnormal body movements were included as cases of neonatal seizure by pediatricians or pediatric residents on duty. Clinical details of each seizure episode observed by pediatric doctors on duty were recorded and classified according to Volpe's classification.[9]

Neonates having abnormal eye deviation, fixed open stare, chewing sucking movements, apnea, pedaling limb movements were labelled as having subtle seizures. Neonates having rhythmic jerky movements of one limb or one side of body (1-4jerks/seconds) were classified as focal clonic seizure and if jerky movements migrating from one limb to another labelled as multi focal clonic seizure. Neonates having tonic posturing of limb or trunk accompanied by apnea were classified as focal tonic seizures. Myoclonic jerks are rapid synchronous single or multiple lightning-fast jerks of upper limbs or lower limbs with absence of slow return. Generalized tonic clonic seizure is a seizure that has a tonic phase followed by clonic muscle contractions of upper limbs or lower limbs.[10]

Detailed antenatal history and baseline characteristics of convulsing neonates including sex, weight, and head circumference were recorded. Head circumference was determined by measuring the greatest occipital-frontal circumference i.e. from the occipital protuberance to supraorbital ridges by non-elastic measuring tape. The gestational age assessment was done based on the first day of the last menstrual period and the ultrasound was done in the first trimester. The physical examination followed by the determination of the gestational age by modified Ballard scoring was performed in every neonate. Complete blood count, sepsis screening, blood glucose, and serum calcium were done immediately after a seizure episode. A cerebrospinal fluid study was done in every case to find the etiology. Neurosonogram was done in every case to evaluate any intracranial cause of neonatal seizures. Neonates with congenital brain abnormalities and syndromic babies were excluded from the study.The extracted data were analyzed using the SPSS software package version 21.

The sample size was calculated according to the formula n= Zα2 PQ/d2 where n= required sample size, Zα= Z deviate corresponding to deviate reliability level (1.96) for 95% reliability, 12.26% of neonates (prevalence) had neonatal seizures during 12 months period in a study done in Dhulikhel hospital by Singh et al [11], P= estimated

proportion in the population (0.12), Q=1-P (0.88), d = maximum acceptable error (5%). The sample size was calculated as 162.

RESULTS

During the period of one year, 162 neonates were admitted with a diagnosis of neonatal seizure. Among them, 77.7% were term followed by preterm 12.3% and post-term 9.8%. Male neonates were in majority comprising 59.87%, while female neonates were 38.8%.

Table 1: Distribution of neonates according to gestational age and sex

Gestational age	Male	Female	Total
Preterm	6	12	20 (12.34%)
Term	84	42	126 (77.77%)
Post-term	7	9	16 (9.87%)
Total	97 (59.87%)	63 (38.88%)	162 (100%)

Table 2. Distribution of neonates according to weight

Weight (kg)	No. of neonates	Percentage
1 -1.49	13	8.02%
1.5 -2.499	25	15.43%
2.5-3.99	119	73.45%
>4	5	3.08%
Total	162	100%

It was observed that the majority of neonates having seizures were weighing 2.5-3.99kg followed by 1.5-2.49kg comprising 15.43% and 1-1.49kg in 8%.

Table 3. Distribution of neonates according to the age of onset of seizures.

Age of onset	Number of patients	Percentage
0-7 days	136	83.95%
8-14 days	16	9.8%
15-28 days	10	6.17%
Total	162	100%

In our study neonatal seizure was most common during the first seven days of life 83.95%.

Table 4: Distribution of neonates according to the type of seizures

Type of seizures	Number of patients	Percentage (%)
Generalized tonic-clonic	62	38.27%
Subtle	57	35.18%
Focal clonic	23	14.19%
Multifocal Clonic	12	7.40%
Focal tonic	7	4.32%
Myoclonic	1	0.61%
Total	162	100%

Among 162 neonates admitted for neonatal seizure, the most common type of seizure recorded was generalized tonic-clonic type 38.27% followed by subtle 35.18%, focal clonic 14.19%, and multifocal clonic 7%.

Table 5. Distribution of neonates according to etiology of seizures

Etiology	Number of patients	Percentage
Hypoxic Ischemic Encephalopathy	82	50.61%
Sepsis	40	24.69%
Meningitis	14	8.64%
Hypocalcemia	9	5.55%
Hypoglycemia	6	3.70%
Hyperbilirubinemia kernicterus	2	1.23%
Unknown	9	5.55%
Total	162	100%

The most common cause of neonatal seizure was HIE accounting for 50.6% (Table 5).

DISCUSSION

Neonatal seizure is one of the most common problems encountered in the NICU. Neonates having seizures are at high risk for mortality and neurological impairment in later life. It is also an important cause leading to neonatal mortality and morbidity. In our study, 77.77% were term neonates

while 12.3% were preterm followed by post-term neonates. These findings are similar to a study done by Kansakar et al at Patan hospital where 81 % of neonates developing seizures were term and similar findings were found by Sheth et al.[12,13]

In the present study, 73% of neonates having seizures were of birth weight more than 2500 grams followed by neonates weighing 1500-2499 grams accounting for 15%. This is similar to various studies in the past where seizures were common in neonates weighing more than 2500 grams.[14,15]

In our study, 83 % of neonates developed seizures during the first seven days of life. This is similar to a study done by Sahana et al who found 35% of cases, seizures occurred within 24 h of birth, 66% by 72 hours, and in 81.6% of cases, within the first week.[16] Similarly, Mahmood A et al found 85.41% of the neonates had seizures within 7 days of life. [17]

In this study, generalized tonic-clonic seizures were the predominant type of neonatal seizures accounting for 38.27% followed by subtle (35%), focal clonic(14%), and multifocal clonic(7%). In contrast to our study, the subtle seizure was most common in various studies.[18,19,20] This may be due to a limited number of cases.

In the present study, the main cause of seizures was hypoxic ischemic encephalopathy accounting for 50% followed by infection (24%) and meningitis (8%). Talebian A et al also found that HIE was the main etiology of neonatal seizures in Iran.[21]

In our study, 24% of neonatal seizures were due to neonatal sepsis and 8% of cases were due to intracranial infections. This is supported by a study done in the Netherlands.[22] The most common metabolic abnormality responsible for causing seizures in our study was hypocalcemia (5%) followed by hypoglycemia (3.7%). The metabolic abnormalities were comparable to various studies.[23,24]

In our study, 5% of cases had unknown etiologies. A study done by Yildiz et al also didn't find any etiology of neonatal seizures in 8.95% of neonates.[25] This may be due to inadequate investigations like magnetic resonance imaging (MRI) because of financial constraints.

CONCLUSION

The most common type of seizure was the generalized tonic-clonic type and the main cause responsible for neonatal seizures was hypoxic ischemic encephalopathy occurring most commonly within seven days of life. Interventions targeting safe deliveries, timely resuscitation of neonates and prompt treatment of neonatal infections should be prioritized. Improvement in healthcare services and early identification of high risk cases can decrease the occurrence of neonatal seizures and ultimately mortality and long-term morbidities due to seizures.

Limitations

This study could not address the morbidity and outcomes of neonatal seizures.

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