

An Observational Study on Neonatal Seizures in a Tertiary Care Hospital

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Abstract

Background: Seizures are the most frequent clinical manifestation of central nervous system dysfunction in the newborn with the incidence varying from 1-5%. Neonatal seizures often signal an underlying ominous neurological condition, most commonly hypoxia-ischemia, and others include stroke, intraventricular hemorrhage or intraparenchymal hemorrhage, meningitis, sepsis, and metabolic disorders. Neonatal seizures can permanently disrupt neuronal development, induce synaptic reorganization, alter plasticity and "prime" the brain to increased damage from seizures later in life. The objective of this study was to observe neonatal seizures in a Tertiary Care Hospital. **Methods:** This study was a hospital-based, prospective, observational study conducted in the sick new born care unit of department of pediatrics in a tertiary care hospital from March 2017 to February 2018. Out of 2654 admitted neonates, 234 neonates having symptom of seizures were included in the study after informed consent from the mother of the neonate. The data like history, clinical examination and investigation findings was recorded in the pre-designed, pre-tested, semi structured questionnaire. Template was generated in MS excel sheet and analysis was done on SPSS software. **Results:** The incidence of neonatal seizures was higher in male neonates. Subtle types of seizures were the commonest type of seizures. Out of 234 neonates, 68 (29.06%) were preterm while 166 (70.94%) were term neonates. Out of 68 term neonates, 26 (38.23%) neonates had subtle seizures, 16 (23.52%) neonates had focal clonic seizures. Out of 166 term neonates, 56 (33.73%) neonates had subtle seizures, 42 (25.30%) neonates had focal clonic seizures. Almost 68 (29.05%) developed seizures within 24 hours, 84 (35.91%) neonates had seizures between 25-48 hours, 54 (23.08%) neonates developed seizures between 2-7 days and 28 (11.96%) neonates developed seizures after 7 days. Common causes of neonatal deaths in our center were severe birth asphyxia, intra-ventricular hemorrhage (IVH), septicemia and meningitis. **Conclusions:** Neonatal seizures are common and may be the first manifestation of neurological dysfunction after a variety of insults. Most of the causes of neonatal seizures are preventable by good perinatal care and early interventions while metabolic seizures need a sharp vigilance and early suspicion.

Keywords: Complications, Neonate, Seizures, Outcome.

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Introduction

Seizures are the most frequent clinical manifestation of central nervous system dysfunction in the newborn with the incidence varying from 1-5%[1]. Neonates are at higher risk for seizures compared to older children due to immaturity of the brain[2,3]. Neonatal seizures are poorly classified, under-recognized, and often difficult to treat. Neonatal seizures often signal an underlying ominous neurological condition, most commonly hypoxia-ischemia, and others include stroke, intraventricular hemorrhage or intraparenchymal hemorrhage, meningitis, sepsis, and metabolic disorders. Neonatal seizures can permanently disrupt neuronal development, induce synaptic reorganization, alter plasticity and "prime" the brain to increased damage from seizures later in life[4]. Recent advances in diagnostic technology have provided important insights into neonatal seizures. Techniques such as bedside video-electroencephalogram (EEG) monitoring and MRI have challenged

earlier beliefs and raised fundamental questions regarding the diagnosis, etiology and management of seizures in the newborn infant. These advances have further highlighted the essential differences between the seizures in the newborn infants and older patients including their response to conventional anticonvulsant agents. Neonatal seizures are powerful predictors of long-term cognitive and development impairment[5,6].

Neonatal seizures have been shown to be a major risk factor for in-patients mortality and subsequent neurological disability. The incidence of seizure varies from 1.5-3.7/1000 live birth, while in NICU it can be up to 5/1000 live birth[7,8]. The outcome of neonates with neonatal seizures has changed in recent years due to improved prenatal care, better obstetrical care and intensive neonatal care[9]. However, neonatal seizures remain an important predictor of future neurological complications[10]. Although mortality rates have been reduced, there remains a high morbidity rate, with epilepsy a frequent complication of neonatal seizures[11]. The mortality rate can go up to 27% and commonly occurring in neonates with hypoxic ischemic encephalopathy[12,13]. In addition it may be associated with other permanent neurological disorders such as mental retardation and cerebral palsy[8]. Seizures are associated with poor neuro developmental outcome if not diagnosed early and treated properly. With the above background, the present study has

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been done to evaluate Neonatal Seizures and its Outcome in a Tertiary Care Hospital.

This study was a hospital-based, prospective, observational study conducted in the sick new born care unit of department of pediatrics in a tertiary care hospital from March 2017 to February 2018. 117 notates having symptom of seizures were included in the study after informed consent from the mother of the neonate.

Method and Materials

Type of Study

Hospital-based, prospective , observational study.

Study setting

Sick New Born Care Unit of department of pediatrics

Time line

March 2017 to February 2018

Definition of problem:Neonatal Seizures is still a common global health problem despite huge growth in healthcare sciences, difficult to diagnose and treat, associated with higher rate of morbidity and mortality. Most of the etiologies of neonatal seizures can be rapidly reversed by appropriate management and also long term sequelae can be prevented. Seizures were diagnosed by clinical observation and described according to Volpe's classification. All newborns in this study had at least two clinically proven episodes of seizures seen by either authors.

Manoeuvres were attempted to restrain spontaneous events and to provoke events with tactile stimulation before inclusion in study group.

Inclusion Criteria:In this study consecutively admitted 234 newborns admitted to Sick New Born Care Unit with ≥ neonatal seizures (clinical presentation), either provoked by stimulation nor abolished by restraint, were included.

Exclusion criteria:Those who had < 2 episodes of seizures including lacked adequate antenatal and perinatal history, who had history of hospitalisation prior to the study and who succumb to illness/death before investigations, were excluded from the study.

Sample size

The total number of newborns admitted in the Sick New Born Care

Results

The total number of newborns admitted during the study period was 2654 out of which 234 (8.89%) babies were with seizures.

Table 1: Age of gestation and sex wise distribution of neonatal seizures

Age of gestation	Male	Female	Total
<37 weeks	44 (64.7%)	24 (35.3%)	68 (29.06%)
>37 weeks	106 (63.86%)	60 (36.14%)	166 (70.94%)
Total	150 (64.10%)	84 (35.90%)	234 (100%)

Table 1 is showing that out of 234 neonates, 68 (29.06%) were preterm while 166 (70.94%) were term neonates.

Table 2: Types of seizures in preterm neonates

Type of seizure	No. of cases (n=68)	Percentage
Subtle	26	38.23
Focal clonic	16	23.52
Multifocal clonic	06	08.82
Tonic	20	29.41
Total	68	100

Table 2 shows the relationship of types of seizures in preterm neonates. Out of 68 term neonates, 26 (38.23%) neonates had subtle seizures, 16 (23.52%) neonates had focal clonic seizures and 20 (29.41%) neonates had tonic seizures.

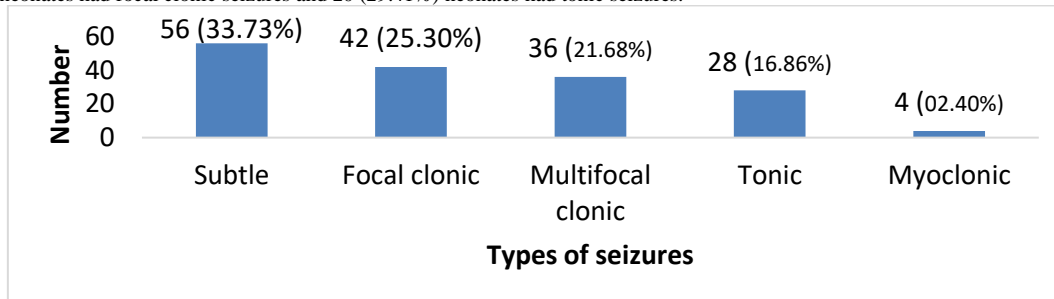


Fig 1: Types of seizures in term neonates (n=166)

Figure 1 shows the relationship of types of seizures in term neonates. Out of 166 term neonates, 56 (33.73%) neonates had subtle seizures, 42 (25.30%) neonates had focal clonic seizures, 28 (16.86%) neonates had tonic seizures and 4 (2.4%) neonates had myoclonic seizures.

Table 3: Etiological classification of seizures in preterm neonates

Aetiology	No. of cases (n=68)	Percentage
Birth asphyxia	22	32.35
Septicaemia	14	20.58
Meningitis	02	02.94
IVH	14	20.58
Hypocalcaemia	06	08.82
Hypoglycaemia	08	11.76
Others	02	02.94
Total	68	100

Table 3 highlights common etiological factors leading to neonatal seizures in preterm neonates, out of 68 (29%) preterm neonates, 22 (32.35%) neonates had birth asphyxia, 14 (20.58%) neonates had septicemia and 02 (02.94%) neonates had meningitis. IVH was seen in 14 (20.58%) neonate, hypocalcemia in 06 (08.82%) neonates and hypoglycemia in 08 (11.76%) while 2 (02.94%) preterm neonate undiagnosed.

Table 4: Etiological classification of seizures in term neonates

Etiology	No. of cases (n=166)	Percentage
Birth asphyxia	80	48.20
Septicaemia	30	18.00
Meningitis	18	10.84
IVH	02	01.20
Hypocalcaemia	20	12.04
Hypoglycaemia	14	08.43
Others	02	01.20
Total	166	100

Table 4 highlights common etiological factors leading to neonatal seizures in term neonates, out of 166 (71%) term neonates, 80 (48.20%) neonates had birth asphyxia, 30 (18%) neonates had septicemia and 18 (10.84%) neonates had meningitis. IVH was seen in 02 (01.20%) neonate, hypocalcemia in 20 (12.04%) neonates and hypoglycemia in 14 (08.43%) while 2 (01.20%) term neonate undiagnosed.

Table 5: Day of onset of neonatal seizures

Hours/days	No. of cases (n=234)	Percentage
0-24 hours	68	29.05
>24-48 hours	84	35.91
>2-7 days	54	23.08
>7 days	28	11.96

Table 5 highlights out of the total number of neonates 68 (29.05%) developed seizures within 24 hours, 84 (35.91%) neonates had seizures between 25-48 hours, 54 (23.08%) neonates developed seizures between 2-7 days and 28 (11.96%) neonates developed seizures after 7 days.

Table 6: Causes of mortality in neonatal seizures

Causes of death	No. of cases (n=42)	%
Birth asphyxia	20	47.6
Septicaemia	06	14.28
Meningitis	06	14.28
IVH	10	23.80
Total	42/234	17.95

Table 6 highlights majority of seizures due to birth asphyxia were observed in first 48 hours life (early onset) while in infection, seizures were observed after 7 days of life.

Discussion

The total number of newborns admitted during the study period was 2654 out of which 234 (8.89%) babies were with seizures. Sandhu R et al studied 80 neonates and his incidence was 14.2%. Grover N studied 59 neonates and his incidence was 1.5%-14% [17,18].

In the present study, out of 234 cases, 150 (64.10%) were male and 84 (35.90%) were female neonates. Incidence of neonatal seizures was higher in male neonates than female neonates. The exact cause of this is not known. Similar results were also observed in study conducted by Holden et al and Powell et al [19,20]. Holden et al studied 227 neonates of which 157 (56.77%) neonates were male and 120 (43.32%) neonates were female [19]. Powell et al studied total of 24 cases of which 17 (70.83%) were male neonates and 7 (29.16%) were female neonates [20].

In the present study, full term neonates were 166 (70.94%) and 68 (29.06%) neonates were preterm. The term neonates showed predominance for seizure activity. The possible higher incidence in term neonates can be explained by the fact that most of the neonates in this group were intrauterine growth retardation (IUGR). Similar findings were also observed in the study conducted by Legido et al and Kumar et al [21,22]. Legido et al studied 40 neonates out of which 28 (70%) were term neonates and 12 (30%) were preterm neonates

and Kumar et al studied 35 neonates, out of which 30 (85.71%) neonates were term neonates [21,22].

In preterm neonates the subtle seizures were found 26 (38.23%) neonates followed by focal clonic seizures in 16 (23.52%) neonates which were the commonest type of seizures observed. Tonic seizures were observed in 20 (29.41%) neonates. Of all the seizures in neonates, subtle seizure is the commonest in majority of the studies. In the present study among the term group, subtle seizures were found in 56 (33.73%) neonates followed by focal clonic seizures in 42 (26.30%) neonates which were the commonest type of seizures observed. Tonic seizures were seen in 28 (16.86%) neonates. Similar result were also shown by studies conducted by Ross et al and Soni et al [23,24]. Rose et al studied 118 neonates, out of which 48 (40.60%) neonates had subtle, 42 (35.59%) neonates had clonic, 10 (8.9%) neonates had generalized tonic and 28 (27.78%) neonates had myoclonic type of seizures [23]. In a study conducted by Soni et al the commonest type of seizures in term group was tonic seizures which were seen in 15 (37.5%) neonates and subtle seizures in 10 (25%) neonates [24]. In the present study, out of 166 term neonates, 80 (48.20%) neonates had birth asphyxia, 48 (28.84%) neonates had infection. Among 68 preterm neonates, 22 (32.35%) neonates had birth asphyxia, 16 (23.53%) neonates had infection. Intra-ventricular hemorrhage (IVH) was seen in 14 (20.58%) neonates.

In present study the birth asphyxia as a cause of seizures was seen in 80 (48.20%) term neonates and 11 (32.35%) preterm neonates. The similar result was also shown by Eriksson studied 77 neonatal seizure cases out of which 48% were due to birth asphyxia[17]. Legido A et al studied 40 neonatal seizure cases out of which 35% were due to birth asphyxia[21].

In the present study, 16 (6.83%) neonates had intra- ventricular hemorrhage. Hypocalcemia is one of the important metabolic causes of neonatal seizures. In the present study neonatal seizures due to hypocalcaemia was observed in 26 (11.11%) neonates. The similar result was also shown by studies conducted by Kumar et al out of 35 neonatal seizure cases 14.28% were due to hypocalcaemia[12]. Taksande AM et al out of 110 neonatal seizure cases 13 (11.81%) neonates develop seizures due to hypocalcaemia[18].

In the present study majority of seizures due to birth asphyxia were observed in first 48 hours life (early onset) while in infection, seizures were observed after 7 days of life, and with the study conducted by Kumar et al he found 45 (97.83%) within 48 hours, Holden R et al found all cases of birth asphyxia i.e. 16 (100%) neonates had onset of seizures within the first 48 hours of life[19,22].

Conclusion and Recommendations

The early recognition and treatment of neonatal seizures is essential for optimal management and satisfactory outcome, as seizures in neonatal period are associated with high mortality and morbidity. Most of the causes of neonatal seizures are preventable by good perinatal care and early interventions while metabolic seizures need a sharp vigilance and early suspicion

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Ethical approval

The study was approved by the institutional ethics committee.

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