

Analysis of Etiology of Neonatal Seizures in Term Neonates: An Institutional Based Study

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ABSTRACT

Introduction: Abnormal electric impulses transmitted to the central nervous system normally develops as seizures in an individual. New-born babies are more vulnerable to the development of seizures because of their hyperexcitability. And the seizures are broadly classified into vascular, infectious, malformation and metabolic.

Materials and Methodology: All the term neonates were identified with clinically identifiable seizures before 28 days of life were basically registered in the study. Diagnosis of HIE was generally oriented on the history, physical examination, Apgar score, arterial blood gas (ABG), brain MRI brain or cranial sonography. Prompt diagnosis of neonatal infection was related on the clinical manifestations, sepsis screening tests and blood culture, CSF analysis. Metabolic disorders were considered as hypoglycaemia (serum glucose < 1.5 mg/dL). Intracranial haemorrhages were diagnosed by CT scan brain. The results were analysed by necessary statistical methods.

Results: In the present study, 105 neonates were studied who are seen with chief complaints of seizures were included. 55 (63.3%) neonates were between 37 to 39 weeks of gestation, while 33 (37.1%) neonates were between 40 to 41 weeks of gestation. 55 neonates had vaginal delivery and 50 neonates were delivered by caesarean section. The most common type of seizure seen was focal clonic type (n=35, 33.3%); followed by subtle seizures (n=32, 30.5%), myoclonic (n=19, 18.4%), focal tonic (n=8, 7.8%), multifocal (n=7, 6%) and generalized tonic clonic type (n = 4, 4%). Among the studied population,

perinatal asphyxia was identified as the most common cause of neonatal seizure (n=35, 33.8%).

Conclusion: The most common cause of neonatal seizures obtained from this current study were found to be HIE, septicaemia, metabolic conditions like hypoglycaemia, hypocalcemia, hypomagnesemia and hyperbilirubinemia, intracranial haemorrhages and brain anomalies. Early identification of mothers who are at risk pregnancies, institutional delivery and aseptic precautions with timely resuscitation is recommended to eliminate morbidity and mortality that occur due to neonatal seizures.

Keywords: Seizures, Neonates, Hypoxia, NICU, Onset.


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INTRODUCTION

Seizures occur due to abnormal electrical discharges to the central nervous system. They are the most common neurological disorder affecting the neonates.¹ The newborn brain is subjected to a greater level of hyperexcitability and hence neonates are more vulnerable to seizure.^{2,3} It occurs in 1 and 3 in one per 1000 newborns.⁴ The etiology behind most of the seizure affecting neonates are symptomatic whereas in some newborns it remains idiopathic.⁵ Seizures are broadly divided into vascular, infectious, malformation and metabolic. HIE (hypoxic encephalopathy) is the most common cause among the various etiological factors.⁶ There is an increased risk of mortality and morbidity among infants with neonatal seizures. They are subjected to numerous

adverse effects affecting the motor, cognitive skills, and behavioural developmental changes and epilepsy during the later stages of life. A higher risk of developing epilepsy is reported to be 17.9%.⁷ A universal scoring system which provides data regarding the prognosis on epilepsy development is quite impossible due to the uncertainty of etiology and the gestational age. The aim of this study is to evaluate the incidence of aetiology of seizures in neonates.

MATERIALS AND METHODOLOGY

Present prospective study was done in Department of Paediatrics, Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha,

India. An informed written consent was obtained from parents of the study neonates. All the term neonates were identified with clinically identifiable seizures before 28 days of life were basically registered in the study. Exclusion criteria include pre-term neonates, babies affected with neonatal tetanus and those babies with visible congenital anomalies.

A detailed antenatal, natal, postnatal and family history was priorly recorded and documented in the predesigned proforma. Diagnosis

of HIE was generally oriented on the history, physical examination, Apgar score, arterial blood gas (ABG), brain MRI brain or cranial sonography. Prompt diagnosis of neonatal infection was related on the clinical manifestations, sepsis screening tests and blood culture, CSF analysis. Metabolic disorders were considered as hypoglycaemia (serum glucose < 1.5 mg/dL). Intracranial haemorrhages were diagnosed by CT scan brain. The results were analysed by necessary statistical methods.

Table 1: Gender wise distribution of cases (N=105)

Gender	Total	%
Male	57	54
Female	48	46
Total	105	100

Table 2: Distribution of cases according to onset of seizures (N=105)

Day of onset	Number	%
1	37	35
2	27	25.7
3	11	9.4
4	6	6.2
5	2	2.2
6	5	5
7	5	5
>8	12	11.5
Total	105	100

Table 3: Distribution of seizures according to type of seizures (N=105)

Seizure type	Number	%
Focal clonic	35	33.3
Subtle	32	30.5
Myoclonic	19	18.4
Focal tonic	8	7.8
GTCS	4	4
Multi focal	7	6
Total	105	100

Table 4: Distribution of seizures according to aetiology (N=105)

Seizure aetiology	Number	%
HIE	35	33.8
Sepsis	26	24.5
Hypocalcaemia	13	11.9
Hypoglycaemia	11	10
Hypomagnesaemia	3	3.1
Intracranial haemorrhage	5	4.8
Hyperbilirubinemia kernicterus	6	5.8
Brain malformations	5	4.9
Withdrawal of drug	1	1.2
Total	105	100

RESULTS

In the present study, 105 neonates were studied who are seen with chief complaints of seizures were included. 57 (54%) were males and 48 (46%) were females as tabulated in table-1. 55 (63.3%) neonates were between 37 to 39 weeks of gestation, while 33 (37.1%) neonates were between 40 to 41 weeks of gestation. 55 neonates had vaginal delivery and 50 neonates were delivered by caesarean section. Onset of seizure was day 1 in 37 (35%), day 2 in 27 (25.7%), and day 3 of life in 11 (9.4%) neonates as shown in Table-2. The most common type of seizure seen was focal clonic type (n=35, 33.3%); followed by subtle seizures (n=32, 30.5%), myoclonic (n=19, 18.4%), focal tonic (n=8, 7.8%), multifocal (n=7, 6%) and generalized tonic clonic type (n=4, 4%) which is briefly mentioned in table-3. Among the studied population, perinatal asphyxia was identified as the most common cause of neonatal seizure (n=35, 33.8%). This was closely followed by septicaemia (n=26, 24.5%). Other significant causes identified were hypocalcaemia (n=13, 11.9%), hypoglycaemia (n=11, 10%), hyperbilirubinemia (n=6, 5.8%), intracranial haemorrhage (n=5, 4.8%) brain malformations (n=5, 4.9%). While, 3 (3.1%) neonates had hypomagnesaemia and 1(1.2%) neonate had seizures due to lignocaine injection as tabulated in table-4.

DISCUSSION

The most common neurological problem reported so far has been neonatal seizures which have a frequency of about 1.5-14/1000 neonates. Summarising with the aetiology, about 80-85% of neonatal seizures are usually accompanied with clinical symptoms and the rest are idiopathic or silent. And the most common reported causative factor is hypoxic ischemic encephalopathy (HIE); the other causes include haemorrhage, metabolic disturbances and infections.⁸ In this present study, 57 (54%) neonates were male and 48 (46%) were females with slight male predilection 1.2:1 as tabulated in table-1. This finding was in concordance with the studies done by the Sahana G et al⁹, Sabzehei MK et al¹⁰, Parvin R et al¹¹ and Moayedi AR et al¹². 55 (52%) babies with neonatal seizure were born through the vaginal delivery and 50 (47%) babies were through the LSCS. This was found in correlation with the study done by Sabzehei MK et al¹⁰ (53% and 47% respectively). Of the 105 neonates with seizures, 37 (35%) had seizures on day 1 followed by 27 (25.7%) on day 2 of life, 11 (9.4%) on day 3, and 12 (11.5%) on day >8 days of life. Almost similar figures were obtained by the Sahana G et al⁹ and Ronen Gabriel et al¹³. Based on clinical seizure types, 35 (33.3%) neonates had focal clonic type followed immediately by the subtle seizures in 32 (30.5%). Myoclonic type of seizures was seen in 19 (18.4%), focal tonic type in 8 (7.8%) and multifocal type in 7 (6%) neonates. This was found in corroboration with the study conducted by Aziz A et al¹⁴ and Verma YS et al¹⁵.

When observed in table-3, perinatal asphyxia was reported to be the most common cause of neonatal seizures identified in 33.3% of neonates. This was found to be in concordance with the study done by Najeeb S et al¹⁶ who reported 46%. Sabzehei MK et al¹⁰ obtained (34%), Glass HC et al¹⁷ observed 38% and Malik BA et al¹⁸ revealed 35%. In few other studies, conducted by Verma YS et al¹⁵ observed that 70% of neonates had developed seizures due to hypoxic ischemic encephalopathy (HIE). In the present study 26 (24.5%) of 105 babies had sepsis (septicemia and meningitis). This was found to be identical to the study performed

by Parvin R et al⁸ (26%, n=51), Sabzehei MK et al¹⁰, (24.4% n=102) and was found to be (29%) by the study done by Najeeb S et al¹⁶.

In a study done by Malik BA et al¹⁸, 34% of babies had septicaemia. But in the present study, it was observed that only 1 (4.8%) baby had herpes infection as the cause for seizure which was found to be same with the study done by Parvin R et al¹¹ reported 1.96%. Seizures that normally occur due to hypoglycaemia are mostly in association with certain comorbidities like HIE, septicaemia and IDM were contributed for 37 (44%) whereas 11 (10%) babies had seizure only due to hypoglycaemia without any visible comorbidities. This was seen in correlation with the study done by Kumar A et al²¹, (11.11%), Sahana G et al⁹ who reported 9.17%. This could possibly be due to the depletion of glycogen storage in the body and inadequate feeding during early postnatal days. Seizures that occur due to hypocalcaemia are most commonly associated with other comorbidities like perinatal asphyxia, septicaemia and IDM were reported to be 19 (22.6%) babies, whereas isolated hypocalcaemia causing seizures were found in 13 (11.9%) of the 105 neonates studied.

This was found to be similar to the study done by Parvin R et al¹¹ 15.65% (n=51) and Taksande A M et al¹⁹ (n=110) where they found about 11.8% and Verma YS et al¹² found it to be 11.67% (n=60). In 3 (3.5%) cases neonatal seizure was caused by hypomagnesaemia. Identical findings were seen by Taksande AM et al¹⁹. Seizures that happen due to hyperbilirubinemia (kernicterus) was seen in 6 (5.8%) neonates in the current study. Similar findings were obtained in the study done by Najeeb S et al¹³, (n=6, 6%). 5 (4.8%) neonates had developed seizures due to intracranial haemorrhage. Same findings were revealed by Najeeb S et al¹³ (n=100, 4%) and Sudia S et al²⁰, (n=90, 4.6%). Seizures due to lignocaine toxicity was seen in 1 (1.2%) neonate in our study, where similar finding was seen by Malik BA et al¹⁸, (n=2, 1%).

CONCLUSION

The most common cause of neonatal seizures obtained from this current study were found to be HIE, septicaemia, metabolic conditions like hypoglycaemia, hypocalcaemia, hypomagnesaemia and hyperbilirubinemia, intracranial haemorrhages and brain anomalies. Early identification of mothers who are at risk pregnancies, institutional delivery and aseptic precautions with timely resuscitation is recommended to eliminate morbidity and mortality that occur due to neonatal seizures.

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