

## Retrospective Assessment of the Clinic-etiologic Profile of Neonatal Seizures in Level III NICU

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### Abstract

**Aim:** Study of Clinical Profile of Neonatal Seizures in Level III NICU in Bihar region.

**Methods:** This retrospective study was carried out in the Department of Pediatrics, Saraswathi Institute of Medical Sciences, Hapur, India from September 2019 to March 2020 . A comprehensive history was collected for the antenatal, natal, postnatal and family history. Age of initiation, form, duration and amount of seizures, consciousness before and after the seizures were taken. Comprehensive neonate examination was performed after detailed history. Relevant investigations were carried out depending upon clinical presentation.

**Results:** In our analysis of 100 neonatal seizures, 97 had one of the four classically identified neonatal seizures. Multifocal clonic seizures were among the most common type of seizures 36% (36 cases) followed by subtle 27% (27 cases), GTS 26% (26 cases), Myoclonic 7% (7 cases), mixed type of seizures 3% (3 cases) and focal clonic seizures 1% (1 cases).

**Conclusion:** Neonatal seizures are most frequently due to birth asphyxia, better antenatal and perinatal care reduces birth asphyxia and if mothers are identified as high-risk.

**Keywords:** neonatal seizures, etiology, birth asphyxia

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### Introduction

Seizures represent the most distinctive signal of neurological disease in the newborn period. The convulsive phenomena are the most frequent of the overt manifestations of neonatal neurological disorders. Population based studies using a clinical definition of seizures indicate sharp decrease in incidence as birth weight of the newborn increase to 57.5% per 1000 in infants with birth weight lower than 1500g, but only 2.8 per 1000 for infants with birth weights of 2500 to 3999 g.[1-3]

The incidence of neonatal convulsions ranges from 0.5% to 20% in various studies. The discrepancies in incidence figures among various studies are due to varying conception ages of newborns and criteria for selection. Various studies revealed that the incidence was as low as 0.5% to as high as 14%.[4,5]

Neonatal seizures are common and may be the first manifestation of neurological dysfunction after a variety of insults.[6] this study is aimed at providing a clear picture regarding the epidemiology, etiology,

onset, types and mortality of neonatal convulsions in our hospital. Hence the present study was conducted to assess the etiology of neonatal seizures, type, time of onset of neonatal seizures and its relationship with the etiology.

### Material and methods

This retrospective study was carried out in the Department of Pediatrics, Saraswathi Institute of Medical Sciences, Hapur, India from September 2019 to March 2020.

### Methodology

A total of 100 neonates with seizures consistent with the inclusion requirements were included. All neonates with Seizures were admitted to NICU were included in this study. Isolated minor symptoms such as Apnea or Paroxysmal autonomic shifts (only slight motor periods or apnea without tachycardia) should be omitted from the analysis. Detailed antenatal, natal and postnatal background and family background have been documented. Age of onset, form, period and amount of seizures, sensitivity during and between seizures. After an adequate history, a thorough

review of neonates was carried out. Relevant investigations were carried out depending upon clinical presentation

### Results

In our sample, 100 (59 percent) were male infants and 41(41 percent) were female infants with a male-to-female ratio of 1.43:1. In the present research, 30(30%) of the 100 babies were preterm, 70 (70%) were term. In the present sample of the 100 cases, 58(58 percent) were Inborn and 42 (42 percent) were Outborn. The majority of neonates in this sample were delivered by regular vaginal birth in 60 (60 percent) situations. The Caesarean section was performed in 40 (40 percent) cases. In our sample of 100 with neonatal epilepsy, <1.5 kg was 7 percent, 1.5-2.49 kg was 46 percent and 2.5 kg was 47 percent. Throughout the latest 6-hour seizure initiation analysis 20 cases (20 percent), 6-12 hours 8 cases (8 percent), 12-24 hours 01 event (1 percent) gross first-day seizures were 31 percent ( 31 cases), on the second day 17 (17 percent) neonates were seizures, and on the third day of existence.

**Table 1: Distribution of Neonatal Seizures According to Gender, Gestational Age, Place and Type of Delivery and Birth Weight**

Sex	No of cases	Percentage
Male	59	59%
Female	41	41%
Total	100	100%
Gestational age		
Term	70	70%
Preterm	30	30%
Gestational age		
No of cases		
Percentage		
Place of delivery		
Inborn	58	58%
Outborn	42	42%
Type of delivery		
Normal vaginal delivery	60	60%
Cesarean section	40	40%
Birth Weight (Kg)		
< 1.5	7	7 %
1.5-2.49	46	46 %
≥ 2.5	47	47%

**Table 2: Distribution According to Day of Onset, Type, Etiology of Neonatal Seizures**

Time of onset	No of cases	Percentage
<6 hours	20	20%
6-12 hours	8	8%
12-24 hours	01	1%
First day	31	31%
Second day	17	17%
Third day	8	8%
Fourth day	5	5%
Fifth day	4	4%
Sixth day	1	1%
Seventh-day	1	1%
8 to 28 days	4	4%
<b>Type</b>		
Subtle	27	27%
Tonic	26	26%
Myoclonic	7	7%
Multifocal clonic	36	36%
Focal clonic	01	1%
Mixed	03	3%
<b>Etiology</b>		
Birth asphyxia	39	39%
Meningitis	20	20%
Hypoglycemia	18	18%
Hypocalcemia	11	11%
Hypomagnesemia	03	3%
Hyponatremia	02	2%
CNS Anomalies	7	7%

**Table 3: Correlation of Etiology with the Day of Onset of Neonatal Seizures**

Etiology of Neonatal Seizures	Gestational Age		Total	p-value
	Term No. (%)	Pre-Term No. (%)		
Birth asphyxia	30 (30%)	9 (9%)	39	0.0001*
Meningitis	12 (12%)	8 (8%)	20	0.1
Hypoglycemia	14(14%)	4 (4%)	18	0.05
Hypocalcemia	8 (8%)	3 (3%)	11	0.01*
Hypomagnesemia	02 (2%)	01(1%)	03	0.3
Hyponatremia	02(100%)	–	02	0.1
CNS Anomalies	4 (4%)	03 (3%)	7	0.1

**Table 4: Distribution of Etiology According to Gestational Age**

Etiology	Type of Seizures						Total
	Subtle	GTS	MC	MFC	FCS	Mixed	
Birth Asphyxia	11(11%)	8(8%)	03(3%)	17(17%)	–	–	39
Meningitis	3(3%)	4(4%)	05(5%)	7(7%)	–	01(1%)	20
Hypoglycemia	1(1%)	1(1%)	02(2%)	13(13%)	–	01(1%)	18
Hypocalcemia	03(3%)	04(4%)	04(4%)	–	–	–	11
CNS anomalies	03(3%)	02(2%)	–	01(1%)	–	01(1%)	7

**Table 5: Correlation of Etiology with Type of Neonatal Seizures**

Day of onset of the	Etiology					Total	%
	Birth Asphyxia	Meningitis	Hypoglycemia	Hypocalcemia	CNS Anomalies		
<6 hours	16 (16%)	02 (2%)	01 (1%)	01 (1%)	01 (1%)	20	20%
6-12 hours	6 (6%)	01 (1%)	01 (1%)	01 (1%)	01(1%)	8	8%
12-24 hours	–	05 (5%)	05(5%)	03 (3%)	–	01	01%
Day 1	12(12%)	2(2%)	04 (4%)	01 (1%)	01(1%)	31	31%
Day 2	02 (2%)	2 (2%)	02 (2%)	03 (3%)	01 (1%)	17	17%
Day 3	01(1%)	02(2%)	01 (1%)	01 (1%)	01 (1%)	8	8%
Day 4	01 (1%)	02 (2%)	01 (1%)	01 (1%)	01 (1%)	5	5%
Day 5	01 (1%)	01 (1%)	01 (1%)	–	–	4	4%
Day 6	–	01 (1%)	01 (1%)	–	–	01	1%
Day7	-	01 (1%)	-	-	-	01	1%
8 to 28 days	–	01 (1%)	01 (1%)	–	01 (1%)	4	4%
Total	39	20	18	11	7		

8 neonates (8 percent) had seizures. The first three days in development combined accounted for 56% of neonatal seizures. In the present analysis, 31 cases were seizures on the first day, 17 cases were seizures on the second day, 8 cases were seizures on the third day, 11 cases were seizures on the 4th-7th day and 4 cases were seizures between

8 and 28 days. In our analysis of 100 neonatal seizures, 97 had one of the four classically identified neonatal seizures. Multifocal clonic seizures were among the most common type of seizures 36% (36 cases) followed by subtle 27% (27 cases), GTS 26% (26 cases), Myoclonic 7% (7

cases), mixed type of seizures 3% (3 cases) and focal clonic seizures 1% (1 cases).

The most common cause of neonatal seizures is birth asphyxia (39%) followed by neonatal meningitis in 20 (20%) cases, hypoglycemia in 18 (18%) cases, hypocalcemia in 11 (11%) cases, congenital anomalies in 7 (7%) cases, hypomagnesemia in 3 (3%) cases and hyponatremia in 02 (2%) cases.

The onset of seizures on the first three days of life is statistically significant with the etiology of birth asphyxia. The onset of seizures on the first day seen in 31 babies, in those 12 babies had birth asphyxia. On the second day of life 17 babies developed seizures, 0 2 babies were due to birth asphyxia, 2 babies were due to meningitis, 2 babies were due to hypoglycemia. On the third day of life 8 babies developed seizures, 1 baby due to hypoglycemia, 2 babies were due to meningitis, 1 baby due to birth asphyxia. On the fourth to the seventh day of life 5 babies developed seizures, meningitis and hypoglycemia were common causes for neonatal seizures. After the first week of life 7 babies have developed seizures, meningitis was a common cause for neonatal seizures.

In the present study, 70 out of 100 cases were the term of which 30 cases developed seizures due to birth asphyxia, 14 cases developed seizures due to hypoglycemia, 12 cases developed seizures due to meningitis, 8 cases developed seizures due to hypocalcemia, 2 cases developed seizures due to hypomagnesemia, 2 cases developed seizures due to hyponatremia and 4 cases developed seizures due to CNS anomalies. Out of 30 preterm babies, 4 cases developed seizures due to hypoglycemia, 8 cases developed seizures due to meningitis, 9 cases developed seizures due to birth asphyxia, 1 cases developed seizures due to hypomagnesemia and 3 cases developed seizures due to CNS anomalies. Birth asphyxia was statistically significant and more common among term babies and

hypocalcemia was slightly more common in preterm babies.

In the present study out of 39 neonates with birth asphyxia, 17 babies had multifocal clonic seizures, 11 babies had a subtle type, and 8 babies had GTS type of seizures. Out of 18 babies with hypoglycemia, 13 babies had multifocal clonic seizures, 1 babies had subtle seizures, and 1 babies had GTS type of seizures. Out of 20 babies with meningitis, 13 babies developed multifocal clonic seizures, 3 babies developed subtle seizures, and 4 babies had GTS type of seizures.

### Discussion

The duration of occurrence of neonatal seizures is substantially linked to etiology (e.g., initiation of seizures during the first three days is strongly correlated with birth asphyxia). Subtle seizures are the most frequent form of seizures that are clinically difficult to detect, so close monitoring of at-risk newborns is required for diagnosis. Seizures are a symptom of CNS disorder due to systemic or metabolic disturbances. Metabolic disorders are commonly transient and rapidly correctable less commonly developed as recurrent causes. They often occur in the neonatal period either as an underlying cause or as an associated abnormality. Throughout the process of their life, seizures are challenging to control because there is a risk of potential brain damage. Prompt detection and treatment of the root cause of seizures are critical for successful management and appropriate long-term results. Neonatal seizures are the major manifestations of the central nervous system. They are rarely idiopathic and are considered as nonspecific responses of the immature central nervous system to different insults the seizures in neonates are different compared to adults because of the immaturity of the nervous system.<sup>7</sup> Recognition of neonatal seizure etiology is often helpful with respect to prognosis and treatment. Hypoxic-ischaemic

encephalopathy is the most common etiology for neonatal seizures. HIE is also frequently associated with perinatal complications that can be prevented by adequate antenatal and perinatal therapy.[8] The time of onset of neonatal seizures is significantly associated with etiology (e.g., the onset of seizures during the first three days is significantly associated with birth asphyxia). Neonatal seizures occur more commonly in male babies with a male to female ratio of 1.43:1.

Most of the neonatal seizures occurred in babies delivered by normal vaginal delivery (60%). Most of the neonatal seizures occurred in babies with a birth weight of more than 1.5 kg (7%). Most neonatal seizures occurred during the first 3 days of life, i.e. 56%. Most of them occurred on the first day of life (31%). Birth asphyxia was the cause of neonatal seizures in 39% of neonates who developed seizures on day-1 of life. The onset of seizures on the 1st three days of life is a statistically significant correlation with the etiology of birth asphyxia. The most common type of seizures was multifocal clonic (36%) followed by subtle (27%), tonic (26%), myoclonic (7%), and mixed types of seizures seen (3%). Birth asphyxia was the commonest cause of neonatal seizures (39%), followed by meningitis (20%), hypoglycemia (18%). Subtle seizures are the most prevalent type of seizures that are clinically difficult to diagnose, so careful observation of at-risk neonates is critical for diagnosis. Seizures are a symptom of CNS impairment that can be triggered by cognitive or physiological abnormalities. Metabolic disorders are normally sporadic and may be quickly reversed or less commonly developed as recurrent causes. We often occur in the neonatal period either as an underlying cause or as an associated abnormality. Hallucinations are challenging to handle throughout their life, so there is a risk of potential brain damage. Early identification and diagnosis of the

root cause of seizures are important for effective control and a successful long-term outcome. Seizures related to birth asphyxia produce seizures in the first 24 hours of life. The bulk of hypoglycaemic seizures arise between the first and second days of life. Hallucinations attributed to neonatal meningitis include hallucinations towards the end of the first week of diagnosis. Birth asphyxia has a variety of contributing factors, such as extended second-stage labor and MSAF, typically observed in term babies. In addition, the detection of neonatal seizure etiology is also effective in terms of diagnosis and improved results.

### Conclusion

Birth asphyxia is the most prevalent cause of neonatal seizures, an improvement in antenatal diagnosis and early identification of high-risk mothers will decrease the occurrence of birth asphyxia and mitigate the rate of neonatal seizures.

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