



## ETIOLOGICAL FACTORS OF NEONATAL SEIZURES AND THEIR OUTCOME AT A TERTIARY CARE HOSPITAL

### Paediatrics

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### ABSTRACT

**INTRODUCTION:** 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. The purpose of this study was to find the commonest etiological factors of neonatal seizures in this region and determining its outcome.

**MATERIALS AND METHODS:** A total of one hundred and four neonates presented with seizures were advised to undergo required investigations. Detailed clinical history and examination findings were noted.

**RESULTS:** Incidence of neonatal seizures is 11.9%. Out of 104 neonatal seizures, 58 (55.7%) were females and 46 (44.2%) were males. Majority of neonates had seizures in first three days, it was 67.3%. Predominant cause was birth asphyxia and 23% had septicaemia. Mortality rate was 16.3%.

**CONCLUSION:** Most of the etiologies of neonatal seizures can be rapidly reversed by appropriate management and also long term sequelae can be prevented.

### KEYWORDS

Etiology, Neonatal Seizures, Outcome.

### INTRODUCTION

Neonatal seizures or neonatal convulsions are epileptic fits that occur during the neonatal period, in babies < 4 weeks old. Most often caused by Hypoxic ischemic encephalopathy, central nervous system infections, perinatal arterial stroke, intraventricular haemorrhage, congenital central nervous system malformations, in born errors of metabolism, electrolyte abnormalities, neonatal abstinence syndrome [1].

Most often neonatal seizures presents during first 1-2 days of life. The prevalence is approximately 1.5% and the approximately over all incidence is 3 per 1000 live births [2]. Neonatal seizure can be a benign transient phenomenon with favourable outcome and no recurrence, but it may be associated with neurodevelopmental disorders or be complicated with epilepsy later in the child's life in about 30% of survive neonates [3].

Neonatal Seizures categorized by many schemes. Most widely used scheme is by Volpe [4] of five many types as: Subtle seizures, Tonic seizures, Clonic seizures, Myoclonic seizures and non paroxysmal repetitive behaviours.

Diagnosis of seizures is a difficult task in neonates, as most of them have no clinical correlation. Determining the underlying cause for seizures can help to treat appropriately. Several modes of EEG can help to diagnose the cause of neonatal seizures [5].

The purpose of this study was to find the commonest etiological factors of neonatal seizures in this region and determining its outcome.

### MATERIALS AND METHODS

This prospective study was conducted among 872 live births for six months (Jan 2019 to June 2019) at Department of Paediatrics, Government General Hospital, Kurnool, Andhra Pradesh. Out of 872 live births, one hundred and four neonates presented with seizures which are unprovoked by stimulation were included in this study. Patients succumbed to illness or death before investigations were excluded from this study. Study has been started after taking informed consent from their parents.

Data pertaining to presenting complaints, relevant clinical history such as prenatal maternal risk factors, perinatal risk factors and findings in relation to seizures like time of onset of seizure, type, duration and frequency of seizure, neurological examination were noted. Classification of seizures was done according to Volpe as subtle, tonic, clonic, myoclonic.

Birth Asphyxia was noted based on history, examination, APGAR

score and arterial blood gas according to the criteria defined by the American Academy of Paediatrics and the American College of obstetricians and Gynaecologists.

Routine investigations such as complete blood count, urine examination, C-reactive protein, bilirubin, blood grouping, random blood glucose, serum calcium, serum magnesium, serum phosphorus, blood and CSF culture was done. USG investigation was performed to evaluate intracranial haemorrhage. If necessary CT scan was performed after stabilising the baby.

Evaluation of etiological factors of neonatal seizures has been undertaken based on clinical information, laboratory findings and/or imaging studies (USG, CT Scan). Patients were followed for progress during their NICU/hospital stay. All data recorded in a proforma and entered into spread excel sheet.

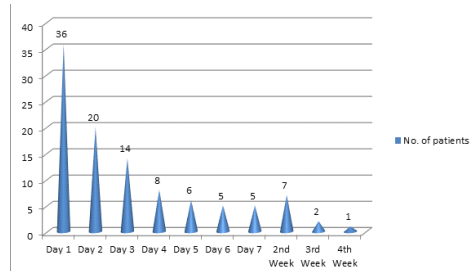
### STATISTICAL ANALYSIS:

Statistical analysis of descriptive variables were expressed as percentages, numbers etc. Association between the variables and outcome was analyzed by Chi Square test by using Graphpad Software. The variables with  $p < 0.05$  were considered as significant.

### RESULTS

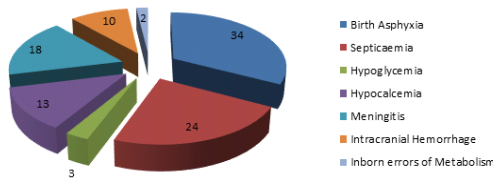
Among 872 live births in study period, 104 (11.9%) cases presented with neonatal seizures. Out of 104 neonatal seizures, 58 (55.7%) were females and 46 (44.2%) were males. Majority of neonates had seizures in first three days, it was 67.3% (Fig 1).

**Fig 1. Timing of onset of neonatal seizures.**



Out of 104 neonates, 34 (32.6%) had seizures due to birth asphyxia, 24 (23%) had septicaemia, 18 (17.3%) had meningitis, 13 (12.5%) had hypocalcaemia, 10 (9.6%) had intracranial hemorrhage, 3 had (2.8%) hypoglycaemia and remaining 2 patients had (1.9%) inborn errors of metabolism (Fig 2).

**Fig 2. Prevalence of various causes of neonatal seizures**



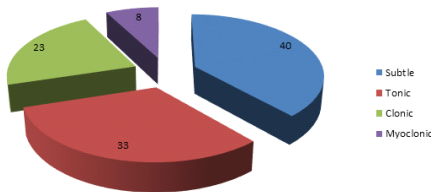
Among 55 preterm babies, 18 (32.7%) patients had birth asphyxia, 13 (23.6%) had septicaemia, 10 (18.2%) had meningitis. Among 49 term neonates, 15.3% had birth asphyxia, 10.5% had septicaemia predominantly. Hypoglycemia (2.8%) and Inborn errors of metabolism (1.9%) were observed in Term neonates. Variables between term and preterm neonates do not show any statistical significance (Table 1).

**Table 1. Prevalence of various causes among term and preterm neonates**

Causes	Term	%	Preterm	%	Chi Square	P value
Birth Asphyxia	16	15.3	18	17.3	0.0405	0.8404
Septicaemia	11	10.5	13	12.5	0.008	0.9285
Hypoglycemia	3	2.8	0	0	-	-
Hypocalcemia	6	5.7	7	6.7	0.049	0.823
Meningitis	8	7.6	10	9.6	0.0001	0.9920
Intracranial Hemorrhage	3	2.8	7	6.7	0.6518	0.4194
Inborn errors of metabolism	2	1.9	0	0	-	-
Total = 104	49	47.1	55	52.8		

Among 104 neonates, 40 (38.4%) had subtle seizures, 33 (31.7%) had tonic seizures, 23 (22.1%) had clonic seizures, 8 (7.6%) had myoclonic seizures (Fig 3).

**Fig 3. Prevalence of various types of neonatal seizures**



Out of 40 subtle seizures, 21.1% were observed in preterm babies and 17.3% were noted in term babies. Out of 33 clonic seizures, 16.3% and 15.3% were in preterm and term neonates. Out of 10 tonic seizures, 12.5% and 9.6% were observed in preterm and term neonates. Out of 5 Myoclonic seizures, 2.8% and 4.8% were noted in preterm and term neonates (Table 2).

**Table 2. Seizures in relation to term and preterm neonates**

Types	Term	%	Preterm	%	Chi Square	P value
Subtle	18	17.3	22	21.1	0.0195	0.8888
Clonic	16	15.3	17	16.3	0.0004	0.9838
Tonic	10	9.6	13	12.5	0.0254	0.8734
Myoclonic	5	4.8	3	2.8	0.2902	0.5900
Total = 104	49	47.1	55	52.8		

Among 104 neonatal seizures, 56.7% had normal outcome, 16.3% were expired and 26.9% had sequelae. Expiry and Sequelae outcome was observed predominantly in Birth Asphyxia, Septicaemia. No mortality noted in neonatal seizures caused by Hypoglycemia, hypocalcemia (Table 3).

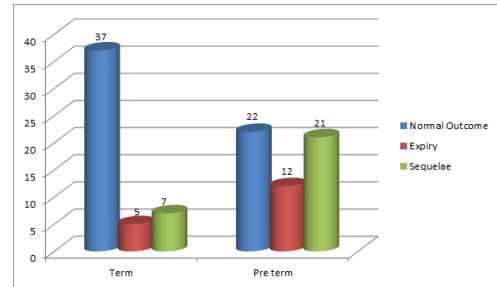
**Table 3. Outcome in relation to various etiological factors**

Causes	Total	Normal Outcome (n=59)	%	Expiry (n=17)	%	Sequelae (n=28)	%
Birth Asphyxia	34	9	8.6	10	9.6	15	14.4
Septicaemia	24	14	13.4	2	1.9	8	7.6
Hypoglycemia	3	3	2.8	0	0	0	0
Hypocalcemia	13	13	12.5	0	0	0	0

Meningitis	18	14	13.4	2	1.9	2	1.9
Intracranial Hemorrhage	10	6	5.7	1	0.9	3	2.8
Inborn errors of metabolism	2	0	0	2	1.9	0	0

Out of 55 preterm neonates, 12 (21.8%) were expired and 21 (38.1%) had sequelae. Out of 49 term neonates, 5 (10.2%) were expired and 7 (14.2%) had sequelae. Outcome between term and preterm neonates was assessed statistically, shown the chi-square was 13.39, the p value was 0.001; statistically significant (Fig 4).

**Fig 4. Outcome in relation to term and preterm neonates**



**DISCUSSION**

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.

Among 872 live births in study period, 104 (11.9%) cases presented with neonatal seizures. Out of 104 neonatal seizures, 58 (55.7%) were females and 46 (44.2%) were males. Majority of neonates had seizures in first three days; it was 67.3% in the present study.

Srinivasa Rao D et al [6] did a study from Central Andhra Pradesh, India reported 53.7% were female and 46.2% were male; 68.5% were term neonates. Out of 108 neonates, 65 (60.1%) term and 32 (29.6%) preterm babies presented with seizures within the first week of life. 35.1% neonates had seizures on Day 1. Sheth RD et al [7] also reported similar findings as this study. Similar incidence report was found by Saliba RM et al [8], Holden KR et al [9]. In contrast to this study, Moayedi AR et al [10] documented lower incidence of 2.4%. Venkataramana Reddy K et al [11] noted male predominance among neonatal seizures, 60.7% had seizures within first two days of life. Eghbalian F et al [12] also reported male neonates presented with seizures predominantly.

As per this study, out of 104 neonates, 34 (32.6%) had seizures due to birth asphyxia, 24 (23%) had septicaemia, 18 (17.3%) had meningitis, 13 (12.5%) had hypocalcemia, 10 (9.6%) had intracranial hemorrhage, 3 had (2.8%) hypoglycaemia and remaining 2 patients had (1.9%) inborn errors of metabolism.

In line with this study Moayedi AR et al [10] observed 36.4% HIE (Hypoxic Ischemic Encephalopathy), 19.1% infections, 7.3% metabolic abnormalities, 2.7% intra cranial haemorrhage, 1.8% structural disorders and 32.7% idiopathic. Venkataramana Reddy K et al [11] noted birth asphyxia and septicaemia as predominant cause for neonatal seizures in similar to this study. Faiz N [13] and Taghdiri MM [14] reported 28.8% and 28.2% central nervous infections respectively. Fiaz N et al [13] reported 8.9% of intracranial haemorrhage.

Among 55 preterm babies, 18 (32.7%) patients had birth asphyxia, 13 (23.6%) had septicaemia, 10 (18.2%) had meningitis. Among 49 term neonates, 15.3% had birth asphyxia, 10.5% had septicaemia predominantly as per this study.

Shah B et al [15] did a clinic epidemiological study on neonatal seizures stated that 34.4% of neonates had birth asphyxia (p<0.05) and was most commonly seen in preterm neonates (23.3%). Second most common was septicaemia alone (21.1) followed by meningitis (18.8%) In both preterm (58.3%) and term (31.8%) the most common type of seizure seen was subtle seizures, followed by tonic, clonic and subtle seizure respectively.

In the present study among 104 neonates, 40 (38.4%) had subtle seizures, 33 (31.7%) had tonic seizures, 23 (22.1%) had clonic seizures, 8 (7.6%) had myoclonic seizures. Srinivasa Rao D et al [6], Moayedi AR et al [10] reported similar prevalence of neonatal seizures.

Among 104 neonatal seizures, 56.7% had normal outcome, 16.3% were expired and 26.9% had sequelae. Expiry and Sequelae outcome was observed predominantly in Birth Asphyxia, Septicaemia. In similar to this study, mortality rate observed by other studies were 13-14% [10,12,16]. Lai YH et al [17] also reported subtle seizures as most common type, clonic seizures as second or third most common types.

In this study out of 55 preterm neonates, 12 (21.8%) were expired and 21 (38.1%) had sequelae. Out of 49 term neonates, 5 (10.2%) were expired and 7 (14.2%) had sequelae. Outcome between term and preterm neonates was assessed statistically, shown the chi-square was 13.39, the p value was 0.001; statistically significant.

In similar to this study, Srinivasa Rao D et al [6] stated that out of 74 cases of term babies, normal outcome was observed in 30 cases (40.5%), sequelae have been observed in 26 cases (35.1%), 13 cases expired (17.6%). Out of 34 cases of preterm babies, 13 cases had normal outcome (38.2%), death occurred in 12 cases (35.3%), sequelae have been observed in 8 cases (23.5%).

## CONCLUSION

Most of the etiologies of neonatal seizures can be rapidly reversed by appropriate management and also long term sequelae can be prevented. Still many of the research studies are ongoing trials on use of newer anti epileptics for treatment of neonatal seizures. Neonatologists should be aware of epidemiology of neonatal seizures to avoid neurological damage.

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