Original Research Article

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A clinico-etiological evaluation of neonatal seizures in a tertiary care hospital: a prospective cohort study

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ABSTRACT

Background: Neonatal seizure is defined as a paroxysmal alteration in neurological function. The diagnosis of neonatal seizures is difficult to establish because of varied etiologies involved. The incidences vary from 1.5-3.7/1000 live births in term babies.

Methods: Hospital based Observational Study was conducted from December 1, 2016 till March 31, 2018. Universal sampling technique was followed. 93 neonates fulfilling the inclusion criteria were included in the study after consent from parents.

Results: Present study results showed that 60.2% were males. Pre-term delivery occurred in 12.9% neonates. Most common etiology of neonatal seizures was birth asphyxia with 47.3% followed by metabolic abnormalities 32.3%.

Conclusions: The most common etiology for neonatal seizures was birth asphyxia followed by metabolic abnormalities in which hypoglycaemia was the most common type. A significant association of seizures due to meningitis and metabolic abnormalities was observed with pre-term gestation.

Keywords: Birth asphyxia, Neonates, Pre-term, Seizures

INTRODUCTION

Neonatal seizures (NS) are the most frequent and distinctive clinical manifestation of neurological dysfunction in the new-born infant. The incidence of NS is 2.8 per 1000 in infants with birth weights of more than 2500gm; it is higher in preterm low birth weight neonates- as high as 57.5 per 1000 in very low birth weight infants.¹

Infants with NS are at high risk of neonatal death or neurological impairment and epilepsy disorders in later 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.²

The most common cause of neonatal seizures is hypoxic-ischemic encephalopathy (HIE), which occurs in approximately 1 to 2 per 1000 live births.³ Other cerebrovascular disorders including arterial and venous stroke, intracerebral haemorrhage and subarachnoid haemorrhage also frequently present clinically with seizures.

Additional etiological problems like hypoglycaemia, hypocalcaemia, and ICH may co-exist with perinatal asphyxia and these should always be excluded.

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Neonatal seizures also differ considerably from seizures observed in older children, principally because the immature brain is less capable of propagating generalized or organized electrical discharges.⁴

The neonatal seizures may be the first and perhaps the only, clinical sign of a central nervous system disorder in the new-born infant. Seizures in neonates may indicate the presence of a potentially treatable etiology and should prompt an immediate evaluation to determine cause and to institute early etiology-specific therapy. Hence, the clinical diagnosis, classification of neonatal seizures and appropriate management are critical for the neonate's care.

Hence the present study was conducted to evaluate the clinical and etiological profile of neonatal seizures.

METHODS

The present study was conducted in NICU, Department of Pediatrics, Base Hospital, Delhi Cantonment, India. It was a tertiary care hospital of Armed Forces, which serves as referral center for the healthcare needs of defense personnel and their dependents. Guidelines provided by Indian Council of Medical Research for human research were followed strictly and clearance from Institutional Ethics Committee taken.

Study population

Neonates admitted to NICU of the hospital with complaints of seizures during the study period.

It was a hospital based observational study.

Sample

Universal sampling technique was followed, 93 neonates fulfilling the inclusion criteria were included in the study after consent from parents.

Study duration

The study was conducted from December 1, 2016 till March 31, 2018.

Inclusion criteria

Newborns till the age of 28 days with a diagnosis of neonatal seizures. Informed consent was given by the parents.

Exclusion criteria

- Congenital abnormalities
- Scalp swellings
- Critically ill
- Cases where no consent can be obtained.

At the time of enrollment of the patient, all relevant clinical and demographic information was collected.

Demographic information like gender of the neonate, gestational age at which the neonate was born. We also elicited intrauterine growth status from the history obtained from the mother. Accurate clinical description of an event of seizure was noted for each enrolled patient.

To study the etiological profile of neonatal seizures in patients, we obtained antenatal history from the mother, history of any infection, drug intake, hypertension, diabetes, hemorrhage and mode of delivery. History of consanguinity and family history of any inborn error of metabolism (IEM) also taken.

Statistical analysis

The quantitative data was represented as their mean±SD. Categorical and nominal data was expressed in frequency and percentage. The t-test was used for analyzing quantitative data while non-parametric data was analyzed by Mann Whitney test. Categorical data was analyzed by using chi-square test. The significance threshold of p-value was set at <0.05. All analysis was carried out by using SPSS software version 21.

RESULTS

The table shows that the study population included neonates of which the majority 60.2% were males while remaining 39.8% were females. It was found that preterm delivery occurred in 12 (12.9%) neonates while remaining 81 (87.1%) were term gestation.

Table 1: Distribution of study population based on gender and gestation.

Sex	Frequency	Percentage
Male	56	60.2%
Female	37	39.8%
Gestation		
Full term	81	87.1%
Pre-term	12	12.9%

The weight of neonates was measured, low birth weight was seen in 51 cases (54.9%) while the remaining neonates were of normal weight.

The clinically diagnosed cases showed that most common etiology of neonatal seizures was birth asphyxia (47.3%) followed by metabolic abnormalities (32.3%). Other etiologies included: hyperbilirubemia (7.5%), meningitis (3.2%), hypoxia (2.2%) and structural malformations (2.2%) and no etiology could be identified in 5.4% cases. Table 3 shows that among the metabolic abnormalities being the cause of seizures, 16 (53.3%) had hypoglycaemia while 12 (40%) had hypocalcaemia and 2

(6.7%) neonates had both hypoglycaemia and hypocalcaemia.

Table 2: Distribution of study population based on etiology of seizure.

Aetiology	Frequency	Percentage	
Birth asphyxia	44	47.3%	
Metabolic	30	32.3%	
Hyperbilirubinemia	7	7.5%	
Hypoxia	2	2.2%	
Meningitis	3	3.2%	
Structural malformation	2	2.2%	
Unknown	5	5.4%	
Total	93	100.0%	

The seizures among the neonates were tonic type in majority 38 (40.9%) followed by clonic type in 34 (36.9%) and subtle type of seizures were present in minority of 21 (22.6%) cases.

Table 3: Distribution of study population based on type of metabolic abnormalities.

Metabolic abnormalities	Frequency	Percentage
Hypoglycaemia	16	53.3%
Hypocalcaemia	12	40.0%
Both	2	6.7%
Total	30	100.0%

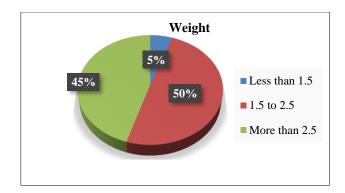


Figure 1: Distribution of study population based on birth weight.

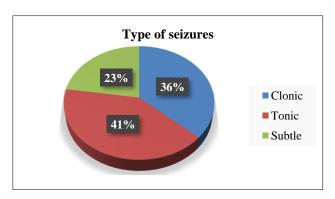


Figure 2: Distribution of study population based on type of seizures.

Table 4: Association of term of gestation with etiology of seizure.

Andalana	Gestation		Total	n volvo
Aetiology	Full term	Preterm	Total	p-value
Dinth combanic	42	2	44	0.029
Birth asphyxia	95.45%	4.55%	100.00%	0.029
Metabolic	23	7	30	0.051
Wietabolic	76.67%	23.33%	100.00%	0.031
Hyperbilirubinemia	7	0	7	0.59
нурегоппиотетта	100.00%	0.00%	100.00%	0.39
Нурохіа	2	0	2	1.00
нурохіа	100.00%	0.00%	100.00%	1.00
Meningitis	0	3	3	<0.01
ivieningitis	0.00%	100.00%	100.00%	<0.01
Structural Malformation	2	0	2	1.00
Structural Manormation	100.00%	0.00%	100.00%	1.00
Unknown	5	0	5	1.00
UIIKIIOWII	100.00%	0.00%	100.00%	1.00

Chi square test was conducted to find out association between the term of gestation of neonate with etiology of seizure, it was found out that Birth asphyxia and meningitis had strong association with p-value less than 0.05 whereas the other factors such as metabolic

disorders, structural malformation and unknown causes did not have association with p-values greater than 0.05.

When the association of between types of seizures with etiology was studied it was found that among the various factors, birth asphyxia and metabolic disorders has got strong association with type of seizures with p-value less than 0.05. The other factors such as hyperbilirubinemia, hypoxia, meningitis, structural malformation and unknown causes did not have association with p-values greater than 0.05.

Table 5: Association of type of seizures with etiology.

Aetiology	Type of seizure			Total	n volue
	Clonic	Tonic	Subtle	10tai	p-value
Birth asphyxia	14	27	3	44	<0.01
	31.82%	61.36%	6.82%	100.00%	<0.01
Metabolic	11	3	16	30	< 0.01
	36.67%	10.00%	53.33%	100.00%	<0.01
Hyperbilirubinemia	4	2	1	7	0.49
	57.14%	28.57%	14.29%	100.00%	0.49
Нурохіа	0	2	0	2	0.23
	0.00%	100.00%	0.00%	100.00%	
Meningitis	1	1	1	3	0.90
	33.33%	33.33%	33.33%	100.00%	
Structural malformation	2	0	0	2	0.20
	100.00%	0.00%	0.00%	100.00%	
Unknown	2	3	0	5	0.43
	40.00%	60.00%	0.00%	100.00%	

DISCUSSION

In the present study conducted it was found that, out of the total 93 neonates with seizures, 60.2% were males while 39.8% were females. Present results were in accordance with the studies carried out by Moayedi AR et al, in which 64 were male (58.2%) and 46 female (41.8%) and in study carried out by Eghbalian F et al, 25/34 (73.55%) were males and 9/34 (26.5%) were females. A similar type of finding was seen in study done by Digra SK et al in which 72 out of 102 neonates were males and remaining 30 were females. Pravin R et al in their study observed 76.5% males and 23.5% females in their study of 51 cases.

This preponderance of males over females in present study could be due to social beliefs that male babies are cared better by their parents and are brought to the hospital even with minor complaints but female babies are usually neglected and are managed at home even if they are very sick.

Pre-term delivery occurred in 12 (12.9%) neonates while remaining 81 (87.1%) were term gestation. Our results are consistent with other studies like Marzoki J et al, in which 84 out of 88 (95.4%) full term neonates had seizures.⁹ Parvin R et al also observed 80.4% cases as term and 19.6% as pre-term.⁸

Low birth weight was seen in 51 cases (54.9%) while 45.1% neonates had normal birth weight i.e. >2.5 Kg. This was not consistent with other studies like Eghbalian

F et al, Digra SK et al and Marzoki J et al in which the majority of neonates had the birth weights more than 2.5 kg. 6.7.9 Though this study has majority of full term (81/93) neonates, majority have intra uterine growth retardation which is the reason why being full term they have birth weight less than 2.5 kg.

Most common etiology of neonatal seizures was birth asphyxia (47.3%) followed by metabolic abnormalities (32.3%). Other etiologies included: hyperbilirubemia (7.5%), meningitis (3.2%), hypoxia (2.2%) and structural malformations (2.2%). No etiology could be identified in 5.4% cases. Out of the 30 cases with metabolic abnormalities, 16 had hypoglycaemia while 12 had hypocalcemia. Two neonates had both hypoglycaemia and hypocalcemia.

In the study by Parvin R et al, half of the neonate had perinatal asphyxia (56.86%), followed by septicemia (15.67%), meningitis (11.76%), neonatal jaundice (kernicterus) (3.92%), neurometabolic disorder (3.92%), TORCH (Rubella infection 1.96%). There were 1.96% neonates whom diagnosis could not be identified. Thirty five neonates had biochemical abnormalities and most of them had hypoglycemia (19.5%) and hypocalcaemia (15.7%). In the study by Kumar A et al, perinatal asphyxia was the most common etiology in pre-term and term babies (39% and 49%) respectively. In another study done by Digra SK et al, birth asphyxia is the most common cause accounting for 67.65% cases followed by infections (septicemia and meningitis). Birth asphyxia was also the commonest cause of neonatal seizures

reported by Soni et al and Ronen et al.^{11,12} Most common type of seizures were tonic (40.9%) and clonic (36.9%) while subtle seizures were present in 22.6% cases. Parvin R et al found majority of seizures was tonic (45.1%) in nature, followed by subtle seizure (35.3%), clonic (15.35) and mixed type (3.9%).⁸ In a study of neonatal seizures by Brunquell J et al, subtle seizures were the commonest occurring in 51% (27 of 53), followed by focal clonic (42%), multifocal clonic (30%) and GTS (23%).¹³ Lakra et al also reported that subtle seizures were the commonest type.¹⁴ But in the study of Soni et al generalized tonic seizure was commonest type of seizure, followed by subtle seizures.¹¹

A significant association of seizures due to meningitis and metabolic abnormalities was observed with pre-term gestation (p<0.05) while no association was seen between type of seizures with any particular etiology (p-0.69).

Parvin R et al and Kumar A et al in their studies also observed significant association between meningitis and metabolic abnormalities with pre-term gestation. 8,10 Madhusudhan K et al in their study also observed a higher prevalence of metabolic abnormalities in pre-term babies especially hypoglycemia. 15

CONCLUSION

Present study revealed that the most common aetiology seizures in this series was birth asphyxia followed by metabolic abnormalities in which hypoglycaemia was the most common type. Males outnumbered females in present study and most common type of seizure was tonic type (focal) followed by clonic and then subtle seizures. A significant association of seizures due to meningitis and metabolic abnormalities was observed with pre-term gestation.

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Institutional Ethics Committee

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