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A Study Of Etiology, Onset And Type Of Neonatal Seizures In A Tertiary Care Hospital

Dr. Money Sachdeva
Junior Resident 3rd year Department of Paediatrics Narayan Medical College Sasaram Bihar.
Dr. Anupama Singh
Junior Resident 2nd year Department of Paediatrics Narayan Medical College Sasaram Bihar.
Dr. Sandesh Srivastava
Junior Resident 3rd year Department of Paediatrics Narayan Medical College Sasaram Bihar.
Dr. Akhila
Junior Resident 2nd year Department of Paediatrics Narayan Medical College Sasaram Bihar.

Abstract
Introduction:
The neonatal phase is the most prone to seizure development. These occurrences frequently indicate severe injury or malfunction of the developing central nervous system. Neonatal seizures can occur as a result of a variety of causes and manifest in a variety of ways.
Aim:
To Study aetiology, Onset and Type of Neonatal Seizures.
Method:
The current study comprised 107 new-borns hospitalised to the NICU of Narayan Medical College & Hospital, Sasaram, Bihar for seizures between March 2021 to March 2023. Except for neuroimaging, which was an optional examination, all study participants were subjected to all of the investigations included in the proforma. The data was analysed using tools such as Epi-info and Microsoft Excel.
Result:
Chi-squared for the onset of seizures on the first three days and more than three days with aetiology, $\chi 2 = 13.1312$ with a p-value of 0.0107. Seizures during the first three days of life have a statistically significant correlation with birth asphyxia with a P value of < 0.05. Out of 71 neonates with birth asphyxia, 36 (50.7%) had subtle seizures, followed by GTS in 26 neonates (36.62%) & MFC in 6 (8.45%) neonates. In neonates with hypoglycaemic seizures, 7 out of 15 (46.67%) babies had subtle seizures followed by GTS in 6 (40%), neonates. In neonates with meningitis (10 neonates), 5 developed subtle seizures (50%) and 3 had MFC (30%). In our study, there was no correlation between the type of neonatal seizures with the aetiology (p>0.05).
Conclusions:
Recognising the cause of new-born seizures is frequently beneficial in terms of prognosis and therapy.
Keywords: *Neonatal Seizures; Aetiology of Neonatal Seizures.*

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I. INTRODUCTION

Seizures are the most common and serious sign of neurologic dysfunction in neonates, and they pose a substantial risk of death and adverse long-term outcomes. 57.5 per 1000 neonates with birth weight < 1.5 gm and 2.8 per 1000 neonates weight between 2.5 and 3.99 kg have seizures. The occurrence of neonatal seizures per se has been positively correlated with structural brain damage and its consequent sequels at later stages in life. Seizures are symptoms of an underlying cerebral pathology, the most prevalent of which is Hypoxic Ischaemic Encephalopathy (HIE) in term infants (78%), followed by Septicaemia, Hypoglycaemia, and Meningitis in that order. The most common type of seizure (45.5%) is a mild seizure, followed by tonic, clonic, spasm, and myoclonic seizures.[1] The most prevalent cause of neonatal seizures is hypoxic-ischemia. The second most common cause of neonatal seizures in full-term tiny for gestational age infants is metabolic problems and meningitis. 10% to 15% of seizures are caused by intracranial haemorrhage. Hypomagnesaemia with serum < 1.5 mg/dl can occasionally manifest with tetany and seizures at 2- 4 weeks of age. Fluid overload, renal impairment, and SIADH (syndrome of inappropriate ADH secretion) can all cause hyponatraemia.[2]

Birth asphyxia is a problem that could affect the management of seizures in this scenario. Subtle seizures are the most common type of seizure, characterised by merely horizontal deviation and or jerking of the eyes, recurrent blinking or fluttering of the eyelids, drooling, suckling, or other oro- buccal motions. Seizures in neonates are fatal, but survivors are at risk of neurological sequelae, developmental delay, subsequent epilepsy, and cognitive impairment. As a result, we must conduct an early diagnostic workup to establish the causes.[3]

The early detection and treatment of metabolic abnormalities is critical for optimal management and a satisfying outcome. The aetiology and prognosis of new-born seizures are strongly related to the timing of start. Birth asphyxia, for example, frequently appears within the first three days of life, whereas meningitis appears after the first week. If the kid convulses within hours of birth, it indicates a dismal prognosis and brain damage.[4]

Seizures represent the most distinctive signal of neurological disease in the new-born period. The convulsive phenomenon is the most frequent the overt manifestations of neonatal neurological disorders. Neonatal seizures are common and may be the first manifestations of neurological dysfunction after a variety of insults. Neonatal seizures are clinically significant because very few are idiopathic. It is critical to recognize neonatal seizures to determine their aetiology and to treat them for 3 major reasons: 1. First, seizures are usually related to significant illness, sometimes requiring specific therapy. 2. Second, neonatal seizures may interfere with important supportive measures, such as alimentation and assisted respiration for associated disorders. 3. Third, experimental data give a reason for concern that the seizures per se may be a cause of brain injury. Neonatal seizures present with varying manifestations like generalized tonic, multifocal clonic and subtle activity. Therefore, it is important to recognize the seizures and treat it, as a delay in recognition and treatment may lead to brain damage. The time of onset of seizure has a relationship with the aetiology and prognosis[5]. Hughlings Jackson described seizure as "excessive discharge of nerve tissue on muscle". Jackson went on to say that this discharge occurs in all degrees, it occurs with all sorts of conditions of ill health, at all ages and under innumerable circumstances. These observations by Jackson remain as true today as they did 130 years ago[6] . Von Rosenstein in 1776 stated that "Lastly we may observe, to the great comfort and satisfaction of the parents of those young children subject to convulsion, that they need not be apprehensive for its changing into the true epilepsy, for it generally disappears by degree, as they grow older and acquire more strength"[7].

AIMS AND OBJECTIVES:

To Study Etiology -Onset and Type of Neonatal Seizures.

II. MATERIALS AND METHODS

The present study included 107 neonates presenting with seizures admitted to the NICU of Narayan Medical College & Hospital, Sasaram,Bihar during the period of two years i.e. March 2021 to March 2023. Neonates (first 28 days of life) presenting with at least one of the following clinical type of seizures : Generalized tonic seizures, Multifocal clonic seizures Focal clonic seizures, Myoclonic seizures, With or without accompaniment of subtle motor movements, apnoeas or autonomic changes or the sole combination of subtle motor and autonomic manifestation were included in the study group. Neonates with the isolated subtle phenomenon, apnoea or paroxysmal autonomic changes, i.e., only subtle motor moments or apnoea without tachycardia or hypertension were excluded from the study. Jitteriness in neonate's Tetanic spasms in neonate's participants in the study was subjected to all investigations mentioned in the proforma, except for neuroimaging which was an optional investigation. The data was then analysed using software like Epi-info, Microsoft Excel.

III. Results:

TABLE 1: Correlation of aetiology with a day of onset of neonatal seizures

Etiology of seizures	Day of Onset of Seizures		
	First 3 days	After 3 days	Total
Birth asphyxia	60	11	71
Row %	84.51%	15.49%	100.00%
Hypoglycemia	11	4	15
Row %	73.33%	26.67%	100.00%
Neonatal Meningitis	6	4	10
Row %	60.00%	40.00%	100.00%
Hypocalcemia	3	1	4
Row %	75.00%	25.00%	100.00%
Other	2	5	7
Row %	28.57%	71.43%	100.00%
Total	82	25	107
Row %	74.64%	23.36%	100.00%

$\chi 2 = 13.1312$;df=8 $p < 0.0107$.

Chi-squared for the onset of seizures on the first three days and more than three days with etiology. $\chi 2 = 13.1312$ with a p-value of 0.0107. Seizures during the first three days of life have a statistically significant correlation with

birth asphyxia with a P value of < 0.05

In neonates with hypoglycemic seizures, 7 out of 15 (46.67%) babies had subtle seizures followed by GTS in 6 (40%), neonates. In neonates with meningitis (10 neonates), 5 developed subtle seizures (50%) and 3 had MFC (30%). In our study, there was no correlation between the type of neonatal seizures with the etiology (p>0.05).

TABLE 2: Correlation of Etiology with the type of neonatal seizures

Etiology of seizures	**Type of Seizure**					
	Subtle	**Generalized Tonic**	**Multifocal Clonic**	**Focal Clonic**	**Mixed**	**Total**
Birth asphyxia	36	26	6	1	2	71
Row %	50.70%	36.62%	8.45%	1.41%	2.82%	100%
Hypoglycemia	7	6	1	1	0	15
Row %	46.70%	40.00%	6.67%	6.67%	0.00%	100.00 %
Neonatal Meningitis	5	0	3	1	1	10
Row %	50.00%	0.00%	30.00%	10.00 %	10.00%	100.0 0%
Hypocalcaemia	3	1	0	0	0	4
Row %	45.00%	25.00%	0.00%	0.00%	0.00%	100.0 0%
Other	3	1	0	1	0	7
Row %	42.86%	42.86%	0.00%	14.29 %	0.00%	100.0 0%
Total	54	36	10	4	3	107
Row %	54.47%	33.64%	9.35%	3.74%	2.80%	100%

X2 =17.5995; d. f. =16 p< 0.3479.

In the present study, out of 71 neonates with birth asphyxia, 36 (50.7%) had subtle seizures, followed by GTS in 26 neonates (36.62%) & MFC in 6 (8.45%), neonates.

IV. Discussion:

Over the course of two years, 107 newborns with seizures were investigated in the current study. The study included both inborn and outborn babies. In our study, newborn seizures occurred throughout the first two weeks of life. The majority of the days were due to birth asphyxia (74.32%), and the commencement of seizures related to birth asphyxia occurred in 60 out of 82 instances (73.17%) with a significant p-value of < 0.05. Seizures due to hypoglycemia manifested from the first day itself, with incidence more in the first 3 days and decreases as the days go on. In our study, out of 15 cases of hypoglycemia 11 (73.33%) had convulsions by the third day of life. Seizures are mostly caused by neonatal meningitis at the end of the first week, but they can also occur in the early second week and later. Seizures are less likely to occur after the first week and are largely caused by meningitis and late-onset hypocalcemia in our study.

In a study of neonatal seizures by Rose Arthur L et al , majority of babies with perinatal anoxia convulsed on the first day of life (5/10 – 50%), hypoglycemic neonates convulsed on second and third day (5/7 – 71%), majority of neonates with CNS infection convulsed at the end of first week and early second week (9/13 – 69%) and babies with hypocalcemia present with convulsions during first and second day of life (6/28) and again during late first week and second week (19/28)[8].

Seizures are frequently evident within the first three days of life, preferably within the first 48 hours. Hypoglycemia appears on the second and third days due to glycogen depletion. Hypocalcemia manifests on the first and second days if it is of early onset, and later, i.e., late first week and second week, if it is of late onset. Seizures accompany neonatal meningitis in the late first and second weeks of life.

In the current study, 50.7% of neonatal seizures with birth asphyxia had a mild kind of seizure, with GTS accounting for 36.2% and MFC accounting for 8.45%. 46.67% of infants with hypoglycemia seizures had mild seizures, while 40% exhibited GTS. In newborns with meningitis, half had mild seizures while the other half had MFC. In our investigation, there was no link between the type of newborn seizures and the aetiology (p>0.05). Mizrahi M et al found that GTS and mild seizures were more likely to be induced by diffuse pathologic processes such as HIE in a study of neonatal seizures compared to EEG investigations.[9]

Clonic seizures were more likely to be associated with focal or regional lesions such as infarction or ICH with p=0.0047.

V. Conclusion:

Hypoglycemia and hypocalcemia, two of the most common causes, should be suspected and treated as soon as possible before they cause more brain damage. Hypoglycemic seizures are more likely in premature newborns. Before administering typical anticonvulsants to the newborn, treatable reasons should be evaluated. The onset of neonatal seizures is highly related to the aetiology (for example, development of seizures within the first three days is significantly related to birth asphyxia).

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