

# A Study of Clinico-Etiological Profile and Early Outcome of Neonatal Seizure.

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## ABSTRACT

**Background:** Neonatal seizures are an important cause of mortality and morbidity in newborn period. This study was aimed to find out most common clinical type and etiology of neonatal seizure and their co- relation with early outcome. **Methods:** We prospectively reviewed the history and evaluated the newborns with seizures and also collected samples for biochemical investigations in neonatal ICU at tertiary health care centre and analysed the early outcome. **Results:** Total 90 newborns were recruited in the study, out of which, 38.8% newborns developed subtle seizure, followed by tonic in 32.8%, clonic in 23.3% and myoclonic in 5.5% neonates. Among the various etiological factors of seizure, birth asphyxia was the most commonly seen in 34.4% neonates. Second most common cause was septicaemia alone in 21.1%. In birth asphyxia most common type of seizure seen was subtle seizures (40.6%). Most common type of seizure in both term (58.3%) and preterm (31.8%) neonates was subtle seizure. Data suggests that the leading cause of mortality was birth asphyxia seen in 7.77% neonates and was more common in preterm neonates (4.44%) followed by septicaemia alone (3.33%) neonates. **Conclusion:** According to present study, there was significant correlation between birth asphyxia and subtle seizures which was more commonly seen in preterm neonates. Also higher chances of mortality was found to be in neonates with birth asphyxia which can be prevented by adequate neonatal resuscitation during first golden minute.

**Keywords:** neonatal seizures, subtle seizures, birth asphyxia, mortality.

## INTRODUCTION

Clinical seizures are defined as change in neurological function (sensory, motor or autonomic) that is associated with abnormal synchronous discharge from the cortical neurons.<sup>[1]</sup> Neonatal seizures are the most common overt manifestation of neurological dysfunction in neonates. The incidence of neonatal seizure in India is 10.3 per thousand live births and in world is 1-5 per 1000 live birth.<sup>[1]</sup> There are four recognisable clinical types including subtle, tonic, clonic and myoclonic.<sup>[1]</sup> Each one can be focal, multifocal and generalised. Most common cause of neonatal seizures is birth asphyxia followed by other causes such as intracranial haemorrhage, intracranial infections, metabolic disorders, CNS malformations, less commonly inborn error of metabolism and drug withdrawal. Seizures are one of the immediate neonatal emergencies, where diagnostic and therapeutic plan is necessary because delay in therapy often results in poor neurological outcome. The present study was conducted to evaluate the incidence, clinico- etiologi- cal profile and early

outcome in relation to etiology of neonatal seizure.

## MATERIALS AND METHODS

The present study was a prospective analytical study conducted in the Neonatal ICU, tertiary care centre for period of 6 months, from 1st November, 2017 to 31st March, 2018. All neonates with seizures before 28 days of life were included in the study after taking written informed consent from parents. Clinical history in form of prenatal maternal history and intrapartum events were noted. The neonatal seizures were classified according to Volpe's classification<sup>13</sup> into subtle, tonic, clonic, myoclonic. Seizure etiology diagnosis was based on positive clinical data, laboratory findings and /or imaging studies (USG brain). The diagnosis of birth asphyxia was based on history, physical 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.

Samples for CBC, CRP, blood culture, CSF, blood sugar and S.Calcium were taken. Intracranial haemorrhage was determined by USG brain in relevant patients. Patients were followed for progress during their NICU stay.

All data were extracted from records and entered in a proforma and was analysed by using SPSS software.

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## RESULTS

Total admissions during the study period of five months were 782 live births out of which 90 neonates presented with seizure. Thus, incidence of seizures in hospitalised neonates was found to be 11.5% in our study. Out of 90 neonates 51(57%) were male and 39(43%) were female. Most of them were preterm 66 (73.3%), whereas only 24(26.6 %) were term. We found that 46 (51.1%) neonates had first seizure before 24 hours of age, 34(37.7%) had onset between 24-72 hours of birth and rest 10 (11.1%) had onset after 72 hours of birth. In terms of

clinical type, subtle seizure was the most common type, which was seen in 35(38.8%) neonates, followed by tonic in 29(32.8%), clonic in 21 (23.3%), and myoclonic in 5 (5.5%). Among the various etiological factors of seizure, birth asphyxia was the most common seen in 32(34.4%) neonates. Second most common cause was septicemia alone in 19 (21.1%) followed by meningitis in 17(18.8%). Hypocalcemia accounted for 10 (11.1%), Intracranial haemorrhage 8(8.8%), hypoglycemia 3 (3.3%) and inborn error of metabolism 1(1.1%) of seizures during admission.

Table 1: Etiological factors of neonatal seizures

Etiology	N	Preterm	Term	%	Chi Square	P Value
Birth asphyxia	31	21	11	34.4	1.832	0.04
Septicemia	19	13	06	21.1	0.996	0.05
Meningitis	17	14	03	18.8	0.885	0.08
Hypocalcemia	10	08	02	11.1	0.474	0.12
Intracranial haemorrhage	08	07	01	8.8	0.531	0.14
Hypoglycemia	03	03	00	3.3		
Inborn error of metabolism	01	00	01	1.1		

Table 2: Different types of seizures

Type	N	Preterm	Term	%	Chi Square	P Value
Subtle	35	21	14	38.8	0.987	0.18
Tonic	29	23	6	32.8	0.756	0.40
Clonic	21	18	3	23.3	0.654	0.32
Myoclonic	5	4	1	5.5	0.741	0.38
Total	90	66	24	100	0.859	

Table 3: Correlation of age of onset of neonatal seizure with etiology

Etiology	Age Of Onset			Chi square	p value	%
	<24 hour	24-72 hour	>72 hour			
Birth asphyxia	21	9	1	1.54	0.03	37.7
Septicaemia	7	10	2	1.21	0.06	11.1
Meningitis	4	10	3	1.08	0.12	100
Hypocalcemia	6	3	2	1.11	0.32	
Intracranial hemorrhage	5	2	1	1.05	0.21	
Hypoglycemia	3	0	0			
Inborn error of metabolism	0	0	1			

Table 4: Correlation between etiology and type of neonatal seizure

Etiology	Subtle	Tonic	Clonic	Myoclonic	Total	Chi Square	P Value
Birth asphyxia	13	10	8	1	32	1.273	0.04
Septicemia	7	6	5	1	19	0.191	0.09
Meningitis	6	7	3	1	17	1.022	0.07
Hypocalcemia	4	3	2	1	10	0.825	0.08
ICH	4	2	2	0	08	0.339	0.09
Hypoglycemia	1	1	1	0	03	0.155	0.19
IEM	0	0	0	1	01		
Total	35	29	21	5	90		

Table 5: Etiological factors in relation to early outcome

Etiology	Survival	Expiry	Total	Chi Square	P Value
birth asphyxia	25	7	32	3.156	0.0166
septicemia	16	3	19	0.1257	0.7228
meningitis	16	1	17	1.0069	0.3156
hypocalcemia	10	0	10		
ICH	8	0	8		
hypoglycemia	3	0	3		
IEM	0	1	1		

Table 6: outcome in relation to gestational age

	Survival	Expiry	Total
PRETERM	59	7	66
TERM	19	5	24
TOTAL	78	12	90

Out of 32 neonates with birth asphyxia, 13(40.6%) had subtle seizures, 10 (31.2%) had tonic, 8(25%) had clonic and 1(3.1%) had myoclonic seizures. Out of 19 neonates with septicemia, 7 (36.8%) had subtle

seizure, 6(31.5%) had tonic, 5 (26.3%) had clonic and 1(5%) had myoclonic seizures. Out of 17 neonates with meningitis, 7(41.1%) had tonic, 6 (35.2%) had subtle, 3(17.1%) had clonic and 1(5.8%) had myoclonic seizures. Out of 10 neonates with hypocalcemia, 4(40%) had subtle, 3 (30%) had tonic, 2(20%) had clonic and 1(10%) had myoclonic seizures. Out of 8 neonates with intracranial haemorrhage, 4(50%) had subtle, 2 (25%) had tonic, 2(25%) had clonic seizures. Out of 3 neonates with hypoglycemia, 1(33.3%) had subtle, 1 (33.3%) had tonic, 1(33.3%) had clonic seizures. The 1 neonate with inborn error of metabolism had myoclonic seizure.

The mortality rate observed in our study was 13.3%. The leading cause of mortality was birth asphyxia (58.3%), followed by septicaemia alone(25%), meningitis( 8.3%) and inborn error of metabolism(8.3%)

The most common etiological factor was found to be birth asphyxia in 34.4% neonates ( $p < 0.05$ ) 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.

From this data we found that seizures due to birth asphyxia most commonly present within 24 hours of birth ( $p < 0.05$ ).

The most common clinical type of seizure seen was subtle seizure (38.8%). Birth asphyxia was found to be significantly correlated with subtle seizures ( $p < 0.05$ ).

The most common cause of mortality was found to be birth asphyxia (7.77%)

The mortality rate was higher in preterm than term babies.

## DISCUSSION

Neonatal seizures are an important cause of neonatal mortality and morbidity. In our study we found that incidence of neonatal seizures in hospitalised neonates was 11.5% which is similar to Holden KR12 et al study and Saliba et al.<sup>[10]</sup> It was more common in preterm newborns (73.3%) compared to term.

In the present study the most common type of seizure observed were subtle which constitutes 38.8% of all neonates, followed by tonic in 29(32.8%), clonic in 21 (23.3%), and myoclonic in 5 (5.5%). Similar results were reported by Moayedi et al and Tetgul et al.<sup>[3,6]</sup>

Among the etiological factors, birth asphyxia (34.4%) was the most common cause which is comparable to Moayedi et al (36.4%),<sup>[3]</sup> Arpino et al (36.2%) and Nunes et al (34.9%).<sup>[5,9]</sup> In our study, septicaemia and meningitis were also common

reported in 21% and 18% cases respectively. Takande et al and Fiaz et al also reported infections in 28.2% and 28.8% of neonates respectively,<sup>[2,11]</sup> similar to our findings.

In the present study intracranial haemorrhage was observed in 8.8% of neonates, which is comparable to Ross et al (8.6%) and Fiaz et al (8.9%) observations.<sup>[2,7]</sup> The most common metabolic disturbances were hypoglycaemia and hypocalcemia which was consistent with findings of Fiaz et al,<sup>[2]</sup> The mortality rate observed in our study was 13.3% which was higher than (9%) reported in the study of Ronan et al,<sup>[4]</sup> but similar to finding of Moayedi et al (13.6%).<sup>[3]</sup> This increased mortality maybe due to the severity of etiological factors in neonates with seizures.

## CONCLUSION

To conclude, neonatal seizures are an important cause of neonatal mortality and morbidity. In the present study the most common type of seizure observed were subtle which can be easily missed. The most common cause of seizure encountered in this study was birth asphyxia. Therefore effort should be made to improve intrapartum care and can be managed by providing adequate resuscitation during first golden minute and thereafter intensive care. Early recognition and treatment will improve the long term outcome. Meningitis and septicemia also contributed significantly to neonatal seizures, which need aggressive management.

### Limitation of Study

Unavailability to obtain EEG/amplitude integrated EEG at the time of study as it plays crucial role in the evaluation of neonatal seizure.

## REFERENCES

1. Cloherty And Stark's Manual Of Neonatal Care, 2017:812-818
2. Faiz N Malik, Malik M, Azan M, Afzal U. Etiology and type of neonatal seizures, Ann park Inst of Medical Sci 2009;5(2):77-86
3. Moayedi AR, Zakeri S, Moayedi F. Neonatal seizures: Etiology and type. Iran J child Neurol 2007:23-6. Moayedi AR, Zakeri S, Moayedi F. Neonatal seizures: Etiology and type. Iran J child Neurol 2007:23-6.
4. Ronen GM, Penney S, Andrew W. The epidemiology of clinical neonatal seizure in new found land, a population based study. J Pediatr 1999;134(1):71-5.
5. Arpino C, Domizio S, Carrieri MP, Brescianini DS, Sabatino MH, Curatolo P. Prenatal and perinatal determinants of neonatal seizures occurring in first week of life. Abs J child Neurol 2001;16(9):651-6.
6. Tekgul H, Gauvrea K, Soul J, Murphy L, Robertson R, Stewart J, et al. The current etiology profile and neurodevelopmental outcome of seizures in term newborn infants. Pediatrics 2006;117(4):1270-80.
7. Ross AL, Lombroso CT. Neonatal seizures state. A study of clinical, pathological, and electroencephalographic features in

- 137 full-term babies with a long-term followup. *Pediatrics* 1970;45(3):404-25.
8. Malik BA, Butt MA, Shamoan M, Tehseen Z, Fatima A, Hashmat N. Seizuresetiology in the newborn period. *J Coll Physicians Surg Pak* 2005;15(12):786-90.
  9. Nunes ML, Martins MP, BareaBM, Wainberg R C, Costa da Costa J. Neurological outcome of newborns with neonatal seizures. *ArqNeuropsiquiatr* 2008;66(2A):168-74
  10. Saliba RM, Annegeraf, waller DK, Tyson JE. Incidence of Neonatal seizures in harris county, *American Journalof epidemiology* 2000,150(7):763-9.
  11. Taghdiri MM, Emadi M, Tavasoli AR. Plain CT Scan in neonatal convulsion. *Iranian Red Crescent Medical Journal* 2005;7(3):43-45.
  12. Holden KR , Mellitus D and Freeman JM. Neonatal Seizures: Correlation of Prenatal and Perinatal Events with Outcome. *Pediatrics*.1982; 70: 165-176.
  13. Neonatal Seizures. In: Volpe J J eds., *Neurology of the new born* 4th ed. Philadelphia: W.B. Saunders, 2001:178-216.
  14. Aiiims protocols in neonatology

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