

Etiology and outcome of neonatal seizures in NICU, KIMS, Karad

Jaiom Dagar*, Suryakant Ingale, Chandershekhar Aundhakar, Allapa Koppad, Siddharth Singh

Department of Paediatric, Krishna Institute of Medical Sciences, Karad, Maharashtra, INDIA.

Email: jai.dagar05@gmail.com

Abstract

Seizures frequency in the neonatal period is more than the remainder of childhood. Seizure is a common neurological disorder in neonatal age group. Primary metabolic derangement is one of the common reasons behind seizures during this period. **Objective:** To determine the incidence, type and aetiology of seizures in neonates admitted to Neonatal Intensive Care Unit of Krishna Institute of Medical Sciences University. **Methodology:** This descriptive study was conducted in the NICU of Krishna Institute of Medical Sciences from 1st January 2011 to 31 December 2013. During the study period, all admitted neonates were examined and records on neonatal seizures were collected. Neonates having seizures either at presentation or during their stay in the hospital were investigated. In order to determine the aetiology of seizures, metabolic profile and serum calcium and sodium levels were done in all cases. The data was recorded and analysed. **Results:** Out of 2990 neonates admitted, 87/2990 (2.9%) neonates had episodes of neonatal seizure. Out of 87 cases, 55 were male and 32 were female. Commonest type of seizures observed in this study were subtle (51.82%) followed by Clonic (48.92%), tonic (36.09%) and myoclonic (6.14%). The most common aetiology was perinatal asphyxia (54.02%), followed by metabolic disturbances (19.54%), infections (19.54%) and intracranial bleed (2.30%). In the present study 77.01% (67/87) cases of neonatal seizures recovered completely. 5.74% (5/87) were lost during study (discharged against medical advice) and 17.24% (15/87) of cases of neonatal seizures expired. **Conclusion:** Neonatal seizures were found in about 2.9% of NICU admissions and presented most commonly as subtle type. Birth asphyxia was the commonest aetiology followed by metabolic causes.

Keywords: Aetiology, Birth Asphyxia, Hypocalcaemia, Hypoglycaemia, Seizures.

*Address for Correspondence:

Dr. Jaiom Dagar, Resident, Department of Paediatric, Krishna Institute of Medical Sciences, Karad-415110, Maharashtra, INDIA.

Email: jai.dagar05@gmail.com

Received Date: 28/07/2015 Revised Date: 12/08/2015 Accepted Date: 25/08/2015

Access this article online	
Quick Response Code:	Website: www.statperson.com
	DOI: 06 September 2015

INTRODUCTION

Seizures represent the marker of neurological disease in the newborn period and these convulsive phenomena are the most frequent manifestations of neonatal neurological disorders.¹ Seizures in neonates are one of the most important neurologic events which contribute to both mortality and morbidity.^{2,3} Neonatal seizures occur most commonly due to hypoxic - ischemic injury or biochemical abnormalities although no cause may be

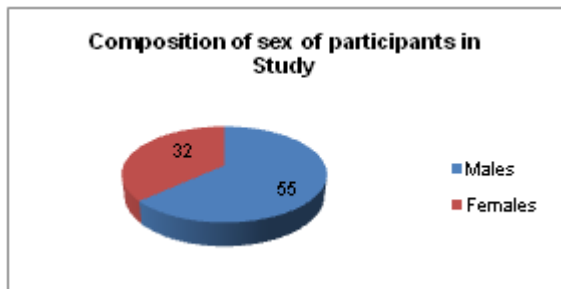
identified in 10% of cases.⁴ In the Neonatal Intensive Care Unit, the incidence of seizures is as high as 10-25% of total admissions, out of which there is about 15% mortality and 35 to 40% morbidity.⁵ They are associated with high neonatal mortality and morbidity in terms of neurological sequelae, and their ultimate outcome depends more on the underlying aetiology rather than on gestational age.^{6,7} Morbidity manifests as cerebral palsy, epilepsy, or long-term neural deficit in memory, behaviour and cognition because of disturbed neural connectivity and changes in receptor composition and dendritic structure.^{7,8} Recognition of the aetiological factors of neonatal seizures would enable us to identify the quantum of a problem. Neonatal seizures are clinically significant because very few are idiopathic. Further investigation leading to prompt diagnosis of the underlying condition is important because many of the aetiologies have specific treatments which, when used early, may improve the prognosis.

MATERIALS AND METHODS

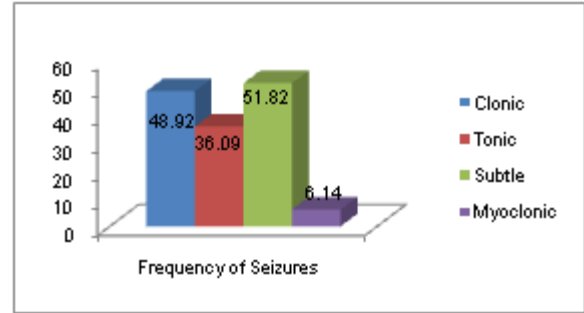
The present study is a retrospective, observational study conducted in the Neonatal Intensive Care Unit of Krishna Institute of Medical Sciences from 1st January 2011 to 3rd December 2013. All neonates, admitted during study period, were retrospectively identified from the neonatal intensive care unit's medical records, based on their diagnoses of "neonatal seizures." Their full medical records were reviewed and analysed. The neonatal seizures were classified according to Volpe's classification into subtle, focal clonic, multifocal clonic, tonic and myoclonic.¹ The metabolic abnormalities and sepsis was noted. Hypoglycaemia was defined as blood sugar < 40 mg/dl, and hypocalcaemia was defined as total serum calcium < 7.0 mg/dl. Total 87 cases of neonatal seizure were identified and included in the study. Age, sex, etiological factors and biochemical parameters of these cases were noted and analysed. Mortality was defined as death during hospital stay. The diagnosis of seizures was based on clinical observation and description noted in records. It is known that the gold standard to recognize neonatal seizures is video-EEG. However, it is not always available in developing countries. It has also been observed that continuous EEG monitoring of infants after one clinical seizure showed majority (79%) of subsequent EEG seizures as clinically silent.⁹

OBSERVATIONS AND RESULTS

Total number of neonates admitted to Neonatal Intensive Care Unit of Krishna Institute of Medical Sciences from 1st January 2011 to 31 December 2013 was 2990; out of it 87(2.9%) neonates had episodes of neonatal seizures. **Sex Incidence:** Out of 87 cases, 55 were males and 32 were females. Ratio is 1.7:1.



Type of convulsion: Commonest type of seizures observed in this study were subtle (51.82%) followed by Clonic (48.92%), tonic (36.09%) and myoclonic (6.14%). 42.97% had multiple episodes of seizures compared with those having single episode (57.03%).



Age distribution: forty (45.97%) neonates had their first seizure within 24 hours of birth; 62 (71.25%) had seizures in the first 72 hours.

Age	No. Of cases (n = 87)	Percentage (%)
< 24hr.	40	45.97
24 TO 72 hrs	22	25.28
72 hrs TO 7 days	19	21.83
8 days TO 14 days	4	4.59
>14 days	2	2.30

Weight: In our study, seizures were common in babies less than 2500gm.

Weight	No. of cases (N =87)	Percentage (%)
< 2500 gm	46	52.88
2500 gm and above	41	47.12

Aetiology: The most common aetiology was perinatal asphyxia (54.02%), followed by metabolic disturbances (19.54%), infections (19.54%) and intracranial bleed (2.30%). It was not possible to determine aetiology of seizures in 4 patients.

Aetiology	No. of cases (N =87)	Percentage (%)
I. Perinatal Asphyxia	47	54.02
II. Metabolic	17	19.54
III. Infections	17	19.54
IV. Intracranial Bleed	02	2.30
V. Undetermined aetiology	04	4.60

DISCUSSION

Seizures are still the most important clinical manifestation of neurological disorders in the neonatal period^{10,11} **Sex:** In the present study, neonatal seizures were found to be more in male as compared to female babies (1.7:1). This observation may be because of social bias in our culture. As we see traditional Indian families always give special care to male babies and they are brought to the hospital even with minor complaints whereas female babies are usually neglected and are managed at home even if they are critical. This can be one of the important factors in causing male sex preponderance in our study.

Type of seizures

Domenech, Martinez E *et al*, in their works concluded that 42% babies presented with subtle seizures, 33.9% with tonic, 64.3% with multifocal clonic, 10.7% with focal clonic and 16.1 % with multifocal myoclonic seizures. It was also observed that 55.4% of infants had 2 or more types of clinical convulsions.¹² Neonatal seizures may present in various ways and several types may be seen in the same neonate over a period of time.⁸ Suryavanshi A. R. *et al* reported subtle seizures as the most common seizure type found in 37 i.e. 46.25% neonates followed by multifocal Clonic seizure type found in 34 neonates i.e. 42.50%,¹³ also only one episode of seizure was observed in 35 (43.75%) while status convulsion was found in 7(8.75%) in their study, which is consistent with our study. At our centre, we recorded that 42.97% neonates had multiple episodes of seizures compared with those having a single episode (57.03%). Ross AL *et al* studied 118 babies, out of which 48 (40.60%) had subtle seizures¹⁴.

Aetiology of seizure

In our study the most common aetiology of neonatal seizures was perinatal asphyxia (54.02%), followed by metabolic disturbances (19.54%), infections (19.54%) and intracranial bleed (2.30%). It was not possible to determine aetiology of seizures in 4 patients. Lack of essential investigations for diagnosing rare causes of neonatal seizures is probably the cause. Sood A *et al*¹⁵ also demonstrated that hypocalcaemia and hypoglycaemia were most common metabolic abnormality. The above results were comparable with finding of this study. In our study, intracranial haemorrhage was seen in 2 (2.30%) cases. Sood A *et al*¹⁵ and Kumar A *et al*¹⁶ reported that birth asphyxia as aetiology of seizure was seen in 45.71% and 48.27% cases respectively which are comparable with the results of our study. G. Sahana *et al* in his study observed that perinatal asphyxia was the common cause of seizures observed in 57.80% of cases followed by infections, hypoglycaemia and hypocalcaemia which is consistent with our study¹⁷. Eriksson M. *et al*, reported that in 48% of infant, hypoxia was considered to be the probable main aetiology, while infection and metabolic diseases including hypoglycaemia and hypocalcaemia were next commonest causes, 12% for each condition²⁰

Weight: In our study, seizures were common in babies less than 2500gm. Low birth weight is an important risk factor, as clinical seizure in them often indicates severe brain injury and are associated with serious morbidity and high mortality risk. The risk of neonatal seizures varies inversely with birth weight. As reported by Lanska *et al* also, incidence of seizures was higher among low birth weight babies in our set up¹⁸. **Age distribution:** When the age distribution of neonatal seizures was observed in

our study, it was found that 72.41% neonates had first seizure before 72 hours of age (i.e. early onset) and rest had onset after 72 hours which is similar to the findings of Erikson *et al*²⁰ who reported highest incidence of neonatal seizures on first and second day of life in their studies. Ross AL *et al*¹⁴ also found early onset seizures in 75 (50.33%) babies. Brown JK *et al*²¹ observed that 60 (43%) neonates had seizures in the first 4 days of life while Ronen GM *et al*¹⁹ reported 83% of seizures in the 1st week of the life. **Outcome:** 77.01% (67/87) cases of neonatal seizures recovered completely. 5.74% (5/87) were lost during study (discharged against medical advice) and 17.24% (15/87) of cases of neonatal seizures expired.

CONCLUSION

In conclusion, the commonest cause of seizure in term babies was perinatal asphyxia with majority presenting within the first 72hrs. Subtle seizures were the commonest type of seizures observed. Hypoglycaemia and hypocalcaemia were the most common biochemical abnormality noted in neonates with seizures. Neonatal seizures can be extremely refractory to conventional AEDs, especially those associated with HIE. Seizures due to asphyxia are most refractory and due to their short course (over 72–96 hrs) and poor prognosis, early treatment is necessary and should be guided by EEG of seizures. Early diagnosis and prompt treatment of metabolic abnormalities and sepsis should be the key in management. High risk of development of epilepsy and motor and cognitive deficit is there in survivors of neonatal seizure in future.²²

REFERENCES

1. Joseph J. Volpe. Neonatal Seizures. Neurology of the new born 5th ed. Philadelphia: Saunders Elsevier, 2008; 203-244.
2. Lawrence R, Mathur A, Nguyen. A pilot study of continuous limited-channel EEG in term infants with encephalopathy. J Pediatr 2009; 154(6): 835-41.
3. Stone BS, Zhang J, Mack DW. Delayed neural network degeneration after neonatal hypoxia-ischemia. Ann Neurol 2008; 64(5): 535-46.
4. Neurological disorders. Meharban Singh. Textbook of Care of the New Born 8th ed., New Delhi: CBS publishers and distributors, 2015: 417-444.
5. Scott L. Pomeroy, Blaise F. D. Bourgeois. Disorders of the Nervous System. Rudolph's Pediatrics. Colin D. Rudolph, Abraham M Rudolph, George E. Lister, Lewis R. First, Anne A. Gershon. 22nd ed. New York: McGraw Hill Medical, 2011: 2131-2272.
6. Scher MS, Aso K, Beggarly ME, Hamid MY, Steppe DA, Painter MJ. Electrographic seizures in preterm and full-term neonates: Clinical correlates, associated brain lesions, and risk for neurologic sequelae. Pediatrics 1993; 91:128-34.

7. Tekgul H, Gauvreau K, Soul J, et al. The current etiologic profile and neurodevelopmental outcome of seizures in term newborn infants. *Pediatrics* 2006; 117:1270-80.
8. Levene M, Tudehope D, Sinha S. Neurological disorders. In: *Essential Neonatal Medicine*. Australia: Blackwell Publishing; 2008.
9. Clancy RR, Legido A, Lewis D. Occult neonatal seizures. *Epilepsia* 1988; 29:256-61.
10. Scher MS, Painter MJ. Controversies concerning neonatal seizures. *Pediatr Clin N Am* 1989; 36:281-310.
11. Lombroso CT. Prognosis in neonatal seizures. In Delgado-Escueta AV, Wasterlain CG, Treiman DM, Porter RJ (Eds). *Status epilepticus: mechanisms of brain damage and treatment*. *Advances in Neurology*. New York: Raven Press, 1983:101-113.
12. Doménech-Martínez E, Castro-Conde JR, Herraiz-Culebras T, González Campo C, Méndez-Pérez A. Neonatal convulsions: influence of the electroencephalographic pattern and the response to treatment on the outcome. *Rev Neurol*. 2003 Jan 1; 37(5):413-20.
13. Suryavanshi A. R. et al. Study of Clinical Profile in Neonatal Seizures in rural area. *International Journal of Recent Trends in Science and Technology*. Volume 11, Issue 1, 2014; 87-90.
14. Ross AL, Lomorso C. Neonatal Seizures state: A study of clinical, Pathology and electrographic features in 137 full term babies with a long term follow up. *Pediatrics* 1970; 45: 404-425.
15. Sood A, Grower N and Sharma R. Biochemical abnormalities in neonatal Seizure. *Indian J Pediatric*; 70 (3):221-224.
16. Kumar A, Gupta V, Kacchawaha and singla. A study of biochemical abnormalities in neonatal Seizure. *Indian Pediatrics*.1995; 52: 424-427.
17. G. Sahana, B. Anjaiah. Clinical Profile of Neonatal Seizures. *International Journal of Medical and Applied Sciences*. Volume 3, Issue 1, 2014:21-27
18. Lanska MJ, Lanska DJ, Baumann RJ, Kryscio RJ. A populations based study of neonatal seizures in Fayette county, Kentucky. *Neurology* 1995; 45: 724-72.
19. Ronen GM, Penney S, Andrews W. The epidemiology of clinical neonatal seizures in Newfoundland: a population based study. *J Pediatr*. 1999; Jan; 134 (1):71-5.
20. Eriksson M, Zetter Strom R. Neonatal convulsions. *Acta Pediatr Scand* 1979; 68: 807-11.
21. Brown JK, Cockburn F and Forfur JO. Clinical and chemical correlate in convulsion of new born. *Lancet*. 1992; 1:135-138.
22. Frances E. Jensen and Faye S. Silverstein. *Neonatal Seizures*. Swaiman's Pediatric Neurology. Kenneth F. Swaiman, Stephen Ashwal, Donna M. Ferriero, Nina F. Schor. 5th ed., USA: Elsevier. 2012: 33-46.

Source of Support: None Declared
Conflict of Interest: None Declared