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Original Research Article

## CLINICAL AND BIOCHEMICAL PROFILE OF NEONATAL SEIZURES ADMITTED IN NICU OF A TERTIARY CARE HOSPITAL

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### ABSTRACT

Several factors contribute to seizures among neonates. To avoid complications from underrecognition of clinical seizures and the adverse effects of medications administered, the diagnosis and management of neonatal seizures necessitate an interprofessional approach. Present study was done to study the clinical and Biochemical profile of neonates with seizures admitted to a tertiary care hospital, Chennai. In the present study, 50 neonates satisfying the inclusion and exclusion criteria were included in the study. The main Mode of delivery was Normal vaginal delivery (50%) followed by LSCS (40%) and Assisted delivery (10%). 54% were male and 46% were female and majority of babies were delivered at Term i.e. 72% and 28% were Pre term babies. The mean day of onset of seizures in the present study was  $3.18 \pm 2.09$ . Based on day of onset of seizures, with in 24hrs (28%), 24hrs to 72 hrs (46%), 4th day to 1 week (22%), more than 1 week (4%). Based on type of seizure 64% had subtle type, 26% had Tonic type and 10% had Clonic type of seizures. In this study, 24% had Hypoglycemia, and 10(20%) had Hypocalcemia, 14% in the present study had Hyponatremia, and 2(4%) had Hypomagnesemia, 2(4%) had Hypernatremia, 6% had combination of Hypocalcemia and Hypoglycemia. Hypocalcemia, Hypoglycemia, Hyponatremia were the common biochemical abnormalities observed in our study. Subtle seizures were the common type of seizures observed among both pre term and term infants.

**KEYWORDS:** Neonatal Seizures, Hypernatremia

Neonatal seizures are a frequently encountered neurologic condition among neonates (Glass, 2014) (Plouin and Kaminska, 2013) (Abend and Wusthoff, 2012). They are defined as the occurrence of a sudden, paroxysmal, abnormal alteration of the electrographic activity at any given point from birth to end of the neonatal period.

The incidence of neonatal seizures was reported between 1 to 5.5 per 1000 live births among term infants, and incidence is higher among preterm infants (Vasudevan and Levene, 2013) (Orivoli *et al.*, 2015) (Ronen *et al.*, 1999) (Lanska *et al.*, 1995).

Because of its immaturity, the neonatal brain is more prone to seizures due to an imbalance of neuronal excitation over inhibition (Glass, 2014). Numerous factors cause this discrepancy. The primary factor is the neonatal neuron in its developmental. Other factors include the development of excitatory synapses before inhibitory synapses and early maturation of voltage-gated ion channels specific to depolarization. (Jensen, 2009)

The clinician should immediately rule out hypoglycemia, hyponatremia, hypomagnesemia, hypocalcemia sepsis/meningitis/encephalitis. (Nardone *et al.*, 2016)

To avoid complications from underrecognition of clinical seizures and the adverse effects of medications administered, the diagnosis and management of neonatal seizures necessitate an interprofessional approach. The present research was done to study the clinical and Biochemical profile of neonates with seizures admitted to a tertiary care hospital, Chennai.

### METHODS

#### Study Population

All the neonates from birth to 28 days of life satisfying the inclusion and exclusion criteria who got admitted in the Neonatal Intensive Care Unit of a Shri Sathya Sai Medical College and Research Institute.

#### Inclusion Criteria

- All Term and preterm babies presenting with seizures including both intramural and extramural neonates were enrolled in the study and sample size 50.

#### Exclusion Criteria

- Babies already on anticonvulsant therapy.
- Mothers or caregivers not giving consent for the study.

## DATA COLLECTION

An informed consent was taken from the parents/Care givers before the enrolment of the study participant into the study.

Detailed antenatal history like, maternal age, medical history, parity, gestational age, history of illness during pregnancy, drug history during pregnancy.

Intranatal history like, evidence of fetal distress, Apgar score, type of delivery, and medication given to mother during delivery and perinatal history were recorded.

Baseline characteristics of all the babies were noted on the prescribed proforma which includes name, age, sex, address weight, length, head circumference, gestational age, which is determined from mother by last menstrual period or ultrasound study of fetus before birth or by new Ballard scoring of the neonate. Thorough physical examination was done and seizures were diagnosed by clinical observation. Clinical details of each seizure episode were recorded like age at onset of seizures, duration of seizure, number and type of seizure. Seizure was classified into subtle, focal clonic, multifocal clonic, tonic, and myoclonic as per criteria by Volpe.

Before instituting specific treatment, 3ml of blood will be collected by sterile technique in a sterile test tube for following investigations like blood glucose, total serum calcium levels, serum sodium and serum magnesium levels apart from capillary blood glucose estimation by glucostrix method.

## STATISTICAL ANALYSIS

Data entry and tabulation was done using Microsoft Excel 2013 and Analysis using SPSS 16. For quantitative data, mean  $\pm$  SD was calculated. For Qualitative data, Frequency and Percentages were estimated. Chi square test was used to find the significant association between the study groups. P value of  $<0.05$  was considered to be statistically significant.

## RESULTS

In the present study, 50 neonates satisfying the inclusion and exclusion criteria who got admitted in Neonatal Intensive Care Unit (NICU) of Shri Sathya Sai Medical College and Research Institute were included in the study. Demographic profile of the study population (Table 1).

**Table 1: Demographic profile of study participants**

Variable	Frequency (%)	
Mode of Delivery	Normal Vaginal	25 (50%)
	LSCS	20 (40%)
	Assisted delivery	5 (10%)
Gender	Male	27 (54%)
	Female	23 (46%)
GA at delivery	Term	36 (72%)
	Pre Term	14 (28%)
Delivery	Inborn	38 (76%)
	Outborn	12 (24%)
Mean Birth weight	2.67 $\pm$ 0.74 kg	
Mean day of onset of seizures	3.18 $\pm$ 2.09 days	

Based on day of onset of seizures, with in 24hrs (28%), 24hrs to 72 hrs (46%), 4th day to 1 week (22%), more than 1 week (4%).

Based on type of seizure 64% had subtle type, 26% had Tonic type and 10% had Clonic type of seizures.

In this study, 24% had Hypoglycemia and 10(20%) had Hypocalcemia, 14% in the present study had Hyponatremia, and 2(4%) had Hypomagnesemia, 2(4%) had Hypernatremia, 6% had combination of Hypocalcemia and Hypoglycemia (Table 2). 2% had combination of Hypocalcemia and Hypomagnesemia.

Among pre term 5 (35.71%) had Hypoglycemia, and among term babies 19.44% had Hypoglycemia. ( $p>0.05$ ). Among pre term 42.86% had Hypocalcemia and among term 22.22% had Hypocalcemia. ( $p<0.05$ ) (Table 3)

Among term babies 11.11% had Hyponatremia and 21.43% had Hyponatremia among pre term. ( $p>0.05$ ). 14.29% had hypomagnesemia, and none presented with hypomagnesemia among term babies. ( $p<0.05$ )

5.56% of term babies had Hypernatremia. ( $p>0.05$ ). 21.43% of preterm babies had both Hypoglycemia and Hypocalcemia. ( $p<0.05$ ).

Among preterm babies, 64.29% had subtle seizures, 21.43% with Tonic, 14.29% had Clonic seizures. Among Term babies, 63.89% had Subtle seizures, 27.78% with Tonic and 8.33% had Clonic seizures.(p>0.05) (Figure 1).

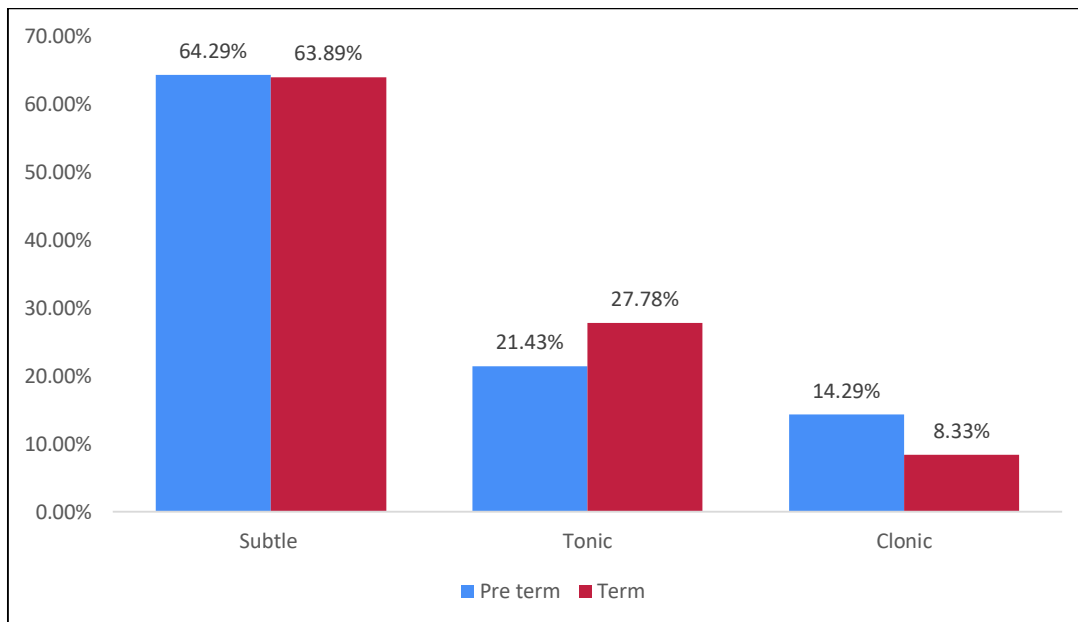


Figure 1: Distribution of Type of Seizures based on Gestational age at birth

Table 2: Summary of various biochemical abnormalities in study population

	Frequency (n)	Percentage(%)
Hypoglycemia	12	24%
Hypocalcemia	10	20%
Hyponatremia	7	14%
Hypomagnesimia	2	4%
Hypernatremia	2	4%

Table 3: Hypocalcaemia in the study population

Hypocalcaemia	Pre term	Term
Yes	6 (42.86%)	4 (22.22%)
No	8 (57.14%)	32 (88.89%)
Total	14 (100%)	36 (100%)

Chisquare value – 6.35 , p = 0.01\* (statistically significant)

**DISCUSSION**

Seizures are the common neurological disorders among newborn. In our study, out of 50 neonates with seizures, majority of babies were delivered at Term i.e.72% and 28% were Pre term babies. Among the study population, the SGA was 12 (24%), AGA was 36 (72%), and LGA was 2 (4%). Similarly, in a study conducted by Moayedi and Zakeri, term AGA babies accounted for 83.6 percent, preterm AGA babies accounted for 12.7

percent, and post-term AGA babies accounted for 3.6 percent. (Moayedi and Zakeri, 2007)

In our study, neonatal seizures were common among males i.e. 54%. In our study, The mean birth weight was 2.67 ± 0.74 kg. Majority i.e. 58% were normal weight at birth and 42% were low birth weight.. Moayedi and Zakeri's study revealed a similar result of 73.6 percent > 2.5 kg and 22.7 percent in <2.5 kg. (Moayedi and Zakeri, 2007)

In our study, the majority of neonates with seizures were delivered via normal vaginal delivery (50%) followed by LSCS (40%) and Assisted delivery (5%). (10 percent ). In a study of neonatal seizures conducted by Mahaveer et al, 68.7 percent were delivered vaginally, 28.1 percent via lower segment caesarean section, and 3.1 percent via forceps delivery. (Lakhra, 2003)

The mean day of onset of seizures in the present study was  $3.18 \pm 2.09$ . Based on day of onset of seizures, with in 24hrs (28%), 24hrs to 72 hrs (46%), 4th day to 1 week (22%), more than 1 week (4%). This presentation is consistent with earlier studies. (Plouin and Kaminska, 2013) (Kumar *et al.*, 2007) (Rabindran *et al.*, 2015)

Based on type of seizure 64% had subtle type, 26% had Tonic type and 10% had Clonic type of seizures. Aziz *et al.*, 2015 reported clonic convulsions are more common while Taksande *et al.*, 2005 reported subtle seizures are the most common among 50% cases. In a study of neonatal seizures by Kumar and Gupta, 46.55% were subtle seizures and 21.55% were generalized tonic seizures (Rabindran *et al.*, 2015). In a study of neonatal seizures by Philip et al, subtle seizures were the most common occurring in 51% (27 of 53), followed by focal clonic (42%), multifocal clonic (30%) and GTS (23%). (Brunquell *et al.*, 2002)

In this study, 24% had Hypoglycemia, and 10(20%) had Hypocalcemia, 14% in the present study had Hyponatremia, and 2(4%) had Hypomagnesemia, 2(4%) had Hypernatremia, 6% had combination of Hypocalcemia and Hypoglycemia. 2% had combination of Hypocalcemia and Hypomagnesemia.

In a study done on 100 neonates by Estan and Hope, HIE accounted for 37%, intracranial hemorrhage 7%, meningitis 5%, and hypoglycemia 3% (Estan and Hope, 1997). Goldberg in a 10-year review of 81 cases had HIE (16%), ICH (6%), hypoglycemia (6%), hypocalcemia (2%), and meningitis (8%), and remaining were due to congenital abnormalities (Goldberg, 1982). Nelson et al in 2006 observed that 10-20% of cases were due to hypocalcemia and hypomagnesemia. (Kliegman *et al.*, 2007)

## CONCLUSION

Hypocalcemia, Hypoglycemia, Hyponatremia were the common biochemical abnormalities observed in our study. Subtle seizures were the common type of seizures observed among both pre term and term infants.

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