

# Study of Clinical and Biochemical Profile in Neonatal Seizures

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## Abstract

**Background:** Neonatal seizures are one among the common as well as distinct clinical indexes of neurological system dysfunction implicating mortality besides long term morbidities that might affect the development of brain. Timely diagnosis is said to reiterate a positive outcome in the management of this disorder. In places where advanced diagnostic techniques could not be implemented, the etiology of these seizures could be determined by analysing biochemical parameters.

**Aim:** To study the incidence of biochemical abnormalities associated with neonatal seizures.

**Methods:** This prospective study was conducted in the department of Special Newborn Care Unit in Government Headquarters, Government Virudhunagar Medical College Hospital. After taking a complete history and appropriate physical examination, blood sample was collected for detecting metabolic abnormalities before instituting specific therapy.

**Results:** The current study records the prevalence of seizures to be predominant in AGA neonates. Neonates with birth weight greater than 2.5kg and those delivered by NVD were reported with higher number of seizures. Male neonates were affected in higher numbers with a predominant onset time within 3 days after birth. Subtle type of seizure was found to have a leading occurrence. Among the biochemical etiologies analysed, hypoglycaemias followed by hypocalcemia were recorded.

**Conclusion:** The success of management of neonatal seizures is dependent on timely diagnosis which could be effectively facilitated by the analysis of biochemical parameters in an efficient and more economic ways. In such way the analysis of these biochemical attributes could be employed as effective strategy in the management of this disorder.

**Keywords:** neurological dysfunction, diagnosis, hypoglycaemia, hypocalcemia, prognosis.

## INTRODUCTION

A neonatal period comprises the initial 28 days of an infant and is the most defenceless period of a child. Seizures can occur in both neonatal terms, reasoning for the prevalence of higher fatality as well as morbidities worldwide.<sup>[1]</sup> Neonatal seizures are a set of convulsions that are said to occur since birth towards the completion of neo-natal period. This condition is associated with the occurrences of convulsive, repetitive besides stereotypical events.<sup>[2]</sup> Neo-natal period is designated as the most vulnerable period for the development of seizures, can encompass a clinical manifestation that may exist as either for a few

days or produce long term effects vital enough to cause damage to the brain that might summon an emergency management strategy.<sup>[3]</sup>

As the neonatal seizure denote a set of non-specific response to the immature neurological system of the infants, deaths along with iterating serious complications on both the motor and cognitive functionalities of the child.<sup>[4]</sup> As an added complication, identifying the decisive etiology for neonatal seizure is difficult and varies with the age of children. Hence the successful management of a neonatal seizure is largely dependent on the appropriate recognition of etiology that bases an effective therapeutic plan.<sup>[3]</sup> Also an early diagnosis could always deliver a better treatment result, lack of proper diagnostic procedures such as synchronized video-EEG monitoring in most of the developing countries implies a great challenge in the management of this neurological disorder.<sup>[5]</sup>

In places where EEG monitoring for early diagnosis for neonatal seizures is practically impossible, clinical

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conditions along with various biochemical attributes could be used for the accurate identification of these seizures.<sup>[6]</sup> Several biochemical instabilities transpire recurrently in neonatal seizures. These aspects present themselves as either a primary origin or concomitant anomalies.<sup>[7]</sup> Such features are frequently under-diagnosed. Prompt recognition besides the management of these biochemical instabilities are not only crucial for optimum management of these seizures but are also reported to have a positive influence of the long-term morbidities effected by them.<sup>[8]</sup>

**Aim**

To study the incidence of biochemical abnormalities associated with neonatal seizures.

**MATERIALS AND METHODS**

This prospective study was conducted in the department of Special Newborn Care Unit in Government Headquarters, Government Virudhunagar Medical College Hospital from June 2020 to March 2021. A total of 100 neonates with seizures were included. Exclusion criteria: Neonates with birth asphyxia were excluded. A detailed antenatal history and baseline characteristics of all the babies such as gestational age, term, mode of delivery, age, gender, birth weight were noted. Clinical details were recorded, i.e., age at onset of seizures, duration of seizure, number, and type of seizure. Clinical details of each seizure episode were recorded, such as age at onset of seizures, duration of seizure, number, and type of seizure. Criteria for biochemical attributes were observed that included hypo and hyper glycemia, hypo and hypernatremia along with hypomagnesemia (Table 1).

**RESULTS**

This study included a total of 100 neonatal term (82) as well as pre-term (18) with 44 female as well as 56 male patients. Among them the categorization of patients based on gestational age was done that included 19 small-for-gestational age (SGA), 79 appropriate for gestational age (AGA) and 2 small-for-gestational age (LGA) patients (Table 2). Mode of delivery was also included that encompassed forceps mode (1), Lower segment caesarean

section (LSCS) (37) as well as normal vaginal delivery (62) cases. Based on the birth weight of the infants, 41% of them recorded <2.5kgs and 59% of them were >2.5kgs of weight. The onset of seizures commenced in <24 hours among 43 patients and between 1-3 days in 30 patients. The seizures appeared within 4 to 7 days in 21 patients as well as more than 7 days in 6 patients (Table 2).

Among the types of seizure, 63% of them were subtle and 25 and 12% seizures were observed to be Tonic and Clonic (Table 3).

Among the observation of s electrolyte abnormalities, hypoglycaemia was recorded in 21% of patients followed by Hypocalcemia in 17% of the patients. Hyponatremia was recorded in 12% of patients followed by Hypernatremia and Hypomagnesemia in 4 and 3% of the patients (Table 4).

**DISCUSSION**

Seizures are most commonly prevalent in neonatal period. While early diagnosis determines the success in the

**Table 2: Descriptive analysis of patients under study**

Variables	Frequency	Percentage
Gestational age		
SGA	19	19.0%
AGA	79	79.0%
LGA	2	2.0%
Term		
Preterm	18	18.0%
Term	82	82.0%
Mode of delivery		
Forceps	1	1.0%
LSCS	37	37.0%
NVD	62	62.0%
Birth weight		
<2.5	41	41.0%
>2.5	59	59.0%
Gender		
Male	56	56.0%
Female	44	44.0%
Onset of Seizures		
<24 hours	43	43.0%
1 to 3 days	30	30.0%
4 to 7 days	21	21.0%
> 7 days	6	6.0%

**Table 1: Criteria for biochemical attributes**

Hypoglycemia	<40 mEq/dl (capillary blood) <45 mEq/dl (venous blood)
Hypocalcemia	<7 mg/dl for preterm neonates <8 mg/dl for term neonates
Hyponatremia	<135 mEq/l
Hypomagnesemia	< 1.5 mg/dl
Hypernatremia	>145mEq/l

**Table 3: Descriptive analysis of type of seizures in study population**

Type of Seizure	Frequency	Percentage
Subtle	63	63.0%
Tonic	25	25.0%
Clonic	12	12.0%

**Table 4: Descriptive analysis of type of electrolyte abnormalities in study population**

Electrolyte abnormalities	Frequency	Percentage
Hypoglycemia	21	21.0%
Hypocalcemia	17	17.0%
Hyponatremia	12	12.0%
Hypomagnesemia	3	3.0%
Hypernatremia	4	4.0%

outcome of treatment procedures, in places where timely diagnosis is impossible delineation of various biochemical attributes to the onset of seizures could prove beneficial. As contemplation, the current study was aimed to categorize neonatal seizures through the application of clinical criteria and also to find out the biochemical abnormalities associated with these clinical seizures.

In the current study seizures were recorded in male patients predominantly. In a similar study conducted by previous researchers also the occurrence of seizures were recorded more in male patients.<sup>[9,10]</sup> With respect to the gestational age, the more number of seizures were observed in infants with AGA followed by SGA. Similar dominance of seizure occurrence in infants with AGA was also previously reported by Sandhu *et al.*<sup>[11]</sup> Correlating the mode of delivery and occurrence of seizures, NVD recorded maximum number of seizures. The result was consistent with previous studies.<sup>[6,12,13]</sup> A higher rate of occurrence of seizures in infants with weight > 2.5kg was recorded. A likely occurrence of seizures in infants with higher weight was also reported by previous researchers.<sup>[6,7]</sup>

With reference to the onset of seizures, a predominant number of seizures occurred less than 24 hours followed by 1-3 days. The current study observed the significant occurrence of subtle seizures. The largest occurrence of seizures within 3 days along with a predominant occurrence of subtle type of seizures was recorded and reported by Das *et al.*<sup>[6]</sup> The higher frequency of subtle seizures was also reported by various researchers.<sup>[14,15]</sup> Based on the biochemical attributes; neonates with hypoglycaemia were predominant followed by hypocalcemia as well as hyponatremia. In a similar study conducted by Rose *et al.*,<sup>[16]</sup> neonates with hypoglycaemia recorded maximum number of seizures. Parvin *et al.*<sup>[10]</sup> also reported the predominance of hypoglycaemic condition in neonates with seizures but the conditions of hypernatremia or hyperglycemia were not found in his study. The second most prevalent biochemical abnormality was hypocalcemia. This was also consistent with the findings of previous researchers who reported the leading occurrence of hypoglycaemia

followed by hypocalcemia.<sup>[17,18]</sup> Hypocalcemia was also reported as the major etiology for the occurrence of seizures in neonates earlier.<sup>[19]</sup>

## CONCLUSION

Hence the following study denotes the beneficial aspects of consideration of biochemical attributes in the timely diagnosis of neonatal seizures in conditions where advanced radio EEG diagnostic techniques could not be implemented. As the timing of identifying the disorder plays a crucial role in the management and prevention of long term morbidities, the biochemical profile of neonates could offer as effective tools in providing earlier prognostic identification of the disorder and also a reliable management strategy.

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