

## Original Article

### Serum Calcium Status of Neonates with Seizure in a Tertiary Care Hospital

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#### Abstract

**Background:** Seizure is a common neurological disorder in neonatal age group. Primary metabolic derangement is one of the common reason behind this convulsion during this period. Among metabolic abnormalities, hypocalcaemia is most common followed by hypoglycemia and hypomagnesaemia.

**Objectives:** The present study was carried out to assess calcium status in the serum of neonates with convulsion, where no obvious cause of convulsion was found.

**Methodology:** This prospective case control study was conducted in the neonatal ward of Dhaka Medical College Hospital over one year from July 2003 to June 2004. A total of 50 neonates (1- 28 days) who had convulsion but no apparent reasons of convulsion had been found out, were enrolled as cases and 50 age, sex body weight matched neonates who had no history camalnia admitted cases of were enrolled as controls. After a quick clinical evaluation and control of convulsion and before giving any specific treatment serum calcium status was measured by colormetric determination (O- CRE-SOL Phahalein complex) method. Neonatal hypocalcemia is considered if serum calcium value less than 1.75 mmol/L (7 mg/dl).

**Results:** Among a total of fifty cases, 60% had hypocalcemia, and about 20% of controls also had low calcium level without any manifestation. The mean serum calcium level of cases and controls were  $1.62 \pm 0.29$  and  $2.07 \pm 0.03$  mmol/l respectively ( $p < 0.001$ ).

**Conclusion:** It is seen that hypocalcemia is an important cause of neonatal seizure due to primary metabolic abnormalities. So early recognition and treatment could save these babies from long term neurological sequelies.

**Key words:** Neonate, Seizure, Hypocalcemia.

#### Introduction:

Seizure is a common neurological disorder in neonates. They are at particular risk because seizure among them can be a manifestation of metabolic, toxic, infectious and structural disorder during this time than at another period of life<sup>1</sup>. The manifestations of neonatal, seizure are extremely subtle<sup>2,3</sup>. Repetitive lip smacking, cycling or swimming movements, blinking, nystagmus, deviation of eye and

alteration of respiratory rate including apnea can be manifestations of neonatal seizure which is sometimes difficult to distinguish from neonatal movement<sup>1</sup>.

As many as 20% newborn in intensive care unit may have seizure activity at sometime<sup>4,5</sup> The overall prevalence is as low as 0.5% in term and as high as 21% in preterm babies<sup>6,7</sup>.

Presence of seizure does not constitute a diagnosis but it is a symptom of an underlying central nervous system (CNS) disorder due to systemic or biochemical disturbances<sup>8</sup>. Biochemical disturbances occur frequently in the neonatal seizure. In their presence, it is difficult to control seizure and there is a risk of further brain damage. Early recognition and prompt treatment of biochemical disturbance is essential for optimal management and satisfactory

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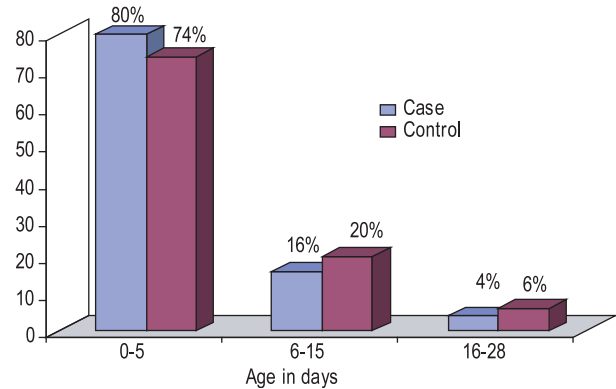
long term outcome<sup>5</sup>. Different types of biochemical abnormalities can cause seizure like hypocalcaemia, hypoglycemia, hypomagnesemia, hypernatremia, hyponatremia, hyperbilirubinemia etc<sup>8,9,10</sup>. Among primary metabolic abnormalities, that occurs in patients with neonatal seizure, hypocalcaemia is the most common followed by hypoglycemia and hypomagnesaemia<sup>5</sup>. Hypocalcaemia is defined as total serum calcium levels of less than 1.75 mmol/L(7mg/dl)<sup>8</sup>. Though several studies on the association with neonatal seizure had been carried out in our country but very few references exist with that of serum calcium. So it is important to measure serum calcium status in neonates with seizure, who had not any apparent reasons of convulsion. It is important to know as because early recognition and treatment can significantly influence the better outcome of neonates with seizure.

**Materials and Method:**

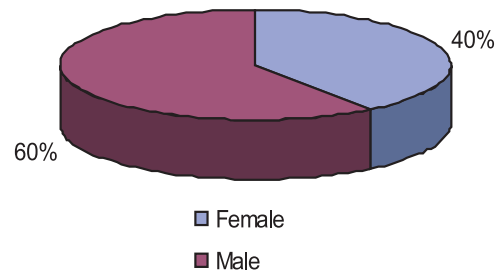
This case control study was carried in neonatal care unit of Dhaka Medical College Hospital over 1 (one) year period from July 2003 to June 2004. A total of one hundred babies were studied, among them fifty neonates who had convulsion but had no history of fever, septicemia, meningitis, perinatal asphyxia, birth injuries, CNS anomalies or other obvious causes of convulsion were enrolled as cases and fifty age, sex and body weight matched neonates were enrolled as controls who were admitted to neonatal ICU for other illness not known to cause convulsion. Informed consent was obtained from all participants according to the study protocol approved by the ethical review committee of BCPS. Detailed history was taken about presenting illness. Antenatal, natal and postnatal history, socioeconomic history, family history regarding consanguinity of marriage between parents, affection of previous sibs, family history of epilepsy were taken very carefully. A through physical examination was done in every neonate. Convulsion was treated by per rectal diazepam (.5 mg/kg), then 3 ml of venous blood was collected from femoral vein as soon as possible for the measurement of serum calcium along with other cause of convulsion and other routine investigations. Serum calcium level was measured by colorimetric determination (O- CRE-SOL Phahalein complex method) in the Department of Biochemistry of Dhaka Medical College. Neonatal hypocalcemia is considered if serum level is less than 1.75 mmol/L (7 mg/dl). Data were analyzed by SPSS / 10.5 using appropriate statistical tools. A p value of <0.05 was regarded to be significant at 95% CI.

**Results:**

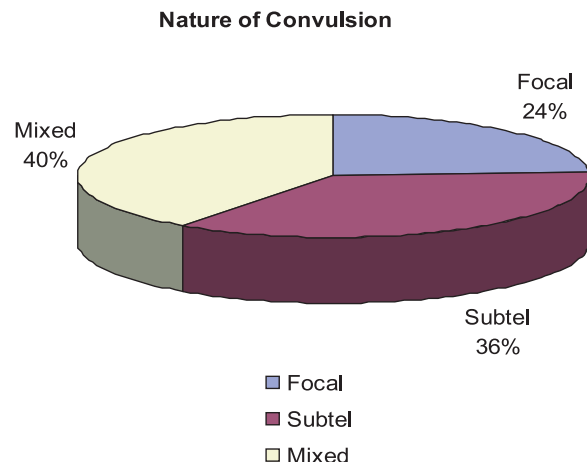
Among fifty cases, 60% were male and 40% were female, 80% were within 1<sup>ST</sup> 5 day and remaining 20% were between 6-28 days, distribution of controls were also similar. Mean age of both cases and controls were 4.37 and 4.22 days respectively. Of different types of convulsion it was found focal in 24%, subtle in 40% and mixed in 36%. Hypocalcemia was present in 60% of cases. It was noted that about 20% of controls also had low calcium level, though they had no manifestation The mean serum calcium level of cases and controls were 1.62 ± 0.29 and 2.07 ± 0.03 mmol/l (p<0.001) respectively.



**Fig-1: Age distribution of cases and controls**



**Fig-2: Sex incidence of cases and controls**



**Fig-3: Nature of convulsion**

**Table- I**

*Number and percentage of neonates by duration of convulsion*

Duration (in minute)	Case(n=50)	Control(n=50)
<5	32(64%)	-
5-30	18(36%)	-

**Table-II**

*Presentation of biochemical abnormalities in cases and controls.*

Total No	No of Hypocalcemia	Percentage of hypocalcemia	Serum Calcium Mmol/L (mean ± SD)
Case (n= 50)	30	60%	1.62 ± 0.29
Control (n=50)	10	20%	2.07 ± 0.30

(p value <.001)

**Discussion**

In this study, the neonates who had no apparent cause of convulsion were studied and were compared with age and sex matched controls. Kumar et al <sup>7</sup> in a study showed that primary metabolic disorder accounted for 25% cause of neonatal convulsion. In a study which was carried out over 2 years period on neonatal convulsion by Cockburn et al <sup>9</sup>, it was found that 55% of neonatal convulsions were due to primary disturbances of mineral metabolism. Metabolic cause of convulsion is common in Bangladesh due to delayed and infrequent breast feeding, faulty feeding practices. This is in contrast to report from western countries where improvement in infant feeding practices have made this category as uncommon cause of seizure<sup>7</sup>.

Among primary metabolic abnormalities in neonates, hypocalcaemia is most common <sup>6</sup>. In this study 60% of seizures were due to hypocalcaemia. Almost similar findings were found by Kumar et al<sup>7</sup>. Arvind sood et al <sup>5</sup> in a study of biochemical abnormalities in neonatal seizure showed that most common cause are hypoglycemia followed by hypocalcaemia. In this study 20% of control had hypocalcaemia. Hypocalcaemia is common between !2-!7 hr of life, specially in premature infants, in infant with asphyxia at birth, and infants of diabetics mother ( early neonatal hypocalcemia)

There is no evidence in the literature concerning the level of plasma calcium which defines neonatal hypocalcemia<sup>9,10</sup>. Some authors have defined neonatal hypocalcemia as plasma calcium level less than 8 mg/dl <sup>9</sup>, less than 7.5 mg/dl and less than 7 mg/dl <sup>7</sup>. In this study neonatal hypocalcaemia was defined as plasma calcium level less than 1.75 mmol/ L (7 mg/dl).

Duration of convulsion has prognostic value. Seizures lasting more than 30 minutes bears a poor prognosis<sup>8</sup>. In this study 64% of the babies had convulsions of less than 5 minutes and 36% had convulsions lasting 5-30 minutes. Clinical observation without EEG may underestimate the true incidence or duration of neonatal seizure. Electrical seizure may persist without clinical signs following an introduction of anticonvulsant. Clinical recognition of seizures is impossible in babies, who have been paralyzed therapeutically. EEG monitoring was not done in this study due to lack of facility.

Stoliar et al. studied 115 neonates with seizure, which showed significantly higher incidence of hypocalcaemia in full term and premature infants<sup>11</sup>. Jajoo et al. showed that in 13 out of 35 infants with convulsion had serum calcium level 7.5mg/dl<sup>12</sup>. Tsang el al showed that, mean serum calcium was 7.51 ± 0.25 mg/dl in neonates with convulsion compared with 8.12 ± 0.23 mg/dl in control infants (p<0.0025)<sup>13</sup>. In the present study, mean serum calcium was 1.62 ± .29 which is significantly lower than the level in controls 2.07 ± .30 mml/L (p<0.0001).

Finding of present study were consistent with other studies in some aspect and different in some other aspects. A study containing greater number of cases covering a wide range of time may overcome these differences although varied associated factors like race and geography may have their individual effect on the problem.

**Conclusion & Recomendation:**

From the study it is revealed that hypocalcemia is common among neonatal seizure due to primary metabolic abnormalities, where no cause of seizure is identified. So early recognition and treatment could save these babies from long term neurological sequelies. Further studies with large sample size covering both urban and rural population will give more information about the biochemical changes in neonatal convulsions in our country.

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