

Serum Calcium and Albumin Levels in the Neonatal Seizure

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Neonatal seizure is a common neurological disorder that adversely affects the neonatal homeostasis. It may cause further brain injury and interrupt respiration. To observe serum calcium and albumin levels in neonatal seizure this cross sectional study was carried out in the department of the Physiology, Rangpur Medical College, Rangpur, Bangladesh between 1st July, 2007 to 30th June, 2008. The study population were group – A that included 60 healthy neonates (control) and 60 neonates of both sexes suffering from seizure of age ranged from 01 to 28 days were experimental group (Group – B). Seizure neonates (Group – B) were recruited from the pediatric department in Rangpur Medical College Hospital. Age and sex matched 60 apparently healthy neonates were collected from inpatient department of obstetrics and gynaecology in Rangpur Medical College Hospital for comparison (Group – A). Serum calcium and albumin of all these neonates were determined and data were analyzed by unpaired 't' test. In this study the mean total serum calcium and albumin levels were significantly lower ($P < 0.001$) in the neonates suffering from seizure than those of control. So it may be concluded that, deficiency of calcium and albumin may be a cause of neonatal seizure.

[Dinajpur Med Col J 2015 Jul; 8 (2):200-203]

Key words: Calcium, albumin, seizure, neonate

Introduction

The seizure is a common neurological problem in the neonates with a frequency of about 1.5–14/1000 live birth.¹ Neonatal seizure is a common cause of neonatal morbidity and mortality.² It is an abnormal paroxysmal electrical discharge in the cerebral cortex. The changes occur in consciousness, behavior, movement or other body functions.

Neonatal seizure is caused by metabolic derangements like hypocalcaemia or hypoglycaemia.³ Other causes include hypoxic-ischaemic encephalopathy (HIE), meningitis, ischaemic stroke, intracranial hemorrhage, developmental anomalies and tumor of brain.

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Neonatal seizure adversely affects the neonatal homeostasis. It may cause brain injury and also interrupt respiration. Metabolic derangements like hypoglycaemia or hypocalcaemia are an avoidable cause of mortality and neurodevelopmental impairment. So it is very important to determine the cause of neonatal seizure. If it is due to reversible causes like hypocalcaemia, then we can initiate proper treatment. Here outcome is much better and prognosis is good.

In Bangladesh the neonatal mortality rate is 37/1000 live birth.⁴ It is necessary to achieve the targets for reduction of child mortality under the United Nation's Millennium Development Goals.⁵ In the western country pregnant and lactating mothers usually used to take balanced diet. Their food habit is different from Bangladesh. They are well nourished and healthy. The literatures and journals related to this study mostly reflects those population. But from the socioeconomic point of demography this study in Bangladesh might be different from the western society. Therefore this study may explore the role of serum calcium and albumin to the occurrence of neonatal seizure.

Methods

The cross sectional study was conducted in the department of the Physiology, Rangpur Medical College, Rangpur, Bangladesh from 1st July, 2007 to 30th June, 2008. Study subjects were selected by the following purposive sampling procedure and the study was approved by the ethical review committee of Rangpur Medical College. Total number of 120 neonates were enrolled in the study. Sixty(60) neonates of both sexes suffering from seizure of age ranged from 01 to 28 days were experimental group (group – B).

Age and sex matched 60 apparently healthy subjects (group – A) was served as control group. Seizure neonates were recruited from the pediatric department in Rangpur Medical College Hospital. While control neonates were collected from inpatient department of obstetrics and gynaecology in Rangpur Medical College Hospital. Any neonates suffering from jaundice or having obvious congenital anomalies were excluded from the study. The objectives and the procedures of the study were explained in detail to the parents/guardians. They were informed about the risk and benefit before enrollment of the study. Then the informed written consent of the parents/guardians were obtained from the willing parents/guardians. All the neonates admitted in the pediatrics ward during the study period were the population of interest. Among them the neonates who were suffering from seizure on admission were taken as study subjects. Neonatal seizure was detected in consultation with the assistant professor in the pediatric department.

Serum calcium and albumin of all these neonates were determined by Cresophthalein-complexone (CPC) and photometric coloremtric test (BCG) method respectively. Statistical analysis were performed by using SPSS for windows version 12.0. Independent sample t-test compares the mean of serum calcium and albumin between the two groups. P value < 0.05 was considered as the level of significance.

Results

Mean values of serum calcium and albumin levels were significantly lower (P < 0.001) in the neonates suffering from seizure (group B) than those of control (Group A, Table I).

Table I: Showing mean \pm SD total serum calcium and albumin levels in different groups

Parameter	Group A n = 60 mean \pm SD	Group B n = 60 mean \pm SD	't' value	P
Total serum calcium level mmol/L	02.31 \pm 0.26 (01.75 – 02.70)	01.66 \pm 0.29	3.222	< 0.001
Ionized serum calcium level	01.0 \pm 0.09 (0.78 – 01.26)	0.70 \pm 0.21 (0.38 – 01.10)	2.8165	< 0.001
Serum albumin level gm/dl	03.80 \pm 0.60	02.51 \pm 01.05	8.274	< 0.001

Data were expressed as mean \pm SD. Figures in parentheses indicate range. Statistical analysis was performed by Independent sample t-test.

A – Healthy neonates (control); B – Neonatal seizure; n – Number of subjects.

SD – Standard deviation; *** = $p < 0.001$ indicates highly significant.

Discussion

In the present study hypocalcaemia was found in the neonates suffering from seizure. The mean total serum calcium level was significantly lower ($P < 0.001$) in the neonates suffering from seizure than that of control. This finding is in consistent with that of some other researchers. The researchers suggested that hypocalcaemia was commonly seen in the premature and low birth weight neonates due to decreased intake, less absorption, intake of cow's milk, cessation of maternal calcium transfer to the neonates and functional hypoparathyroidism.^{2,5-9} Refractoriness of bone to mobilize calcium might be one of the factors to cause hypocalcaemia in the premature neonates.¹⁰ Early onset neonatal hypocalcaemia occurred in the neonates born by cesarean section It was due to failure of proper breast feeding in the premature and low birth weight babies.^{9,11} It might also be result of relative unresponsiveness of parathyroid hormone.^{7,11,13}

But late onset hypocalcaemia was commonly found in the full-term and average weight neonates due to cow's

milk and commercial food.^{8,9,11,12} Besides this perinatal asphyxia and hypoxicischaemic encephalopathy were more commonly associated with neonatal seizure.^{3,8,10,14,15}

In addition, in the present study a decrease in albumin level was observed in the preterm neonates suffering from seizure than that of control. It has been suggested that the liver of the preterm neonates is not mature enough to produce adequate amount of albumin.^{9,13}

From the above discussion, it may be concluded that the lower level of total serum calcium in the neonates suffering from seizure in the present study may be due to functional hypoparathyroidism, inadequate breast feeding and less absorption. Though it is very difficult to comment on this as we have not studied the serum parathyroid hormone level in the neonates suffering from seizure.

Conclusion

From this study it can be concluded that serum calcium and serum albumin levels are lower in the neonates suffering from seizure. These are common in the preterm neonates and in the neonates associated with hypoxicischaemic encephalopathy.

Acknowledgement

Authors of this study are thankful to the department of paediatrics and to the department of obstetrics and gynaecology, Rangpur Medical College & Hospital for permission to collect samples. The authors also acknowledges partial financial support from research grant of DGHS of Bangladesh. The authors are also grateful to the parents/guardians of the neonates for their co-operation.

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