

## Calcium status of perinatal asphyxiated newborn babies

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### Abstract

**Background:** Birth asphyxia is one of the major neonatal problems in Bangladesh. It is a common cause of neonatal hospital admission. **Objective:** To evaluate calcium status in birth asphyxiated babies of different grading of Hypoxic Ischemic Encephalopathy admitted into pediatrics department of Rajshahi Medical College Hospital. **Methods:** This cross sectional comparative study was conducted among birth asphyxiated babies admitted in Rajshahi Medical College Hospital. Total 266 neonates, 133 asphyxiated and 133 healthy neonates were selected as cases and controls by inclusion and exclusion criteria. Data were collected by data collection sheet through interview of the mothers, pathological reports and patients' treatment files and attending doctors if needed. Data were analyzed in computer by using SPSS version 18. Chisquare and One Way ANOVA test were applied. **Results:** Out of 133 asphyxiated neonates mean serum calcium values in mild, moderate, severe asphyxia were  $8.37 \pm 1.51$ ,  $8.47 \pm 1.37$  and  $8.03 \pm 1.14$  respectively. Among the cases 20(15.0%) neonates had hypocalcaemia. Among these hypocalcaemic babies 6(25.0%) had mild, 9(45.0%) had moderate, and 5(25.0%) had severe perinatal asphyxia respectively. Hypocalcaemic neonates were only 6(4.5%) in controls. There was no association found between the grading of asphyxia and serum calcium level. But the incidence of hypocalcaemia in asphyxiated neonates was significantly ( $p < 0.005$ ) higher than that of controls. **Conclusion:** A provision of serial measurement of serum electrolyte especially calcium for perinatal asphyxiated neonates should be made available.

**Key words:** hypocalcaemia, perinatal asphyxia, convulsion.

### Introduction

Out of 130 million newborn infants born each year globally, about 4 million die in the neonatal period.<sup>1</sup> In the least developed countries perinatal asphyxia remains a major cause of death and disability. According to WHO, perinatal asphyxia and injuries accounts for 23% of neonatal deaths.<sup>2</sup> So perinatal asphyxia is an important determinant of perinatal mortality.<sup>3</sup> Many of them manifested as perinatal asphyxia and may developed life-long neurological deficits.<sup>4</sup> Fluid, electrolytes and metabolic abnormalities are the commonest derangements encountered in critically ill asphyxiated neonates. There may be hypocalcaemia in perinatal asphyxia, which further cause convulsion or tetany.

A variety of metabolic problems are present in asphyxiated infants including hyponatremia, hypoglycaemia, hypocalcaemia and hypomagnesaemia.<sup>5</sup> Some of the biochemical disturbances may trigger seizure or potentiate further brain

damage in asphyxiated infants. Therefore, high index of suspicion, prompt recognition and careful understanding of common electrolyte abnormalities are necessary to ensure their correction and improving neonatal outcome. With this vision the present study has been conducted to find out the pattern of calcium abnormalities in asphyxiated neonates.

### Methods

This study was carried out in neonatal unit of Paediatrics Department, in collaboration with Department of Gynecology and Obstetrics, Rajshahi Medical College Hospital during January 2013 to December 2013.

All the Asphyxiated babies admitted into Paediatrics, and Gynaecology and Obstetrics wards of RMCH constitute the study population. Total 266 subjects were selected with which 133 were case (asphyxiated babies) and 133 were control (healthy, without asphyxia). Cases were selected by some inclusion and exclusion criteria.

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**Inclusion criteria of cases:** Live born babies with perinatal asphyxia who have delay to establish first breath within sixty seconds, delayed cry over 90 seconds, heart rate <100 beats/minute at birth, bluish colorations of whole body over first 60-90 seconds, if the newborn remains hypotonic or floppy over hours, APGAR score <7 at 5 min, early neonatal seizures.

**Inclusion criteria of Controls:** In this study 133 healthy (without asphyxia) newborns, who were delivered in the department of Obstetrics and Gynecology, RMCH and admitted in neonatal ward for suspicion of illness other than birth asphyxia, were included as control.

**Exclusion criteria of both cases and controls:** Babies with a diabetic mother, septicemia, very low birth weight (<1.5 Kg) babies, inborn error of congenital metabolic disorders and lethal congenital deformity were excluded from the study.

3 ml of blood was collected from peripheral vein within 24 hours of birth in a clean sterilized vial with due precautions to avoid haemolysis and contamination. Serum was separated by using a micropipette after centrifuged at 3000-4000 rpm from 5-10 minutes. Samples were analyzed on the same day. Serum calcium is estimated by orthocresolphthalein complexone method.<sup>6,7</sup>

Data were collected by data collection sheet through interview of the mothers, pathological reports and patients' treatment files and attending doctors if needed. The data collection sheet was designed to record the information about parity of the mother and infant's gender, place of delivery, status of hypoxic-ischaemic encephalopathy (HIE) and serum calcium level. Data were analyzed in computer by using SPSS version 18. Chi-square and One Way ANOVA test were applied.

## Results

A total of 133 asphyxiated neonates, 79 (59.4%) were male and 54 (40.6%) were female. Majority (94, 70.7%) of their mothers were primipara and the rest (39, 29.3%) were multipara. 51(38.3%) asphyxiated neonates were delivered at hospital, 47(35.3%) were delivered at clinic and the rest 35(26.3%) were delivered at home.

Out of 133 asphyxiated babies, 47 (35.3%) presented with hypoxic-ischaemic encephalopathy (HIE) stage I. Among them 25 (31.6%) babies were male and 22 (40.7%) were female. While 58 (43.6%) babies presented with HIE stage II. Among them 39(67.2%) were male and 19(32.8%) were female. The rest 28 (21.1%) babies were presented with HIE stage III, where 15(53%) were male and 13(46.4%) were female respectively. Of the 47(35.3%) mildly asphyxiated neonates, all excellently recovered. In moderately asphyxiated neonates, 35(60.3%) survived and 23 (39.7%) died. Of the total 28 severely asphyxiated neonates, only 1 (3.6%) survived and unfortunately 27(96.4%) died.

Of the total 133 asphyxiated neonates, 20 (15.0%) were hypocalcaemic. Among the hypocalcaemic babies 6(30.0%) had mild, 9(45.0%) had moderate and 5(25.0%) had severe perinatal asphyxia. But there was no association ( $p>0.05$ ) found between the grading of asphyxia and serum calcium level (Table 1). The mean serum calcium values among mild, moderate and severe asphyxiated babies were  $8.37\pm 1.51$ ,  $8.47\pm 1.37$  and  $8.03\pm 1.14$  respectively. These were not significantly ( $p=0.3791$ ) differed from each other (Table 2).

But the incidence of hypocalcaemia in asphyxiated neonates was significantly ( $p<0.005$ ) higher than that of controls, neonates without asphyxia (Table 3). Among the 50 dead asphyxiated neonate 7(14.0%) were hypocalcaemic and 43(86.0%) were normocalcaemic.



**Table 1: Relationship of asphyxiated babies by grading of HIE and serum calcium level (n=133):**

Serum calcium level	Grading of asphyxiated baby							
	Mild (n=47)		Moderate (n=58)		Severe (n=28)		Total(133)	
	N	%	N	%	N	%	N	%
Hypocalcaemia (<7 mg/dl)	6	30.0	9	45.0	5	25.0	20	15.0
Normal calcium level	41	36.3	49	43.4	23	20.4	113	85.0
Total	47	35.3	58	43.6	28	21.1	133	100.0

$$\chi^2 = 0.375, \text{ df}=2, \text{ p}>0.05$$

**Table 2 Serum calcium level among the infants having different grading of asphyxia**

Level of asphyxia	Number N	Mean serum calcium level (mg/dl)	F	Significance between groups
Mild	47	8.37 <sup>a</sup>	0.9772	0.3791
Moderate	58	8.47 <sup>a</sup>		
Severe	28	8.03 <sup>a</sup>		

Values in the same column sharing common superscript letter are not significantly ( $p < 0.05$ ) different

**Table 3: Comparison of serum calcium level between case and control (n=266):**

S.calcium level	Case (n=133)		Control (n=133)		Total (266)	
	N	%	N	%	N	%
Hypocalcaemia (<7 mg/dl)	20	15.0	6	4.5	26	9.8
Normal calcium level	113	85.0	127	95.5	240	90.2
Total	133	50.0	133	50.0	266	100.0

$$\chi^2 = 8.35, \text{ df}=1, \text{ p}<0.05$$

### Discussion

Out of 133 asphyxiated neonates 79 (59.4%) were male and 54 (40.6%) were female. There was predominance of male babies over female babies in this study. Male predominance was observed in birth asphyxia. The present study findings also consistent with the previous studies.<sup>8-11</sup>

Parity may be an important factor as the newborn of primipara had higher incidence of

perinatal asphyxia. This fact is reflected in this study which showed that 94(70.7%) asphyxiated neonates were born of primigravida and 39(29.3%) born of multigravida mothers. Similar result was also found by Shireen et al,<sup>10</sup> Choudhury<sup>11</sup>, Bhuiyan.<sup>12</sup> Less expansibility of birth canal in primipara with the consequence of prolongation of labour might have some causal relationship with the high incidence of birth asphyxia in primipara mothers.

In a study conducted at Rajshahi medical college hospital in 2005 by Haidary et al<sup>13</sup> showed that 18.32% mildly, 20.94% moderately and 60% babies were severely asphyxiated. Comparing with that the present study findings suggest that the current situation is far better than that time. It may be due to improved perinatal health care facilities, increased awareness of the people and better communication.

Hypoxic ischemic encephalopathy is the most common and important consequence of perinatal asphyxia. Out of 133 asphyxiated babies majority 58(43.6%) babies presented with HIE stage II. This study indicates that HIE stage II is the common presentation of asphyxiated babies where convulsion is common. This study is consistent with Azam et al<sup>8</sup> in Pakistan.

In different studies birth asphyxia appears to play a role in neonatal calcium homeostasis. Stoliar et al (1971)<sup>14</sup> in their study on serum calcium levels in birth anoxic neonates found 26.76% incidence of hypocalcaemia in full term infants and 58.3% in premature infants. Tsang et al (1973)<sup>15</sup> in their study found that hypocalcemia was significantly higher in the asphyxiated newborns than the healthy babies. Jajoo D (1995)<sup>16</sup> studied on 35 term infants with asphyxia. Asphyxiated infants had significantly lower serum calcium levels than control infant during each of time period studied. The present study findings also agreed with these studies findings.

The results of this study have certain implication in clinical practice. The study findings suggest that monitoring of calcium as well as electrolyte level of asphyxiated newborn is very important to manage them properly. A provision of serial measurement of serum electrolyte specially calcium for perinatal asphyxiated neonates should be made available.

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