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INCIDENCE OF HYPOMAGNESEMIA AND HYPOCALCEMIA ON DAY ONE AND DAY FOUR IN NEONATES BORN

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Abstract: Present study is to assess the incidence of hypomagnesemia and hypocalcemia on day one and day four in neonates who are born in a tertiary care hospital of western maharashtra. Study done at KRISHNA Hospital, Karad. Children s who were born congenitally, and who met the eligibility criteria, were studied in the obstetric department of Krishna Hospital. 2.5 ml of cord blood was collected on day 1 of life in a plain bulb. On Day 1 of life, Hypocalcemia occurred in 0.5% of the 400 neonates studied. On Day 1 of life, Hypomagnesemia occurred in 1% of the 400 neonates studied. On Day 4 of life, Hypocalcemia occurred in 10.5% of the 400 neonates studied. On Day 4 of life, Hypomagnesemia occurred in 0% of the 400 neonates studied. No cases of Hypocalcemia with Hypomagnesemia occurred together at the same time either on Day 1 of life or on Day 4 of life.

Keywords: Hypomagnesemia, Hypocalcemia, Neonates born, Convulsions

1. INTRODUCTION

Hypocalcemia is a clinical and laboratory abnormality in neonates that is commonly found. Ionized calcium is essential for many biochemical processes, including blood coagulation, neuromuscular excitability, cell membrane integrity, and certain cell enzyme activities [1]. Low levels of magnesium in blood is treated by administration of 0.2 ml/kg of 50% magnesium sulphate solution (1 ml of 50% magnesium sulphate solution provides 4 mEq of magnesium) intramuscularly one or two injections followed by oral supplementation of magnesium in a dose of 30 mg per day for three to four days [2]. Association of hypomagnesemia with calcium deficiency is a known disorder in neonates which needs immediate attention. While most cases occur along with calcium deficiency, there are a sizeable number of cases which have primary magnesium deficiency [3]. Due to lack of adequate published evidence regarding the incidence of hypocalcemia and hypomagnesemia in neonates and their associated clinical features in our region of Maharashtra, as well as my interest, it was decided to conduct a prospective study to assess the incidence of the same in this population at birth by cord blood sample [3] on Day 1 and on Day 4 of life respectively.

2. AIMS AND OBJECTIVES

To assess the incidence of hypomagnesemia and hypocalcemia on day one and day four in neonates who are born in a tertiary care hospital of western maharashtra. To study the correlation of hypomagnesemia and hypocalcemia with clinical status of the baby. To study the risk factors associated with hypomagnesemia and hypocalcemia.

3. REVIEW OF LITERATURE

Cockburn F et al (1973)[4] studied 75 newborn children suffer from convulsions. They studied plasma biochemical abnormalities in these patients. In their study they found Hypocalcemia was present in 93% of cases, Hypomagnesemia in 54%, and Hyperphosphatemia in 64% of cases. In nearly 80% of cases, combination of biochemical disturbances was present, the commonest being hypocalcemia with hypomagnesemia with hyperphosphatemia (32%); hypocalcemia with hyperphosphatemia (27%); hypocalcemia with hypomagnesemia (15%); and hypomagnesemia with hyperphosphatemia (4%). Isolated hypocalcemia was present in 19% of cases and isolated hypomagnesemia in 3% of the cases. Hypocalcemia was the most frequent source of seizures in 7 (28 per cent) of patients, in whom 2 were neonates and 5 were infants between 1-3 months of age. Among the 7 hypocalcemic babies, associated hypomagnesemia was seen in 5 (83.3%) babies, in whom 2 were neonates and 3 were infants between 1-3 months of age.

Sood AV et al (2003)[5] studied 59 neonates with seizures, out of whom biochemical abnormalities of calcium, phosphorus, magnesium, sodium, potassium, zinc and blood glucose were detected in 29 (49.15%) of cases.

Taksande AM et al (2005)[6] studied 110 neonates with neonatal seizures who developed seizures before 28 days of life. Among the 110 cases, 77 were term babies and 33 were preterm babies. In term babies, primary metabolic abnormalities were seen in 16 (20.8%) neonates, out of whom hypocalcemia was most commonly found in 10 (12.9%) neonates followed by hypoglycemia in 5 (6.4%) and hypomagnesemia in 1 (1.2%) neonate. In preterm babies, hypocalcemia was seen in 3 (9.09%) , hypoglycemia in 4 (12.2%) and hypomagnesemia in 2 (6.06%) neonates. Among Metabolic abnormalities that were found, they reported hypocalcemia in 13 (11.8%) babies, among whom early hypocalcemia was seen in 6 (46.1%) while late hypocalcemia was detected in 7 (53.8%) babies. The 13 neonates who had hypocalcemia, 2 had seizures (0-1 days), 4 had seizures (1-2 days), 5 had seizures (3-7 days) and 2 had seizures (> 7 days of life). Hypomagnesemia was seen in 3 babies among whom 2 had seizures in first 2 days of life and 1 between 3-7 days of life.

Hannan FM et al (2013)[7] described conditions associated with Calcium Sensing Receptors (CaSR).

Liang C et al (2013)[8] conducted a study to determine the effect of Electrolyte Disruptions (ED) and asphyxia on the hearing of infant and their outcomes. Children born at the Maternal and Child Health Care Center, Shenzhen, PR China from January 2009 to August 2010 were enrolled in the research. Infants with known background of ototoxic drugs were omitted from the study. Infants who were provided full-time without any problems were allocated to the regular category and infants who had been admitted to the neonatal intensive care unit (NICU) for longer than 48 hours were placed in the NICU community. Pre-term delivery was described as delivery at or below 37 weeks of gestation. Hypocalcemia has been characterized as less than 2.2 mM of calcium in the blood. Electrolyte disruption is a high risk factor for preterm infant vision. Hypocalcaemia may cause more severe damage at a low recovery pace. Korkmaz HA et (2013)[9] described a detail case report in which, because of repeated severe tonic convulsions and apneic episodes consistent with bradycardia and cyanosis, a 15-day-old male child has been admitted to their pediatric emergency room. He

was born to a 24-year-old Gravida 2, Para 2 mother by the Caesarean section, after an uncomplicated birth. The birth weight and length is 4050 gms and 52 cms, respectively.

The child was combined (with breast milk and infant formula). Its weight at entry was 4025 gms (50th-75th percentile), its height was 53 cms (50th-75th percentile) and its head diameter was 37.3 cms (50th-75th percentile). Physical assessment showed an healthy, febrile baby with typical physical features and facial expression. The baby's ionic Calcium level reached 1.75 µmol/L with IV Calcium gluconate, and he was started on 1α-hydroxyvitamin D3 in a dose of 0.25 µg/day, vitamin D3 2000 IU/day, and oral Calcium lactate (50 mg/kg/day). Treatment with 1α-hydroxyvitamin D3 and oral Calcium lactate were stopped at 2 months of age. Serum calcium, serum phosphate, serum alkaline phosphatase, and 25(OH) D levels of the patient returned to usual at 3 months of age, and the therapy with vitamin D3 for 2000 IU / day was also stopped. The patient's growth and development status and his ionic Calcium and 25(OH) D rates were both natural at age 6 months. At this point his echocardiography revealed no cardiovascular abnormalities.

4. MATERIALS AND METHODS

This is an analytical observational cross sectional study conducted in KRISHNA HOSPITAL, KARAD. Babies who were born consecutively in Obstetrics department of Krishna Hospital, and who fulfilled the eligibility criteria were studied. 2.5ml of cord blood was collected on day 1 of life in plain bulb. This blood sample was taken to biochemistry laboratory of the institute where the samples were processed as soon as serum separated. Follow up blood samples were collected on Day 4 of life of the baby from peripheral vein and the method of processing the samples was similar to that of the cord blood samples on day 1 of life. Babies were grouped according to Weight, Maturity, Illness and Treatment, and Data was analyzed. Qualitative data will be expressed as Mean ± Standard Deviation and Median (Range). Quantitative Data will be expressed as ratios & proportions. The data will be analyzed using Student t-test.

5. OBSERVATIONS AND RESULTS

Table 1: Distribution of Neonates as per Maturity at Birth

Maturity:	**Number of Neonates (%):**
Term Neonates	385 (96.25%)
Pre-Term Neonates	15 (3.75%)
Total:	**400**

As seen in table no. 1, the study population consisted of 96.25% of Term Neonates and 3.75% of Preterm Neonates.

Table 2: Observed cases of hypocalcemia and hypomagnesemia on Day 1 in neonates classified on basis of Mother's Parity

Parity	**Hypocalcemia (n=2):**	**Hypomagnesemia (n=4):**
Primipara (n=69)	0	2 (2.89%)

Multipara (n=331)	2 (0.60%)	2 (0.60%)
Total: 400	**2 (0.5%)**	**4 (1.0%)**

As seen in table no. 2, on day 1 of life, 2 cases of hypocalcemia was observed in neonates whose mothers were multipara. Hypomagnesemia in 2 cases of neonates whose mothers were primipara and 2 cases in neonates whose mothers were mutipara.

6. DISCUSSION

Calcium is the body's most concentrated stone. With the overall calcium in the body, 99 per cent is contained in the bone and less than 1 per cent in the serum. Serum calcium is found in two forms: free (ionized) and attached. Just 50% of the calcium circulating is found in free form. 40 per cent is bound to protein or complexed (10 per cent) with bicarbonate, citrate and phosphate. Although rare, hypomagnesemia can occur in association with hypocalcemia, intrauterine growth retardation, severe diarrhea and following massive resection of gut. Decreased serum magnesium levels have been reported in infants of toxemic or diabetic mothers and following exchange blood transfusion with citrated blood [10]. Low serum magnesium level of < 1.6 mg/dL suggests hypomagnesemia.[11]

Cockburn F et al (1973)[4] studied 75 newborn infants suffering from convulsions. They studied plasma biochemical abnormalities in these patients. In their study they found Hypocalcemia was present in 93% of cases, Hypomagnesemia in 54%, and Hyperphosphatemia in 64% of cases. They also found that in nearly 80% of cases combination of biochemical disturbances was present, the commonest being hypocalcemia with hypomagnesemia with hyperphosphatemia (32%); hypocalcemia with hyperphosphatemia (27%); hypocalcemia with hypomagnesemia (15%); and hypomagnesemia with hyperphosphatemia (4%). In their study, isolated hypocalcemia was present in 19% of cases and isolated hypomagnesemia in 3% of the cases. However, in our study no neonate had seizures, hence the occurrence of hypocalcemia and hypomagnesemia cannot be related exactly with the findings of Cockburn F et al.

Taksande AM et al (2005)[6] studied 110 neonates with neonatal seizures who developed seizures before 28 days of life. Among the 110 cases, 77 were term babies and 33 were preterm babies. In term babies, primary metabolic abnormalities were seen in 16 (20.8%) neonates, out of whom hypocalcemia was most common found in 10 neonates (12.9%), next in occurrence was hypoglycemia in 5 (6.4%) and hypomagnesemia in 1 (1.2%) neonate. Whereas, in preterm babies, hypocalcemia was seen in 3 (9.09%) , hypoglycemia in 4 (12.2%) and hypomagnesemia in 2 (6.06%) neonates. In comparison with our study, we found 0.5% occurrence of hypocalcemia on day 1 of life and 9.61% on day 4 of life in term neonates. The occurrence of hypocalcemia on day 4 of life was 33.33% in preterm neonates. No preterm in our study had hypocalcemia on day1 of life and no neonate had seizure.

The article by Alphonsus N. Onyiriuka titled Prevalance of neonatal hypocalcemia among full term infants with severe birth asphyxia in the Pacific Journal of Medical sciences (April 2011) states that early onset neonatal hypocalcemia accounts for 95% of all cases of neonatal hypocalcemia [12].

B K Jain in his article published in Indian Journal of Pediatrics (2000) has stated that birth asphyxia accentuates the physiological fall in serum calcium in neonates leading to hypocalcemia [13]. In our study, among the 6 cases of birth asphyxia, 2 (33.33%) asphyxiated neonates developed hypocalcemia on Day 4 of life. Birth asphyxia was defined as 1-minute Apgar score of 3 or less as suggested by the National Neonatology Forum of India [14].

7. CONCLUSION

On Day 1 of life, Hypocalcemia occurred in 0.5% of the 400 neonates studied. On Day 1 of life, Hypomagnesemia occurred in 1% of the 400 neonates studied. On Day 4 of life, Hypocalcemia occurred in 10.5% of the 400 neonates studied. On Day 4 of life, Hypomagnesemia occurred in 0% of the 400 neonates studied. No cases of Hypocalcemia with Hypomagnesemia occurred together at the same time either on Day 1 of life or on Day 4 of life. 44 neonates had Hypocalcemia in the study. Hypocalcemia occurred on Day 1 of life in 2 neonates and in 42 neonates on Day 4 of life. Clinical symptoms of Hypocalcemia were observed in 20 neonates. The clinical symptoms observed in these 20 cases were, lethargy was seen in 2%, high pitched cry in 1%, poor feeding in 0.75%, apnoea in 0.75% and jitteriness in 0.5%. Out of 400 neonates studied, Hypomagnesemia occurred in 4 neonates on Day 1 of life and no neonate had Hypomagnesemia on Day 4 of life. The risk factors for Hypocalcemia observed in the study were: Prematurity, Formula feeding, Infant of Diabetic Mother and Birth asphyxia. Hypomagnesemia was not associated with any risk factor.

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