Frequency of Hypocalcemic Fits in Children Presenting with Afebrile Seizures and Risk Factors for Hypocalcemia – A Descriptive Study

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Abstract

Background: Seizures are common in paediatric age group, occurring approximately in 10% of children. Hypocalcemia is one of the most common metabolic causes of afebrile seizures.

Objective: To determine the frequency of hypocalcemic fits in children presenting with afebrile seizure, from 2 months to 2 years of age and to study the risk factors for hypocalcemia in these patients.

Study Design: Descriptive study.

Setting: Department of Paediatric Medicine Unit-I, Mayo Hospital, Lahore.

Duration: Six months (January to June 2007).

Sampling Technique: Non probability purposive sampling.

Subjects and Methods: After consent, 60 cases of afebrile convulsions were registered for the study. Different variables like age, sex, poor sun exposure, low birth weight, prematurity, milk feeding, weaning, nutritional status, maternal age, parity, child spacing and maternal anemia were recorded. Each child was investigated for serum calcium, phosphate, alkaline phosphatase and x-ray left wrist. Information was recorded on a structured pretested proforma.

Results: Study population consisted of 60 children. Hypocalcemia was observed in 68.3% cases. Most common age group was < 6 months (51.2%). There was male predominance (56%). Common risk factors were poor sun exposure (68.3%), unfortified fresh milk feeding (63.4%), malnutrition (61%), low birth weight (54%), inadequate weaning (36.5%), and prematurity (17%) while maternal risk factors were multiparity (73%), mother age < 30 years (70.7%), anemic mothers (63.4%), and < 2 year child spacing (51.2%).

Conclusion: Hypocalcemia is a common cause of afebrile fits in children. Poor sun exposure, low birth weight, prematurity, malnutrition, maternal anemia and multiparity are major risk factors for hypocalcemia.

Key words: *Hypocalcemia, Seizure, Convulsions, Risk Factors.*

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Introduction

A seizure or convulsion is a paroxysmal, time limited change in the motor activity or behavior that results from abnormal electrical activity in the brain. Seizures are common in the pediatric age group and occur in approximately 10% of children.[1] The presence of seizure does not constitute a diagnosis but it is a symptom of an underlying central nervous system disorder due to systemic or biochemical disturbances.[2] The

most common biochemical abnormality causing seizures is hypocalcemia, which in children may manifest as tetany, seizures, muscle cramp, and paresthesia.[3]

Maintaining normal calcium level is important because hypocalcemia is associated with poor outcome as measured by either survival or length of intensive care stay.[4] During daily activities, casual exposure to sunlight provides most of our vitamin D requirements, hence, sunlight also plays an important role in maintaining calcium homeostasis.[5] Hypocalcemia is also common in infants who are fed with buffalo's / cow's milk or formula containing high amount of phosphate.[1] International and local studies have determined the risk factors for hypocalcemia. Balasubramanian et al[6] in India identified low maternal levels of vitamin D, indoor confinement during the day, living in urban areas with tall buildings, and use of sunscreen as major risk factors. Humayun et al[4] in Pakistan found fresh unfortified milk, inadequate exposure to sunlight, lower maternal educational status, and large family size as risk factors for hypocalcemia.

The objectives of this study were to determine the frequency of hypocalcemic fits in children presenting with a febrile seizure, from 2 months to 2 years of age and to study the risk factors of hypocalcemia in these patients.

Material and Methods

This study was conducted in the department of Paediatrics Unit – I, King Edward Medical University / Mayo Hospital Lahore. It was a descriptive study and was conducted in six months time (January to June 2007). Sample was collected by non probability purposive sampling. Serum calcium level < 8.0 mg/dl was taken as hypocalcemia and temperature < 99.5°F was taken as afebrile. After consent from mothers, 60 children of age 2 months to 2 years of age, with their first episode of afebrile convulsions were registered for the study. Known cases of epilepsy, and those who had already received intravenous calcium were excluded from the study. Demographic data was recorded, and detailed examination was carried out. Each child was investigated for serum levels of calcium, phosphate and alkaline phosphate and x-ray of left wrist joint. The data was entered into the S.P.S.S. version 13 and analyzed for statistical package. Socio-demographic data was presented as frequency tables. It was a descriptive study, no statistical test applied. Each child was treated according to the individual merit.

Results

A total of 60 cases of afebrile seizure from 2 months to 2 years of age with their first presentation were studied. Hypocalcemia as a cause of afebrile seizure was noted in 41 (68.3%) cases (Figure 1).

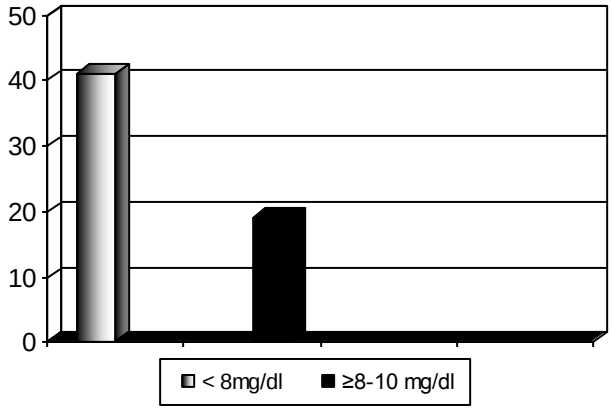

Figure 1: Distribution of cases by Serum Calcium Level (n = 60).

In children with hypocalcemia, majority (51.2%) presented within six months of age (mean 7.5 ± 1.3 months). There was male predominance (male to female ratio 1.3 : 1). Poor sun exposure was the most common risk factor observed in 28 (68.3%) cases. Seven (17%) children were preterm (age < 37 weeks) while 19 (46%) were with low birth weight (weight less than 2.5 kg). Feeding pattern showed breast milk 14 (34%), cow milk 26 (63.4%), and formula milk 1 (2.4%). Twenty five (61%) had malnutrition according to Gomez classification (Table 1). Fifteen (36.5%) children received inadequate weaning according to their age.

Majority of mothers 44 (72%) were < 30 years (mean age 28.70 years). Multiparity was observed in 29 (70.7%) (Figure 2). Fifty one (85%) mothers had child spacing less than 2 years. Maternal anemia was observed in 26 (63.4%). Thirty seven (90.2%) presented with generalized tonic clonic fit while 4 (9.8%) presented with focal fits. Duration of fit was less than 5 min in 33 (80.4%). Radiological evidence of rickets was observed 30 (73.2%) (Table 2).

Discussion

Seizures are common in paediatric age group and one of the most common biochemical abnormality causing

Table 1: Distribution of cases by demographic profile of children (n = 60).

	Hypocalcemic children n (%) n = 41	Normocalcemic children n (%) n = 19
Age Distribution		
< 6 months	21 (51.2)	10 (52.6)
7 – 12 months	10 (24.5)	4 (21)
> 12 months	10 (24.5)	6 (31.5)
Sex Distribution		
Male	23 (56.0)	12 (63.2)
Female	18 (44)	7 (36.8)
Feeding pattern		
Fresh diluted milk	26 (63.4)	7 (36.8)
Breast milk	14 (34.1)	9 (47.4)
Formula milk	1 (2.4)	3 (15.8)
Exposure to sunlight		
Poor < 30 min / week	28 (68.3)	11 (57.8)
Gestational age		
Preterm	7 (17)	2 (10.5)
Birth weight		
Low (< 2.5 kg)	19 (46.3)	6 (31.6)
Nutritional Status according to Gomez classification		
No Malnutrition	16 (39)	11 (57.9)
Grade I Malnutrition	11 (26.8)	1 (5.3)
Grade II Malnutrition	8 (19.5)	4 (21.1)
Grade III Malnutrition	6 (14.6)	3 (15.8)

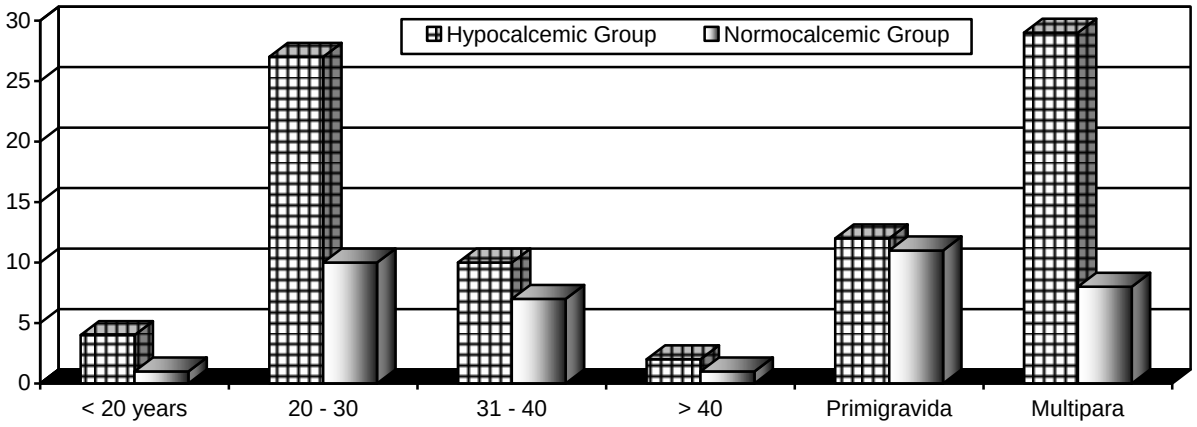

Figure 2: Maternal age and parity (n = 60).

Table 2: Distribution of cases by Laboratory findings and radiological evidence (n = 60).

Variable	Hypocalcemic children n (%) n = 41	Normocalcemic children n (%) n = 19
Serum phosphate level (mg/dl)		
< 4	30 (73.2)	8 (42.1)
Serum alkaline phosphatase (IU/dl)		
< 1000	19 (46.3)	4 (21.1)
Signs of rickets in X-ray wrist		
Present	30 (73.2)	6 (31.6)

seizures is hypocalcemia.[2] Hypocalcemia is emerging as a very common problem perhaps due to lack of awareness of the morbid consequences.[4] In our study, 41 (68%) cases were hypocalcemic among total study population of 60. The mean age at time of admission was 7.5 ± 1.34 month. The majority of children (51.2%) were below 6 month. This is consistent with results by Binmohana et al,[7] and Humayun et al[4] but is in contrast with Abanamy et al[8] showing 39.2% patients less than 6 months of age. Present study noted male predominance (56%) comparable with Binmohana MA et al[7] but Sharma et al[9] found no sex difference.

Inadequate exposure to sunlight is an important factor associated with the development of vitamin D-deficient rickets which in turn is a common cause of hypocalcemia in children.[4] Our study highlighted this fact and the results showed that significant number of children (68.3%) had poor exposure to sunlight and these results are comparable with other studies.[10,11] In present study, 63.4% children received unfortified fresh milk, 34% breast milk and 2.4% formula milk. The results are comparable with observations made by Temashek et al[12]. However, Hatun et al[5] observed that 83% infant who had vitamin D deficiency were exclusive breast feed with out supplemental vitamin D. This study showed 36.5% children with inadequate weaning and is comparable with results of Carvelt NF et al[13] and Younas M et al.[14] Seventy two percent of our study population had malnutrition according to Gomez classification which is comparable to a study by Khattak et al.[15] Present study showed that 46% were low birth weight while 17% were preterm. The incidence of hypocalcemia is inversely proportion to gestational age and birth weight.[16]

Present study noted that 41.4% mothers belonged to 26 – 30 years of age which is comparable to a study by Judkins et al.[17] Parity also plays an important role and in this study 70.7% mother with multiparity and 85% mother with spacing, < 2 years were observed these results are also comparable with the results by Erfan et al[11] and Meddeb et al.[18] Present study observed 63.2% anemic mothers which is also a risk factor and is comparable with Saihibzada et al.[19]

Hypocalcemia can present with a wide variety of symptoms, the most important of which are seizures. In 90% of cases, seizure type was noted generalized tonic clonic which was comparable with Sharma et.[20] Elevated alkaline phosphatase > 1000 1U/L was observed in 53.3% patient which is consistent with other studies.[7,20,21] This study showed that 76% patient had radiological evidence of rickets in the form of cupping and fraying and is comparable with the results of Newham et al.[22]

Conclusion

It concluded from present study that hypocalcemia is a major etiological factor in infant and children with afebrile seizures. Poor sun exposure, animal milk feeding without fortification, inappropriate weaning, mother's anemia, mother's young age, parity, less child spacing were identified as significant risk factors. These factors can be easily overcome through public health education and hypocalcemia can be prevented leading to significant reduction in the morbidity in the form of hypocalcemic fits and rickets.

References

1. Johnston MV. Seizures in childhood. In Behrman RE, Kliegman RM, Jenson HB. Nelson textbook of Paediatric. 18th ed. Philadelphia : WB Saunders 2008: 2457-75.
2. Sood A, Grover N, Sharma R. Biochemical abnormalities in neonatal seizures. J Pediatr 2003; 70: 221-4.

3. Singh SC, Singh J, Prasad R. Hypocalcemia in Paediatric care unit. J Pediatr 2003; 49: 298-302.
4. Khan HI, Abdullah A, Kazi MY, Afzal MF. Hypocalcemia and nutritional rickets in children: common etiological factors. Ann King Edward Med Coll 2006; 12 (1): 29-32.
5. Hatun S, Ozkan B, Orbak Z, Doneray H, Cizmecioglu F, Toprak et al. Vitamin D deficiency in early infancy. J Nutr 2005; 135: 279-82.
6. Balaubramanian S, Ganesh R. Vitamin D deficiency in exclusively breast – fed infants. Indian J Med Res 2008; 127 (3): 250-5.
7. Binmohana MA, Raja YA, Saif GA. Prevalence of hypocalcemia in children examined for serum calcium in Sana'a, Yamen. Saudi Med J 2005; 26: 457-9.
8. Abanamy A, Salman H, Cheriyan M, Shuja M, Siddrani S. Vitamin D deficiency Ricket in Riyadh. Ann Saudi Med 1991; 11: 35-9.
9. Sharma A, Virmani DN. Ricket in wall city of Dehli. Indian Paediatr 2004; 41 (10): 1076-1.
10. Mivako K, Kinjo S, Kohmo H. Vitamin D deficiency ricket. Caused by the improper life style of the Japanese children. Pediatr Int 2005; 47: 142-6.
11. Erfan A, Nafir OA, Aziz A. Vitamin D deficiency rickets in maternity and children hospital, Makkah, Saudi Arabia. Ann Saudi Med 1997; 17: 371-3.
12. Temashek KM, Nesby S, Scanlon KS et al. Nutritional ricket in Goorgia. Pediatrics 2001; 102: 45.
13. Carvalh NF, Kenney RD, Carrington PH, HallDE. Severe nutritional deficiencies resulting from milk alternate. Pediatrics 2001; 107: E46.
14. Yonas M, Rahim F. A cross sectional study. On epidemiology of Ricket in Pakistani children. JMS 2003; 11: 26-32.
15. Khattak AA, Rehman G. Study of ricket in admitted patient at Lady Reading Hospital, Peshawar. JPMI 2004; 18: 52-8.
16. Larry A, Baum. Hypocalcemia in Behrman RE, Kliegman, Jenson HB. Nelson the textbook of paediatric 17th ed. Philadelphia. Elsevier Science; 2003: 210-214.
17. Judkins A, Eagleton C. Vitamin D deficiency in pregnant Newzealand Women. NZ Med J 2006; 119 (1241): 2144.
18. Meddeb N, Sabli H, Abdelmoula J. Vitamin D deficiency in Tunisia Osteoporos Int 2005; 16: 180-3.
19. Saihibzada AS, Khan MS, Javed M. Presentation of Osteomalacia in Kohistani women. J Ayub Med Coll Abbottabad 2004; 16: 63-5.
20. Sharma J, Bajpai A, Kabra M, Menon PS. Hypocalcemia – clinical biochemical radiological profile and follow up in a tertiary hospital in India. Indian Pediatr 2002; 39: 276-82.
21. elHaq AI, Kanzar ZA. Neutritional vitamin D deficiency rickets in Saudanes children. Ann Trop Paediatr 1995; 15: 69-76.
22. Ladhani S, Srinivasan L, Buchanan C. Presentation of Vitamin D deficiency. Arch Dis Child 2005; 90: 437-8.