ORIGINAL ARTICLE

An Experience of Hypocalcaemia in Children with A febrile Fits Presenting at a Tertiary Care Hospital of Sindh

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ABSTRACT

Objective: To measure serum calcium in children presenting with afebrile fits at the Pediatric Department of Isra University Hospital.

Methods: This cross sectional study was conducted in the department of Pediatrics, Isra University Hospital Hyderabad. A sample of 200 children was selected through non-probability purposive sampling. Inclusion and exclusion criteria were followed strictly. Blood samples were taken for estimation of serum calcium levels. Data was analyzed on SPSS version 22.0 (IBM, Incorporation, USA). Comparisons with p-value of ≤0.05 were taken statistically significant.

Results: Mean ±SD age was noted as 3.5±1.59 years (P=0.0001). Majority of children belonged to 3- 3.9 years age. Out of 200 study population, 91 (45.4%) were male and 109 (54.5%) were female (p=0.0001). Serum calcium was noted as 5.3±2.58 mg/dl (range 3.75 to 7.95 mg/dl). Serum calcium levels as low as 3.57 mg/dl were noted in study population.

Conclusion: Hypocalcemia is a very common underlying cause of fits in afebrile children. Serum calcium level must be analyzed in children presenting with fits for an immediate therapy.

Key Words: Hypocalcemia, Afebrile, Fits, Children

Article Citation: Memon MA, Radhan H, Kazi SA, Roomi M, Siyal SA, Qazi S. An Experience of Hypocalcaemia in Children with A febrile Fits Presenting at a Tertiary Care Hospital of Sindh. J Peoples Uni Med Health Sci. 2018;8(3):253-7.

INTRODUCTION:

Low serum calcium is termed as hypocalcemia that clinically manifests as neuromuscular excitability, tetany, delirium and brain fits (seizures or convulsions). Spontaneous neuronal excitation is rule with hypocalcemia and is the predisposing factor of seizures[1,2]. Latent hypocalcemia may be checked by simple clinical maneuvers such as tapping over the facial nerve causes muscle twitching, it is a clinical signs termed as the Chvostek's sign that reveals hypocalcemia induced nerve fiber excitation. Vagal nerve excitability is another manifestation of hypocalcemia that causes abdominal colic due to visceral muscle spasm. How hypocalcemia induces generalized-neuromuscular excitation has been explained by various mechanisms[1,2]. One such proposed mechanism is the uncontrolled neuronal depolarization by sodium ions in the absence of low serum calcium. Hypocalcemia produces generalized body symptoms of which brain seizures is a serious medical emergency[3]. Hypocalcemia induced brain seizures/fits are caused by various clinical conditions such as the parathyroid gland hypofunctioning, parathormone resistance, vitamin D deficiency, renal insufficiency, etc. These conditions are characterized by abnormal calcium homeostasis. Chromosome 22q syndrome is a cause of congenital hyperparathyroidismwhich manifests as brain seizures during early childhood.[2,3]Certain drugs alter the serum calcium levels and

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serum calcium levels and produce hypocalcemia seizures[4]. One of such class of drugs is the bisphosphonates drugs which interfere with calcium homeostasis through its osteoclast inhibitory effects[5,6]. Dihydantoin is an anticonvulsant drugs which interferes with calcium and vitamin D metabolism. Dihydantoin may induce a paradoxical exacerbation of brain seizures if serum calcium levels are subnormal[7]. Therefore the clinicians and pediatricians should always analyze serum calcium in a child presenting with afebrile fits. A child on anticonvulsant therapy should be watched for serum vitamin D and serum calcium level on regular basis. The hypocalcemia brain seizures is a frequently encountered medical emergency[8,9]. The serum calcium is essential for the neuronal electrical activity, neuronal impulse, and electrochemical coupling at the neuromuscular junction with pre-synaptic release of Neurotransmitter. Hence hypocalcemia induces the abnormal neuronal excitability and fits[10-11]. Keeping in view the low serum calcium as one of casues of brain seizures in children, there is a need to evaluate its frequency in our population for seizure management. The present small scale study reports on the serum calcium levels in afebrile fits in children presenting at Department of Pediatrics of Isra University Hospital, Hyderabad.

METHODS:

Ethical approval was taken from institutional committee for human research in accordance to the declaration of Helsinki for conducting the present cross sectional study. The study subjects were selected according to inclusion and exclusion criteria presenting at the Department of Pediatrics, Isra University Hospital Hyderabad from 2015 to 2016 (1-year duration).The Pediatric Department provides all essential facilities and is well equipped. A sample of two hundred children was selected through non-probability convenient sampling. Age 1-5 years, afebrile fits, and of either gender were the inclusion criteria. Febrile fits, age <1 year and >5 years, premature born babies and other systemic disease were the exclusion criteria.

A proforma was designed by the authors for data collection. Demographic variables were noted on proforma. Children were examined clinically. Birth history, mode and type of childbirth were enquired and noted. Children with generalized clonic movements whether preceded by generalized rigidity or not were admitted in Pediatric ward.

3 ml of venous blood was taken from peripheral vein. Blood was centrifuged to separate sera for calcium estimation by colorimetric method[12]. This method utilizes measurement of serum calcium by EDTA chelation with "murexide indicator". An EEL photoelectric titrator at filter peak of 5750-5800A was used. Singing of Informed consent by volunteer guardians/caretakers was mandatory. Confidentiality of data was strictly maintained and secured. Only research authors were allowed to access the data otherwise it was kept in lockers.

Research variables were typed on Microsoft Excel sheet, followed by data entry in SPSS version 22.0 for windows (IBM, Incorporation, USA). Chi square and one sample student`s t-tests were used for the analysis of continuous and categorical variables respectively. Data was analyzed at 95% confidence interval ($P \leq 0.05$).

RESULTS:

Age (mean±SD) was noted as 3.5±1.59 years (P=0.0001). Majority of children belonged to 3- 3.9 years age group and accounted for 51.5% of total study subjects. Demographic characteristics of study population are shown in table-I (p=0.0001). Of 200study population, 91 (45.4%) were male and 109 (54.5%) were female (p=0.0001). Socioeconomic status reveals majority of population belonged to the poor social class (55.0%). Majority of childbirths took place at the home and vaginal births were common as shown in table-I. Nutritional status of mothers was not good in majority of presenting families. Frequency of convulsions is shown in table-II. Convulsion frequency of 3 fits per child was most commonly noted in 34.5% followed by 2 convulsions in 28.0% and 4 convulsions in 27.0%

Table-I. Demographic characteristics of study subjects (n=200)

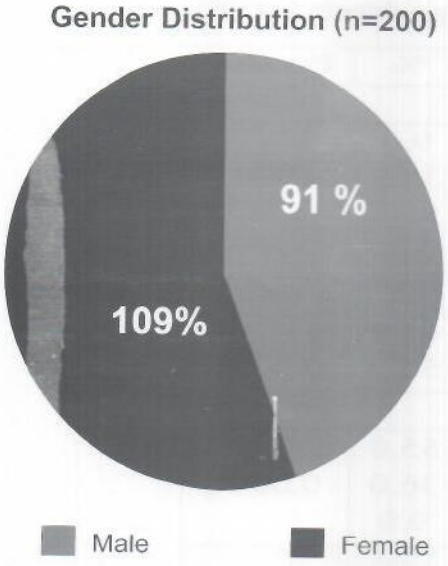
Parameter	No.	%	P-value
Age (years)			
— 1- 1.9 years	18	9.0	0.0001
— 2- 2.9 years	72	36.0	
— 3- 3.9 years	103	51.5	
— 4- 5 years	07	3.5	
Gender			
— Male	91	45.5	0.0003
— Female	109	54.5	
Socioeconomic Status			
— Poor class	110	55.0	0.0001
— Middle class	72	36.0	
— Upper class	18	9.0	
Place of Delivery			
— Home	127	63.5	0.0001
— Hospital	73	36.5	
Mode of Delivery			
— Vaginal delivery	127	63.5	0.0001
— Cesarean section	73	36.5	
Maternal Nutritional Status			
— Poor	109	54.5	0.0001
— Good	74	37.0	
— Very good	17	8.5	

Table-II. Frequency of convulsions in children with hypocalcemia (n=200)

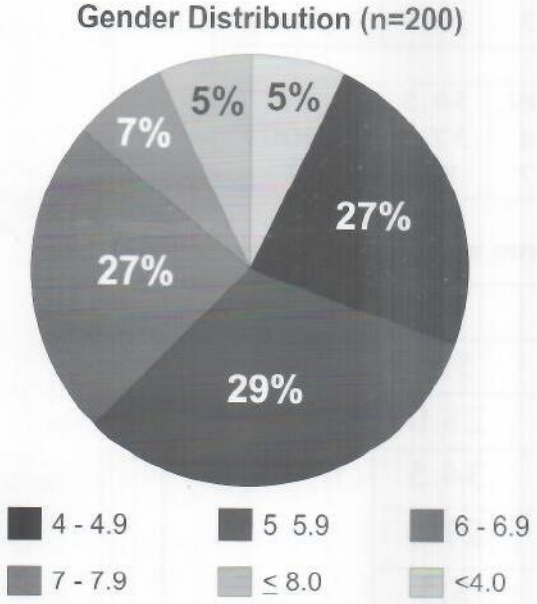
No. of convulsions	No.	%	P-value
≤1	10	5.0	0.00001
2	56	28.0	
3	69	34.5	
4	54	27.0	
≥5	11	5.5	

Table-III. Serum calcium in children presenting with fits (n=200)

Serum Ca++ (mg/dl)	No.	%	P-value
<4.0	10	5.0	0.00001
4 - 4.9	55	27.5	
5 - 5.9	59	29.5	
6 - 6.9	54	27.0	
7- 7.9	13	6.5	
≤ 8.0	09	4.5	



Graph-I: Pie Chart Showing Gender Distribution



Graph-II: Pie Chart Showing Serum Calcium Distribution

of study population (table 3) (p=0.0001). Serum calcium (mean± SD) 5.3±2.58 mg/dland range was 3.75to7.95 mg/dl. Serum calcium levels as low as 3.57 mg/dl were noted in study population. The present study shows a high frequency of hypocalcemia in children presenting with afebrile fits.

DISCUSSION:

The present is the first study reporting on the serum calcium levels in children presenting with afebrile fits. Fits (seizures or convulsions) are very common among children presenting in the pediatric emergency wards. Fits are of varied etiology, but the presenting report studied only afebrile convulsions. Age (mean ±SD) was noted as 3.5±1.59 years (Table 1, P=0.0001). Majority of children belonged to 3- 3.9 years age group and accounted for 51.5% of study subjects. The findings are consistent with previous studies[13-16]. Of 200 study population, 91 (45.4%) were male and 109 (54.5%) were female children (p=0.0001). The results are comparable to previous studies[13,14] but in contradistinction to other studies[15,16]which reported male dominancy. Socioeconomic status revealed majority of population belonged to the poor social class (55.0%). Nutritional status of mothers was poor which is a common finding in developing countries like Pakistan. Poor social class puts the female at poor nutritional status; this is because of the prevailing condition of economic crisis which has put the families at more sufferings. The findings of poor social class, malnourishment and home vaginal deliveries of presenting study are consistent with reports from developing countries[17-20]. The home child birth is social dilemma, the finding is comparable to another previous study[21], which has also reported high frequency of home delivery. Convulsion frequency of 3 fits per child was most commonly noted in 34.5% followed by 2 convulsions in 28.0% and 4 convulsions in 27.0% of study population (p=0.0001). The finding is comparable to previous studies[15,16]. However a previous study reported conflicting results[19]. The above findings are comparable to previous studies[16-18]. Hypocalcemia is considered a common cause of afebrile fits in children[18]as has been noted in the present study. In present study, the upper cut off value of normal serum calcium was defined at ≥8.0 mg/dl which was not noted in any of child presenting with fits. (p=0.0001).The finding is consistent with previous studies[16-18]. Serum calcium (mean± SD) 5.3±2.58 mg/dl and range was 3.75 to 7.95 mg/dl. Serum calcium levels as

low as 3.57 mg/dl were noted in study population. The present study shows a high frequency of hypocalcemia in children presenting with afebrile fits. These findings are supported by previous studies[18-23]. A previous study[22]reported hypocalcemia in children with fits. This previous study reported low vitamin D and serum calcium levels in mother which belonged to poor social class. The evidence based finding of low serum calcium level in children with afebrile fits is a worth clinical finding which may help the pediatricians which should be kept in mind as the most common cause of fits in our less privileged population. The present study has a few limitations such as; vitamin D, serum phosphate and serum albumin were not estimated. Similarly, non-estimation of maternal serum calcium and vitamin D are also limitations. However, the strength of study lies in its prospective study design and simple finding of hypocalcemia in afebrile fits in children.

CONCLUSION

Hypocalcemia is common cause of afebrile fits in children. Serum calcium level must be analyzed in children presenting with fits for a prompt and immediate institution of goal directed therapy. Pediatricians should be cautious of a common treatable condition of hypocalcemia in routine clinical practice. Calcium and vitamin D supplements may be prescribed after proper investigation of mothers to overcome the problem.

REFERENCES

1. Liaqat S, Zubair A, Noor T, Waseem R. Hypocalcemia: Underlying Factors in Rural Area. PJMHS.2016;10(4):1110-11.
2. Kakajiwala A, Barton KT, Rampolla E, Breen C, Pradhan M. Acute hypocalcemic and metabolic alkalosis in children on cation exchange resin therapy. Hindawi Case Reports Nephrol.2017;3:1-5.
3. Tsai PL, Lian LM, Chen WH. Hypocalcemic-seizure mistaken for idiopathic epilepsy in two cases of DiGeorge syndrome (chromosome 22q11 deletion syndrome). Acta Neurologic Taiwanica. 2009;18:272-5.
4. Kinoshita H, Kokudo T, Ide T, Kondo Y, Mori T, Homma Y, et al. A patient with DiGeorge syndromewith spina bifida and sacral myelomeningocele, who developedboth hypocalcemia-induced seizure and epilepsy. Seizure. 2010; 19: 303-5.
5. Piret SE, Gorvin CM, Pagnamenta AT, Howles SA, Cranston T, Rust N, et al. Identification of a G-Protein Subunit-a11 Gain-of-Function Mutation, Val340Met, in a FamilyWith Autosomal Dominant Hypocalcemia Type 2 (ADH2). J Bone Mineral Res. 2016;31(6):1207-14
6. Tsourdi E, Rachner TD, Gruber M, Hamann C, Ziemssen T, Hofbauer LC. Seizures associated with zoledronicacid for osteoporosis. J Clin Endocrinol Metabol. 2011;96:1955-9.
7. Ali FE, Al-Bustan MA, Al-Busairi WA, Al-Mulla FA. Loss of seizure control due to anticonvulsant-inducedhypocalcemia. Ann Pharmacother. 2004;38:100-25.
8. Kidwell KS, Kopp WE, Albano EA, Brown AE. Ghosts in My Body: Seizure-like presentation of hypocalcemic tetany secondary to hypomagnesemia in a patient receiving cetuximab therapy for metastatic medulloblastoma. J Pediatr Hematol Oncol. 2013; 36:305-7.
9. Korkmaz HA, Dizdarer C, Ecevit CO. Hypocalcemic seizure in an adolescent with Down syndrome:A manifestation of unrecognized celiac disease. Turkish J Pediatr. 2014; 55:53-68.
10. Sudhof TC. Neurotransmitter release: The last millisecondin the life of a synaptic vesicle. Neuron. 2013; 80:675-90.
11. Gleichmann M, Mattson MP. Neuronal calcium homeostasis and dysregulation. Antioxid Redox Signal. 2011;14:1261-73.
12. Lazarevic V, Pothula S, Andres-Alonso M, Fejtova A. Molecular mechanisms driving homeostatic plasticityof neurotransmitter release. Frontiers Cellular Neurosci. 2013; 7:244.
13. Stanely F. Reference intervals for laboratory tests and procedures. In: Nelson textbook of

pediatrics. 20th ed. Philadelphia: Elsevier. 2016; 3464-72.
14. Han P, Trinidad BJ, Shi J. Hypocalcemia induced seizure: demystifying the calcium paradox. ASN Neuro. 2015:1-9.
15. Qasim M, Kamran A, Memon H M, Hanif S, Murtaza G. Frequency of Nutritional Vitamin D Deficiency in Children 6 Months to 5 Years of Age Presenting with Rickets at Civil Hospital, Karachi. Ann Abbasi Shaheed Hosp Karachi Med Dent Coll. 2016; 21(1):4-8.
16. Ijaz A, Mehmood T, Qureshi AH, Anwar M, Dilawar M, Hussain I, et al. Estimation of ionized calcium, total calcium and albumin corrected calcium for the diagnosis of hypercalcemia of malignancy. J Coll Physicians Surg. 2006; 16 (1): 49-52.
17. Prasad R, Singh AR, Das BK, Upadhyay RS, Singh TB, Mishra OP, et al. Cerebrospinal fluid and serum zinc, copper, magnesium and calcium levels in children with idiopathic seizures. J Clin Diagn Res.2009;3(7):1841-6.
18. Mehrotra P, MarwahaRK, Aneja S, Seth A, Singla BM. Hypovitaminosis D and hypocalcemic seizures in infancy. Indian Pediatr. 2010; 47:581-6.
19. Jain V, Gupta N, Kalaivani M, Jain A, Sinha A. Vitamin Ddeficiency in healthy breastfed term infants at 3 months & their mothersin India: seasonal variation & determinants. Indian J Med Res. 2011;33:267-73.
20. Sheinberg R, Heyman E, Dagan Z, Youngster I, Kohn E, Gandelman-Marton R, et al. Correlation Between Efficacy of Levetiracetam and Serum Levels Among Children With Refractory Epilepsy. Pediatric Neurol. 2016;52 (6):624-8.
21. Malik R, Mohapatra JN, Kabi BC, Halder R.5-Hydroxy Cholecalciferol Levels in Infants with Hypocalcemic Seizures.J Nutr Food Sci. 2014;4:3.
22. Cheung ENM, George SR, Andrade DM, Chow EWC, Silversides CK, Bassett AS. Neonatal hypocalcemia, neonatal seizures, and intellectualdisability in 22q11.2 deletion syndrome. Genet Med. 2014;16(1):40-4.
23. Khan MA, Iqbal SMJ, Afzal MF, Sultan MA. Frequency of Hypocalcemia Fits in Children Presenting with Afebrile Seizures and Risk Factors for Hypocalcemia A Descriptive Study. Annals KEMJ. 2011;17(1):31-5.