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Original Research Article

Assessment of Ionized Calcium Status in Febrile Seizures

Kalpesh Kumar Jain[1], Akber Ali Bohra[2], Ravi Prakash Meena[3]

[1]Associate Professor, Department of Paediatrics, American International Institute of Medical Science Udaipur Rajasthant

[2]Assistant Professor, Department of Paediatrics, Govt. Medical College, Baran, Rajasthan

[3]Assistant Professor, Department of Paediatrics, Govt. Medical College, Baran, Rajasthan

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Corresponding Author: Dr. Kalpesh Kumar Jain

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Abstract:

Background: Febrile seizure (FS) is a highly common neurological problem at childhood. Approximately, 2%-5% of children are estimated to undergo at least one seizure during a febrile illness before they get 5 yrs old, accounting for 30% of all seizures among children.

Methods: Hospital based Prospective, Analytical, Case – Control study conducted on children aged between 6 months to 5 years with simple/complex febrile seizures (seizure occurring in developmentally normal child in association with a febrile illness in the absence of CNS infection or any other defined cause of seizures).

Results: In study group, 13(26%) patients had abnormal (<4.4 mg/dl) range of ionized calcium level while in control group no patient had abnormal ionized calcium level.Mean ionized calcium level was 4.32±0.23 mg/dl and 4.74±0.24 mg/dl in study and control groups respectively and this difference was found statistically highly significant ($p<0.001$).

Conclusion: The findings suggest that a considerable percentage of children having febrile seizures suffer from calcium deficiency.

Keywords: Hypocalcemia, Serum Calcium, Febrile Seizures.

Introduction

Febrile seizure (FS) is a highly common neurological problem at childhood. Approximately, 2%-5% of children are estimated to undergo at least one seizure during a febrile illness before they get 5 yrs old, accounting for 30% of all seizures among children. Seizure is associated with feveral though there is no evidence of intracranial infection or a definite cause for it. The mechanisms underlying FS have multifactorial etiology, complicated by the fact that the pathogenesis of FS is unknown in most cases. [1-2]

Calcium ion (Ca) via relative depolarization of neurons sheath and activation of voltage dependent sodium channels are involved in the pathophysiology of seizure. Hypocalcemia (Ca <8.5 mEq/L) makes the muscle skips, paresthesia of face and extremities, spasms, stridor, and seizures. Hypercalciuria is the most common cause of kidney stones. It occurs in 2 pathologic and idiopathic modes. Hypercalciuria was defined as calcium excretion higher than 4 mg/kg/day. [3,4]

Variety of pathological conditions affects the calcium excretion via urine. One of the idiopathic hypercalciuria is renal which causes a negative calcium balance leading to calciopenic state. In these children fever increases the respiratory rate and causes respiratory alkalosis and hypocalcaemia affecting the pathophysiology of febrile seizures.

Materials and Methods

Study design: Hospital based Prospective, Analytical, Case – Control study.

Study population: Infants and children aged between 6 months to 5 years.

Sample size: 100 patients were enrolled in the study out of which 50 were cases which were febrile convulsion patients and 50 were control who were age and weight matched children.

Selection of control: The control group included the age and weight matched children suffering from a febrile illness without seizures, such as urinary tract infection, gastroenteritis and respiratory tract infection, coming to children hospital.

Sampling Method: Convenience sampling.

Inclusion Criteria: Children aged between 6 months to 5 years with simple/complex febrile seizures (seizure occurring in developmentally normal child in association with a febrile illness in

the absence of CNS infection or any other defined cause of seizures).

Exclusion Criteria

1. Children with previous history of established non febrile seizures
2. Neurological infections (meningitis, encephalitis)
3. Hereditary metabolic disorders
4. Developmental delay
5. Children with history of birth asphyxia
6. Persistent neurological deficits

Data Collection: Demographic data, seizure details, nature of febrile illness, complete developmental history, family history of epilepsy/febrile seizures, temperature at admission, general examination, Systemic examination and nutritional status were recorded (IAP weight for age classification was used to grade protein energy malnutrition) including the final diagnosis was recorded.

Data Analysis: Data was collected from eligible patients on a pre-structured pre-tested Proforma. For data analysis statistical software SPSS-20 version was used and data were analyzed with the help of frequencies, figures, proportions, measures of central tendency and appropriate statistical test.

Results

Mean age was 2.18±1.12 years and 2.13±1.04 years in study and control group respectively and this difference was found statistically insignificant (p>0.05).

In present study, male predominance over females in both study and control groups, where total 64% and 62% patients were males in study and control groups respectively. On applying chi square test, the difference was found statistically insignificant (p>0.05).

Table 1: Distribution of cases according to Ionized Calcium (mg/dl) level in both groups

Ionized Calcium (mg/dl)	Groups			
	Study		Control	
	No.	%	No.	%
Abnormal (<4.4)	13	26.0	0	-
Normal (4.4-5.54)	37	74.0	50	100.0
Total	50	100	50	100
Mean	4.32		4.74	
SD	0.23		0.24	
p	<0.001			

According to above table, in study group, 13(26%) patients had abnormal (<4.4 mg/dl) range of ionized calcium level while in control group no patient had abnormal ionized calcium level.

Mean ionized calcium level was 4.32±0.23 mg/dl and 4.74±0.24 mg/dl in study and control groups respectively and this difference was found statistically highly significant (p<0.001).

Discussion

In this Hospital based study 100 cases meeting the criteria were included and randomized equally into two groups: 50 cases and 50 controls. The control group included the age and weight matched children suffering from a febrile illness without seizures, such as urinary tract infection, gastroenteritis and respiratory tract infection coming to hospital.

Convulsions or seizures are one of the important pediatric health problems in developing and developed countries and febrile seizures are the most common seizure disorder in childhood, affecting 2% to 5% of children between the ages of 6 and 60 months [1]. It is generally believed that FS is an age-dependent response of the immature brain to fever. This postulation is supported by the fact that most (80-85%) febrile seizures occur between 6 months and 3 years of age, with the peak incidence at 18 months. Although the mechanism of this increased susceptibility is unclear, animal models suggest that there is enhanced neuronal excitability during the normal brain maturation [2].

Mean ionized calcium level was 4.32±0.23 mg/dl and 4.74±0.24 mg/dl in study and control groups respectively and this difference was found statistically highly significant (p<0.001).

In a study by Akbayrams et al [5] where 48 children with febrile seizures were compared with age matched controls and found low serum calcium (P=0.001). In literature there are inadequate studies relating serum calcium in children with febrile seizures.

Conclusion

The findings suggest that a considerable percentage of children having febrile seizures suffer from calcium deficiency.

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