International Journal of Medical and Health Research
ISSN: 2454-9142
www.medicalsciencejournal.com
Volume 4; Issue 5; May 2018; Page No. 22-25

The association between serum zinc level and febrile seizures in childhood

Dr. SY Ingale[1], Dr. Madhura Karguppikar[2], Dr. Raghav Kakar[3]
[1] Associate Professor, Department of Pediatrics, KIMS, Karad, Maharashtra, India
[2, 3] Resident, Department of Pediatrics, KIMS, Karad, Maharashtra, India

Abstract
Background: Febrile seizure defined by national institute of health as "an event in infancy or childhood usually occurring between 3 months to 6 years but without evidence of intracranial infection or defined cause for seizure". Serum Zinc levels are shown to be low in febrile seizure in some studies. Hence we want to study this association in our study group.
Objective: To study the association between serum zinc levels and febrile seizures in childhood.
Method: A prospective case control study was done in Krishna Institute of Medical Sciences. All children with febrile seizure between 3 months and 6 years from Pediatric ward of Krishna institute of medical sciences, Karad, were taken as cases. Detailed clinical history comprising of age, sex, body temperature at admission, cause of fever, history of recent zinc supplementation, seizure history, duration, frequency, Type of seizure (simple or complex) was taken. Serum zinc level was measured using zinc kit by colorimetric method between cases and controls. Normal serum zinc levels is 60-120 µgm/dl.
Results: Out of 60 cases, 40 had low serum zinc levels and 20 had normal values. Out of 60 controls, 30 controls with fever, 6 had low serum zinc levels, 20 had normal values and 4 had high values. 30 controls without fever, 4 had low values and 26 had normal values.

Keywords: serum zinc, febrile seizures, pediatric

Introduction

Febrile seizures are defined by the National Institute of Health as an event in infancy or childhood usually occurring between three months and six years but without evidence of intracranial infection or defined cause for the seizure. Peak age of febrile seizures is 18 months. Simple febrile seizures are most common form and are single, brief, and generalized tonic clonic in nature last upto 15 min, occurs once in 24 hrs Complex febrile seizures, last longer than 15 minutes, or include more than 1 seizure associated with febrile illness in 24 hrs and focal findings are present during post ictal period. Genetics factors contribute significantly to the etiology of febrile seizures. Risk factors associated with increase recurrence risk were, age of 12 months or less, birth weight of 2 kgs or less, and initial temperature of 38^0C or less, positive family history of febrile seizure and complex features. A recent study suggested that zinc supplementation may be able to help febrile seizures. Zinc is known to play a control role in immune system and zinc deficient persons experience increased susceptibility to a variety of pathogens. Zinc also functions as an anti oxidant and can stabilize membranes. Zinc modulates the activity of glutamic acid decarboxylase, a rate limiting step in the synthesis of gamma amino butyric acid (GABA), and affinity of neuro transmitters such as glutamate to their receptors and facilitates the inhibitory effect of calcium on N-methy-D-aspartate receptors and thus prevents the excitatory neuronal discharge. Thus in hypozincemia n methyl d aspartate receptors get activated inducing an epileptic discharge in febrile children.

Aim the study

To study the association between Serum Zinc level and febrile seizure in childhood.

Materials and Methods

Source of data: All the Pediatric cases admitted in the Pediatric ward at Krishna Institute of Medical Sciences.

Duration of study: From 1st Jan 2017 to 31st Dec 2017

Type of study: Prospective Case Control Study

Method of collection of data

Inclusion Criteria

All children with febrile seizures between 3 months and 6 years from the pediatric wards of Krishna institute of medical sciences were taken as cases.

Exclusion Criteria

- Children on zinc supplementation since past 1 week
- All Afebrile seizures
- Compromised nutritional status
- Fever with convulsion due to CNS pathology
- Children with delayed developmental milestones

Methodology

Detailed clinical history comprising of age, sex, birth order, birth weight, and present weight, developmental milestones, body temperature at admission, cause of fever, history of

recent zinc supplementation, family history of febrile seizure, as well as details of seizure history, duration, frequency, type of seizure (simple or complex) and duration between initiation of fever and convulsion were noted. Detailed physical and routine systemic examination was recorded.

Blood samples were collected only once within 24 hours of febrile convulsion. Children were included in the study only once. Routine haematological investigations after collection of blood samples were performed for all patients. Routine investigations like blood routine and peripheral smear were done. Serum zinc levels were done by colorimetric method.

Observations

Age distribution

60 children with febrile seizures were studied in the group (3 months – 6 years). Maximum numbers of cases were seen in 1-2 years age group. As the age increases the incidence of febrile convulsions were less.

Table 1

Age in Months	No of cases	Percentage
3-12	14	23.33
12-24	28	46.66
24-36	10	16.66
36-48	8	13.33
48-72	-	-

Sex Distribution

In the age group between 3-36 months the incidence of febrile convulsions was significantly more in male children as compared to female children.

Table 2

Age in Months	No of cases	
	Male	Female
3-12	8	6
12-24	20	8
24-36	6	2
36-48	4	6
48-72	-	-

Presenting Symptoms

Major symptoms noticed were:
Upper Respiratory Tract Infection in 46 children
Lower Respiratory Tract Infection in 4 children
Acute Gastroenteritis in 8 children
Chronic Suppurative Otitis Media in 2 child.

Table 3

Causes of Pyrexia	No of cases	Percentage
URTI	46	76.66
LRTI	4	6.66
AGE	8	13.33
CSOM	2	3.33
Total	60	

Type of seizures

Most of the seizures associated with a febrile illness were generalized. In the present study 52 cases had generalized seizures. Focal seizures were present in 8 cases and all were clonic seizures. Tonic clonic seizures were most common.

Table 4

Types	No of cases	Percentage
Generalized	52	86.6
Focal	8	13.3
Total	60	

- In the present study febrile seizures lasted for less than 15 mins in 60 cases. Majority of the cases had seizure lasting less than 10 mins (30 cases), 22 cases had seizure lasting for 10-15 mins and 8 cases had seizure lasting for less than 5 mins.
- Out of 60 children 52 had single episode of febrile seizure, 8 had more than 2 episode.
- Family history of febrile convulsion was positive in 8 out of 60 cases

Biochemical Studies

Serum zinc levels in cases

Normal values of Serum Zinc level are 60-120µgm/dl. Out of 60 cases serum zinc levels were low in 40 cases (66.66%) and normal values in 20 cases (33.33%), P value <.0098

Table 5

Serum Zinc Levels (µgm/dl)	Cases (febrile convulsion)	Percentage
< 60	40	66.66
60-120	20	33.33
> 120	-	-
Total	60	

Serum zinc levels in controls with fever v/s without fever

60 controls- Out of 30 controls with fever, 20 had normal Zinc levels, 6 had low values and 4 had high values, whereas in 30 controls without fever, 26 had normal Zinc levels and 4 had low Zinc levels.

Table 6

Serum zinc levels (µg/dl)	Controls with fever	Controls without Fever	P – value
< 60	6	4	>.06
60-120	20	26	>0.19
> 120	4	0	>0.14

Comparison of serum zinc levels in cases vs controls (with fever and without fever)

Out of 60 cases with febrile seizure, 40 had low serum Zinc levels. Out of 60 controls with fever and without fever, 10 had low serum zinc levels, 46 had normal values and 4 had high values.

Table 7

Serum Zinc Levels	Cases	Controls
< 60	40	10
60 – 120	20	46
> 120	0	4
Total	60	60

Summary
60 children in age group of 3 months to 6 years admitted to Pediatric ward of Krishna Institute of Medical Sciences with febrile convulsion were matched with 60 controls i.e. 30 with fever and 30 without fever to find out the association between serum zinc levels and febrile seizures in childhood. Other observations were also made like age incidence, sex ratio, duration, type of convulsion, family history and religion etc.
This study showed an increased incidence in children in age group of 3 months to 3 years. 6 months- 1 year- 14 cases (23.3%), 1-2 years -28 cases (46.6%), 2-3 years- 10 cases (16.66%). Male children out numbered the female children in the incidence of febrile seizures. Males formed 63.3% and the females 36.6% of the cases. Male to Female ratio was 1.72:1.
Peak incidence of febrile convulsion noticed in the months of April and October. The commonest cause of fever in febrile convulsion cases was upper respiratory tract infection?? Viral i.e 76.6%, followed by acute gastroenteritis 13.3% and lower respiratory tract infection 6.6%.
In this study 86.6% of the cases had generalized seizures and 13.3% had focal seizures. Of the 60 cases studied 86% of the cases had single seizure during febrile episode, 13.3% of the cases had more than one seizure per febrile episode. History of febrile seizures either in siblings, parents or close relatives accounted for 13.3% of the cases. In the present study mean serum zinc levels in cases was 59.4±16.78 µgm/dl and in controls with fever was 82.36±24.72 and in cases without fever was 84±28.47 (p value. 000106). Whether zinc supplementation in febrile seizures reduces the recurrence rate is to be studied and if proved will be a evidence based prophylactic supplementation.

Conclusion
The observations made both in clinical and biochemical parameters in the present study was in conformity with other studies that serum zinc levels are low in children with febrile convulsions.

References
1. World Health Organization. “Epilepsy” fact sheets, 2012. Available at: http://www.who.int/mediacentre/factsheets /fs999/en/. Accessed 24 January 2013.
2. Kleigman RM, Stanton BF, Schor NF, St. Geme JW, Bherman RE. Chapter 586. In: Kleigman RM, Stanton BF, Schor NF, St. Geme JW, Bherman RE, eds. Nelson Textbook of Pediatric. 19th ed. Philadelphia: Saunders. 2012: 2017.
3. Doose H, Maurer A. Seizure risk in offspring of individuals with a history of febrile convulsion. Eur J Pediatr. 1997; 156:476-81.
4. Prasad AS. Zinc deficiency: has been known of for 40 years but ignored by global health organisations. Br Med J. 2003; 326(7386):409-10.
5. Broadley MR, White PJ, Hammond JP, Zelko I, Lux A. Zinc in plants. N Phytol. 2007; 173:677-702.
6. Hambidge KM, Krebs NF. Zinc deficiency: a special challenge. J Nutr. 2007; 137(4):1101-5.
7. Nakashima AS, Dyck RH. Zinc and cortical plasticity. Brain Res Rev. 2009; 59(2):347-73.
8. Mollah MA, Dey PR, Tarafdar SA, Akhter S, Ahmed S, Hassan T, *et al*. Zinc in CSF of patients with febrile convulsion. Indian J Pediatr. 2002; 69(10):859-61.
9. Mishra OP, Singhal D, Upadhya RS, Prasad R, Atri D. Cerebrospinal fluid zinc, magnesium, copper and gammaaminobutyric acid levels in febrile seizure. J Pediatr Neurol. 2007; 5:39-44.
10. Frederickson CJ, Suh SW, Silva D, Frederickson CJ, Thompson RB. Importance of zinc in the central nervous system: the zinc-containing neuron. J Nutr. 2000; 130(5):1471-83.
11. Ebadi M, Pfeiffer RF. Zinc in neurological disorders experimentally induced epileptiform seizures. In: Frederickson CJ, Howell GA, Kasarskis EJ, eds. The Neurobiology of Zinc. Vitamin B6 Deficiency. Toxicity and Pathology. 2nd ed. New York: Alan R Liss Inc. 1984, 307-324.
12. Ganesh R, Janakiraman L. Serum zinc levels in children with simple febrile seizures. Clin Pediatr. 2008; 47:164-6.
13. Kumari PL, Nair MKC, Nair SM, Lalitha K, Geetha S. Iron deficiency as a risk factor for simple febrile seizures - a case control study. 2001; 30(5):1-4.
14. Hartifeld DS, Tan J, Yager JY, Rosychuk RJ, Spandy D, Haines C, *et al* The association between iron deficiency and febrile seizure in childhood. Clin Pediatr. 2009; 48(4):420-6.
15. Guzman AR, Castillejos EL, Vicuña WL, Laguia VL, Balarezo W, Gurreoner RL. Anemia: a possible risk factor for the first febrile seizure. Paediatrica. 2005; 7(2):62-5.
16. Offringa M, Bossuyt PM, Lunsen J, Ellenberg JH, Nelson KB, Kundsen FU, *et al*. Risk factors of seizures recurrences in children with febrile seizures: a polled analysis of individual patient data form studies. J Pediatr. 1994; 124:574-8.
17. Sadlier LG, Scheffer IE. Febrile seizures. BMJ. 2007; 334:307-11.
18. Berg AT, Shinnar S. Unprovoked seizures in children with febrile seizures: short-term outcome. Neurology. 1996; 47:562-8.
19. Papierkowski A, Mroczkowska-Juckiewicz A, Pawlowska-Kamieniak A, Pasternak K. Magnesium and zinc levels in blood serum and cerebrospinal fluid in children with febrile convulsions. Pol Merkur Lekarski. 1999; 6(33):138-40.
20. Hershfinkel, Silverman M, William F, Sekler, Israel. The zinc sensing receptor, a link between zinc and cell signaling. Molecul Med. 2007; 13(7-8):331-6.
21. Kumar L, Chaurasiya OS, Gupta AH. Prospective study of level of serum zinc in patients of febrile seizures, idiopathic epilepsy and CNS infections. People’s J Sci Res. 2011; 4:1-4.
22. Ehsanipour F, Talebi-Taher M, Harandi N, Kani K. Serum zinc level in children with febrile convulsion and its comparison with that of control group. Iran J Pediatr. 2009; 199:65-8.
23. Amiri M, Farzin L, Moassessi ME, Sajadi F. Serum trace element levels in febrile convulsion. Biol Trace Elem Res. 2010; 135(1-3):38-44.
24. Mahyar A. The preventive role of zinc from communicable and noncommunicable diseases in children. NCD Malaysia. 2005; 4:21-5.

25. Margharetha L, Masloam N. Correlation between serum zinc levels and simple febrile seizure in children. Pediatr Indonesia. 2010; 50:326-3.