

Children with Febrile Seizures have Lower Zinc Levels

Syeda Mamoon Qudrat¹, Najaf Masood², Ammara Khalid³, Tanzeela Rani⁴, Mobeen Tabussum⁵,
Rai Mohammad Asghar⁶

^{1,4,5} Senior Registrar, Department of Paediatrics, Benazir Bhutto Hospital, Rawalpindi.

² Associate Professor, Department of Paediatrics, Services Institute of Medical Sciences, Lahore.

³ Senior Registrar, Department of Paediatrics, Abbottabad Medical Complex, Abbottabad.

⁶ Professor and HOD, Department of Paediatrics, RMU and Allied Hospitals, Rawalpindi.

Author's Contribution

² Conception of study

^{1,3} Experimentation/Study conduction

^{2,3,4,5} Analysis/Interpretation/Discussion

^{4,5} Manuscript Writing

⁵ Critical Review

¹ Facilitation and Material analysis

Corresponding Author

Dr. Syeda Mamoon Qudrat,

Senior Registrar,

Department of Paediatrics,

Benazir Bhutto Hospital,

Rawalpindi

Email: mamoon_qudrat@yahoo.com

Article Processing

Received: 10/04/2020

Accepted: 09/09/2020

Cite this Article: Qudrat, S.M., Masood, N., Khalid, A., Rani, T., Tabussum, M. & Asghar, R.M.(2020). Children with Febrile Seizures have Lower Zinc Levels. Journal of Rawalpindi Medical College. 30 Sep. 2020; 24(3): 245-248.

DOI: <https://doi.org/10.37939/jrmc.v24i3.1377>

Conflict of Interest: Nil
Funding Source: Nil

Access Online:



Abstract

Objective: To find the association between zinc deficiency and febrile seizures in children of 6 months and 5 years of age.

Materials and Methods: Cross-Sectional Descriptive Study was carried out at the Department of Pediatrics, Benazir Bhutto Hospital, Rawalpindi for six months (From 11th March to 31st August 2017). After taking approval of the Ethical Research Committee of Rawalpindi Medical College and taking informed consent from the parents/guardians, children selected according to the inclusion/exclusion criteria.

Patient profile including name, age, sex, address, hospital number, serial number, date of inclusion in the study was noted. Data was collected from the Patient's charts and/or by direct interview of the child's guardian.

Using aseptic measures, 2ml of blood from venipuncture utilizing a 22-gauge antiseptic needle, in no more than 24 hours of hospital visitation was reserved. Evaluation of serum zinc was completed in no more than 6 hours of collection. The copy was then given to the lab testing and thus this report was then approved by the physician.

Results: In our study, out of 145 cases, 52.41% (n=76) were between 1-3 years of age whereas 47.59% (n=69) were between 4-6 years of age, the mean and standard deviation was calculated as 3.54 ± 1.50 years, 50.34% (n=73) were male whereas 49.66% (n=72) were females. Mean serum zinc levels were calculated as 64.28 ± 12.13 mcg/dl. The frequency of hypozincemia in febrile seizures among children presenting at tertiary care hospitals was 54.48% (n=79).

Conclusion: These analysis outcomes depicted that children with febrile seizures had notably lesser serum zinc measures.

Keywords: Children, Febrile seizures, hypozincemia.

Introduction

A febrile convulsion (FC) was defined as a seizure occurring in a child with a documented temperature of 37.8°C.¹ FC is one of the familiar kinds of seizures in childhood from which 2-5% of children suffer.² About 80-85% of febrile seizures occur between 6 months and 3 years of age with a peak incidence at 18 months.³ Trace elements have been hypothesized to involve in the pathophysiology of febrile convulsions.⁵ Zinc is an important element in growth, development, and normal brain function.⁶ Zinc is recognized as a convulsion promoting factor.⁸ Zinc modulates the production of Gamma-aminobutyric acid in the central nervous system.^{5,6,7} A low Gamma-aminobutyric acid level in cerebrospinal fluid, seems to be related to seizure disorders.⁷ The decrease of Zn in the blood and central nervous system, makes N-Methyl-D-Aspartate receptors active, eliminates the inhibitory effect of GABA, and, hence, causes seizures/convulsions.^(8,9,14) Zinc complements the inhibitory effects of calcium on the excitatory N-methyl-d-aspartate receptors which become activated when a patient develops low levels of zinc and induce an epileptic discharge in children with a high fever.¹¹

In febrile seizure, hypozincemia has been suggested as a possible change during the rising phase of body temperature in patients.⁴

Materials and Methods

This study was done at the Department of Pediatrics, Benazir Bhutto Hospital, Rawalpindi, children whose ages starting from 6 months old to 5 years old.

Study Design: Cross-Sectional Descriptive Study.

Sample Size:

- WHO Calculator
- Confidence Interval= 95%
- Population Proportion=60%⁽⁶⁾
- Absolute Precision= 8%
- Sample Size=145

Sample Technique: Non-probability of consecutive sampling.

Sample Selection:

Inclusion Criteria:

1. Gender: male & female.
2. Age: 6 months to 5 years.
3. First febrile seizures (assessed on history) as per operational definition within the last 24 hours.
4. Simple febrile seizure.

Exclusion Criteria:

1. Diagnosed patients of meningitis (lumbar puncture proved).
2. History of developmentally delayed
3. Known case of epilepsy.
4. On zinc therapy for any ailment
5. Weightless than 60% of the expected weight.
6. Patients with metabolic seizures assessed on labs with abnormal levels of serum sodium (135-145meq/l), calcium (8-10mg/dl), magnesium (1.8-3.6mg/dl).
7. Patients with focal seizures were assessed on history and electroencephalogram).
8. Patients with pneumonia and diarrhea.

A total of 145 children were included. Informed consent was obtained from the parents or guardians. A detailed history was obtained including age, sex, socioeconomic status, duration of fever before the onset of seizures, duration of seizures, consanguinity, family history of epilepsy, family history of febrile seizures, and consanguinity. Complete physical examination of the child was performed with weight, height, head circumference, and mid-arm circumference to emphasize that there is no evidence of malnutrition

Taking all aseptic precautions, 2ml of blood from venipuncture using a 22-gauge sterile needle, within 24 hours of hospital visit was withdrawn. Estimation of serum zinc was done within 6 hours of collection via the colorimetric method. The specimen was sent to the hospital lab pathologist for verification.

Reference ranges are defined as 70-120 µg/dL, while the values lower than 70 µg/dL is defined as zinc deficiency.¹²

Results

A sum of 145 cases of patients satisfying the addition/barring standard was registered to regulate the frequency of hypozincemia in febrile seizures amid child handed over at triennial protection hospital.

Age Distribution: Age-wise division of clients was done, it manifests that 52.41% (n=76) were betwixt 1-3 years of age while 47.59% (n=69) were betwixt 4-6 years of age, mean+sd was estimated as 3.54+1.50 years. (Table 1)

Table 1: Age Distribution

Age (in years)	No. of patients	%
1-3	76	52.41
4-6	69	47.59
Total	145	100
Mean±SD	3.54±1.50	

(n=145)

Gender Distribution: Gender division manifests that 50.34%(n=73) were males while 49.66%(n=72) were females. (Table 2)

Table 2: Gender Distribution

Gender	No. of patients	%
Male	73	50.34
Female	72	49.66
Total	145	100

(n=145)

Mean Serum Zinc Levels: Mean serum zinc levels were estimated as 64.28±12.13 mcg/dl. (Table 3)

Table 3: Mean Serum Zinc Levels

Zinc level (mcg/dl)	Mean	SD
	64.28	12.13

(n=135)

Frequency of Hypozincemia: Recurrence of hypozincemia in febrile seizures amid children presenting at tertiary care hospital as 54.48% (n=79) whereas 45.52% (n=66) had no hypozincemia.(Table 4)

Table 4: Frequency of Hypozincemia in Febrile Seizures among Children Presenting at Tertiary Care Hospital

Hypozincemia	No. of patients	%
Yes	79	54.48
No	66	45.52
Total	145	100

(n=145)

Data Stratification: Result transformers such as age, gender, detection of seizure was managed by sampling option. After this sampling, the chi-square test. P-value ≤ 0.05 was regarded as notable. (Table 5 & 6)

Table 5: Stratification for Frequency of Hypozincemia in Febrile Seizures among Children Presenting at Tertiary Care Hospital with regards to Age

Age (in years)	Hypozincemia		P-value
	Yes	No	
1-3	42	34	0.84
4-6	37	32	

Table 6: Stratification for Frequency of Hypozincemia in Febrile Seizures among Children Presenting at Tertiary Care Hospital with regards to Gender

Gender	Hypozincemia		P-value
	Yes	No	
Male	43	30	0.28
Female	36	36	

Discussion

Febrile seizure (FS) is a common neurological disorder among children, which has been observed in 2-5% of cases. FS occurs with fever (temperature degree greater than 38°C) and without symptoms of central nerve infection, severe electrolytic disorder, or a specifically defined cause. Considering the high incidence of febrile seizures among children under 5-years of age, Thus, it is expected that each FS concerns parents. Zinc, as a major element of some enzymes, plays an important role in the central nervous system (CNS) and can affect some inhibitory mechanisms of CNS.^{8,9,13}

In a study done in Iran, there is a significant difference between case and control group regarding hypozincemia (P < 0.05) with thirty-seven (53.81%) of children in the case group and 10 (9.6%) in the control group were found to have hypozincemia.¹⁵

In another study done in Iran by Mehri Taherya, in the patient's group, serum zinc level was significantly lower (70 µg /dl) than the control group (90ug/dl) which is statistically significant (P<0.001).⁵

In a study done in Multan, Pakistan; the low serum zinc levels (26%) are fairly sufficient to support the hypothesis that Zinc deficiency could be a potential risk factor for febrile seizures in children.³

Currently, there is little information on the spectrum of association of zinc deficiency with febrile seizures in south-east Asian countries and India.

Conclusion

These analysis outcomes depicted that children with febrile seizures had notably lesser serum zinc measures.

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