ROLE OF SERUM ZINC LEVEL IN CHILDREN WITH FEBRILE CONVULSIONS

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Abstract

Background: The aim of the present study was to determine whether there were any changes in serum zinc level in children with febrile seizure in comparison with febrile children without seizure.

Methods: A prospective observational study was done on 100 children, admitted in a tertiary care centre. Of these 50 children were diagnosed to have febrile convulsions. The other 50 were febrile children without seizures. Serum zinc levels were measured in all 100 subjects using calorimetric methods. Data was analyzed using SPSS version 22.

Results: In present study, we studied 50 children (36 males, 14 females) with febrile seizure and a control group of 50 patients (37 male, 13 female). The mean ages of patients in the febrile seizure and control group were 25.01±14.07 months and 26.07±13.6 months, respectively. Mean zinc level was 69.78±13.13mcg/dl and 80.72±10.21 mcg/dl in study and control groups respectively and this difference was found statistically highly significant ($p<0.001$).

Conclusion: Our findings revealed that serum zinc level was significantly lower in children with febrile seizure in comparison with children without seizure.

Keywords: febrile seizure, children, epilepsy.

Introduction:

Febrile seizure is the most common seizure in children. It occurs in children aged 6 month to 6 years . Their incidence is 2-5% or 4.8/1,000 person-year.¹⁻²

It is often said that due to their coenzyme activity and impact on ion channels and receptors, some elements have an important role in febrile seizures. Studies have shown that iron, zinc, magnesium, selenium and copper are highly effective in febrile seizures. Zinc is one of the essential minerals that plays the main role in treatment and prevention of neurological diseases. The highest zinc concentration has been found in hippocampus. Zinc is an important factor for growth, evolution and normal function of the brain and a significant cofactor for DNA and RNA polymerase enzymes³. Zinc regulates the activity of glutamic acid and the rate-limiting enzyme (Glutamic acid decarboxylase) in the synthesis of gamma-aminobutyric acid (GABA) which is an inhibitory neuro-transmitter. This element also facilitates the inhibitory effect of calcium on N-methyl-D-aspartate receptors (NMDA) and by these effects prevents the stimulation of neuronal discharge. High concentration of zinc exists in the synaptic vesicles of glutamatergic

neurons including the hippocampal mossy fiber which can be synaptically released during neuronal activity as in convulsion⁴⁻⁵. As zinc plays important role in the functioning of nervous system, studies have shown that lack of zinc might have a role in pathogenesis 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 children hospital.

Sampling Method

Random 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.

Serum Zinc detection from blood was carried out in a PerkinElmer A-Analyst 800 tool atomic absorption spectrophotometry after diluting the serum 5 fold in 1/1000 priton.x.100 solution

OBSERVATIONS

Table 1: Socio-demographic variable

Variable	Case	Control	p-value
Mean age $\pm$ SD (Months)	25.01 $\pm$ 14.07	26.07 $\pm$ 13.6	>0.05
Male : Female	36:14	37:13	>0.05
Rural : Urban	31:19	30:20	>0.05
Hindu : Muslim	43:7	42:13	>0.05

In present study, we studied 50 children (36 males, 14 females) with febrile seizure and a control group of 50 patients (37 male, 13 female). The mean ages of patients in the febrile seizure and control group were

25.01 $\pm$ 14.07 months and 26.07 $\pm$ 13.6 months, respectively.

Table 2: Zinc level

Zinc level	Case	Control	p-value
Mean	69.78	80.72	<0.001
SD	13.13	10.21	

Mean zinc level was 69.78 $\pm$ 13.13mcg/dl and 80.72 $\pm$ 10.21 mcg/dl in study and control groups respectively and this difference was found statistically highly significant ($p < 0.001$).

DISCUSSION

The present study was undertaken to assess the serum zinc status in febrile seizures – a prospective case control study. 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.

In present study, we studied 50 children (36 males, 14 females) with febrile seizure and a control group of 50 patients (37 male, 13 female). The mean ages of patients in the febrile seizure and control group were 25.01 $\pm$ 14.07 months and 26.07 $\pm$ 13.6 months, respectively.

In a study done by Waheed N et al⁶, they found that 55.8% of cases and 56.5% of controls were in the age group less than 17 months. Guzman et al⁷ found that 55% of children with febrile seizures were in age group 6 months to 24 months.

Regardless of the era of the study or particulars of the design, boys have consistently emerged with higher frequency of febrile seizures. Incidence ratios of boys: girls have ranged from 1.1:1 to 2:1 in the study conducted by Nelson and Ellenberg⁸. However present study finding are different in contrast to another set of large studies conducted by van der Berg et al⁹, 1969 and Verity et al¹⁰, 1985, who found no sex difference. Amir Salari also found no gender difference between cases and controls while NCPP study showed male predilection only among black population (Nelson and Ellenberg)⁸. Whether there is a biological basis for the gender-specific differences in febrile seizure susceptibility or whether boys just contract more fevers and therefore are at greater risk, is currently not established.

Zinc is a fundamental component of body enzymes that modulates CNS activities. CSF hypozeinemia activates N Methyl- D-aspartate receptors or disinhibits GABAergic action, thus resulting in febrile convulsion. In our study Mean zinc level was 69.78 ± 13.13 mcg/dl and 80.72 ± 10.21 mcg/dl in study and control groups respectively and this difference was found statistically highly significant ($p < 0.001$). Similar findings were noted by others. Guzman et al⁷ found that the mean serum concentration of magnesium and zinc were significantly lower in the children with febrile convulsion. In another study by Verity et al¹⁰, researchers have shown that children with febrile convulsion had significantly higher plasma IL-1 beta and prostaglandin levels and lower serum zinc levels during the acute phase. They concluded that these changes may be responsible for the pathogenesis of febrile convulsion. In their study mean zinc levels were comparatively lower in FS group compared to FI group, but however it was statistically insignificant.

CONCLUSION

Our findings revealed that serum zinc level was significantly lower in children with febrile seizure in comparison with children without seizure.

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