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Study of Serum Zinc Level in Febrile Seizure.

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ABSTRACT

The aim of the study is to measure the serum zinc levels in children with simple febrile and epileptic seizures and compare them with controls. A prospective, case-control study was conducted between in a tertiary care hospital in Chennai were 50 subjects of 6 months to 5yrs of age group age matched and sex matched were included in the study (15 with febrile seizures, 15 with epileptic seizures and 20 controls). Serum zinc level was estimated using atomic absorption spectrometry and data was analysed with SPSS package. Mean serum zinc level in children with, simple febrile seizures, epileptic seizures and controls were 32.1, 79.8 & 88.9 $\mu\text{g/dL}$ respectively with a significant p-value of 0.001. Serum zinc levels are lower in children with febrile seizures than in those with epileptic seizures and normal children.

Keywords: Febrile seizure, Seizure disorder, Serum zinc levels.

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INTRODUCTION

Febrile convulsions is one of the most common convulsive seizures in infants and preschool children between 6 months and 5 years of age. Children with a simple febrile seizure has potential for recurrence. Contrary to simple febrile seizure, complex febrile seizures are prolonged (>15 minutes), focal and occur more than once in 24 hours [1,2]. Such events, have great impact on the parents and are a leading cause of parental anxiety and family disruption. This is an age dependent response of the immature brain to fever in children, who do not have an intracranial infection, metabolic disturbance, or history of afebrile seizures.

However patho physiology of febrile convulsions has not been known. Genetics and environment have been implicated in their generation. Trace elements have been hypothesised to involve in the pathophysiology of febrile convulsions. However, several theories, such as genetic basis, reduction of serum as well as cerebrospinal fluid (CSF) zinc and magnesium level and low Gamma- aminobutyric acid (GABA) have been proposed. Low CSF GABA values have been reported in association with several seizure disorders, including febrile convulsion. Zinc is known to play a control role in the immune system, and zinc- deficient persons experience increased susceptibility to a variety of pathogens. Zinc also functions as an antioxidant and can stabilize membranes. Zinc modulates the affinity of neurotransmitters such as glutamate to their receptors and facilitates the inhibitory effect of calcium on N-methyl-D-aspartate receptors and thus prevents the excitatory neuronal discharge [3-5].

Aim

The aim of the study is to measure the serum zinc levels in children with simple febrile and seizure disorder and compare them with controls .We carried out a prospective case-control study to reveal the relationship between low serum concentration of zinc and febrile convulsion.

MATERIALS AND METHODS

This prospective control study was conducted in tertiary pediatric care hospital in Chennai. 50 subjects age and sex matched were included in study between age group of 6 months to 5 years. Of which 15 case was febrile seizure, 15 was epileptic and 20 control group. Prior consent was obtained from the patients parents. Data was analysed with SPSS package Sample was collected and centrifuged and serum was preserved in -80°C. Serum zinc was estimated by Atomic Absorption Spectrophotometry.

Inclusion Criteria

Children aged between 6 months to 5 years with Febrile seizures.

Febrile seizures (Febrile seizures being defined as a seizure occurring in association with a febrile illness, in the absence of CNS infection or any other defined cause of seizures)

Exclusion Criteria

- 1) Children who had mental retardation.
- 2) Atypical convulsion.
- 3) Chronic diseases.
- 4) Malnutrition.
- 5) Central nervous system infection.
- 6) Unprovoked seizure.

RESULTS

Mean serum zinc level in children with, simple febrile seizures ,epileptic seizures and controls were 32.1, 79.8 & 88.9 µg/dL respectively with a significant p-value of 0.001. In the current study a significantly low serum zinc level was found in patients with febrile convulsion as compared other seizure disorders and controls.

Supporting studies are available to correlate this low levels. The mean ages of patients in the febrile seizure, seizure disorder and control group were 26.5 months, 27.8 months and 25.3 months respectively. Upper respiratory tract infection was the most frequent cause of fever apparent in 24% followed by tonsillitis 17%, pneumonia 16%, urinary tract infection 16%, otitis media 15%, and bronchiolitis 12%.

DISCUSSION

Zinc is an important micronutrient that plays a significant role in growth and development, immune system response, enzymatic activity of different organs, proteins and cellular metabolism, neurological functions, nerve impulse transmission and hormone release. Zinc is second to iron as the most abundant trace element in the body. More than 300 zinc metal enzymes occur in all six categories of enzyme system [6].

Severe zinc deficiency is known to affect mental health, with varying degrees of confusion and depression being consistent with zinc enzymes have important role in brain development and function . The possible role of zinc deficiency in provoking febrile seizures has been reported in different studies. Zinc stimulates the activity of pyridoxal kinase, the enzyme that modulates GABA level, a major inhibitory neurotransmitter. It also modifies the affinity of neurotransmitters and thus prevents the excitatory neuronal discharge. In addition, zinc significantly reduces the severity of illness and the duration of fever in children with pneumonia and diarrhea by the activation of immune enhancing T cells . The major limitation of this study is that serum zinc levels were measured during a acute phase of the illness and therefore we could not compare serum zinc level during illness free period [7].

Few studies with the similar methods were conducted in different countries to measure the serum zinc level in children with febrile convulsions. In all of these studies results was found that children with simple febrile convulsions had serum zinc levels lower than that of febrile children with the same age. In conclusion a considerable body of evidence now exists that shows hypozincemia in children with febrile convulsions during an episode of seizure. So it is valuable to design large prospective trials to assess the serum zinc level in children at risk for the occurrence of febrile convulsions during healthy states and before a seizure occurrence [8,9].

On the other hand, in one report by Cho et al. from Korea in Pusan Hospital, there was no significant difference between serum zinc level of children with febrile seizure and that of control group. This difference with our result may be due to their small sample size (study was performed on 11 patients in each group). Also, Garty et al.'s results do not support the hypothesis that febrile convulsions are related to reduce CSF zinc concentration [1]. We think that this may be due to delayed CSF sampling after the febrile illness in their study.

CONCLUSION

This study concludes that Zinc deficiency could be a potential risk factor for febrile seizure in children. Its important to know that how zinc level plays role in the pathophysiology of febrile seizure and whether zinc supplementation could be effective in preventing febrile seizures which needs larger clinical trials.

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