SERUM ZINC LEVEL IN CHILDREN WITH FEBRILE CONVULSIONS AND ITS COMPARISON WITH THAT OF CONTROL GROUP

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AIMS AND OBJECTIVES

Febrile convulsion is the most common form of convulsions in children between the age groups 6 months to 60 months. Febrile convulsions, which occurs in 2.5% of children aged between 6 months and 60 months. There are different hypotheses about neurotransmitters and trace elements (such as zinc) changes in cerebrospinal fluid and serum, which can have a role in pathogenesis of febrile convulsions. The aim of the study is to determine whether there was any changes in serum zinc level in children with febrile convulsions during seizure.

Methods: 92 children aged 6 months to 60 months were divided into 3 groups: group A, 34 children with febrile convulsions, group B, 40 children having fever without convulsion, and group C, 18 children with non-febrile convulsions.

Type of study: Case-control study

Place of study: Paediatrics department, Hitech medical college and hospital, Bhubaneswar.

Study period: August 2014 to August 2016.

Findings: Serum zinc level og group A was lower than those of the other groups (p<0.006). It was also lower in group B than in group C (p<0.006).

Conclusion: These findings revealed that serum zinc level decreases during infections. This decrease was more significant in patients with febrile convulsion.

KEY WORDS

Fever, convulsions, febrile convulsions, serum zinc level.

INTRODUCTION

Febrile seizures (FS) are the most common form of convulsion in children, which occurs in 2 to 5% of children aged between 6 months to 60 months [1]. Based on the definition of The American Academy of Paediatrics, FS occur in the absence of central nervous system infection, metabolic disorders and history of febrile seizures [2]. FS usually have a good prognosis. FS occurs because the electrical system of the brain has not been adequately evolved so as to struggle against the stress of body temperature increases [3]. Studies have shown that iron, zinc, magnesium, selenium and copper are highly effective in the treatment of febrile seizures [4]. Zinc is one of the important element that plays a vital role in the treatment and prevention of neurological studies [5]. Zinc concentration is highest in the hippocampus of the brain [6]. Zinc is an important mineral responsible for growth, evolution and normal function of the brain and it also acts as a co-factor for DNA and RNA polymerase enzyme [7]. Reduction of serum as well as cerebrospinal fluid zinc and magnesium level and low gamma-aminobutyric acid (GABA) have been proposed [8]. We carried out a prospective case-control study to reveal the relationship between low serum concentration of zinc and febrile seizures.

SUBJECTS AND METHODS

This study included included 92 children between 6 months to 60 months of both sexes (34 with febrile seizure, 18 with generalized seizure and 40 age and sex matched febrile patients). Febrile children were taken as control. All patients in febrile seizure group (first bout of single generalized febrile seizure persisting for <15 minutes) and fever group were suffering from viral infection. In non-febrile seizure group the final diagnosis was idiopathic seizure.
Children who had mental retardation, atypical convulsion, focal seizure, chronic diseases, malnutrition, central nervous system infection, pneumonia, urinary tract infection and other bacterial infections, diarrhoea, hemolysis or local infections were excluded from the study.

Blood was collected in an acid-propylene tube within 12 hours of admission. Serum zinc was estimated by Atomic Absorption Spectrophotometry. For statistical analysis, SPSS 13 program using t-test was employed. Chi-square test was performed to compare proportion between 2 or more discrete variables. P<0.05 was considered statistically significant.

Table 1: Demographic data and serum zinc level in febrile seizure children in comparison with fever and seizure group.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Male/Female</th>
<th>Mean (SD) age (year)</th>
<th>Mean (SD) serum zinc levels (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>fever</td>
<td>21/19</td>
<td>3.5+ or - 1.2</td>
<td>90.1+ or – 14.6</td>
</tr>
<tr>
<td>Febrile seizure</td>
<td>24/20</td>
<td>3.1+ or - 1.5</td>
<td>76.8+ or – 24.4</td>
</tr>
<tr>
<td>seizure</td>
<td>9/9</td>
<td>2.7+ or - 1.4</td>
<td>94.5+ or – 17.4</td>
</tr>
</tbody>
</table>

P value = 0.00

FINDINGS

From 92 children, 40 (43.5%) patients were females, and 52 (56.5%) patients were males. Patients age was 3.23 + or – 1.37 years (females: 3.23+ or – 1.41 years, males: 3.22+ or – 1.35 years). Mean zinc level in patients was 86.06+ or – 20.42 mg/l. There was no significant relation between the mean serum zinc level in females and males (84.12+ or – 16.94 mg/l vs 87.56+ or – 22.78 mg/l, p value >0.05). Table 1 shows the demographic data and mean serum zinc levels in the three groups.

DISCUSSION

The mechanisms underlying febrile seizures, which have multiple etiologic factors, are not yet clear. Some changes in the levels of proinflammatory cytokines, and zinc in serum and cerebrospinal fluid have been suggested to be responsible for the pathogenesis of febrile seizures [9]. We conducted this cross sectional study in the children of age group 6 months to 60 months. In comparison with the other study [10], our patients were older and we observed no significant gender difference in relation to serum zinc level. Mollah et al indicate that male children are more prone to develop febrile seizures than female children [9].

In or study a significantly low seum zinc level was found in patients with febrile seizure as compared to the controls. Papierkowski et al found that the mean serum concentration of magnesium and zinc were lower in the children with febrile seizures[10]. In another study, researchers have shown that children with febrile seizures had significantly higher plasma IL1 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 seizures.

To understand further the role of trace elements in pathogenesis of febrile seizures, serum zinc, copper, magnesium and CSF zinc, magnesium and protein levels were measured by spectrometry in patients with febrile seizures, bacterial meningitis and viral CNS infection and in the control group. Authors showed serum and CSF zinc levels were decreased in children with febrile seizures. Gunduz et al conducted a study to determine the serum and CSF zinc levels in children with febrile seizures. They observed that serum and CSF zinc levels decreased during infectious diseases, and that this decrease was more significant in patients with febrile seizures [11].

As a limitation in our study, we couldn’t assess the CSF zinc level. Zinc is a fundamental component of the body enzymes that modulates CNS activities.

CSF hypozincemia activates Nmethyl- D- aspartate receptors or disinhibits GABAergic action, thus resulting in febrile convolution. However, Garty et al findings do not support the hypothesis that febrile seizures are related to reduced CSF zinc concentration [12].

CONCLUSION

This study has shown a significant relation between low levels of serum zinc and febrile seizures.
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