To study the prevalence of iron deficiency anemia in children aged 6 months – 6 years presenting with febrile seizures in Department of Pediatrics

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ABSTRACT

Background: Febrile seizure is a common cause of seizures in young children but with an excellent prognosis. In addition to genetic predisposition, febrile seizures are generally thought to be induced by elemental changes such as iron deficiency. Regarding the high prevalence of febrile seizures with iron deficiency anemia in children, the aim of our study is to investigate the role of iron deficiency anemia in febrile seizures patients. Iron deficiency (ID) is the most common nutritional deficiency. The peak age for ID is between 1 and 2 years, which coincides with the peak incidence for febrile seizures. Aim: To study the prevalence of iron deficiency anemia in children aged 6 months to 6 years having febrile seizures. Study design: It is a prospective observational case control study. Material & Method: The present study included 50 children aged 6 months to 6 years with febrile seizures (cases) and 30 febrile children without seizures (controls), coming to Pediatrics OPD and emergency, RAJINDRA HOSPITAL PATIALA. Hemoglobin level (Hb) and serum ferritin levels were estimated in all the patients. Results: In cases the mean serum ferritin levels was 25.52±29.8 ng/dl and in controls was 61.36±77.5 ng/dl. It was seen that serum ferritin levels were significantly low in children with febrile seizures as compared to controls (p < 0.004). Conclusion: Prophylactic iron supplementation should be considered in all children who are anemic as it may have a preventable role in febrile seizures.

Key words: Febrile seizure, Iron deficiency anemia

INTRODUCTION

A seizure is a transient occurrence of symptoms and/or sign resulting from abnormal excessive or synchronous neuronal activity in brain or seizure or convulsion is a paroxysmal, time limited change in motor activity and or behavior that results from abnormal electrical activity in the brain. Seizures are the most common problem in pediatric neurology, occurring in 10% of children.

Febrile seizure is a special category. Febrile seizures are the most common form of convulsions, occurring in 2–5% of children. Between the age of 4 months and 5 years, 2% to 4% of all children will have at least one febrile convulsion. In addition to genetic predisposition, febrile seizures are generally thought to be induced by elemental changes such as iron deficiency.

Iron deficiency is reported to be one of the most prevalent nutritional problems in the world today, especially in developing countries, with an estimated 5 billion people so afflicted, and iron deficiency anemia is a very common nutritional insult among human infants, especially between 6 and 24 months. The peak age for iron deficiency is between 1 and 2 years, which coincides with the peak incidence for febrile seizures.

AIMS AND OBJECTIVES

I. The aim of the present study was to study the prevalence of iron deficiency anemia in children aged 6 months – 6 years having febrile seizures.

II. To correlate the Hemoglobin and serum ferritin levels with febrile seizures.
MATERIAL AND METHODS

The present study was an prospective observational case-control study, conducted on 80 children who were reported to the Department of Pediatrics (Indoor and Outdoor) of Rajindra Hospital, Patiala, out of 50 children diagnosed as febrile seizures were taken as cases and 30 age and sex matched children with fever but without seizures were taken as controls.

The Case group:

It included 50 consecutive children admitted in pediatric department fulfill the following criteria:

Inclusion criteria:
- Aged between 6 months to 6 years.
- Febrile seizures (Febrile seizures being defined as a seizure occurring in association with a febrile illness, in the absence of CNS infections and metabolic disturbances).

Exclusion criteria:
- Neurological infections.
- Metabolic causes.
- Previous afebrile seizures.

The Control group:

It included 30 children aged 6 months to 6 years who got admitted with febrile illness but without febrile seizures. All children included in the study had the following done:

- 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 was recorded (IAP weight for age classification was used to grade protein energy malnutrition) and the final diagnosis.
- Criteria for Iron deficiency anemia as defined by WHO, hemoglobin < 11.5 g/dl and serum ferritin levels < 10 ng/ml. (Mild anemia: Hb levels = 10-10.9 gm/dl, Moderate anemia: Hb = 7-9.9 gm/dl and Severe anemia: Hb = <7 gm/dl) was used.
- Sample was collected by pin prick method & Hb estimated by Sahli’s method.
- The data were analysed using student’s t-test (95% confidence limit), chi-square test, and ANOVA where appropriate. P-value of less than 0.05 was considered significant.
- For estimation of Serum ferritin levels, fasting morning serum sample was collected without additives or anti-coagulants and analysed by Immuno enzymometric sequential assay (ELISA).
- The results were recorded on proforma sheet and was analysed statistically.

RESULTS

The results were obtained from our study after exclusion of 130 children with meningitis and other CNS disorders and 12 with some metabolic disturbances, summarized in the form of tables given in the subsequent headings.

Table 1. Comparison of prevalence of anemia in children presented with febrile seizures

<table>
<thead>
<tr>
<th>Group</th>
<th>No. of children</th>
<th>Anemia</th>
<th>p-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Absent</td>
<td>Present</td>
<td></td>
</tr>
<tr>
<td>Cases</td>
<td>50</td>
<td>2(4%)</td>
<td>48(96%)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Controls</td>
<td>30</td>
<td>6(20%)</td>
<td>24(80%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>8(10%)</td>
<td>72(90%)</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: Shows that children presenting with febrile seizures, most of them had anemia (48 out of total 50 children) as compared to controls. (p<0.05)

Table 2. Comparison of serum ferritin levels (ng/dl) between cases and controls.

<table>
<thead>
<tr>
<th>Group</th>
<th>No. of children</th>
<th>Serum ferritin levels</th>
<th>p-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Range/ng/dl</td>
<td>Mean±SD/ng/dl</td>
<td></td>
</tr>
<tr>
<td>Cases</td>
<td>50</td>
<td>1-119</td>
<td>25.52±29.88</td>
<td>0.004</td>
</tr>
<tr>
<td>Controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3. Relationship between febrile seizures and serum ferritin levels in cases and controls

<table>
<thead>
<tr>
<th>Serum ferritin levels(&lt;15 ng/dl)</th>
<th>Febrile seizures</th>
<th>p-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Absent</td>
<td>Present</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>24(80%)</td>
<td>25(50%)</td>
<td>0.008</td>
</tr>
<tr>
<td>Low</td>
<td>6(20%)</td>
<td>25(50%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2: Shows that children presenting with febrile seizures had low serum ferritin levels compared to controls (p<0.004)

Table 3 shows significant low levels of serum ferritin in children with febrile seizures as compared to controls. (p<0.008)
DISCUSSION

Febrile seizures are the commonest seizures in childhood, quite benign but frightening for the parents and siblings.

Their association with iron deficiency anemia is being widely explored all over the world. There is considerable evidence that iron has important role in neurological functions in addition to its biological affects (Parks YA et al). 5

It is needed in neurotransmitter metabolism, myelin formation and brain energy metabolism. Neurotransmitters, mono-amine and aldehyde oxidases are reduced in iron deficiency anemia. 5

Iron deficiency was also reported to reduce the GABA metabolism via the alteration of glutamate decarboxylase and GABA transaminase enzyme (Auvichayapat P et al). 6

There is a controversy about the relationship between iron deficiency anemia and simple febrile convulsions. Piscacane et al. Vaswani RK et al. Kumari PL et al 7,8 reported a significantly higher rate of iron deficiency anemia among children with febrile convulsions and Kobrinsky et al. 9 reported a protective effect of iron deficiency by raising the threshold for these convulsions. On the other hand Momen et al. 10 found no relationship between iron deficiency anemia and febrile convulsions.

In our study it was noted that children with febrile seizures had significantly low serum ferritin levels as compared to controls, suggesting that iron deficient children more prone to febrile seizures. These observations were similar to innumerable studies in this regard carried out in children. 7,9,12-16

CONCLUSION

Based on results of this study, iron deficiency anemia is more frequent in children with febrile seizures and iron deficiency seems to be an important risk factor for the development of febrile convulsion. Evaluation of iron status is encouraged to be performed in children with febrile seizure, and febrile seizures can be prevented by early introduction of iron supplementation in these children.

REFERENCES