Association of Iron Deficiency Anaemia and Febrile Seizures in Children

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Abstract

Background: To determine the association of iron deficiency anaemia with febrile seizures.

Methods: In this descriptive study 100 patients were selected. Out of these 100 subjects, 50 were control who had fever but did not have seizures and 50 were cases presenting with febrile seizures. Serum ferritin level was checked in both groups and an intergroup comparison was undertaken.

Results: Mean age of patients without febrile seizures (control) was 13 months while mean age of patients with febrile seizures (cases) was 16.4 months. In patients without febrile seizures, mean serum ferritin level was 7.9 µg/L whereas in patients with febrile seizures; the mean serum ferritin level was 6.9 µg/L. Serum ferritin level was significantly lower in children with febrile seizures in comparison with the children in control group (p value of 0.028).

Conclusion: There is positive association of iron deficiency with febrile seizure. In children with febrile fits, iron deficiency should be excluded.

Key Words: Iron deficiency anemia, febrile seizures, ferritin.

Introduction

Nutritional deficiencies among children are global issue especially in developing countries. Among various pediatric physiological problems associated with the nutritional inadequacies, iron deficiency anemia is found to be the most common nutritional deficiency and haematological disease of infancy and childhood. In United States, the prevalence of dietary iron deficiency has markedly declined in infants but poor, minority and immigrant children remain at increased risk. In developing countries 46 - 66% of children less than 4 years of age are anemic and 50% of them have iron deficiency anemia. Its prevalence among the Pakistani children is nearly 65%. It is established that iron is a key player in various metabolic transactions, therefore, must be provided at sufficient levels to sustain the normal functioning of the body. Iron is also essential for enzymes involved in neurochemical reactions. However its deficiency can affect several organs and cause malfunctioning of different systems of the body including neurological symptoms like behavioral changes, poor attention span and hearing deficits in childhood. It is interesting to note that reduction in the levels of several neurotransmitters, monoamines and aldehyde oxidase is also critically associated with iron deficiency which proved to influence normal behavioral and developmental processes.

Febrile convulsions are the ones that occur in the presence of fever with no evidence of underlying CNS infection based on history, clinical examination and relevant laboratory tests. Febrile convulsions occur in 2-5% of all children with a recurrence rate of 30-40%. Generally the children, 6 months to 5 years of age are more prone to this disease. However, age for peak incidence is 14 to 18 months which overlaps with that of iron deficiency anemia which is from 6 to 24 months. In this context, it becomes more important to evaluate iron deficiency anemia of the children who had febrile seizures. Iron deficiency is a significant risk factor for febrile seizures in children of age group 6 months to 3 years. Many studies over the globe have clearly demonstrated that anemia was more prevalent in those patients who presented with febrile seizures.

Patients and Methods

This case control study was carried out at Holy Family Hospital, Rawalpindi from 1st October 2011 to 31st March 2012 in the pediatric department. All febrile children with or without febrile seizures coming through outpatient department or emergency were included in the study. Using this non probability consecutive sampling technique a total of 100 patients having age range from 6 months to 5 years were included in the study. Febrile convulsions were defined as seizures associated with fever in which there is no evidence of CNS infection. Out of these 100
patients, 50 were classified as cases having febrile convulsions as per standard definition whereas 50 were controls having febrile illness but no convulsions. Both groups were compared on basis of serum ferritin levels. For this inter group comparison, venous sample of each patient for serum ferritin level was sent to laboratory and additional serum sugar and calcium levels were also checked to exclude metabolic seizures.

Results

A total of 100 patients were included in the study and among these, 50 were controls and 50 were cases. The mean age of the patients with febrile seizures (cases) was 17.4 ± 8.04 months with a range of 6 to 48 months whereas the mean age of the patients without febrile seizures (control) was 18.7 ± 10.7 months with a range of 6 to 52 months(Table 1). Twenty four (48%) patients were male and 26 (52%) patients were female among the controls while 32 (64%) patients were male and 18 (36%) were female among the cases. In the cases, the mean serum ferritin level was 6.9 ± 0.9 µg/L with a range of 5 to 10 µg/L. However, in the controls, the mean serum ferritin level was 7.9 ± 1.72 µg/L with a range of 5 to 12 µg/L(Table 2). Out of the 50 cases, 32 (64%) patients had low serum ferritin level and 18 (36%) patients had normal serum ferritin level while among the 50 controls, 21 (42%) had low serum ferritin level and remaining 29 (58%) had normal ferritin level(Table 3).

Table 1: Iron deficiency and febrile fits- Age profile

<table>
<thead>
<tr>
<th>Group</th>
<th>Total no of patients (n)</th>
<th>Mean Age ± SD (months)</th>
<th>Age Range (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>50</td>
<td>17.4 ± 8.04</td>
<td>6-48</td>
</tr>
<tr>
<td>Controls</td>
<td>50</td>
<td>18.7 ± 10.7</td>
<td>6-52</td>
</tr>
</tbody>
</table>

Table 2: Iron deficiency and febrile fits- Ferritin levels

<table>
<thead>
<tr>
<th>Group</th>
<th>Total no of patients (n)</th>
<th>Mean ± SD serum Ferritin</th>
<th>Serum Ferritin Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>50</td>
<td>6.9 ± 0.9 µg/L</td>
<td>5-10 µg/L</td>
</tr>
<tr>
<td>Controls</td>
<td>50</td>
<td>7.9 ± 1.72 µg/L</td>
<td>5-12 µg/L</td>
</tr>
</tbody>
</table>

Discussion

Febrile convulsion is the most usual disorder found in children with a frequency of about 2-5% in America and Europe and 6-9% in Japan13. It is slightly more common in males and the predominant age for seizures in children is found to be between 6 months to 5 years.25 Factors increasing the risk of recurrence are a family history of febrile convulsions, first attack at the age less than 12 months, and the intensity and duration of the fever.26,27 Iron deficiency is one of the most prevalent nutrition associated clinical problems in the world. Emerging data from various reliable sources depicted that 2.5-5 billion people including infants between 6 and 24 months of age are affected with this disorder.28 In a number of studies a possible association of iron deficiency and febrile seizures has been reported. 29,30

Our results indicated that the mean age of patients without seizures (control) was 16.47 months and the mean age of patients with seizures (cases) was 13.70 months. In contrast, some studies show contradiction to our findings and those cited elsewhere. Bidabadi et al5 found that mean age of the cases was 22.86 while that of control was 21.91 months. On the similar grounds, the studies of Susan et al31 show evidence of divergent results as compared to our findings; the mean age of cases was found to be 39 months and the mean age of controls was 35 months. In our set up iron deficiency and sequelae associated with it manifest at an earlier age, in childhood. It is also worth noting that male and female have different susceptibility for the disease. Our findings showed that 45% were male and 55% were female having both iron deficiency anemia and febrile fits. In our study this difference between gender distribution was significant and it was confirmed by Susan et al.31

Conclusion

Iron plays an important role in normal brain metabolism; consequently, its down regulation may
halt many substantive physiological functions and could lead to initiation of febrile convulsions.

References