Original Article

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Association of Febrile Convulsion with Iron Deficiency Anaemia: A Retrospective Study

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Abstract

Introduction: Febrile seizures are a benign condition of childhood and most common cause of seizures in children less than 5 years. Many risk factors predisposing the children to febrile seizures have been identified and studied. Among those many studies have found a significant association with anaemia. *Objective:* To study the clinical profile of children admitted with febrile convulsion and its relation with anaemia. *Materials and Methods:* Retrospective case series study of children admitted with first episode of febrile convulsion in the Pediatric department of a tertiary care teaching hospital over period of 15 months. Detailed history was taken and blood investigations were done to diagnose anaemia as per WHO criteria. *Results:* Higher incidence of FS was found in males (63.4%) and children between 6-24 months (71%) with male: female ratio of 1.7:1. 78% had simple FS, 82.5% had fever of less than 24 hours and 20.6% with h/o FS in first degree relatives. 76% of cases had anaemia with 55.5% having iron deficiency features and 36 (57.1%) cases had leucocytosis. *Conclusions:* Iron deficiency is a possible risk factor for febrile seizures in children of age group 6 months to 5 years. Early detection and timely correction of iron deficiency may help in preventing and reducing the incidence febrile seizures in children of this age group.

Keywords: Febrile Seizures; Hemoglobin; Iron Deficiency Anaemia; ILAE; WHO.

Introduction

Febrile seizures (FS) are the single most common seizure type with incidence of 3% to 5% of children in North America and Europe and in up to 14% of children of Asian origin [1]. FS have a peak incidence at 18 months and are common between 6 and 60 months [2]. In 1993, an Inter-national League Against Epilepsy (ILAE) committee established the current definition of FS as "an epileptic seizure occurring in childhood after age 1 month, associated with a febrile illness not caused by an infection of the CNS, without previous neonatal seizures or a previous unprovoked seizure, and not meeting criteria for other acute symptomatic seizures" [3,4].

FS can be separated into two categories, simple and complex. A simple FS is isolated, brief and generalized whereas Complex FS is one with focal onset, one that occurs more than once during a febrile illness, or one that lasts more than 10 to 15 minutes. Febrile status epilepticus is a febrile seizure lasting longer than 30 min [2,5].

The underlying cause of the infectious process does not appear to be a determining factor of febrile seizures. Febrile seizures are most common in the first day of fever, and correlate more with peak temperature than with speed of onset. A history of febrile seizures in first-degree relatives is common, and concordance rates of febrile seizures are much higher in monozygotic than in dizygotic twin pairs [6,7]. While most studies have suggested iron insufficiency as a predisposing factor for febrile seizures, some have even described iron deficiency anaemia to be less frequent in children with febrile seizures [8].

Febrile seizure episodes are agonizing to the parent and child and can cause psychological trauma to both Overall, febrile seizures are benign, and children who have had them show no significant difference in intelligence, head circumference growth, or behavior when compared with children with no history of the condition [9].

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Iron deficiency is the commonest micronutrient deficiency worldwide, and is a preventable and treatable condition. Iron is needed for brain energy metabolism, for metabolism of neurotransmitters and for myelination. Thus, iron deficiency may alter the seizure threshold of a child [10]. Iron deficiency is postulated as a risk factor for febrile seizures in children and it is an easily correctable condition. We, therefore, studied the association between iron deficiency and febrile seizures.

The objective of the study was to evaluate the clinical profile and relation of febrile seizures with Anaemia and type of Anaemia.

Materials and Method

A retrospective case series study of children aged 6 months to 60 months admitted over period of 15 months from July 2015 to September 2016 for febrile convulsion in a tertiary care rural teaching hospital was conducted after obtaining ethical clearance from the institution.

Children aged 6 months to 5 years admitted in paediatric wards with first episode of febrile seizures having normal serum glucose and calcium levels were considered for the study.

The patients with evidence of central nervous system infection, epilepsy, metabolic seizures, past h/o febrile seizures; patients previously diagnosed with hematologic problems like haemolytic anemias, bleeding or coagulation disorders, haematologic malignancy; those who were on iron supplementation, and very sick children were excluded from the study.

A detailed history of presenting complaints were recorded, history included duration of fever, time of onset of seizures, type of seizures, duration of seizures, past and family history of febrile seizures in first degree relatives, Iron supplementation.

Blood investigations done to diagnose anaemia and its type included hemoglobin estimation, red cell distribution width (RDW) & Mean corpuscular volume (MCV) using an automated hematology analyzer (Sysmex Kx-21). Peripheral smear study to know the morphological type of anaemia was also included. Iron deficiency was diagnosed by hematologic investigations of hemoglobin value <11g%, MCV <70 fl & RDW > 15% and total WBC's count more than 11,000/ mm^3 was considered as Leucocytosis [12,12]. Data were entered in MS Excel and analysis was done using SPSS Version 17.

Results

Over a period of 15 months, 63 children aged 6 months to 5 years fulfilling the inclusion criteria, were considered for the study. Majority of children with febrile seizures 45 out of 63 (71.4%) were below the age of two years. Mean age of children was 21±3 months with youngest age being 7 month and eldest being 56 months. 40 (63.4%) of them were males with male to female ratio being 1.7:1.

Majority of cases 52 (82.5%) had fever of less than one day duration whereas 7 (11%) and 4 (6.3%) cases had fever of 1-3 days and >3days respectively. 13 (20.6%) cases had h/o febrile convulsion in first degree relative and 6 (9.5%) had family h/o epilepsy.

Out of 63 cases 49 (78%) were simple and 14 (22%) were complex FS out of which 4 presented as febrile status convulsion.

Table 1: Clinical Profile of febrile seizures

Sex		Age in completed months		Duration of fever in days			h/o FS in first degree relative		Family h/o epilepsy		Type of FS	
Male	Female	6-24	24-60	<1	1-3	>3	Yes	No	Yes	No	simple	complex
40	23	45	18	52	7	4	13	50	6	57	49	14

48 (76%) cases had anaemia i.e. Hb less than 11gm/dl with mean Hb of 8.9±0.6. out of 48 cases with anaemia, 30 (65%) had increased RDW and 26 (56.5%) having MCV less than 70fl. On peripheral smear examination 32 (50.7%) had microcytic red blood cells, 20 (31.7%) and 3 (4.7%) had normocytic and macrocytic cells respectively whereas 8 (12.6%) cases had dimorphic blood picture. 36 (57.1%) cases had leucocytosis.

Discussion

In our study, iron deficiency was diagnosed by considering Hb, RDW, MCV and PS study. Serum ferritin was not considered as it could be falsely elevated in infections as it is acute phase reactant and was not investigated in all cases. Other iron profile studies were not done as many of the patients were from lower socioeconomic section and were not

affordable.

We found higher incidence among male children (63.4%) with M:F ratio being 1.7:1 and children less than 2years (71%) similar to study done by Srinivasa S et al [13] where M:F was 1.4:1, 60% were males and 56% were below 2 years. In a study by Khawaja et al[14] 72% were male, 56% were between 6-24 months, 12% had family h/o seizures and 82% had simple FS similar to our study where simple FS was 78%.

In our study 76% of cases had anaemia with 55.5% having some or other features of iron deficiency in form of Microcytic cells, '!RDW, "!MCV. Srinivasa S et al[13], 39.96% of cases were found to have iron deficiency anaemia as revealed by low levels of haemoglobin level, serum ferritin level, Mean Corpuscular Haemoglobin Concentration and Mean Corpuscular Volume. Odds ratio was 1.847. Patients with febrile seizures were 1.847 times more likely to have iron deficiency anaemia compared to febrile patients without seizures. Higher incidence of anaemia in our study could be due to increased malnutrition as majorities were from lower economic class.

Iron deficiency was found as a significant risk factor for simple febrile seizures in children of age group 6 months to 3 years in study by Kumari L et al [10]. In a study by Bidabadi et al [8], found that iron-deficiency anemia was less frequent among patients with febrile seizure than in controls. Auvichayapat P et al [15] in their study found that the incidence of febrile seizures in patients with thalassemia was much lower than among children in the general population. Thus, iron overload may be a major factor in the brain metabolism that prevents febrile seizures.

Limitations

Complete Iron profile studies could have yielded better correlation between iron deficiency and FS. Prospective case control study would help to derive association of iron deficiency with FS.

Conclusion

Children with febrile seizures are likely to have iron deficiency anaemia. Iron deficiency anaemia can be regarded as a possible risk factor that predisposes to febrile seizures in children between 6 months to 5 years. Early detection and timely correction of iron deficiency may help in preventing and reducing the incidence febrile seizures in children of this age group.

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