

To Study the Role of Iron Deficiency Anemia as a Risk Factor in Children with Febrile Seizure

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Abstract

Background: Febrile seizures are the most common type of seizure in the first 5 years of life, and many factors that increase seizure risk have been identified. Iron deficiency anemia is preventable and treatable disease. **Objectives:** To study association between iron deficiency anemia and febrile seizures. **Methods:** A prospective case control study was performed in 50 cases of febrile seizures and 50 controls with febrile illness without any seizures. Their temperature, age, sex were recorded and laboratory hematological parameters hemoglobin, Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Hemoglobin Concentration (MCHC), Red Cell Distribution Width (RDW) and serum ferritin values were collected and analyzed statistically with SPSS Version 20.0. **Results:** Hemoglobin, MCV, MCH, MCHC, RDW and serum ferritin were significantly lower in children with febrile seizures compared to the controls (p value <0.001). Iron deficiency, defined as ferritin <30ng/mL, was more prevalent in the febrile seizure group (50%) than in the control group (12%). In the study the mean age of onset of febrile seizures is 22 months. **Conclusion:** From the current hospital based study we have concluded that, iron deficiency anemia was more frequent among children with febrile seizures. The result suggests that iron deficiency anemia may be a risk factor for febrile seizures. Screening for IDA should be considered in children with febrile seizures. All the investigations carried out to evaluate iron deficiency anemia were significantly lower. This suggests that iron deficient children are more prone for febrile seizures.

Keywords: Anemia; Febrile seizures; Iron deficiency.

Introduction

Febrile seizures are the most common seizures in children. Febrile seizures are the seizures that occur between the age of 6 and 60 months with a temperature of 38 degree celsius (100.4 degree F) or higher and not the result of central nervous system infection or any metabolic imbalance that occur in the absence of history of prior afebrile

seizures.

The peak onset being 14-18 months of age, incidence approaches 3-4% of young children. Febrile seizures are frequently genetically determined. A strong family history of febrile convulsions in siblings and parents suggests genetic predisposition.

Convulsions due to neurological damage may also be precipitated by fever as the cerebral threshold

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for seizures is reduced with the rise in temperature. These are distinct from febrile convulsions which occur in a neurodevelopmentally normal child.

Earlier studies in children support the hypothesis that the cytokine network gets activated and has a role in the pathogenesis of FS, but the clinical and pathological significance of these observations is not yet clear.

The International League Against Epilepsy had defined the febrile seizures as a seizure occurring in association with a febrile illness, in the absence of a CNS infection/acute electrolyte imbalance in children older than 1 month of age without prior afebrile seizures. The National Institutes of Health (NIH) Consensus Conference had defined the febrile seizures as ILAE except that a febrile seizure as an event usually occurring between 3 months and 5 years of age. The febrile illness must include a body temperature of more than 38.3° C, although the increased temperature may not occur until after the seizure.

A simple febrile seizure is isolated, of short duration and generalized. Conversely, a complex febrile seizure is focal, multiple (more than one seizure during the febrile illness), or prolonged, lasting more than 15 minutes. The child's prior neurological condition is not used as part of the classification criteria.

A simple FS is primary generalized, tonic-clonic, which is associated with fever, and lasts for a maximum of 15 min, and does not recur within a 24-hr period.

A complex febrile seizure is more prolonged (>15 min), focal in nature, and/or reoccurs within 24 hr. Febrile status epilepticus is a febrile seizure lasting longer than 30 min. Some use the term simple febrile seizure plus for those with recurrent febrile seizures within 24 hr. Most patients with simple febrile seizures have a short postictal state and return to their reference line normal behavior and consciousness within minutes of the seizure.

Material and Methods

The study will be a case control prospective study conducted on all children between 6 months to 60 months of age with febrile seizures and febrile illnesses in Pediatrics Intensive Care Unit and Pediatrics Wards of Basaveshwar Hospital and Sangameshwar Hospital from January 2018 to July 2019.

The study will include two groups:

The case group: It will include 50 consecutive children admitted in pediatrics ward fulfilling the following:

Inclusion Criteria

- Aged between 6 months to 5 years
- 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

- Neurological infections
- Developmental delay
- Previous afebrile seizures
- Children on Iron therapy

The control group

It will include 50 children aged 6 months to 5 years who get admitted with febrile illness without febrile seizures.

All children included in the study will have the following done:

- Demographic data, seizure details, nature of febrile illness, family history of epilepsy/ febrile seizures, temperature at admission.
- Estimation of haemoglobin, red blood cell indices and serum ferritin will be done.
- Detailed clinical examination including anthropometry and systemic examination were done to find out cause of fever.
- Detailed CNS (Central Nervous System) examination was also done to rule out other causes of seizure in the cases.

According to WHO Iron deficiency anemia will be defined as haemoglobin < 11g/dl, MCV <70 fl, MCH <27 pg and serum ferritin <30ng/dl.

Statistical Analysis

Data was entered into Microsoft Excel (Windows 7; Version 2007) and analyses were done using the Statistical Package for Social Sciences (SPSS) for Windows software (version 22.0; SPSS Inc, Chicago). Descriptive statistics such as mean and standard deviation (SD) for continuous variables, frequencies and percentages were calculated for categorical Variables were determined. Association between Variables was analyzed by using Chi-

Square test for categorical Variables. Bar charts and Pie charts were used for visual representation of the analyzed data. Level of significance was set at 0.05.

Observations and Results:

Table 1: Comparison of Age between Cases and Controls (N=100).

Age (in Years)	Group	
	Cases (n=50) n (%)	Controls (n=50) n (%)
≤ 1	19 (38.0)	23 (46.0)
1-2	19 (38.0)	7 (14.0)
2-3	6 (12.0)	8 (16.0)
3-4	4 (8.0)	4 (8.0)
4-5	2 (4.0)	8 (16.0)
Mean (SD)	1.88 (1.11)	2.24 (1.59)

Chi-Square Test, P Value = 0.044, Significant

- Among 50 children with febrile seizures, maximum cases fall in the age group of 13-24 months [76%] followed by the age group of 2-3years [12%], 3-4years [8%].
- 46% controls were < 1 year. 14% controls were 1-2 years. 8% controls were 2-3 years. 4% controls were 3-4 years. 8% controls were > 4 years.
- The mean age of cases was 1.88 ± 1.11years and mean age among the control group was 2.24±1.59 years.

Table 2: Comparison of HB between Cases and Controls (N=100).

HB	Group	
	Cases (n=50)n (%)	Controls (n=50) n (%)
≤ 7.0	3 (6.0)	1 (2.0)
7.0-11.0	38 (76.0)	28 (56.0)
>11.0	9 (18.0)	21 (42.0)

Chi-Square Test, P Value = 0.025, Significant.

- 76% of cases and 56% of controls had Hb levels between 7-11.
- 18% of cases and 42% of controls had Hb levels >11.
- 6% of cases and 2% of controls had Hb levels <7.
- Mean Hb among cases-9.67 and among controls is 10.17.

Table 3: Comparison of Serum Ferritin between Cases and Controls (N=100)

Serum Ferritin	Group	
	Cases (n=50) n (%)	Controls (n=50) n (%)
<30	25 (50.0)	6 (12.0)
30-300	24 (48.0)	39 (78.0)
>300	1 (2.0)	5 (10.0)
Mean (SD)	56.13 (61.74)	127.87 (145.51)

Chi-Square Test, P Value <0.001, Significant.

- Mean plasma ferritin level was 56.13ng/ml in cases.
- Mean plasma ferritin level was 127.8ng/ml in controls.

Discussion

1. Maximum number of febrile seizures were in the age group of 13-24 months of age.
2. Mean age of presentation of febrile seizures is 22.56 months.
3. Male preponderance was more on comparing with female in cases with febrile seizures which was 1.5times common in males.
4. Family history of febrile seizures and epilepsy were slightly higher in febrile seizures cases comparing to the controls.
5. Simple febrile seizures were more common than complex febrile seizures.
6. Maximum number of cases admitted with febrile seizures belonged to class III socio economic classes(according to modified kuppuswamy classification).
7. The mean Hb, MCH, MCV, Serum ferritin levels were significantly lower in febrile seizures comparing to the controls.
8. The mean Hb, MCH were significantly lower in simple febrile seizures indicating significant correlation between iron deficiency and febrile seizures.
9. Iron deficiency anaemia was more frequent among children with simple febrile seizures than those with complex febrile seizures.
10. Mean serum ferritin on case study group is 56.13 where as in control group is 127.87ng/ml.
11. Serum ferritin is on lower side in 50% of febrile seizure group and 12% in febrile illness group.
12. Thus screening for IDA should be considered in children with febrile seizures. Fever can worsen the negative effect of anemia or for iron deficiency on the brain and a seizure can occur as a consequence. This suggests that iron deficient children are more prone for febrile seizures.
13. Early identification and preventive measures help in reducing iron deficiency anemia prevalence in community and thus it may help to reduce occurrence of febrile seizures and even supplementation of oral iron in patients of febrile seizure will reduce further seizure episodes.

Conclusion

This is a prospective case control study conducted over a period of 18 months from January 2018 to June 2019 conducted in the department of Pediatrics, MR Medical college, Kalaburagi.

Febrile Seizures (FS) are a form of acute symptomatic seizures occurring in 2% to 5% of children and are the most common form of childhood seizures. The association between the iron deficiency and febrile convulsions has been described in several studies with conflicting results. In present study Mean age of presentation of febrile seizures is 22.56 months with a slightly higher male preponderance in cases with febrile seizures.

Overwhelming 88% cases had generalized tonic-clonic seizures and atypical seizures were reported in only 12% of cases.

All the cases presented within 24 hours from onset of fever and single seizure episode in febrile period was reported.

Family history of febrile seizures and epilepsy were slightly higher in febrile seizures cases comparing to the controls. Maximum number of cases admitted with febrile seizures were belonged to the class III socio economic class.

Children with FS were more Iron deficient in terms of low HB, low MCH, low MCV, low MCHC, high RDW, low serum ferritin as compared to control group. The result strongly suggests that Iron deficiency anaemia may be a risk factor for febrile seizures. Hence forth Screening for IDA should be considered in children with FS.

All the investigations carried out in present study to evaluate iron deficiency anemia were significantly lower in cases as compared to controls. This suggests that iron deficient children are at risk for febrile seizures.

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