

A Case Control Study to Evaluate Iron Deficiency Anemia as a Risk Factor for the First Episode of Febrile Seizure

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Conflict of interest: Nil

Abstract

Aim: Iron deficiency anemia as a risk factor for the first episode of febrile seizure

Methods: This prospective observational study was carried out in the Department of Pediatrics, Rama Medical College and Hospital, Hapur, India for 4 months. Cases (n=80) were patients with typical febrile convulsions between 1 year to 5 years (AAP clinical practice guidelines). A control group (n=80) was selected from age and sexmatched children admitted with febrile illness but without a seizure. Hematological investigations include Haemoglobin, MCV, MCH, RDW, Serum Ferritin, Serum Iron, TIBC and Peripheral blood smear.

Results: 87.5% (n=70) children had Hb <11 gm/dl from the case group as compared to 26.25% (n=21) in control group with significant p-value (p <0.01). The proportion of cases with anemia was significantly higher as compared to that of controls (p=0.019). Mean hemoglobin level and MCV in cases were significantly lower as compared to that in controls (p <0.04). RDW value is significantly higher in cases as compared to control (p <0.04). No significant difference between the two groups was observed with respect to mean MCH levels (p>0.04). Serum ferritin and serum iron levels in cases were significantly lower as compared to that in controls (p <0.01). TIBC value is significantly higher in cases as compared to control (p <0.01).

Conclusion: The findings suggest that a considerable percentage of children having febrile seizures suffer from iron-deficiency anemia and low serum iron. This means the low serum iron and the presence of anemia can serve as a reinforcing factor for febrile seizures in children.

Keywords: Anemia, Iron-Deficiency, Febrile Seizure.

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Introduction:

Febrile seizures (FS) are a form of acute symptomatic seizures. They occur in 2% to 5% of children and are the most common

form of childhood seizures. In the past, it was believed that most FS represented a form of epilepsy and that prognosis was not

favorable. FS was believed to cause brain damage and subsequent epilepsy. Over the past 25 years, much more information on FS has accumulated from both human and animal studies. The prognosis for FS usually has been found to be good. Such seizures are not associated with any detectable brain damage and epilepsy will eventually develop in only a small minority of children who have had FS[1]. The term febrile seizures is used for under 5 years children with temperature of 38 °C or higher without cerebral infection or metabolic imbalances[2]. The duration of fever is less than 15 minutes in simple febrile seizures also called generalized tonic clonic[3]. While the distinguishing features of complex febrile seizures are their focal location, duration less than 15 minutes and recurrence within 24 hours[4]. Another condition which has longer duration of more 30 minutes of seizure attack is called status epilepticus[5]. In pediatric practice febrile seizure is a major challenge due to high prevalence in under 5 years age children and its recurrent nature. The awareness about complications of febrile seizure is increased in recent times[6]. In Europe the incidence of febrile seizures is 2-5% in 6 months to 5 years children[7] but it higher in Asian children (5-10%)[8]. The problems associated with this condition are the risk of aspiration and psychological trauma to both parent and child[9]. Iron deficiency anemia is most common condition in which human body is lacking enough mineral iron. In developing countries upto half of the preschool population are affected by iron deficiency anemia[10,11]. Iron deficiency anemia can be prevented and treated easily. Iron is required for hemoglobin synthesis as well as for enzymes participating in neurochemical reactions[12]. The features of iron deficiency anemia are attention deficit, poor memory, leaning disability, retarded motor activity and behavioural imbalance[13]. Literature has reported positive association between iron

deficiency anemia and febrile seizures in children of less than five years age[1,14]. The proposed mechanism can be iron deficiency may alter the seizure threshold of a child.10 Studies reported frequency of iron deficiency in patient with febrile seizures to 63% in India 9 and 51.3% in Iran[1]. The rationale of this study was to find out frequency of iron deficiency anemia in children with febrile seizures. As no local data is available so this study will help in providing local data on this important aspect of iron deficiency anemia in children with febrile seizures. As iron deficiency anemia is preventable and treatable, it will help in the prevention and management of febrile seizures.

Material and methods

This prospective observational study was carried out in the Department of Pediatrics, Rama Medical College and Hospital, Hapur, India for 4 months

Methodology

Cases (n=80) were patients with typical febrile convulsions between 1 year to 5 years (AAP clinical practice guidelines). A control group (n=80) was selected from age and sexmatched children admitted with febrile illness but without a seizure. Hematological investigations include Haemoglobin, MCV, MCH, RDW, Serum Ferritin, Serum Iron, TIBC and Peripheral blood smear. Anthropometrical data collection includes weight, recorded on an electronic weighing scale; Measurement of length and height using infantometer and stadiometer respectively; Head circumference was measured using a plastic tape measure by cross tape method; IAP weight for age classification was used to grade protein-energy malnutrition. patients with age between 1 year to 5 years, the temperature of 38 degree Celsius (100.4°F) or higher, Not the result of central nervous system infection or any Metabolic imbalance., Occur in the absence of a history of prior afebrile seizure,

Primarily generalized, usually tonic-clonic, Lasting for a maximum of 15 min and Not recurrent within a 24 hrs period were included in this study. Children with neurological infection, Children with

developmental delay, Children on iron therapy and Children with previous febrile/afebrile seizure were excluded from this study.

Results

Table 1: Distribution of cases according to hemoglobin levels

Haemoglobin Level(gm/dl)	Cases=80	Controls=80
No anemia (≥ 11 gm/dl)	10(12.5%)	59(73.75%)
Anemia		
Mild anemia (10-10.9gm/dl)	20(25%)	9(11.25%)
Moderate anemia (7-7.9gm/dl)	45 (45.25%)	9(11.25%)
Severe anemia (<7gm/dl)	5(6.25%)	3(3.75%)

Table 1 shows that 87.5% (n=70) children had Hb <11 gm/dl from the case group as compared to 26.25% (n=21) in control group with significant p-value (p <0.01). The proportion of cases with anemia was significantly higher as compared to that of controls (p=0.019).

Table 2: Hematological parameters

Parameters	Cases		Controls		P-Value
	Mean	S.D.	Mean	S.D.	
Hb(gm/dl)	9.26	1.78	10.78	1.79	<0.01
MCV(fl)	68.90	15.86	16.66	9.96	<0.04
MCH(pg)	22.99	5.11	23.81	5.45	0.065
RDW	18.13	6.79	15.20	2.35	<0.04

Table 2 shows, mean hemoglobin level and MCV in cases were significantly lower as compared to that in controls (p <0.04). RDW value is significantly higher in cases as compared to control (p <0.04). No significant difference between the two groups was observed with respect to mean MCH levels (p>0.04). serum ferritin and serum iron levels in cases were significantly lower as compared to that in controls (p <0.01). TIBC value is significantly higher in cases as compared to control (p <0.01).

Discussion

A total of 160 subjects were included in the study. The case group comprised 80 children admitted with the first episode of simple febrile seizure and 80 children in the control group of the matched age gender with febrile illness but without seizures and without iron supplements. In the present study, the majority of subjects in both groups were males. Sex analysis reveals that 65% were males and 36% females in the case group. Leela Kumari et al[15] also reported 53% of male children in their study. In the present

study, characteristics studied were temperature, weight (Kg), height (Cm), nutritional status among which mean temperature was found to have a difference between cases and control but was not statistically significant (p-value = 0.31). This is in accordance with study by Modaresi M et al[16] Vaswani et al[17] and Daoud et al[18] who although reported a higher incidence of high temperature in case group but it was not statically significant. The incidence of anemia was higher among cases as compared to controls. This difference was statistically significant (p<0.01). Other workers of the

field as Derakhshanfar et al[19] and Modaresi M et al also reported a statistically significant difference from the control group. The iron status components were measured (Hb, MCV, MCH, RDW, serum iron, ferritin, and TIBC) among cases and controls. In the present study, it was found that the mean ferritin and serum iron levels in the FS group were significantly lower than the corresponding levels in the control group ($p < 0.01$). Daoud et al reported that the mean level of ferritin in cases with first febrile seizure is significantly lower than that in a control group. Pisacane et al[20] compared the levels of serum iron among controls and patients with FS, and they reported that iron deficiency anemia is significantly more frequent among the cases than among the controls.

Conclusion

The findings suggest that a considerable percentage of children having febrile seizures suffer from iron-deficiency anemia and low serum iron. This means the low serum iron and the presence of anemia can serve as a reinforcing factor for febrile seizures in children.

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