

## A Retrospective Study Determining the Association between Iron Deficiency Anaemia and Febrile Seizures in Children

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### Abstract

**Aim:** To determine the correlation between iron deficiency anaemia and febrile seizures in children.

**Material and Methods:** This retrospective study was carried out in the Department of Pediatrics, MGM Medical College Jamshedpur, Jharkhand, India for one year. 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 sex matched children admitted with febrile illness but without a seizure. Haematological investigations include Haemoglobin, MCV, MCH, RDW, Serum Ferritin, Serum Iron, TIBC and Peripheral blood smear.

**Results:** 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 anaemia and low serum iron. This means the low serum iron and the presence of anaemia can serve as a reinforcing factor for febrile seizures in children.

**Keywords:** IDA, febrile seizures

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### Introduction

Iron deficiency anaemia (IDA) is one of the most common nutritional deficiencies worldwide, particularly affecting children in developing countries. This condition arises when the body lacks sufficient iron to produce haemoglobin, the molecule in red blood cells responsible for oxygen transport. IDA not only impacts physical and cognitive development but also has been linked to a variety of neurological complications, including febrile seizures (FS). Febrile seizures, which are convulsions triggered by fever in young children, are the most common type of seizures in paediatric populations. Understanding the correlation between IDA and FS is crucial for developing preventive strategies and improving child health outcomes. [1-4] Iron deficiency anaemia is prevalent in children, with significant consequences for growth and development. According to the World Health Organization (WHO), approximately 42% of children under five years old globally suffer from anaemia, with iron deficiency being the leading cause. IDA can lead to impaired cognitive and

motor development, reduced immune function, and overall poor health in children. Given its widespread prevalence, addressing IDA is a public health priority. [5-7] Febrile seizures are convulsions that occur in children aged six months to five years, associated with fever but without any intracranial infection or other defined causes. FS are categorized into simple and complex types, with simple febrile seizures being more common and less likely to lead to epilepsy or other long-term neurological issues. Despite their generally benign nature, febrile seizures are distressing for parents and can necessitate medical evaluation and intervention. [8-12] Recent studies have explored the potential link between IDA and the occurrence of FS in children, with mixed results. Several mechanisms have been proposed to explain this association. Iron plays a critical role in the function of neurotransmitters and myelination of the central nervous system, both of which are essential for normal brain function. Deficiency in iron could lead to altered neuronal activity and increased susceptibility to seizures.

[13,14] Understanding the link between IDA and FS has important clinical implications. Early identification and treatment of IDA in children could potentially reduce the incidence of FS and improve overall health outcomes. Routine screening for iron deficiency and appropriate nutritional interventions, such as iron supplementation and dietary modifications, should be considered in paediatric healthcare settings. [15,16]

**Material and Methods**

A retrospective study was carried out in the Department of Pediatrics, MGM Medical College Jamshedpur, Jharkhand, India for one year. 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 sex matched children admitted with febrile illness but without a seizure. Haematological 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 infant meter 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 o 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 haemoglobin levels**

Hemoglobin Level(gm/dl)	Cases=80	Controls=80
No anemia ( $\geq 11$ 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: Haematological 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 to 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 anaemia 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 anaemia 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 anaemia and low serum iron. This means the low serum iron and the presence of anaemia can serve as a reinforcing factor for febrile seizures in children.

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