

## Correlation of Febrile Convulsions and Iron Deficiency Anemia

DR Poornima Shankar<sup>1</sup>, DR Nannapaneni Meghana<sup>2</sup>,  
DR Shilpa Deborah Lysander, DR. Abirami Meenakshi Chandrasekharan,  
DR Pramukh Arun Kumar

<sup>1</sup>Professor of Paediatrics, KIMS Hospital And Research Centre, Bengaluru

<sup>2</sup>Post Graduate, KIMS Hospital and Research Centre, Bengaluru

\*Correspondence Author:Dr Nannapaneni Meghana

### ABSTRACT

#### Introduction

Febrile convulsion is most common type of convulsions seen between 6 months to 60 months of age. There are multiple factors associated with it. On the other side Anemia is most common in this age group, so this study is done to observe if there is any correlation between them.

#### Materials and methods:

This is a case control study of 104 cases and 104 controls between the age group 6 months to 60 months.cases under study are fever with convulsions and are matched with controls having fever, study was conducted in KIMS hospital Bangalore. The complete hemogram, iron profile were done for all participants and then analysed.

#### Results

Case control study was done with 104 cases and 104 controls, 55 cases (52.9%) showed iron paramaters (Hb<11g/dl, serum iron<60 µg/dl ,transferrin saturation<16%,MCV<70fl) iron deficiency anemia was seen in 55 (52.9%)cases and 15(14.4%) control, showing a significance.

#### Conclusion

Iron deficiency Iron deficiency anemia is possible risk factor for febrile convulsions and may be responsible for recurrence of febrile convulsions.so may be its time with different studies done to include anemia as risk factor for febrile convulsions. And follow up studies are required after iron therapy to see if there is any recurrence of febrile seizures

## I. INTRODUCTION

Febrile seizures are seizures that occur between age of 6 and 60 months with a temperature of 38° C (100.4 ° F) or higher, that are not the result of central nervous system infection or any metabolic disorder and that occur in the absence of history of prior afebrile convulsions. This condition occurs in 2-5% of the children who are neurologically healthy <sup>(1)</sup>. The precise cause of febrile convulsions is not known, but several genetic and environmental factors have been implicated<sup>(2,3)</sup>. Complex febrile seizures, featuring any of focal seizures, prolonged seizure duration (greater than 15 min) or multiple febrile seizures in the course of a febrile illness, comprise 10–35% of all cases <sup>(1)</sup>. Complications like aspiration can occur during each episode of seizures <sup>(4-7)</sup>. Febrile seizure episodes are agonizing to the parent and child and can cause psychological trauma to both <sup>(8)</sup>.

Iron deficiency is the commonest micronutrient deficiency worldwide, and is a preventable and treatable condition<sup>(9)</sup>. Some of the recent studies have reported that iron deficiency could be a risk factor for febrile seizure because the latter is more common in children under two years and iron deficiency anemia is also common in children of the same age. Iron deficiency reduces the metabolism of some neurotransmitters <sup>(10)</sup>. Also it is required for appropriate behavioural organization and its deficiency causes poor brain myelination and impaired monoamine metabolism. Glutamate and GABA homeostasis is modified by changes in brain iron status<sup>(11)</sup> As reported fever can exacerbate symptoms that result from anemia, thus a relationship between iron deficiency anemia and febrile convulsions is highly likely. However, the studies carried out so far have reported conflicting results. With respect to the high prevalence of FC and IDA in children and considering the fact that IDA is a probable risk factor for FC occurrence, as well as controversy in previous studies of this subject, Iron deficiency is postulated as a risk factor for febrile seizures in children and it is an easily correctable condition<sup>(12,13)</sup>. We, therefore, studied the association between iron deficiency and simple febrile seizures<sup>(14,15)</sup>

## II. MATERIALS AND METHODS:

This case - control study was performed on 104 cases and 104 controls, aged 6 months to 60months, from July 2018 to august 2019 in kempegowda institute of medical sciences. Patients were selected through simple random sampling. The case group included children with febrile seizure (core temperature over 38.5°C during seizure) without a central nervous system infection or an acute brain insult. The control group included children suffering from a febrile illness without seizure such as urinary tract infection, gastroenteritis and respiratory tract infection, viral fever.

Controls and cases were age and sex matched. Exclusion criteria were previous history of afebrile seizures, developmental delay and neurological deficits. Hemoglobin (Hb), mean corpuscular volume (MCV) and plasma ferritin (PF) were measured for all children in the hospital laboratory. Iron deficiency Anemia was defined when all the of the following were present: Hb<11g/dl, serum iron<60 µg/dl ,transferrin saturation<16%,MCV<70fl, peripheral smear showing microcytic hypochromic anemia.The collected data were analyzed with SPSS 13 software.Descriptive analysis was used to describe, mean and standard deviation, chisquare for comparing qualitative data, independent TTestfor quantitative data and. Statistical significance was set at P < 0.001.

## III. RESULTS

104 cases and 104 controls were included in this study. Average age was matched between cases and controls. In cases the mean (SD) of Age (Months) was 21.85months and controls the mean age was 20.1months with no significant difference (p>0.001).Similarly There was no significant difference between the various groups in terms of distribution of Gender ( $X^2 = 0.179$ , p = 0.672). Family history of febrile convulsions among cases were 14 and among controls were 2 showing a significant difference (Table 1)

Iron deficiency parameters in the cases and controls did not show any significant difference (table1).diagnosis and temperature peaks, of cases and controls also showed no significant difference

**Table 1: Association between Group and variables**

variables	Group: Case	Group: Control	p value
<b>GENDER</b>			0.672
Male	63 (51.2%)	60 (48.8%)	
Female	41 (48.2%)	44 (51.8%)	
<b>FAMILY HISTORY</b>			0.001
Present	14 (13.4%)	2 (2%)	
Absent	90 (86.6%)	102(98%)	
<b>ANEMIA PARAMETERS</b>	<b>MEAN (CASES)</b>	<b>MEAN(CONTROLS)</b>	<b>P VALUE</b>
Serum Iron(µg/dl)	58.76 ± 30.15	60.57 ± 18.62	0.351
Transferrin Saturation%	10.31 ± 7.64	11.14 ± 2.91	0.005
TIBC(µg/dl)	487.96 ± 96.70	496.79 ± 45.46	0.073
Serum Ferritin(ng/ml)	12.4 ± 74.52	14.20 ± 1.66	0.386
Hemoglobin (g/dl)	9.17 ± 0.94	9.15 ± 1.32	0.884
MCV(fl)	63.24 ± 6.16	67.25 ± 1.50	0.278
<b>DIAGNOSIS</b>			
URTI	48(46%)	42(40%)	0.34
LRTI	24 (23%)	19(18%)	0.43
Gastroenteritis	19 (18%)	22(21.1%)	0.673
Others	15 (14%)	21(20%)	0.27

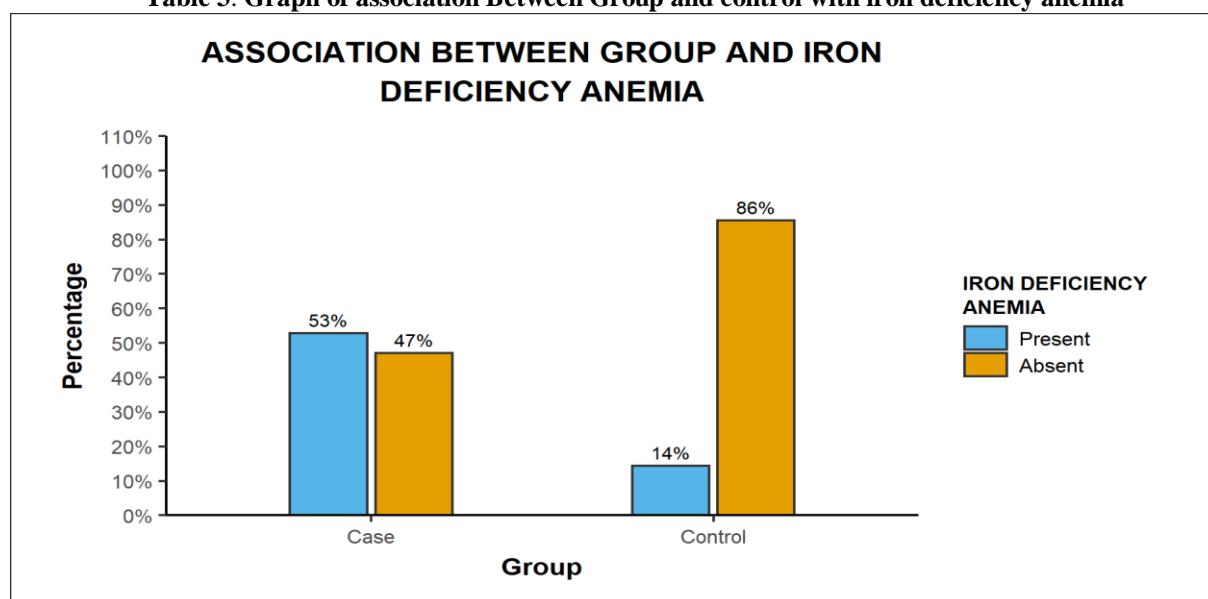
## Correlation Between Febrile Convulsions And Iron Deficiency Anemia

As per the criteria with Hb<11g/dl, serum iron<60µg/dl, transferrin saturation <16%, MCV<70fl in cases and controls have been diagnosed as iron deficiency anemia. In this study there were 55(52.9%)cases of iron deficiency anemia with febrile convulsions and 15(14.4%)controls had iron deficiency anemia There was a significant difference between the various groups in terms of distribution of Iron Deficiency Anemia ( $X^2 = 34.451$ ,  $p = <0.001$ ).. Chi-squared test was used to explore the association between Group and Iron Deficiency Anemia

**Table 2: Association between Group and Iron Deficiency Anemia (n = 208)**

Iron Deficiency Anemia	Group			Chi-Squared Test	
	Case	Control	Total	X <sup>2</sup>	P Value
Present	55 (52.9%)	15 (14.4%)	70 (33.7%)	34.451	<0.001
Absent	49 (47.1%)	89 (85.6%)	138 (66.3%)		
Total	104 (100.0%)	104 (100.0%)	208 (100.0%)		

**Table 3: Graph of association Between Group and control with iron deficiency anemia**



**Table 4: Association between iron deficiency parameters in cases and controls**

	No.Of cases	No.of controls	P value
Hb<11g/dl	63(60.5%)	15(14.4%)	<0.001
MCV<70fl	55(52.9%)	15(14.4%)	<0.001
Transferrin saturation<16%	55(52.9%)	15(14.4%)	<0.001
Serum iron <60µg/dl	55(52.9%)	15(14.4%)	<0.001
Serum ferritin<12µg/l	48(46.4%)	15(14.4%)	<0.001

The study the parameters for iron deficiency was calculated, no.of cases that showed HB<11g/dl was 63(60%), but iron parameters like serum iron iron <60µg/dl, and transferrin saturation<16%,MCV<70fl were 55 cases(52.9%) which were diagnosed as iron defeciency anemia,but serum ferritin was <12 in 48 cases (47.5%).

**Table 5: Association Between Recurrent Seizures and Iron Deficiency Anemia (n = 104) cases**

Iron Deficiency Anemia	Recurrent Seizures			Chi-Squared Test	
	Present	Absent	Total	X <sup>2</sup>	P Value
Present	19 (34.5%)	36 (65.5%)	55 (100.0%)	5.673	0.017
Absent	7 (14.3%)	42 (85.7%)	49 (100.0%)		
Total	26 (25.0%)	78 (75.0%)	104 (100.0%)		

As per table 5 recurrent seizures were seen in 26 cases of febrile convulsions of which associated with anemia are 19 cases(73%-recurrent seizures,34.5%of febrile seizures) it's showing a significant difference i.e,larger proportion of children with recurrent seizures are associated with iron deficiency anemia.

#### IV. DISCUSSION

In this study, the incidence of iron-deficiency anemia in the febrile convulsion group was obviously higher than the control group. Among parameters taken for diagnostic criteria (hb,serum iron,TIBC,MCV) ferritin was not taken, as it is an inflammatory marker which can falsely be increased .Family history of FSs, which most likely represents a genetic susceptibility to seizures with fever were higher among cases than controls . Recurrent convulsions were seen to be more in iron deficiency anemia cases.

Rajwanti KV et al, have done similar study taking 50 cases and 50 controls,taking low ferritin levels as the criteria for iron deficiency anemia and showed The proportion of children with low ferritin <25µg/L was significantly higher in Cases (34, 68%) than in Controls (15, 30%). With serum ferritin <12 µg/L. 34 cases and 15 controls had a low ferritin value (<25 µg/L).<sup>(16)</sup> thus having a significant difference among cases and control. Abaskhanian A et al have done a metanalysis study in which they concluded that the case control studies suggest that iron deficiency anemia is associated with a moderate increased risk of FC in children, particularly in areas with low and moderate prevalence of anemia <sup>(17)</sup> Naveed-ur-Rehman et al<sup>(18)</sup> suggested the same result in a case-control study with 30 cases and 30 controls; Hartfield DS<sup>(19)</sup> did similar case control study with 361 cases and 390 controls and concluded that Children with febrile seizures were almost twice as likely to be iron deficient as those with febrile illness also. Daoud AS et al<sup>(22)</sup> PF(plasma ferritin) level was significantly lower in cases than controls , suggesting a possible rolefor iron insufficiency in febrile seizures

On the contrary certain studies showed that there is no significant difference. Bidabadi E et al<sup>(20)</sup> have done a case control study on 200 cases and controls, but showed no significant difference of febrile seizures in iron deficiency anemia. Kobrinsky et al.<sup>(21)</sup> in a case-control study with 25 cases and 26 controls, showed that anemia raises the threshold for FFC and iron deficiency may protect against the development of febrile convulsions. So there has been controversy as of iron deficiency anemia is an risk factor for febrile convulsions

So in my study it has been shown that iron deficiency has been an important association seen not only in simple febrile convulsions but also in recurrent febrile convulsions. And also anemia was significant factor in febrile convulsions secondary to lower respiratory tract infections, so as there were studies showing association of repeated LRTI in children with anemia<sup>(23)</sup>The strength of our study included standardized criteria for diagnosing febrile seizures, and iron deficiency, concurrent enrolment of controls and cases, and avoiding bias. The study may have some limitations. As it was a hospital-based study the prevalence of exposure and outcome variables may be different from a usual community . confounding factors like family history was present ,other risk factors for recurrence such as gender , temperature parameters Complex febrile seizures have not been considered.

#### V. CONCLUSION

Iron deficiency anemia is possible risk factor for febrile convulsions and may be responsible for recurrence of febrile convulsions.so may be its time with different studies done to include anemia as risk factor for febrile convulsions. And follow up studies are required after iron therapy to see if there is any recurrence of febrile seizures.

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**\*Correspondence Author: Dr Nannapaneni Meghana**  
**Post Graduate, KIMS Hospital and Research Centre, Bengaluru**