



ORIGINAL RESEARCH PAPER

Paediatrics

ASSOCIATION OF FEBRILE SEIZURES WITH IRON DEFICIENCY ANEMIA IN CHILDREN

KEY WORDS: Iron deficiency anemia, febrile seizures, children.

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ABSTRACT

BACKGROUND: Febrile convulsion is amongst the most common convulsive disorder in children between the age group of 6 months to 5 years. Some studies have reported that iron deficiency could be a risk factor for febrile seizures.

AIMS & OBJECTIVES: The present study was conducted to evaluate the role of iron deficiency as a risk factor for simple febrile seizures in children aged 6 months to 5 years

MATERIAL & METHODS: A cross sectional study was carried out in the department of pediatrics Krishna hospital and medical research centre karad, conducted in a period of 6 months from August 2017 to February 2018 in which the number of cases being 20. The cases taken were of children of age between 6 months to 5 years suffering from febrile seizures. All patients were accessed for iron deficiency anemia by measuring hemoglobin level, serum ferritin level, mean corpuscular hemoglobin concentration, mean corpuscular volume, mean corpuscular hemoglobin, packed cell volume, TIBC, transferrin.

RESULT: In the present study total 20 children suffering from febrile convulsions were included. Out of 20 patients 12(60%) were anemic having hemoglobin below 11 gm/dl. All other laboratory findings such as iron profile(MCH, MCHC, MCV), PCV, hematocrit count show significance above 60% except the serum ferritin level which is quite higher as compared to the other laboratory findings. The ferritin level is affected by the severity of fever and increases with fever.

CONCLUSION: As a conclusion, the study suggests that patients with iron deficiency anemia were more likely to have febrile seizures.

INTRODUCTION:

Iron deficiency anemia and febrile seizures are two common diseases in children worldwide as well as in our country. Febrile convulsions refer to the convulsions that occur in children between the ages of 6 months to five years, with body temperature of 38°C or higher not resulting from central nervous system infection or any metabolic imbalance without any prior afebrile seizures. The world health organization estimates that anemia, largely caused by iron deficiency, affects between 500 million and two billion people worldwide. In some developing countries, up to 50 percent of preschool children have anemia that principally is caused by iron deficiency. It is the most common nutritional deficiency and hematological disease of infancy and childhood. Iron is a nutritional element not only needed for the synthesis of hemoglobin, but is also essential for enzymes involved in neurochemical reactions. Neurological symptoms like poor attention span, learning deficits, weak memory, delayed motor development and behavioral disturbances caused by iron deficiency are well known. Thus it is possible that iron deficiency may predispose to other neurological disturbances like febrile seizures. Febrile seizures occur in 2 to 4% of all children with a recurrence rate of 30 to 40%. Age for peak incidence of febrile seizures is 14 to 18 months which overlaps with that of iron deficiency anemia which is from 6 to 24 months.^[1,2]

Iron deficiency stimulates the function of neurons and, consequently, increases the risk of convulsions.³⁻⁵ Similar conditions are observed in attention deficit hyperactivity disorder (ADHD) and restless leg syndrome (RLS).⁶ The relationship between iron deficiency and febrile convulsion is unknown. While some studies have shown iron deficiency as a risk factor for the development of febrile convulsion,⁷⁻¹⁰ this relationship has not been confirmed by other studies.⁵⁻¹¹ On the other hand, few reports have claimed that iron deficiency anemia may have a protective effect on febrile convulsion development.^{2,12,13}

Iron has been found to act as a cofactor in a number of enzymatic reactions at the cellular level, and it affects neurotransmitter production and function, hormone function, and DNA replication.^{12,13} Deficiency of iron, therefore, results in disruption of normal cell and organ function. The most clinically obvious

consequence of iron deficiency is anemia, but virtually every organ system is affected, resulting in changes in cognitive and behavioral performance, impaired physical growth, and impairment of immune function.¹³ Iron deficiency is associated with neurological problems in young children, including developmental delay, stroke, breath-holding spells, and pseudotumor cerebri.¹⁴

Febrile convulsion is a common cause of seizure in young children, with an excellent prognosis. In addition to genetic predisposition, febrile convulsions are generally thought to be induced by elemental changes such as iron deficiency.

Regarding the high prevalence of febrile seizure and iron deficiency anemia in children, the aim was to investigate the role of iron deficiency anemia as a risk factor in febrile convulsion patients. The purpose of this study is to diagnose the presence of iron deficiency anemia in patients of febrile seizures and to further correlate the relation between febrile seizures and iron deficiency anemia.

MATERIAL & METHODS:

The study protocol was approved by the ethical committee of Krishna institute of medical sciences deemed to be university.

A cross sectional study was carried out in the department of pediatrics Krishna hospital and medical research centre karad, conducted in a period of 6 months from August 2017 to February 2018 in which the number of cases were 20. The cases taken were of children of age between 6 months to 5 years suffering from febrile seizures.

After informed consent of parents of children (cases) was taken. All the questions were answered doubts were cleared and signature of the parents was taken. A detailed history of presenting complaints was recorded. Blood investigations done to diagnose iron deficiency anemia included - hemoglobin, PCV, hematocrit, MCV, MCH, MCHC, iron profile, of all the patients with febrile convulsions was sent for further investigation.

- Iron deficiency will be diagnosed as per WHO criteria:- (Hemoglobin value <11g%, PCV- <31%, Hematocrit- <31%,

MCV- <80fl, MCH- <26pg, MCHC-<33%, serum ferritin value < 12ng/mL, TIBC - <250Mg/dl, % tranferrin-200mg/dl)

On the basis of data obtained the % of iron deficiency anemia in the patients was calculated and analyzed as a potential risk factor for febrile convulsions

Statistical Analysis:

Statistical analysis Data were entered and analyzed using the statistical packages for the social sciences (SPSS). Nominal data were expressed as frequency and percentage. Numerical data were expressed as mean ± SD and were compared using Student's t-test. P values of less than 0.05% were considered significant, and P values of less than 0.01 % were considered highly significant.

RESULTS:

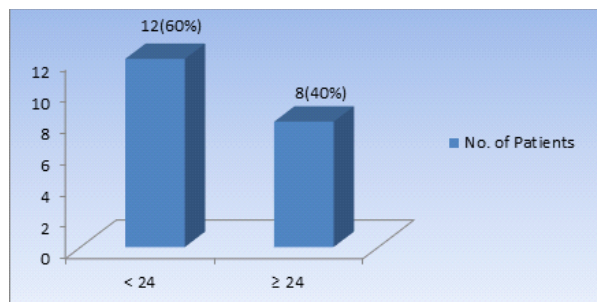


Figure 1: Distribution according to the age of onset of febrile seizures

Out of 20 patients 12 patients are below 24 months of age and 8 are above 24 months a of age (see figure no. 1)

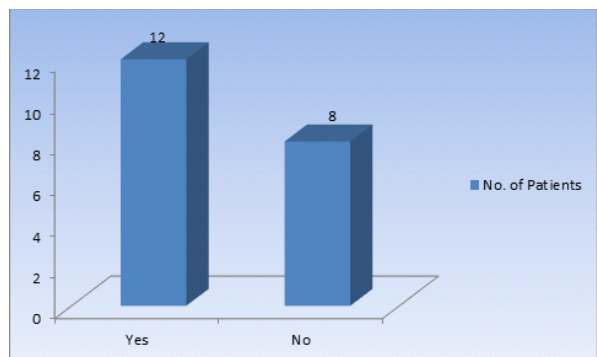


Figure 2: Distribution according to the pallor of the patients

Out of 20 patients 12 patients have pallor and 8 patients do not have pallor (see figure no.2)

Table 3: Distribution of no. of patients with anemia and non-anemia.

Study Variables	No. of Patients	%
Hemoglobin Level		
< 11	12	60
≥ 11	8	40
PCV		
< 35	11	55
≥ 35	9	45
Hematocrit		
< 35	11	55
≥ 35	9	45
MCV		
< 80	17	85
≥ 80	3	15
MCH		
< 26	19	95
≥ 26	1	5

MCHC		
<33	13	65
≥ 33	7	35
S.FERRITIN		
< 12	4	20
≥ 12	16	80
TIBC		
< 250	2	10
≥ 250	18	90

Table no.3 shows that out of 20 patients 12(60%) have hemoglobin below 11 and 8(40%) patients had above 11 hemoglobin. The patients with PCV count <35 are 11(55%) and PCV count >35 are 9(45%). The hematocrit count of the patients is same as that of the PCV count of patients. The patients with MCV count below 80 are 17(85%) and counts above 80 are 3(15%). The patients with MCH count below 26 are 19(95%) and counts above 26 are 1(5%). The patients with MCHC count below 33 are 13(65%) and counts above 33 are 7(35%). The patients with serum ferritin level below 12 are 4(20%) and counts above 12 are 16(80%). The patients with TIBC counts below 250 are 2(10%) and above 250 are 18(90%).

Table 4: Distribution of study variables.

Study Variables	Mean	SD	Normal values
Age	34.6	22.90	-
Age of Onset of Seizure	18.35	14.26	-
HB	10.54	1.67	11
Hematocrit	33.805	3.56	35
PCV	33.805	3.56	35
MCH	22.67	2.85	26
MCHC	32.185	2.78	33
MCV	72.73	8.87	80
Serum Ferritin	41.2	48.71	12
% Saturation	16.5735	12.34	20
TIBC	334.555	67.38	250

Table no.4 holds the record of statistical distribution of study.

Table 5: Age wise distribution of study variables of anemia.

Age (in months)	0-30	30-60
	Mean ± SD	Mean ± SD
HB	10.49	10.59
Hematocrit	33.59	34.02
PCV	33.59	34.02
MCH	22.16	23.18
MCHC	31.19	33.18
MCV	71.67	73.79
Serum Ferritin	38.03	44.37
% Saturation	13.304	19.843
TIBC	336.55	332.56

According to these variables given in table no.5 this signifies that in between 0-30 months of age the mean variables of anemia are significantly less than the 30-60 months of age febrile convulsive patients.

Discussion:

In this study of association of iron deficiency anemia with febrile convulsion in the age group of children between 6 months to 5 years there is significant relationship between the iron deficiency anemia and febrile convulsions. In the present study 20 patients were suffering from febrile convulsions out of 20 febrile convulsion patients 12(60%) were anemic having hemoglobin below 11 gm/dl. All other laboratory findings such as iron profile(MCH, MCHC, MCV), PCV, hematocrit count show significance above 60% except the serum ferritin level which is quite higher as compared to the other laboratory findings. The ferritin level is affected by the severity of fever and increases with

fever. Consequently, ferritin level could not be compared between the two groups. This is consistent with other findings from our statistical analysis.

According to the findings, iron deficiency leads to dysfunction of myelination as well as tyrosine and tryptophan hydroxylase synthesis, which are necessary for neurotransmitter production as well as the release of neurotransmitters from vesicles. The role of iron has also been documented in the production of serotonin, dopamine, and gamma-butyric acid (GABA).¹⁹

The role of iron as an important cofactor for normal functioning of the brain neurotransmitters. However, limited data are available on the biological gradient between the cause (iron deficiency anemia) and the effect (febrile convulsion). Therefore, further study on this topic is recommended. Since febrile convulsion is a multi-factorial disease, specificity criteria cannot be adhered. According to these criteria, iron deficiency anemia should only cause an effect (febrile convulsion) to be concluded as a cause for febrile convulsion. According to other studies in which all patients were assessed for iron deficiency anemia by measuring hemoglobin level, serum ferritin level, mean corpuscular hemoglobin concentration (MCHC) and mean corpuscular volume (MCV).

According to the previous studies such that of Fallah R; study showed that iron deficiency could be an important risk factor for development of febrile convulsion and evaluation of iron status is encouraged to be performed in children with febrile seizure.¹⁶⁻¹⁸

While Narges Habibi et al; in 2014 in his study showed that controversy exists regarding the association between iron deficiency anemia, iron status, and febrile convulsion during childhood. And according to their systemic review and meta-analysis conducted they proved that iron deficiency anemia was associated with a moderate increased risk of febrile convulsion in children.

Byung in 2017; stated that iron deficiency anemia was significantly associated with febrile convulsion. The results of their meta-analysis suggest that iron deficiency anemia is associated with an increased risk of febrile convulsion in children.²⁰

Srinivasa S and Sai Praneeth Reddy²¹; in 2014 in their study they showed the role of iron deficiency as a risk factor for simple febrile seizures in children aged 6 months to 5 years. children with febrile seizures are almost twice as likely to have iron deficiency anemia as compared to children with febrile illness without seizures.

Tariq Saeed et al; in 2013²² study shows iron deficiency is one of the most prevalent nutrition associated clinical problems in the world. Emerging data from various reliable sources depicted that infants between 6 and 24 months of age are affected with this disorder. In a number of studies a possible association of iron deficiency and febrile seizures has been reported.

Tejesh Malla et al; in 2015²³ study shows that Simple febrile convulsion is the most common central nervous system disease seen in children. Iron deficiency anemia was significantly higher in cases compared to controls (p<0.001) Iron supplementation can probably increase the threshold of neuron excitation in fever and help prevent febrile convulsion in children.

Conclusion:

As a conclusion, the results obtain from various laboratory findings and data collection from the patients, the study suggest that iron deficiency anemia is associated with a moderate increased risk of febrile convulsion in children between the age group of 6 months to 60 months.

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