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TO STUDY THE ROLE OF IRON DEFICIENCY ANAEMIA IN FEBRILE SEIZURES IN CHILDREN

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ABSTRACT

Introduction: The world health organization estimates that anaemia largely caused by iron deficiency, affecting between 500 million and two billion people worldwide. Considering the age prevalence of iron deficiency anaemia and febrile convulsion which are the same, the role of iron in the metabolism of neurotransmitter and some enzymes and since fever can exacerbate symptoms that result from anaemia, a relationship between iron deficiency anaemia and febrile convulsions is probable. Some studies have suggested iron deficiency as a predisposing factor for febrile seizures. **Material and methods**: A case control study was done to evaluate the relationship between iron deficiency anaemia and febrile convulsions. The objective of this study was to study the role of iron deficiency as a risk factor for febrile seizures. 70 cases and 70 controls were included in the study. Cases were children of age group 6 months to 6 years presenting with febrile seizures. Controls were children of same age group presenting with febrile illness but without any seizures. A detailed history and clinical examination done in both cases and controls matched for age and sex and blood investigations were done to diagnose iron deficiency anemia. In all children hemoglobin (Hb) level, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), red cell distribution width (RDW) and plasma ferritin (PF) were determined and the data collected were analyzed statistically. **Results:** The mean PF was significantly lower in cases compared to controls (p=0.001) and RDW was significantly higher in cases compared to controls (p=0.001). The mean Hb%, MCV were lower in cases compared to controls. **Conclusion:** Iron deficiency is a significant risk factor for febrile seizures in children of age group six months to six years. Early detection and timely correction of iron deficiency may be helpful for prevention of febrile seizures in children.

KEYWORDS: Febrile seizures, iron deficiency anemia, children.

INTRODUCTION

WHO estimates that anaemia largely caused by iron deficiency, affec ing between 500 million and two billion people worldwide.[1,2] It is the most common nutri onal deficiency and haematological disease of infancy and childhood.[3] Iron is a nutritional element not only needed for the synthesis of haemoglobin, but it is also essential for enzymes involved in neurochemical reactions.[4] The exact pathophysiology of febrile seizure is unknown.[5] Age for peak incidence of febrile seizure is 12 to 18 months, which overlaps with that of iron deficiency anaemia which is form 6 to 24 months.[6,7] Considering the age prevalence of iron deficiency anaemia and febrile convulsion which are the same, the role of iron in the metabolism of neurotransmi er (such as GABA and serotonin) and some enzymes (such as monoaminoxidase and aldehidoxidase), the function of hemoglobin in conveying oxygen to the brain and since fever can exacerbate symptoms that result from anaemia, a relationship between iron deficiency anaemia and febrile convulsions is probable.[8,9,10]

Some studies have suggested iron deficiency as a predisposing factor for febrile seizures, some described iron deficiency anaemia is less frequent in children with febrile seizures.[11] Considering the conflicting results of the previous studies, we designed this case control study to evaluate the relationship between iron deficiency anaemia and febrile convulsions.

MATERIAL AND METHODS

A case control study was conducted from 2011 to 2015 involving 70 children aged between 6 months to 6 years with febrile seizures were enrolled as cases. Sample size was based on Z formula and confidence interval of 95% with 80% power, type one error of 5% to detect any significant difference between the two groups with a level of 0.05. Febrile seizures were defined as a seizure occurring in association with a febrile illness, in the absence of CNS infection or any other defined causes of seizures.[12] Children with a history of epilepsy,central nervous system (CNS) infections, developmental delay and neurological deficits, on iron therapy were excluded

from the study. A control group of 70 children was selected from among children hospitalized for a febrile illness (such as upper and lower respiratory tract infec ons and gastroenteri s) but without seizures. Controls were group matched to cases on age and sex. An informed consent was obtained from parents or the guardian. Demographic data, seizure details, nature of febrile illness, the family history of epilepsy/febrile seizures, temperature at admission and nutritional status were recorded. Blood samples were collected from all participants for measurement of haemoglobin (Hb), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), red cell distribution width (RDW) and serum ferritin was done.

Iron deficiency anaemia was defined as Hb <11g/dl, MCV <70 fl, MCH <27 pg, RDW >15%, serum ferritin <12 ng/ml (WHO).[13] In presence of fever, a higher cut-off value of serum ferritin (25-50ng/ml) was considered.[14] Cases and controls were compared with respect to blood indicies and serum ferritin. Chi-square, ANOVA, unpaired t–tests were used for statistical analysis.

RESULTS

70 cases (40 male, 30 female) and 70 controls (40 male, 30 female) were enrolled. The mean ages of children in the febrile seizure and control groups were 1.7±1.2 and 1.8±1.5 year respec vely. Respiratory tract infections were the most common cause of fever in the study followed by GIT infections. In this study we observed significantly low serum ferritin and significantly higher RDW in febrile seizure cases compared to controls.

Table 1: Haematological parameters of cases and controls.

Haematological parameters of cases and controls			
	Cases	Controls	*p*-value
Parameters	n=70	n=70	
	(Mean±SD)	(Mean±SD)	
Hb%	9.2 ±1.3	9.6 ±1.0	0.50
MCV (fl)	72.3 ± 5.3	75.0 ± 4.9	0.36
MCH (pg)	25.5 ±3.1	25.9 ± 3.3	0.16
RDW%	16.3 ± 1.5	12.9 ± 1.5	0.000
Serum ferri n(ng/ml)	28.5 ± 20.5	54.3±35.6	0.000

Table 2: Underlying causes of fever among cases and controls.

INFECTIONS	Febrile seizure cases (n=70)	Controls (n=70)	*p*-value
Respiratory tract infections	40	45	N.S
GIT infections	25	20	N.S
Enteric fever	3	2	N.S
Viral fever	2	3	N.S

DISCUSSION

Numerous studies have addressed the association between IDA and febrile seizure in children. The results, however, have been controversial and even primary researches with high number of cases have failed to provide unequivocal results. We observed significantly low serum ferritin levels in children with febrile seizures than in controls. Similar results were observed by Pisacame, et al.[15] But in contrast with these studies Mansourietal reported mean ferritin was higher in the convulsive group with no stati stically significant difference.[16] Kobrinsky et al deduced that iron deficiency might have a protective effect on febrile convulsion.[17]

Iron has been found to act as a cofactor in a number of enzymatic reactions at the cellular level and effects neurotransmi tter production, hormone function and DNA replication. Deficiency of iron, therefore, results in disruption of normal cell and organ function.

Iron deficiency is associated with neurological problems in young children, including developmental delay, stroke and breath-holding spells. Screening for IDA should be considered in children with febrile seizures. Fever can worsen the negative effect of anaemia or for iron deficiency on the brain and a seizure can occur as a consequence. Alternatively, anaemia can be associated with the severity of a febrile illness and more severe cases could be more likely to get seizures.[17] Iron deficiency anaemia may reduce the seizure threshold in the infancy and childhood. Low PF level is associated with and may play a role in febrile seizures. The study has some limitations. Serum ferritin, a nonspecific acute phase reactant can rise in any inflammatory conditions, although both cases and controls were having fever at the me of enrollment. Although serum ferritin levels rise in

inflammatory conditions, MCV and RDW are not affected by acute infection.[18]

CONCLUSION

Early detection and timely correction of iron deficiency may be helpful for prevention of febrile seizures in children.

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Conflict of Interest
Nil.

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