(e) ISSN Online: 2321-9599

(p) ISSN Print: 2348-6805

Original Article

To evaluate the association between iron deficiency anaemia and the occurrence of the first episode of febrile seizure

[1]Anil Kumar Gupta, [2]Vinay Kumar Rai

[1]Associate Professor, [2]Assistant Professor, Department of Paediatrics, Gold Field Institute of Medical Sciences, Faridabad, Haryana, India

ABSTRACT:

Aim: To evaluate the association between iron deficiency anaemia and the occurrence of the first episode of febrile seizure. **Methods:** This prospective observational study was carried out in the Department of Pediatrics. Cases (n=50) were patients with typical febrile convulsions between 1 year to 5 years. A control group (n=50) was selected from age and sex matched 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:** 86% children had Hb <11 gm/dl from the case group as compared to 26% 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=0.02). mean hemoglobin level and MCV in cases were significantly lower as compared to that in controls (P=0.03). RDW value is significantly higher in cases as compared to control (P=0.03). No significant difference between the two groups was observed with respect to mean MCH levels (P=0.07). 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 results indicate that a significant proportion of children who have febrile seizures exhibit iron-deficiency anaemia and low levels of blood iron. The coexistence of low blood iron levels and anaemia might potentially contribute to the exacerbation of febrile seizures in paediatric patients.

Keyword: Iron, Anaemia, Febrile seizure,

Corresponding author: Vinay Kumar Rai, Assistant Professor, Department of Paediatrics, Gold Field Institute of Medical Sciences, Faridabad, Haryana, India

This article may be cited as: Gupta AK, Rai VK. To evaluate the association between iron deficiency anaemia and the occurrence of the first episode of febrile seizure. J Adv Med Dent Scie Res 2014;2(3):350-352.

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 38C0 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 epilecticus.[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 up to 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

The present investigation, which was conducted in the Department of Paediatrics, obtained the necessary approvals from the protocol review committee and institutional ethics committee. It was designed as a prospective observational study. The study included a sample of 50 cases, consisting of children who exhibited typical febrile convulsions within the age range of 1 to 5 years, as outlined in the clinical practise recommendations provided by the AAP. A control group consisting of 50 individuals was chosen based on age and sex similarity to children who were hospitalised with febrile illness but did not have 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^{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. This research excluded children who had neurological infection, developmental delay, were receiving iron treatment, or had a history of febrile/afebrile seizure.

RESULTS

Table-1: Distribution of cases according to hemoglobin levels

Haemoglobin Level(gm/dl)	Cases=50	Controls=50
No anemia (≥11gm/dl)	7(14%)	37(74%)
Anemia		
Mild anemia (10-10.9gm/dl)	13(26%)	6(12%)
Moderate anemia (7-7.9gm/dl)	26 (52%)	6(12%)
Severe anemia (<7gm/dl)	4(8%)	1(2%)

Table 1 presents the findings indicating that a higher proportion of children in the case group (86%) exhibited haemoglobin levels below 11 gm/dl, in comparison to the control group (26%). This difference was found to be statistically significant, as shown by a p-value of less than 0.01. The prevalence of anaemia among the patients was found to be considerably greater in comparison to the control group (p=0.02).

Table-2: Hematological parameters

Parameters	Cases		Controls		P-Value
	Mean	S.D.	Mean	S.D.	
Hb(gm/dl)	9.45	1.96	11.01	2.03	0.01
MCV(fl)	69.05	3.58	17.04	3.15	0.03
MCH(pg)	23.08	2.85	24.01	4.67	0.07
RDW	18.23	2.14	15.44	2.06	0.03

Table 2 shows, mean hemoglobin level and MCV in cases were significantly lower as compared to that in controls (P=0.03). RDW value is significantly higher in cases as compared to control (P=0.03). No significant difference between the two groups was observed with respect to mean MCH levels (P=0.07). 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

The research had a sample size of 100 participants. The case group consisted of 50 children who were hospitalised with their first occurrence of simple febrile seizure. The control group consisted of 50 children who were matched in terms of age and gender, had febrile sickness but did not have seizures, and did not get iron supplements. The current investigation revealed a preponderance of male participants in both experimental groups. The investigation of sex distribution in the case group indicates that 66% of individuals were identified as males, while 34% were identified as females. 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 = 0.22). 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 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[16] 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[18] 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 results indicate that a significant proportion of children who have febrile seizures exhibit iron-deficiency anaemia and low levels of blood iron. The coexistence of low blood iron levels and anaemia might potentially contribute to the exacerbation of febrile seizures in paediatric patients.

REFERENCE

1. Knudsen FU, Paerregaard AR, Andersen R, Andresen J. Long term outcome of prophylaxis for febrile convulsions. Arch Dis Child. 1996;74(1):13-8. doi: 10.1136/adc.74.1.13, PMID 8660037.
2. Sadeghzadeh M, Khoshnevisasl P, Moussavinassab N, Koosha A, Norouzi M. The relation between serum zinc level and febrile seizures in children admitted to Zanjan Valie-Asr hospital. J Zanjan Univ Med Sci. 2011;19(74):17-24.
3. Yadav D, Chandra J. Iron deficiency: beyond anemia. Indian J Pediatr. 2011 Jan;78(1):65-72. doi: 10.1007/s12098-010-0129-7, PMID 20814842.
4. Erikson KM, Jones BC, Hess EJ, Zhang Q, Beard JL. Iron deficiency decreases dopamine D1 and D2 receptors in rat brain. Pharmacol Biochem Behav. 2001 Jul-Aug;69(3-4):409-18. doi: 10.1016/s0091-3057(01)00563-9, PMID 11509198.
5. Beard JL, Chen Q, Connor J, Jones BC. Altered monoamine metabolism in caudate-putamen of iron-deficient rats. Pharmacol Biochem Behav. 1994 Jul;48(3):621-4. doi: 10.1016/0091-3057(94)90323-9, PMID 7524105.
6. Chen Q, Beard JL, Jones BC. Abnormal rat brain monoamine metabolism in iron deficiency anemia. J Nutr Biochem. 1995;6(9):486-93. doi: 10.1016/0955-2863(95)00074-A.
7. Vaswani RK, Dharaskar PG, Kulkarni S, Ghosh K. Iron deficiency as a risk factor for first febrile seizure. Indian Pediatr. 2010 May;47(5):437-9. doi: 10.1007/s13312-010-0080-8, PMID 19736364.
8. Johnston MV. Iron deficiency, febrile seizures and brain development. Indian Pediatr. 2012;49(1):13-4. doi: 10.1007/s13312-012-0003-y, PMID 22318097.
9. Brotanek JM, Halterman JS, Auinger P, Flores G, Weitzman M. Iron deficiency, prolonged bottle-feeding, and racial/ethnic disparities in young children. Arch Pediatr Adolesc Med. 2005 Nov;159(11):1038-42. doi: 10.1001/archpedi.159.11.1038, PMID 16275794.
10. Zareifar S, Hosseinzadeh HR, Cohan N. Association between iron status and febrile seizures in children. Seizure. 2012;21(8):603-5. doi: 10.1016/j.seizure.2012.06.010, PMID 22796045.
11. Sherjil A, us Saeed Z. Shehzad S, Amjad R. Iron deficiency anaemia—a risk factor for febrile seizures in children. J Ayub Med Coll Abbottabad. 2010;22(3):71-3.
12. Idro R, Gwer S, Williams TN, Otieno T, Uyoga S, Fegan G et al. Iron deficiency and acute seizures: results from children living in rural Kenya and a meta-analysis. PLOS ONE. 2010 Nov;5(11):e14001. doi: 10.1371/journal.pone.0014001, PMID 21103365.
13. Momen AA, Hakimzadeh M. Case-control study of the relationship between anemia and febrile convulsion in children between 9 months to 5 years of age. Sci Med J Ahwaz Uni Med Sci. 2003;1(4):54-0.
14. Billoo A. Association between iron deficiency anemia and febrile seizures. J Coll Phys Surg. 2005;15(6):338-40.
15. Kumari PL, Nair MK, Nair SM, Kailas L, Geetha S. Iron deficiency as a risk factor for simple febrile seizures-a case control study. Indian Pediatr. 2012;49(1):17-9. doi: 10.1007/s13312-012-0008-6. PMID 21719928.
16. Modaresi M, Mahmoudian T, Yaghini O, Kelishadi R, Golestani H, Tavasoli A, et al. Is iron insufficiency associated with febrile seizure?- experience in an Iranian Hospital. J Compr Pediatr. 2012;3(1):21-4. doi: 10.17795/compreped-6946.
17. Vaswani RK, Dharaskar PG, Kulkarni S, Ghosh K. Iron deficiency as a risk factor for first febrile seizure. Indian Pediatr. 2010;47(5):437-9. doi: 10.1007/s13312-010-0080-8, PMID 19736364.
18. Daoud AS, Batieha A, Abu-Ekteish F, Gharaibeh N, Ajlouni S, Hijazi S. Iron status- a possible risk factor for the first febrile seizure. Epilepsia. 2002;43(7):740-3. doi: 10.1046/j.1528-1157.2002.32501.x. PMID 12102677.
19. Derakhshanfar H, Abaskhanian A, Alimohammadi H, ModanlooKordi M. Association between iron deficiency anemia and febrile seizure in children. Med Glas (Zenica). 2012;9(2):239-42. PMID 22926357.
20. Pisacane A, Sansone R, Impagliazzo N, Coppola A, Rolando P, D'Apuzzo A, et al. Iron deficiency anaemia and febrile convulsions- case-control study in children under 2 years. BMJ. 1996;996(7053)(7053)343:343. doi: 10.1136/bmj.313.7053.343, PMID 8760744.