

Valuation of Iron deficiency associated with simple febrile seizures below five-year children of Telangana

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Abstract

Background: Febrile Seizures (FS) are quite common disorders in anaemic children, especially in Iron deficiency anaemia; hence, the level or profile of Iron in children suffering from FS is mandatory to evaluate the causes of FS. **Method:** 90 Iron children below 5 years were compared with the same number of healthy children (controlled). Blood examinations included Hb% HCT, MCV, MCH, MCHS, RDW, and PS. Serum Ferritin was ruled out and compared in both groups. **Results:** The haematological profile, including serum ferritin, was compared, and all findings had significant p values ($p < 0.001$) in both groups. **Conclusion:** The present study suggests that Iron deficiency anaemia is not the root cause of febrile seizures in children below 5 years of age, but aggravates the episodes of febrile seizures. Hence, the paediatrician must rule out the exact aetiology of FS.

Keywords: Iron deficiency, chemi-luminescence, Immune assay, serum Ferritin, Febrile convulsion, Telnagana

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INTRODUCTION

Febrile seizure is the most common convulsive disorder in children, which affects 2-5% of children age between 3 to 60 months.¹ It is reported that FS is benign and rarely leads to brain damage; it causes emotional, physical, and mental damages, which are stressful for parents and affect the family's quality of life.² Because it is likely to recur in 30 to 50% of children, it often leads to hospitalisation and an economic burden on parents. It is also reported that, Iron deficiency anaemia could be a risk factor for Febrile seizures (FS) because iron carries haemoglobin to the

tissues of the brain. Iron deficiency (ID) reduces the metabolism of neurotransmitters such as monoamine and aldehyde oxidase; hence, Iron deficiency (ID) children are more prone to Fs. It is also reported that FS children without ID were also reported; hence, ID can be a protective mechanism against convulsions by increasing the convulsive threshold; thus, Iron supplementation should be supplemented as a preventive measure or as a caution; hence, an attempt was made to evaluate the profile in FS children.

MATERIAL AND METHOD

90 (ninety) children below 5 years having febrile seizures visited to Maheshwara Medical College, Isnapur, patancheru (Mandal) Sangareddy (dist), Telangana were studied.

Inclusive Criteria: Children below 5 years with simple febrile convulsions and the presence of a short duration of fever (< 4 days) with simple febrile seizures were selected for study.

Exclusion Criteria: Children with complex seizures, a history of epilepsy, mental retardation, or severe malnutrition were excluded from the study.

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Method: 90 children with iron deficiency and simple febrile seizures were compared with 90 healthy children of the same age group (the control group). Blood examination included haemoglobin%, Hct, MCV, MCH, MCHC, RDW, PS Study, serum ferritin, Red blood cell indices (RBC indices), red blood cell distribution by using an automated hemology analyzer (Sysmex KX-21), and serum Ferritin estimation by using a chemiluminescence immunoassay (Advia Centur). The febrile seizures were diagnosed as per the guidelines for iron deficiency anaemia by the WHO ⁽⁵⁾. The patients were treated according to haematological reports.

The duration of the study was from January 2020 to December 2020.

Statistical analysis: parameters from both groups, seizures and the controlled group, were compared by z test, and significant values were noted. The statistical analysis

was carried out in SPSS software. The ratio of male to female children was 2:1.

OBSERVATION AND RESULTS

Table-1: Comparison of haematological profiles in both groups

In Hb% (gm/dl) – 9.55 (± 1.48) in the febrile group, 11.84 (± 1.40) in the controlled group, t test 10.6 and p<0.001. Hct (%) – 28.30 (± 4.05) in the febrile group, 32.10 (± 3.45) in the controlled group, t test value 6.77, and p<0.001. PDW (fl) – 44.26 (± 2.50) in the febrile group, 42.12 (± 3.14) in the controlled group, t test value 5.05, and p<0.001. MCV (fl) – 68.57 (± 5.80) in the febrile group, 74.25 (± 6.30) in the controlled group, t test 6.29, and p<0.001. MCH (pg) – 22.34 (± 3.14) in the febrile group, 24.16 (± 3.02) in the controlled group, t test value 3.96 and p<0.001. MCHC (gm/dl) 30.26 (± 2.20) in febrile cases and 31.40 (± 1.24) in the controlled group; the t test was 4.28 and p<0.001.

Table 1: Comparison of haematological profile in both febrile seizures and controlled group

Sl. No	Haematological profile	Iron deficiency 90 cases mean value	Controlled (Healthy) 90 cases mean value	t test	p value
1	Hb% (gm/dl)	9.55 (± 1.48)	11.84 (± 1.40)	10.6	P<0.001
2	Hct %	28.30 (± 4.05)	32.10 (± 3.45)	6.77	P<0.001
3	RDW (f1)	44.26 (± 2.50)	42.12 (± 3.14)	5.05	P<0.001
4	MCV (f1)	68.57 (± 5.80)	74.25 (± 6.20)	6.29	P<0.001
5	MCH (pg)	22.34 (± 3.14)	24.16 (± 3.02)	3.96	P<0.001
6	MCHC gm (dl)	30.26 (± 2.20)	31.40 (± 1.24)	4.28	P<0.001

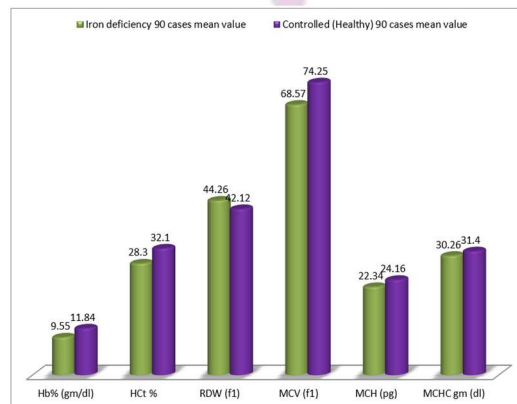


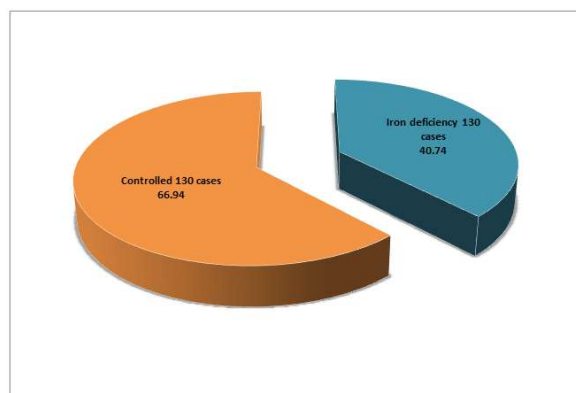
Table 1: Comparison of haematological profile in both febrile seizures and controlled group

Table 2: Comparative study of serum Ferritin in both groups

Serum Ferritin (mg/dl): 40.74 (\pm 15.4) in the febrile group, 66.94 (\pm 22.6) in the controlled group, t test 8.56, and $p < 0.001$.

Table 2: Comparative study of serum Ferritin profile in both groups

Sl. No	Profile	Iron deficiency 130 cases	Controlled 130 cases	t test	p value
1	Serum Ferritin mg/dl	40.74 (\pm 15.4)	66.94 (\pm 24.6)	8.565	$P < 0.001$

**Table 2:** Comparative study of serum Ferritin profile in both groups

DISCUSSION

Present study of the prevalence of Iron deficiency and simple febrile seizures in children below six years of age in the Telangana Population. In the comparative study of the haematological profile, both febrile seizures and the controlled group Hb% (gm/dl) in the FS group was 9.55 (1.48) and 11.84 (1.40) in the controlled group; the t test was 10.6 and $p < 0.001$. In the Hct% study, 28.30 (\pm 4.05) in the FS group and 32.10 (\pm 3.45) in the controlled group had t tests of 6.77 and $p < 0.001$. In RDW (fl), 44.26 (\pm 2.50) in the FS group, 42.12 (\pm 3.14) in the controlled group, the t test was 5.05 and $p < 0.001$. In MCV (fl) study, 68.57 (\pm 5.80) in the FS group and 74.25 (\pm 6.31) in the controlled group, t tests of 6.29 and $p < 0.001$. MCH (pg) study: 22.34 (\pm 3.14) in the FS group, 24.16 (\pm 3.02) in the controlled group; t test was 3.96 and $p < 0.001$. MCHC (gm/dl) 30.26 (\pm 2.20) in the FS group, 31.40 (\pm 1.24) in the controlled group, t test 4.28, and $p < 0.001$ (Table-1). In the comparison study of serum ferritin in both groups, the febrile profile was 40.74 (\pm 15.4) in the FS group and 66.94 (\pm 24.6) in the controlled group, t test was 8.56 and $p < 0.001$ (Table 2). These findings are more or less in agreement with previous studies.^{6,7,8} As dietary habits of children have an important influence on iron intake, most children naturally adopt a schedule of three meals a day by the end of their first year of life, and the same trends would continue. Occasional fever can worsen the effects of anaemia or ID on the brain and, therefore, cause convulsions. Such type of cases was also reported in developing countries, the percentage is 44-60 % of children under the age of 5 years.⁹ Iron deficiency

interferes with the function of many organs, leading to anaemia, abnormal growth and behaviour cognitive deficits, altered thermo regulation, impaired physical performance and immune dysfunction.¹⁰ Iron is important for catecholamine metabolism, and for the various enzymes and neuro transmitters present in central nervous system. It increases extra cellular dopamine and nor epinephrine levels in the caudate put amen and decreases the levels of dopamine D₁ and D₂ receptors and monoamine transmitters.¹¹ Furthermore Iron deficiency (ID) in early life alters metabolism and neuro-transmission in major brain structures such as basal ganglia, and hippo campus and disrupts myelination. ID is associated with several neurological disorders such as restless leg syndrome, breath holding spells and attention deficit hyperactivity disorders which are associated with increased brain excitability. ID leads to leads to febrile seizures was also experimented in mice.¹² and were also prone to infection also.

SUMMARY AND CONCLUSION

The present study of the association between ID and FS by low serum Iron is associated with an increased risk of febrile seizures. It suggests that paediatricians / clinicians should be concerned about Iron status even at a slightly reduced haemoglobin level in children because their bodies need adequate iron in their diet. The present study demands further experimental studies of nutritional, pathophysiological, pharmacological, and genetic aspects because the exact pathogenesis, factors, and mechanisms of febrile seizures are still-unclear.

Limitation of study: Owing to the tertiary location of the present hospital and the small number of patients, we have limited findings and results.

This research paper was approved by the ethical committee of Maheshwara Medical College, Isnapur, Patancheru (Mandal), Sangareddy (dist), Telangana-502307.

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