



Study of Association between Iron deficiency and Simple Febrile Seizures in Children at different age groups in South Karnataka Population -Retrospective Study

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Abstract

- **Background** –The relationship between iron deficiency anemia and febrile convulsions has been observed in many studies. Hence hematological status has to be correlated with simple febrile seizures.
- **Method** –140 iron deficiency anemic children below 5 years were compared with 140 children of same age groups of healthy children. Blood examination of Hb%, HCT, MCV, MCH, MCHC, RDW, PS, Serum ferritin was ruled in both groups and compared.
- **Results** –The hematological profile and serum ferritin was compared in febrile and controlled group and p value was highly significant($p < 0.001$) in all parameters.
- **Conclusion** –The result of this suggests that, Iron deficiency is the main root cause for simple febrile convulsion in the children below 5 years of age. This pragmatic study will help the pediatrician to treat such patients efficiently to avoid morbidity and mortality.
- **Keywords** –Chemi luminescence Immune Assay, Serum ferritin, Febrile Convulsion, Iron Deficiency, South Karnataka.

Introduction

Febrile seizures are defined as seizures accompanied by fever without central nervous system infection or metabolic disorders. It is the common type of seizures in the first five years (up to five years) of life which affect 2-5% of all children⁽¹⁾. Children with simple febrile seizures usually have good prognosis, with no evidence of increased rate of mortality hemiplegia or cognitive deficits⁽²⁾. It was reported that, the risk factors for febrile seizures, including developmental delay, discharge from a neonatal unit after 28 days, day care attendance, viral infections, family history of febrile seizures, Certain vaccinations and nutritional deficiencies including iron and zinc⁽³⁾. The prevalence of febrile seizures varies 5-6.9% in India and globally⁽⁴⁾.

Iron is an important nutrient that acts as a co-factor for several enzymes in the body as well as playing roles in the production and function of neuro transmitters, hormones, and DNA (Deoxyribonucleic Acid) duplication. Iron is also essential for enzymes involved in the neuro-chemical reactions, such as myelin formation, metabolism of some neuro-transmitters and brain energy metabolism⁽⁵⁾. Iron deficiency anemia is associated with behavioral abnormalities and impaired cognitive functions. It has potential for irreversible brain damage if it occurs during the most active period of brain development in young children.

Hence Iron deficiency associated with febrile seizures upto five years children clinical manifestation hematological profile was evaluated.

Material and Method

140(One Hundred Fourty) children admitted at pediatric ward of Sambhram Institute of Medical Science and Research Centre, KGF (Kolar)-563115 were studied.

- **Inclusive Criteria**—Children aged between one to 5 year having simple febrile convulsion and present short duration of fever (<4 days) with simple febrile seizures were selected for study.
- **Exclusion Criteria** – Complex seizures and having history of epilepsy or mentally retarded, severe malnutritious were excluded from the study.
- **Method** – 140 pediatrics having iron deficiency with simple febrile seizures were compared with healthy pediatrics of same age group. 140 were also selected for study (Controlled group), Blood examination, Hb%, Hct, MCV, MCH, MCHC, RDW, Ps study, Serum ferritin. (RBC Indices) Red Blood Cells Indices and red cell distribution by using an automated hematology analyzer (Sysmex kx-21) and serum ferritin estimation using Chemiluminescence Immune Assay (AdviaCentur-Fully Automated).

The febrile seizures were diagnosed as per the guidelines for iron deficiency anemia by WHO. The patients were treated according to the hematological reports.

The duration study was June 2018 to July 2018

- **Statistical analysis** – Both groups seizures and controls were compared by Z test and significant results were recorded. The statistical analysis was carried out in SPSS software. The ratio of male and female children was 2:1.

Observation and Results

Table-1 – Comparison of hematological profile in both febrile and controlled groups -Hb% (gm/dl) 9.58 (± 1.48) in febrile group, 10.80 (± 1.45) in controlled group t test was -6.9 and p value was highly significant ($p < 0.001$).

In Hct+% study 28.32 (± 4.05) in febrile group, 32.10 (± 3.50) in Controlled group + test was -8.3 p value was highly significant ($p < 0.001$)

In RDW (f_1) 44.30 (± 2.50) in febrile group, 42.10 (SD ± 3.11) in Controlled group + test was -6.52 p value was highly significant ($p < 0.001$)

In MCV(f_1) -68.56 (± 5.80) in febrile group, 74.20 (± 6.30) in Controlled group + test was -7.79 p value was highly significant ($p < 0.001$)

In MCH (pg) -22.30 (± 3.18) in febrile group, 24.11 (± 3.01) in Controlled group + test was -4.89 p value was highly significant ($p < 0.001$)

In MCHC (gm/dl) -30.22 (± 2.10) in febrile group, 31.41 (± 1.28) in Controlled group + test was -5.72 p value was highly significant ($p < 0.001$)

Table-2 – Comparative study of Serum ferritin in both groups.

In Serum ferritin (mg/dl) – 40.78 (± 17.8) in febrile group, 66.90 (SD ± 24.5) in Controlled group + test was -10.2 p value was highly significant.

Discussion

The present study of Association between Iron deficiency and simple febrile seizures in children at different age groups in South Karnataka Population. The hematological profile was compared in Iron deficiency simple febrile children and controlled children. Hb% in 9.58 (± 1.48) in febrile group, 10.80(± 1.45) in Controlled group, + test was -6.9 and $p < 0.001$. Hct% 28.3 (± 4.05) in febrile group, 32.10 (± 3.50) in Controlled group, + test was -8.3 and $p < 0.001$. RDW(f_1) 44.3 (± 2.50) in febrile group, 42.10(± 3.115) in Controlled group, + test was -6.52 and $p < 0.001$. MCV(f_1) 68.56 (± 5.80) in febrile group, 74.2(± 6.30) in Controlled group, + test was -7.79 and $p < 0.001$. MCH(pg) 22.3 (± 3.18) in febrile group, 24.11(± 3.01) in Controlled group, + test was -4.89 and $p < 0.001$. MCHC – 30.22 (± 2.10) in febrile group, 31.41(± 1.28) in Controlled group, + test was -5.72 and $p < 0.001$ (Table-1). In comparison of serum ferritin in Iron deficiency febrile group was 40.78(± 17.8)and controlled group was 66.90(± 24.5) + test was -10.2 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 would have an important influence on iron intake most of children naturally adapt themselves to a schedule of three meals a day about the end of first year of life and same trends would continue. It is suggested that Iron Deficiency(ID) may be associated with increased risk of Febrile Seizures(FS) in children. Fever can worsen the effects of anemia or ID on the brain and therefore cause convulsion. It is reported that Iron plays vital role in brain mechanism which leads to reduced occurrence of febrile convulsion in children below five year. In ID anemia the brain metabolism is incapable to function without adequate Iron hence, fever crosses blood brain barrier and causes febrile convulsions. Hence it is concluded that Iron acts as defensive mechanism against febrile convulsion⁽⁹⁾. Iron deficiency interferes with functions of many organs, leading to anemia, abnormal growth and behavior, cognitive deficits altered thermo regulation, impaired physical performance and immune dysfunction⁽¹⁰⁾. The effects Iron deficiency(ID) on developing brain has been experimented on lower mammals and observed that, Iron is important for catecholamine metabolism and for the various enzymes and neurotransmitters present in the Central Nervous System. Iron deficiency increases the levels of dopamine D₁ and D₂ receptors and monoamine transmitters⁽¹¹⁾. Furthermore iron deficiency in early life alters metabolism and neurotransmission in major brain structures such as basal ganglia and hippocampus and disrupts myelination hence the fevereasily cross the blood-brain barrier and cause febrile convulsion. It is also reported Iron deficiency is associated with several neurological disorders such as restless legsyndrome, breath-holding spells, and attention deficit, hyperactivity disorders which are associated with increased brain excitability⁽¹²⁾. Iron status may also reflect general health, including nutrition growth and immunity of child.

Summary and Conclusion

The present study of association between ID and FS is by low Serum Iron is associated with increased risk of febrile seizures. It suggests that clinician/pediatrician should be concerned for Iron status even at normal Hemoglobin level. The present study demands detail pathomechanism underlying the association between Iron deficiency and lower seizure threshold. Moreover further prospective studies are needed to determine whether iron supplementation can prevent the occurrence of febrile seizure because exact pathogenesis or mechanism of seizures is still un-clear.

Table-1

Comparison of hematological profile in both groups (Febrile and Controlled)

SI No.	Hematological Profile	Iron deficiency simple febrile 140 cases	Controlled (Healthy) 140 groups	t test	P value
1	Hb% (gm/dl)	9.58 (SD±1.48)	10.80 (SD±1.45)	-6.9	P<0.001
2	Hct%	28.32 (SD±4.05)	32.10 (SD±3.50)	-8.3	P<0.001
3	RDW(fl)	44.30 (SD±2.50)	42.10 (SD±3.11)	-6.52	P<0.001
4	MCV (fl)	68.56 (SD±5.80)	74.20 (SD±6.30)	-7.79	P<0.001
5	MCH (pg)	22.30 (SD±3.18)	24.11 (SD±3.01)	-4.89	P<0.001
6	MCHC(gm/dl)	30.22 (SD±2.10)	31.41 (SD±1.28)	-5.72	P<0.001

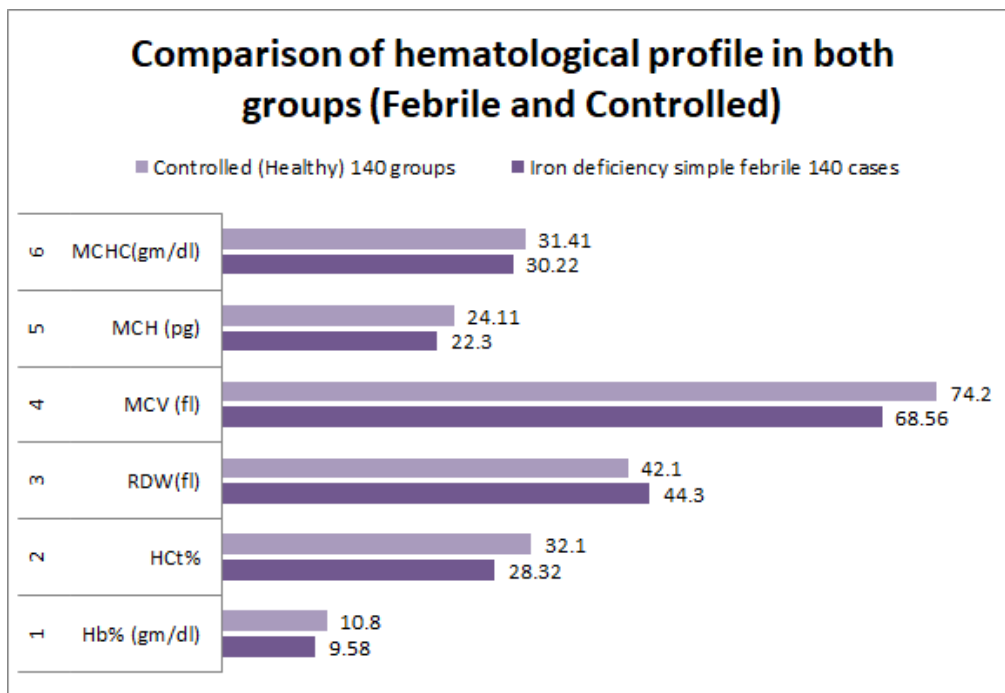
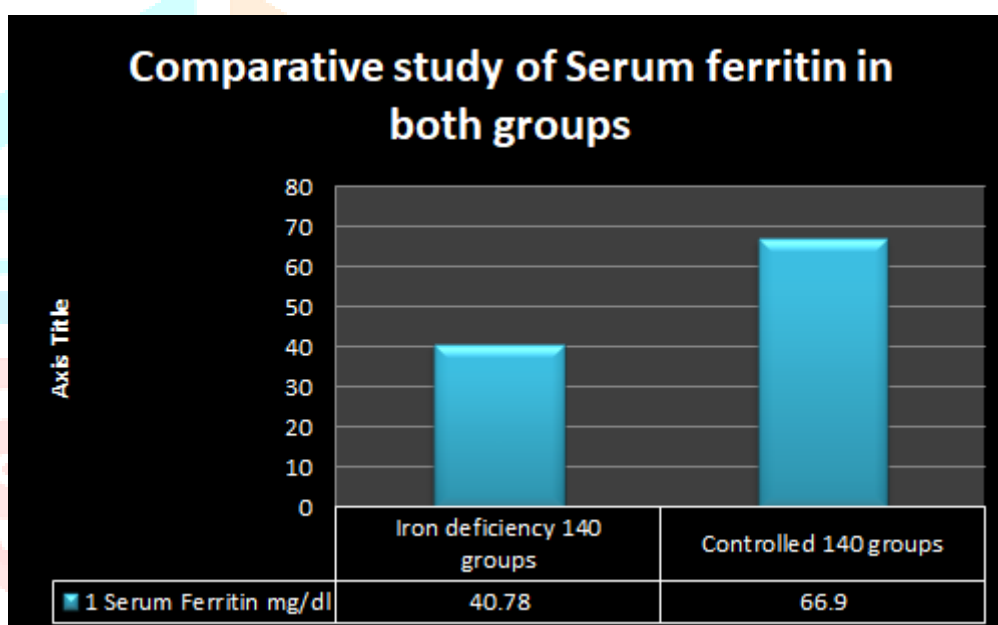


Table-2

Comparative study of Serumferritin in both groups

SI No.	Profile	Iron deficiency 140 groups	Controlled 140 groups	t test	P value
1	Serum Ferritin mg/dl	40.78 (SD±17.8)	66.90 (SD±24.5)	-10.2	P<0.001



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