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Iron deficiency anemia and its relation with febrile seizures

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Abstract
A febrile seizure, also known as a fever fit or febrile convulsion, is a seizure associated with a high body temperature but without any serious underlying health issue. They most commonly occur in children between the ages of 6 months and 5 years. Febrile seizures (FS) are the most common type of seizures in children and iron deficiency anaemia is most common type of anaemia in children.

The children's admitted to paediatric department in Patna medical college and Hospital were enrolled in to the study. The 50 children are diagnosed with febrile seizures to the Paediatrics Emergency Department and wards of the hospital were included in the study. And another 50 control children's were also studies.

The level of the Haemoglobin was seen lower in the febrile seizures patients compared to the control study group patients. Level of the Mean CorpuscularVolume is observed on lower level in febrile seizures. The Mean corpuscular haemoglobin and Mean corpuscular haemoglobin concentration is seen slightly on lower side in normal patients as compared to the enrolled study patients. The level of the serum iron is seen as decreased in the study group when compared to normal patients. There is no significant change in the Total Iron Binding Capacity in both the study group. Mean Plasma Ferritin is also seen on lower side in the both groups.

Hence it can be concluded that Plasma ferritin level was significantly lower in cases as compared to controls suggesting that children who had febrile seizure are more iron deficient than the controls.

Keywords: iron deficiency anaemia, febrile seizures, fever fit or febrile convulsion

Introduction

Anaemia is not a specific disease entity but is a condition caused by various underlying pathologic processes. It may be acute or chronic. The combination of anaemia with leukopenia, neutropenia, or thrombocytopenia may suggest a more global failure of haematopoiesis, caused by conditions such as aplastic anaemia, Fanconi anaemia, myelofibrosis, or leukaemia, or may suggest a rapid destruction or trapping of all blood elements, such as hypersplenism, localized coagulopathy in a large hemangioma, or hemophagocytic lymphohistiocytosis (HLH) or macrophage activation syndrome (MAS).

Paediatric anaemia refers to a haemoglobin or haematocrit level lower than the age-adjusted reference range for healthy children. Physiologically, anaemia is a condition in which reduced haematocrit or haemoglobin levels lead to diminished oxygen-carrying capacity that does not optimally meet the metabolic demands of the body.

Febrile seizures are convulsions that can happen during a fever (febrile means "feverish"). They affect kids 6 months to 5 years old, and are most common in toddlers 12–18 months old. The seizures usually last for a few minutes and are accompanied by a fever above 100.4°F (38°C).

A febrile seizure, also known as a fever fit or febrile convulsion, is a seizure associated with a high body temperature but without any serious underlying health issue. They most commonly occur in children between the ages of 6 months and 5 years [1]. Most seizures are less than five minutes in duration and the child is completely back to normal within sixty minutes of the event [1, 2].

Febrile seizures may run in families. The diagnosis involves verifying that there is not an infection of the brain, there are no metabolic problems, and there have not been prior seizures that have occurred without a fever. There are two types of febrile seizures: simple febrile seizures and complex febrile seizures. Simple febrile seizures involve an otherwise healthy child who has at most one tonic-clonic seizure lasting less than 15 minutes in a 24-hour period. Blood testing, imaging of the brain or an electroencephalogram (EEG) is typically not needed for the diagnosis. Examination to determine the source of the fever is recommended. In otherwise healthy looking children a lumbar puncture is not necessarily required [1].

Neither anti-seizure medication nor anti-fever medication are recommended in an effort to prevent further simple febrile seizures [1]. In the few cases that last greater than five minutes a benzodiazepine such as lorazepam or midazolam may be used [1, 3]. Outcomes are generally excellent with similar academic achievements to other children and no change in the risk of death for those with simple seizures. There is tentative evidence that children have a slight increased risk of epilepsy at 2% [1]. Febrile seizures affect two to ten percent of children before the age of five [1, 2]. They are more common in boys than girls [5]. After a single febrile seizure there is a 15 to 70% chance of another one [1].

During generalized febrile seizures, the body will become stiff and the arms and legs will begin twitching. The child loses consciousness, although their eyes remain open. Breathing can be irregular. They may become incontinent (wet or soil themselves); they may also vomit or have

increased secretions (foam at the mouth). The seizure normally lasts for less than five minutes [2]. The child's temperature is usually greater than 38 °C (100.4 °F) [2].

Methodology

The children's admitted to paediatric department in Patna Medical College and Hospital were enrolled in to the study. The 50 children are diagnosed with febrile seizures to the Paediatrics Emergency Department and wards of the hospital were included in the study. And another 50 control children's were also studies. The approval of the Ethical Committee is taken from the Hospital. The written consent from the parents was taken. The children's in the age group of not less than 6 months and up to the 5 years of age were considered for the study. Following are the inclusion and exclusion criteria for the enrolled study group.

Inclusion Criteria

- Children's diagnosed with febrile seizures
- Having age group of 6 months to 5 years

Exclusion Criteria

- Children's having history of low birth weight & premature birth
- Previous convulsion, birth asphyxia
- Developmental delay
- Neurological deficit
- Any other disorders

A simple febrile convulsion is defined as single seizure of less than 15 min duration in the presence of fever without focal features. The complex seizure usually last for more than 15 minutes.

Routine haematological investigations of all the patients were carried out. Following are the markers are investigated:

Total leukocyte count, Differential Leukocyte count, C-reactive protein, ESR, haemoglobin (Hb), Haematocrit (Hct), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), serum iron concentration, total iron binding capacity (TIBC), and plasma ferritin(PF) were collected for each patient. The CSF examination was done to rule out CNS infections in children's aged less than 12 months.

Results & Discussion

The data were collected from the study group and the control study group patients. Following are the results found in the study conducted.

Table 1: Comparison of Age between two study groups

Age Group	A: Study Group		B: Control Group	
	Number of Cases	Percentage	Number of Cases	Percentage
6 month to 1 year	8	16.0	9	18.0
1 to 2 year	15	30.0	14	28.0
2 to 3 year	12	24.0	16	32.0
3 to 4 year	8	16.0	6	12.0
4 to 5 year	7	14.0	5	10.0
Total	50	100	50	100

Table 2: Comparison of the Serum Markers

Serum Markers	A: Study Group	B: Control Group	P Value
Mean Haemoglobin (g%)	8.90 ± 1.5	13.4 ± 1.4	< 0.0001
Mean Corpuscular Volume (MCV) (fl)	71.2 ± 5.9	82.3 ± 7.7	< 0.0001
Mean corpuscular haemoglobin (MCH) (pg)	23.6 ± 2.5	28.3 ± 2.6	< 0.0001
Mean corpuscular haemoglobin concentration (MCHC) (g%)	32.2 ± 2.8	34.5± 2.0	< 0.0001
Mean serum iron (MCI) (mcg/dl)	22.7 ± 12.5	44.8 ± 8.3	< 0.0001
Total Iron Binding Capacity (TIBC)(mcg/dl)>400	422.5 ± 6.5	435.2 ± 4.8	> 0.05
Mean Plasma Ferritin (MPF)(ng/ml)	15.8 ± 5.4	23.3± 7.2	< 0

The level of the Haemoglobin was seen lower in the febrile seizures patients compared to the control study group patients. Level of the Mean Corpuscular Volume is observed on lower level in febrile seizures. The Mean corpuscular haemoglobin and Mean corpuscular haemoglobin concentration is seen slightly on lower side in normal patients as compared to the enrolled study patients.

The level of the serum iron is seen as decreased in the study group when compared to normal patients. There is no significant change in the Total Iron Binding Capacity in both the study group. Mean Plasma Ferritin is also seen on lower side in the both groups.

Piscane *et al*. Studied children's less than 2 years of age and reported that anaemia was significantly more common in cases then controls [4]. Cut off value for MCV <70 fl in their study but did not analyse other blood indices. Naveed-ur-Rehman and A.G. Billoo in 2001 studied in 6 month to 5 year age on 60 patients (30 cases and 30 controls) [5]. And reported that Iron deficiency anaemia was significantly more frequent among the case as compared to the controls as evident from parameters studied i.e. hemoglobin<10gm/dl (p<0.000), hematocrit<30% (P<0.01),MCV<70fl (P<0.002), MCH<24pg (P<0.001), and serum ferritin <110ng/dl (P<0.000). In their study they did not rule out effect of febrile illness on ferritin [6].

Reverse observation had reported by Korbrinsky *et al*. did a study to determine the effect of iron status on seizure threshold and documented that Iron deficiency may protect against the development of febrile seizures [6]. In present study is similar to study done by Naveed-ur-Rehman and A.G. Billoo *et al*. Our observation Support the hypothesis provided by previous worker about role of iron deficiency.

Hence it can be concluded that Plasma ferritin level was significantly lower in cases as compared to controls

suggesting that children who had febrile seizure are more iron deficient than the controls.

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