



A HOSPITAL-BASED STUDY ON FEBRILE SEIZURE AND IRON DEFICIENCY ANEMIA AT A TERTIARY CARE CENTRE IN BIHAR

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ABSTRACT

Febrile seizures (FS) are one of the common convulsive events in children. They are age-dependent and are uncommon before 6 months and after 5 years of age. **Methodology:** This prospective case control study was performed between April 2017 to March 2018. The study population consisted of 100 patients aged 6 to 60 months admitted in the Department of Pediatrics of Patna Medical College & Hospital, Patna, Bihar. 50 children with febrile seizures and 50 controls with febrile illness only were included in the study. **Result:** We had subdivided our patient's age group at six month interval. The majority of FS were noted in the 6 to 24 months age group, which included 52%. **Conclusions:** Based on our study, there is strong evidence that parameters such as gender, peak body temperature, underlying cause of fever, & microcytic hypochromic anaemia are the risk factors in occurrence of the first febrile seizure episode.

KEYWORDS : Febrile Seizure, Iron Deficiency Anemia

INTRODUCTION

Febrile seizures (FS) are one of the common convulsive events in children [1]. The 1993 International League against Epilepsy defined a FS as "an epileptic seizure occurring in childhood associated with fever, but without evidence of intracranial infection or defined cause" [2]. Seizures with fever in children who have experienced a previous non-febrile seizure are excluded [3]. They are age-dependent and are uncommon before 6 months and after 5 years of age. It is divided into two types: simple and complex [5]. Between 2 to 5% of neurologically healthy children experience at least 1 FS episode in their lifetime [5]. Although earlier Indian studies [6] suggested that up to 10% of children experience a FS, recent data indicate that the incidence rate in India is similar to western figures [7].

Pathophysiology of FS remains unclear [8]. It is suggested that FS is an age-dependent response of the immature brain to fever, as studies in animal models have suggested that during the brain maturation process, there is an enhanced neuronal excitability [8]. This postulation is supported by the fact that most (65 to 85%) FS occur between 6 months and 3 years of age, with the peak incidence at 18 months [9-11].

Despite its benign nature, the febrile convulsion is one of the most common reasons for admission to pediatric emergency worldwide. In most of the patients, fever is due to upper respiratory system and urinary tract infection (UTI) [11]. Regarding the high prevalence of FS in children and parent's apprehension due to seizure episode, efforts have to be made in identifying the influential risk factors so that parents can be counseled and advised to take necessary precaution at time of seizure episode.

Reports regarding the association between febrile seizures and iron status have been inconsistent; some studies indicated that iron deficiency with or without anemia was more prevalent in children with febrile seizures [12-17], whereas others found no association between iron deficiency and febrile seizures [18-20]. Although many studies have dealt this issue, iron deficiency anemia, however, is just as important because it is a widespread nutritional problem and can be prevented by screening and clinical concerns. Nevertheless, almost all of these previous studies were conducted in the Middle East, particularly in Iran and Pakistan, with only a few such studies performed in other parts of the world. Because the iron status and prevalence of iron

deficiency anemia is highly related to socioeconomic state, malnutrition, weaning practices, which is highly dependent on cultural and geographic differences [21], the association of febrile seizures and iron deficiency anemia may vary region to region.

Here, we compared the iron status of children with febrile seizures and controls to investigate the association between iron status and febrile seizures in children admitted in Patna Medical College & Hospital, Patna, Bihar.

Methodology

This prospective case control study was performed between April 2017 to March 2018. The study population consisted of 100 patients aged 6 to 60 months admitted in the Department of Pediatrics of Patna Medical College & Hospital, Patna, Bihar. 50 children with febrile seizures and 50 controls with febrile illness only were included in the study. The parents of all patients provided written informed consent for inclusion in the study, which was approved by the Institutional Ethics Committee.

The febrile seizure group (n = 50) included patients with seizure accompanied by fever ≥ 38 °C without central nervous system infection or metabolic disorders. The control group (n = 50) was selected randomly from among children admitted for febrile illnesses, such as gastroenteritis, otitis media, or respiratory tract infections, without seizure around the same time with the cases. Patients with chronic cardiovascular, renal, rheumatological or malignant diseases, and hemoglobinopathies, or other blood disorders were excluded from the study as they were more likely to have anemia. Patients with central nervous system diseases such as developmental delay, motor disabilities, and mental or cognitive defects were also excluded as they could have nutritional deficiency that may affect the results of the study. All of the febrile seizure patients and controls received appropriate diets for their ages without feeding problems. The febrile seizure and control groups were comparable in age, gender distribution, and clinical characteristics of febrile illness.

Routine hematologic investigation was performed at the emergency department or 1st day of admission. The laboratory results regarding blood indices and iron status were analyzed using complete blood count (CBC), serum iron, plasma ferritin, total iron binding capacity (TIBC), and

transferrin saturation, which were compared between the two groups. Anemia was defined as a hemoglobin (Hb) level of 2 standard deviations below the normal values for age, i.e., Hb < 10.5g/dL for ages 6–24 months and < 11.5g/dL for ages 2–5 years. Iron deficiency was defined as serum iron < 22g/dL, plasma ferritin < 30ng/mL, or transferrin saturation < 16% [23, 24].

Children with a history of afebrile seizures, any antiepileptic drug medication, central nervous system infection, neurological deficit, or developmental delay were excluded from the study.

The collected data were analyzed using SPSS 21.0 statistical software. Descriptive statistics and Chi-square test was used for analysis of qualitative variables. Univariate analysis of all variables affecting febrile seizures were considered statistically significant with P < 0.05.

RESULTS

During the study period, a total of 100 patients between the age of 6 months and 60 months were enrolled. The study group included 50 cases and 50 controls. The mean age of the cases were 23.6 ± 15.1 months and 25.3 ± 14.2 months in controls. We had subdivided our patient's age group at six month interval. The majority of FS were noted in the 6 to 24 months age group, which included 52% (Fig 1).

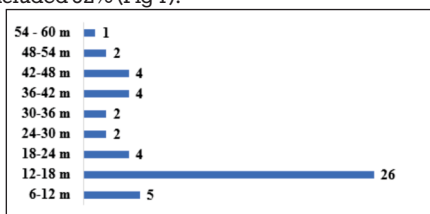


Fig 1: Distribution of study participants based on their age (6 monthly interval)

Upper Respiratory Infection (URI) was the most common cause of febrile illness in our study. The mean temperature (measured from axilla) in the case group during the FS attack was 101.5 ± 1.3 °F which was significantly higher compared to the control group which was 99.6 ± 0.9°F (p-value < 0.05) [Table 1].

Table 1: various parameters across the cases and the control group.

Parameters	Cases	Control	P value
Mean age(months)	23.6 ± 15.1	25.3 ± 14.2	>0.05
Gender (Male)	33	37	>0.05
Etiology of fever			
URTI	38	2	
UTI	8	1	<0.05
Others	4	48	<0.05
Mean maximum temperature (deg F)	101.5 ± 1.3	99.6 ± 0.9	<0.05
Time interval between fever and seizure (hours)			
< 24	41	-	
24-72	7	-	
>72	2	-	-

Table 2 shows the abnormal laboratory findings in patients with febrile seizures in comparison to the control groups.

Parameters	Cases	Controls	P value
Red blood cell indices			
Mean Hb (g/dl)	6.4 ± 1.4	8.9 ± 1.7	<0.05
Mean MCV (fL)	61.8 ± 9.2	76.2 ± 10.8	
Mean MCH (pg/cell)	23.9 ± 2.2	28.0 ± 2.3	
Mean RDW (%)	18.5 ± 1.5	16.7 ± 1.8	

DISCUSSION

In the present study, maximum mean temperature, upper respiratory and urinary tract infection as cause of fever, low mean haemoglobin and RBC indices (low MCV, MCH & high RDW) were found to be the risk factors for first episode of FS.

Most of the children with FS were male below 2 years of age in our study. Fetveit et al., showed that the peak incidence of FS was at 18 months of age, with male predominance [25]. Hesdorffer et al., found younger age, lower temperature, longer duration (1-24 hours) of recognized temperature before FS, female sex, structural temporal lobe abnormalities, and first-degree family history of FS as risk factor for FS epilepticus [26]. Many studies include developmental delay, discharge from a neonatal unit after 28 days, day care attendance, viral infections, a family history of FS, certain vaccinations, and possibly iron and zinc deficiencies [27-29]. In our study, the mean maximum temperature was 101.5°F in cases and 99.6°F in controls, 82.0% of the patients had the seizure within 24 hours of fever onset. Millar JS and Anne T Berg also had similar findings that the height of temperature plays a role in eliciting a FS and that most of the episodes occurred in the initial part of illness [1, 30]. In the study group URTI was the most common cause of fever, followed by UTI and other infections like otitis media, gastroenteritis. Various studies reported similar findings with URI, gastroenteritis and UTI as most common cause of fever [31, 32].

Literature reports that antenatal complications like antepartum and intrapartum haemorrhage, and difficult labour as significant risk factors for the 1st episode of febrile seizure. These factors by contributing to lower iron store in mother and subsequently in child may contribute to FS. Iron deficiency is considered to be a risk factor for FS by some [33]. Ellatif reported that prematurity and difficult labour is the major risk factors [34]. In another series it was revealed that preterm and difficult labour to be considered the risk factors for 1st episode FS [34, 35].

Statistically significant lower mean haemoglobin, MCV, MCH and higher RDW values in patients compared to controls. Similar results were observed by Yousefichaijan et al., who observed significant differences between the febrile convulsion group and the control group regarding blood indices such as Hb, Haematocrit, MCV, MCH, and MCHC as well [36]. In another study, Vaswani et al., observed that low serum ferritin level is a risk factor for first febrile seizure [37].

CONCLUSION

FS are the most common type of convulsive event in children. Although FS is usually a benign and self-limited condition, it can cause a high level of anxiety and fear in parents. The exact cause of febrile seizure is unknown, however, there are several factors considered as risk factors as outlined in this study associated with incidence of the first FS. Based on our study, there is strong evidence that parameters such as gender, peak body temperature, underlying cause of fever, & microcytic hypochromic anaemia are the risk factors in occurrence of the first febrile seizure episode.

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