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Original Research Article

Risk Factors Associated with Recurrence of Febrile Seizures in Western Indian Children

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Abstract

Introduction: Febrile seizure is a very important cause of admission of children especially in developing countries with more commonly seen in young age group children. Risk factors for recurrence of febrile seizures and associated infectious diseases may be different in children in this region with histories of febrile seizures.

Objective: Present study was aimed to evaluate demographic & clinical profile and to determine the risk factors associated with recurrence of febrile seizures in western Indian children aged 6 months to 5 years.

Materials and Methods: It was a hospital based prospective observational study in which 61 children between 6 months to 60 months of age, presented with seizures accompanied by febrile illness diagnosed as febrile seizures as per American Academy of Pediatrics were included.

Results: Age more than 1 year at first episode, fever duration <24 hrs and temperature at the time of seizure was <102.2°F were found to be significantly associated with recurrence of seizures.

Conclusion: Age less than 1 year at first episode of febrile seizure, fever duration <24 hrs, the temperature at the time of seizure <102.2°F were found to be significantly associated with recurrence of febrile seizure.

Keywords: Febrile Seizures, Recurrence, Risk Factors, Fever.

Introduction

Seizures are a major factor in paediatric hospital admissions, particularly in poor nations where they are more frequently encountered in young age groups of children.[1] According to ILAE (1993), a febrile seizure is characterised as one that strikes a child after reaching the neonatal age (1 month), is linked to a febrile illness that is not CNS-infected, does not have a history of neonatal seizures or unprovoked seizures, and does not meet the criteria for any other acute symptomatic seizures.[2]

Numerous studies have shown that genetic and environmental factors affect the frequency of febrile seizures. When epilepsy arises following febrile episodes, genetic

factors seem to be involved. If a first-degree relative experienced a febrile seizure, there is a higher chance that temporal lobe seizures will start early but end permanently. Due to the same frequency of febrile seizures among the siblings of the patients with temporal lobe febrile seizures, a single gene is assumed to be solely to blame. [3] The risk factor for recurrence was previously thought to be solely the age at the time of the initial incidence, but other factors have since been discovered. Younger age groups, prolonged seizure durations, fever intensity and duration, CFS during initial episodes, and a positive personal and family history of FS are all associated with an increased likelihood of recurrence. In reality, up to 40% of patients have first-degree relatives who have a positive family history of FS.[4] Diphtheria and tetanus toxoids, whole-cell pertussis vaccine (DPT), and measles, mumps, and rubella vaccine have all been linked to an increased incidence of febrile seizures (MMR).[5] Additionally, iron deficiency has been linked to a higher incidence of febrile convulsions.

Even with risk factors, the likelihood of developing epilepsy following FS is still only about 15-20%, albeit this risk rises if several risk factors are present. In between 30% and 50% of instances, FS recurs. Families should be ready for an increase in seizures.[6] It is well recognised that prolonged febrile seizures in children can have negative physiological effects, including an increase in the metabolic demand on the brain and systemic alterations like hypoxia, hypoglycemia, and arterial hypotension.[3]

Children in this region with history of febrile seizures may have different risk factors for recurrent febrile seizures and related infectious illnesses when compared to prior research. Information on the natural risk factors might assist parents cope with febrile seizures in children, which frequently cause parents anxiety. From Western India, very few studies have been recorded. As a result, the current study was carried out to assess the demographic and clinical profile and to identify the risk factors for febrile seizures in children from western India aged 6 months to 5 years.

Materials and Methods

Study design, settings and participants

It was a hospital based prospective observational study conducted over a period of eighteen months from January 2019 to June 2020 in paediatrics department of a tertiary care teaching hospital in Udaipur, Rajasthan, India. All children between 6 months to 60 months of age, presented with seizures accompanied by febrile illness diagnosed as febrile seizures as per American Academy of Pediatrics constituted the study population. Suspected case of meningitis, epilepsy, metabolic & toxicological causes of convulsions, Children with previous febrile seizures, unprovoked seizures, and children with intracranial infections, Unstable patients who need ICU care were excluded from the study. Total 61 children fulfilled the inclusion criteria and included in the study.

Data collection

First, using the information sheet, the study's purpose was communicated to parents of children in the local tongue. They were interviewed using a predesigned, pretested, and semi-structured questionnaire after receiving their informed consent. All of the study participants received the questionnaire from a single interviewer who was a postgraduate student in the paediatrics department.

After gathering the necessary data, each study subject had a thorough physical examination and history. Each patient's informants were questioned regarding the patient's prenatal history, family history of epilepsy, history of febrile seizures, and any specific events that occurred during that time.

Development history and anthropometry was taken in detail, which helped to exclude patients having neurological deficit and microcephaly.

Patients were categorised as per their socio-economic status using Modified Kuppuswamy classification using update current price index of 2019. Patients' blood sugar levels were checked at the time of admission using the strip method, and blood samples were sent to be tested for CBC, RBC indices, serum electrolytes, and serum calcium.

Based on history, clinical examination and investigations, clinical profile of cases were established. Sex, domicile, income level (socio-economic status), family history, duration of fever, type of seizure (simple vs complex), age of onset of seizure and other relevant details were filled in the performa. Risk factors were evaluated on basis of cumulative analysis of clinical profile of all cases.

To distinguish a febrile seizure from another form of epilepsy, electroencephalography (EEG) was performed.

Complex seizures were those that started out focal, lasted a long time (January 2019–June 2020), or involved many seizures during the course of the illness. A focused seizure is one that is accompanied by secondary generalisation.

Secondary generalised seizures are defined as focal seizures that progress to generalised seizures, most frequently accompanied by tonic-clonic convulsions.[7]

If a seizure lasted more than 15 minutes, it was deemed to be protracted. Two observers' visual examination of EEG recordings is potentially capable of predicting the length of focused impaired awareness seizures. The duration is measured from the beginning of the first sustained local or regional ictal activity until the point at which the ictal activity stops either globally (global duration) or locally (onset area) (focal duration). However, for the purposes of this investigation, the length of a seizure was defined as the interval between the start of a generalised or focal seizure activity and its cessation [8].

Additionally, information on the current condition, a family history of febrile seizures, and a past with neurodevelopmental issues was gathered. The child was regarded as having a positive history of vaccination if the immunisation (first or subsequent) had been administered within two weeks of the seizure episode.

Using an analogue mercury thermometer, temperatures were taken at the hospital and recorded in degrees Fahrenheit (Hicks). The parents were checked on three months after the initial appointment to determine whether there had been any additional seizures. Each youngster was monitored for a full year. The monitoring phase lasted until June 2020.

Statistical analysis

Software called SPSS, version 17 (Chicago II, USA), was used to examine the data and perform statistical evaluations. The statistical difference in the proportions was examined using the chi square test or Fisher's exact test for quantitative data and the chi square test or Fisher's exact test for qualitative data. A "P" value of 0.05 or less was regarded as statistically significant.

Ethical issues

All parents or caregivers were explained about the purpose of the study. Confidentiality was assured to them along with informed written consent. The study was approved by the Institutional Ethical Committee.

Results

Out of 61 children with febrile seizures, 11 (18.0%) were below 1 year of age while rest

50 (82.0%) were above 1 year of age group. More than two third (n=42; 68.9%) were male while 19 (31.1%) were females. In 11 (18.0%) subjects, temperature at the time of seizure was >102.2°F while in rest 50 (82.0%) children temperature was <102.2°F at the time of seizure. In 44 (72.1%) children duration of fever was <24 hrs while in 17 (27.9%) fever was lasted for more than 24 hrs. Most of the children presented with simple febrile seizure (85.2%) while complex febrile seizure was present in only 9 (14.8%) cases. It was seen than in more than half of children (n=34; 55.7%), seizures lasted for less than 5 minutes and in 24 children seizure lasted for 5-15 minutes while in only 3 (4.9%) children seizure lasted for more than 15 minutes. In our study recurrence of febrile seizure was seen in 34 (55.7%) subjects. Family history of febrile seizure was present in 28 (45.9%) children and developmental delay was present in 5 (8.2%) children.

Age more than 1 year at first episode and temperature at the time of seizure was <102.2°F were found to be significantly associated with recurrence of seizures. Other factors like gender of child, type of febrile seizure, family history of febrile seizure. Family history of epilepsy, anaemia, serum sodium level, duration of seizure and developmental delay were not found to be significantly associated with recurrence of febrile seizure.

Table 1: Finding during episode of febrile seizure in study subjects (n=61)

	No.	%
Temperature at the time of seizure		
<102.2°F	50	82.0
>102.2°F	11	18.0
Duration of seizure		
<24 hrs	44	72.1
>24 hrs	17	27.9
Type of seizure		
Simple febrile seizure	52	85.2
Complex febrile seizure	9	14.8
Duration of seizure		
<5 minutes	34	55.7
5-15 minutes	24	39.3
>15 minutes	3	4.9

Table 2: Association of different risk factors with recurrence of febrile seizure

	Recurrence of febrile seizure				p value
	Absent (n=27)		Present (n=34)		
	No.	%	No.	%	
Gender					
Male	18	42.9	24	57.1	0.74
Female	9	47.4	10	52.6	
Age at first episode of febrile seizure					
<1 year	8	27.6	21	72.4	
>1 years	19	59.4	13	40.6	0.01*
Type of febrile seizure					

Simple febrile seizure	22	42.3	30	57.7	0.49
Complex febrile seizure	5	55.6	4	44.4	
Family history of febrile seizure					
Present	11	39.3	17	60.7	0.61
Absent	16	48.5	17	51.5	
Temperature at the time of seizure					
<102.2°F	19	38.0	31	62.0	0.04*
>102.2°F	8	72.7	3	27.3	
Developmental delay					
Present	2	40.0	3	60.0	0.99
Absent	25	44.6	31	55.4	
Duration of fever					
<24 hrs	16	36.4	28	63.6	0.04*
>24 hrs	11	64.7	6	35.3	
Duration of seizure					
<5 minutes	18	52.9	16	47.1	0.19
>5 minutes	9	33.3	18	66.7	
Family history of epilepsy					
Present	2	25.0	6	75.0	0.28
Absent	25	47.2	28	52.8	
Sodium level					
<135 meq/L	3	27.3	8	72.7	
135-145 meq/L	24	48.0	26	52.0	0.51
Hb level					
<11 g/dl	12	40.0	18	60.0	
≥11 g/dl	15	48.4	16	51.6	0.51

Discussion

In the first two years following a febrile seizure, there is a 15%–70% probability of recurrence, according to several researchers [9] In the current study, 34 (55.7%) of the children experienced another febrile seizure. Agrawal J *et al*'s study [10]. found that 26% of children who had febrile seizures experienced recurrence. Recurrence of febrile seizures was noted in 32.9% of children between the ages of 6 months and 5 years in the study by Kumar N *et al* [11]. Another study by Berg AT *et al* [12] found that 27.1% of kids had recurrence. Our study's recurrence rate was higher than that of other studies, which may have been caused by the tertiary level center's selective referral of participants, making them less likely to be a true representative of the sample.

In our study, recurrence was more frequently observed if the seizure's temperature was below 102.2°F. Our study's findings were consistent with those of Kumar N. *et al* [11] who found that recurrence rates were 52.5% for children whose body temperatures were 101°F or lower at the time of the seizure and 17.2% for children whose temperatures were greater than or equal to 105°F. Low temperature at the start of a febrile seizure was substantially related with recurrence of febrile seizures, according to a study from Nepal by Agrawal J *et al* [10]. Additionally, Berg After *et al* [12] discovered that the

incidence of recurrence at 1 year decreased from 35% to 30%, 26%, 20%, and 13%, respectively, for every degree Fahrenheit rise in temperature, from 101°F (38.3°C) to 105°F (40.6°C).

The recurrence of febrile seizures and family history of epilepsy did not appear to be significantly correlated. The findings were similarly supported by Berg AT *et al* [12]. and Kumar N *et al* [11] who also found no connection between recurrence and family history of epilepsy. But according to Annegers JF *et al* [13], children with a family history of epilepsy are more likely to experience febrile seizures again.

According to other studies, having a developmental delay at birth, having a family history of epilepsy, and having chronic fatigue syndrome are risk factors for developing epilepsy later on [14,15]. However, Hesdorffer DC *et al* [16] from Columbia University were unable to discover any significant correlation between the recurrence of febrile seizure epileptics and age at first seizure, developmental delay, temperature during the seizure, family history of febrile seizures, or family history of epilepsy [16]. In their investigation, febrile seizure epilepticus recurrence was substantially correlated with baseline acute T2 signal and MRI abnormalities. The population's constitutional differences and the fact that the outcome under study was recurrence of febrile status epilepticus rather than just recurrence of febrile seizures may be to blame for this.[16] Recurrent febrile seizures can have a negative impact on the family's quality of life since the parents may get fearful and anxious everytime their child becomes ill. The phrase "vulnerable child syndrome" describes this worry and a collection of behaviours that are supposed to originate from overly anxious parents [17]. Parental behaviour and interactions with their children may suffer as a result of this heightened dread of fever and febrile seizures. By receiving the right information and counselling on febrile seizures, this worry and anxiety can be reduced. Specific instructions on how to care for the child should be given to the parents and other carers. When a febrile illness first appears, the doctor may be prompted by the identification of recurrence risk factors to propose intermittent oral diazepam use or perhaps long-term prophylaxis. For further research on the causes and prognosis of recurrent febrile seizures, a longer-term follow-up is required.

Conclusion & Recommendations

It can be concluded from the study that the significant risk factors for recurrences are age less than 1 year at first episode of febrile seizure, fever duration <24 hrs, the temperature at the time of seizure <102.2°F were found to be significantly associated with recurrence of febrile seizure. These findings need further validation with further studies involving large sample size with long term follow-up.

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