

# Febrile Seizures in Malaysian Children: Epidemiology and Clinical Features

C T Deng, MRCP

H I Zulkifli, M.Med

B H O Azizi, MRCP

Department of Paediatrics, Faculty of Medicine,

Universiti Kebangsaan Malaysia, Jalan Raja Muda Abdul Aziz, 50300 Kuala Lumpur

## Summary

A child with a febrile seizure is a common cause of admission in a general paediatric ward in Malaysia. We set out to look prospectively into the clinical and epidemiological features of these children. A total of 117 children were admitted into the study. The ratio of boys to girls were 1.5:1.0. The racial breakdown was 62.4% Malays, 26.5% Indians, 8.5% Chinese and 2.6% others. The first febrile seizure occurred before the age of three years in 92.9% of our patients. The highest number of febrile seizures was in the six to 12 months age group. The average length of seizure was 9.5 minutes and the majority were non-recurrent. Febrile seizures with complex features occurred in 33.3% of the children. Upper respiratory tract infection was the most common cause of fever in our patients. There was a family history of seizures (febrile or afebrile) in 26.5% of patients.

**Key Words:** Febrile seizure, Clinical features, Epidemiology

## Introduction

A child with a febrile seizure is one of the more common causes of admission to a paediatric ward. From our monthly ward census, febrile seizures accounted for 8-10 per cent of general paediatric admissions. Despite this, little research has been done regarding its epidemiology and its clinical features in our country.

The subject of febrile seizure has controversies ranging from its definition to its prognosis and treatment despite being known since the days of Hippocrates in ancient Greece<sup>1-9</sup>.

The prevalence of febrile seizures among different communities is between 2 and 4%<sup>10</sup>. However, the reported prevalence in a small district in Japan in children up to three years of age was as high as 8.2%<sup>11</sup>. A study done in Bombay, India yielded a

prevalence of about 1.8%<sup>12</sup>. We in Malaysia as yet do not have any prevalence figures.

The prevalence in boys has generally been found to be higher than in girls<sup>7,9,10,11</sup>, though Verity *et al* in the Child Health and Education Study (CHES) found no statistical difference between boys (2.29%) and girls (2.12%)<sup>4</sup>.

Age is an important factor in febrile seizures. Most studies have shown that the majority of febrile seizures occur between six months and three years with the peak in the second year of life<sup>4,9,10,11</sup>.

There is no doubt that there is an inherited component in febrile seizures; however the mode of inheritance is not definite and postulates include autosomal dominant inheritance and polygenic multifactorial inheritance<sup>4,10,13</sup>. It is estimated that 20%

of probands have parents with febrile seizures<sup>10</sup> and 9 to 17% of probands have siblings similarly affected<sup>2</sup>.

It is difficult to compare the proportion of febrile seizures that are complex in different studies because of the differing definitions used. Complex seizures comprised only 8.6% of the febrile seizures in Forsgren's study<sup>9</sup> but the figure was higher (20%) in Verity's study<sup>4</sup>.

In Malaysia there is a lack of basic data on febrile seizures. The prevalence rate, clinical profile, family and social background of children with febrile seizures are unknown. This study did not aim to study prevalence but aimed to provide a clinical profile as well as the family and social background of children with febrile seizures in Malaysia. This information would help in planning our health and education programmes.

### Methodology

This was a prospective study from August 1990 to April 1991. The parents of consecutive children admitted for febrile seizure in the paediatric wards of Universiti Kebangsaan Malaysia in the Paediatric Institute, Hospital Kuala Lumpur were interviewed using a standard questionnaire.

We adopted the definitions used by Nelson and Ellenberg in their study<sup>7</sup> to distinguish simple and complex febrile seizures as this is generally accepted and used by other researchers<sup>4</sup>.

Our inclusion criteria were :

1. Any child admitted to the paediatric wards of Universiti Kebangsaan Malaysia for febrile seizure.
2. A febrile seizure was defined as a seizure which occurred with a fever in which there was no evidence of intracranial infection either clinically or on examination of the cerebrospinal fluid.
3. The presence of the fever was based on parental history or documented temperature. Most seizures occurred at home where a thermometer was usually unavailable.

4. Children from age one month to 12 years were included in the study. Children outside the usual age range of six months to six years were included because 1-2% of febrile seizures occur in children below six months old and 1-6% in those above five years old<sup>1</sup>. Nelson and Ellenberg in their studies included children aged one month to seven years<sup>6,7</sup>.
5. If the febrile seizure was single, generalised in nature and of duration less than 15 minutes in duration, it was defined as a simple febrile seizure<sup>7</sup>.
6. If the febrile seizure was recurrent (more than one febrile seizure in 24 hours), focal and lasting more than 15 minutes, it was defined as complex febrile seizure<sup>7</sup>.

Children were excluded from the study if there was any of the following in the past history :

1. neonatal seizures,
2. afebrile seizures or
3. neurological or developmental impairment.

Data collection was by interview and abstracting clinical information from ward notes. A prepared questionnaire was used to interview the patients' parents. The interviews were all performed by the first author. If the mother was present she was the preferred parent to be interviewed as the mother was usually the one who knew the child better and was almost always the parent who stayed with the child in the ward. In a few patients the father was interviewed as the mother was unavailable. The interview was conducted on the first day or the second day after admission.

Statistical analysis was performed on an IBM PC compatible personal computer using a statistics software package SASv6.

### Results

There were 117 children recruited into the study. There were 70 boys and 47 girls giving a male to female ratio of 1.5:1.

The majority of patients were Malays (62.4%) followed by Indians (26.5%), Chinese (8.5%) and others (2.6%).

The age range at presentation was from one month to 119 months with a mean age of 20.9 months (SD=19.5 months). Most of the patients were aged six months to 24 months (66.7%), with the largest number 33 (28.2%) in the age group six months to 12 months (Figure 1).

Of the 117 patients, 20 had previous history of febrile seizures and 97 had no previous history. Many of the first febrile seizures, occurred at the age range of six

months to 24 months (69.7%). Thirty-five patients (31.3%) had their first febrile seizure at six to 12 months of age (Figure 2).

In 114 patients, the duration of fever prior to onset of seizure ranged from 0 to 168 hours and the mean was 16.5 hours (SD=21.3 hours). In the remaining three patients the parents gave a history of fever prior to onset of the febrile seizure but were unable to remember the duration of fever.



Fig. 1: Age at presentation

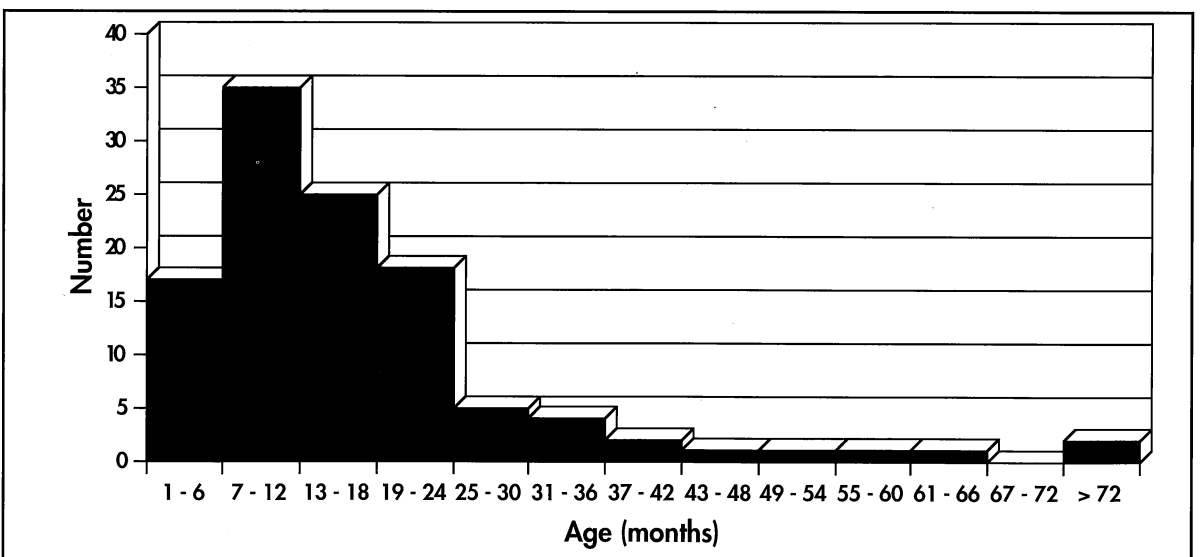


Fig. 2: Age at first febrile seizure

Of the 117 patients, 20 had previous history of febrile seizures; 11 of them had one previous febrile seizure, and the rest had two or more.

In the present admission the mean number of seizures was 1.5 with a minimum of one to a maximum of nine seizures prior to admission. Eighty-nine (76.1%) patients had only one seizure and 28 (23.9%) had recurrent seizures. There were two who had three seizures, two who had four seizures, two who had five seizures and another two who had six seizures. One patient had nine seizures. All of the recurrent febrile seizures occurred within 24 hours of the first seizure.

Only two (1.7%) patients had focal seizures and the rest had generalized seizures.

The duration of the first current seizure ranged from one minute to 60 minutes with a mean of 9.5 minutes (SD=11.0 minutes). A prolonged seizure more than 15 minutes in duration was found in 18 patients.

There was a total of 39 (33.3%) out of 117 patients who had features of complex febrile seizures. Of the 39, one (2.6%) had a focal seizure only, 10/39 (25.6%) had a prolonged seizure only, and 19/39 (48.7%) had recurrent seizures only. Hence 30/39 (76.9%) patients had a single complex feature. In nine (23.1) patients there were two complex features, one (2.6%) had focal seizures which were recurrent and eight (20.5%) had recurrent seizures which were prolonged.

After the seizure none of the children had any post-ictal paralysis; 61 (52.6%) out of 115 were asleep and 54 (46.1%) were awake. Two of the parents were uncertain of their child's condition post-ictally.

The most common symptoms accompanying the febrile seizure were cough 45.3% and coryza 53.8%. The other symptoms were diarrhoea 9.4%, abdominal pain 3.4%, sore throat 6.8% and dysuria 1.7% (Table I).

The physical examination revealed an inflamed throat in 88 (76.5%) and an inflamed tympanic membrane in four (3.4%). There was no neurological deficit noted in any of the patients.

**Table I**  
**Symptoms of underlying cause of fever on admission**

Symptom	Number	(%)
Coryza	63	(53.8)
Cough	53	(45.3)
Sore throat	8	(6.8)
Abdominal pain	4	(3.4)
Dysuria	2	(1.7)

The patients stayed on the average 3.1 days (SD=2.2 days) in the wards with the minimum stay being one day and the maximum 18 days.

In the perinatal history, information was not available on the maturity of seven patients at birth. Of the remaining 110, 108 (98.2%) were term and one (0.9%) was preterm and one (0.9%) was postterm.

Delivery was by spontaneous vaginal delivery in 96 (82.6%), induced vaginal delivery in eight (7.0%), Caesarean section in eight (7.0%), assisted breech in two (1.8%) and instrumental delivery in seven (6.1%).

One hundred and ten of the children were of vertex presentation at the time of birth and three of them were breeches. Two of the breeches were delivered by assisted breech delivery and one required forceps delivery.

Information was available on 114 patients as to who was the birth attendant. Doctors delivered 51 (44.7%) of them, staff nurses 40 (35.1%), trained midwives 20 (17.5%) and traditional midwives two (1.8%).

Eight (6.8%) of the children were admitted to a Special Care Nursery at birth and the reasons included breathing difficulty in one, prematurity in one, small for dates in three and suspected infection in three. The parents were unable to tell the nature of infection. Only one child was ventilated during his neonatal period for seven days presumably for hyaline membrane disease as he was a premature baby.

The mean age of the fathers of these children was 33.4 years with the youngest being 21 years old and

the oldest 55 years old. The mean age of mothers was 29.2 years (range 19-45 years old).

Most of the parents had secondary or tertiary education (82.3% of fathers and 77.8% of mothers). More mothers (4.3%) than fathers (1.8%) had no education but more fathers (9.7%) than mothers (6.0%) had tertiary education (Table II). Mean duration of education for fathers and mothers were 9.8 years and 9.1 years respectively. In four cases the mothers were uncertain of the education level of the fathers.

**Table II**  
**Education of parents**

Level of education	Father No. (%)	Mother No. (%)
Nil	2 (1.8)	5 (4.3)
Primary	18 (15.9)	21 (17.9)
Secondary	82 (72.6)	84 (71.8)
Tertiary	11 (9.7)	7 (6.0)
Total	113 (100.0)	117 (100.0)

Nine out of 117 fathers had past history of seizures, eight fathers had febrile seizures and one had afebrile seizures. On the maternal side, six out of 117 mothers had previous history of seizures; one had febrile seizures, three had afebrile seizures and two were uncertain. Hence 6.9% of fathers and 0.8% of mothers had previous history of febrile seizures.

Twenty-nine of the patients were the only child in the family and thus had no siblings. Thirteen patients had one sibling with febrile seizures and one had two siblings and another had four siblings, giving a total of 15 (12.8%) out of 117 patients who had siblings with febrile seizures. Five of them had history of lumbar punctures performed on them.

A history of seizures was found among the relatives of 18 of 117 patients, though the type of seizure was not known. Thirty one (26.5%) of 117 patients had a family history of seizures.

The mean income of the fathers was RM679.96 (SD=RM464.17) and of the mothers was RM195.44

(SD=RM369.78). Only one out of 117 fathers was unemployed. Of 117 mothers, 79 were housewives and not earning an income.

**Discussion**

This study on febrile seizures in Malaysian children has shown that the children generally share similar clinical characteristics as children with febrile seizures elsewhere. Many febrile seizures occur in children less than three years old with the peak age in the first year of life. There were more boys than girls in this study. A quarter of our patients had a family history of febrile seizures. A third had complex febrile seizures and upper respiratory tract infections were the commonest cause of fever.

This study showed a predominance of boys compared to girls. Paediatric ward admissions statistics from the medical records office in 1991 showed that the ratio of boys to girls for all admissions were 1.4:1.0. Other studies done in the USA<sup>6,7</sup>, Sweden<sup>9</sup>, Japan<sup>15</sup> and Barbados<sup>16</sup> have shown a predominance of boys in febrile seizures. However Verity *et al* found no difference in the prevalence of febrile seizures between boys and girls<sup>4</sup>. Wallace suggests that the male sex may be a potential predisposing factor in febrile seizures<sup>10</sup>.

Malays formed the largest proportion of children with febrile seizures in this study mainly because they made up the largest proportion of admissions to the wards<sup>14</sup>. The surprising result was the relatively large number of Indians in this study making up 26.5% of the patients when they only consisted of 16.2% of total admissions<sup>14</sup>. There were relatively few Chinese children (8.5%) with febrile seizures when 22.2% of total admissions were Chinese<sup>14</sup>. The review by Wallace and the study by Nelson and Ellenberg<sup>7</sup> showed that there was little difference in the prevalence rates between different ethnic groups. This study is too small in number to make any firm conclusions regarding the role of racial factors. It is necessary to conduct a prevalence study of febrile seizures among different ethnic groups in this country to detect any real difference between the various groups.

The patients had their febrile seizures at a younger age than others. The largest number of patients were

in the first year of life while in other studies the peak age group for febrile seizures was the second year of life. A fairly large proportion, 15.2% of children presented with their first febrile seizure at less than six months old. Reports and reviews have mentioned that a small proportion of febrile seizures do occur in children aged less than six months<sup>1,9,10,11</sup>. In Wallace's own personal series there were a few patients as young as two months<sup>10</sup>. Forsgren *et al* had three (2.3%) out of 128 who were below six months<sup>9</sup>. Tsuboi and Okada's study showed that 0.9% of their patients were less than five months of age<sup>11</sup>. In Ouelette's review the figure given was 1 to 2%<sup>1</sup>.

There could be a few explanations why there were more younger children in this series. One is that the patients tend to present with febrile seizures at an earlier age. Another is that we obtained the age of the first febrile seizure from the parents' history and there could be errors in their recollection of the age.

Two (1.8%) out of 117 were older than six years old when they presented with their first febrile seizure. Ouelette in her review said that 1 to 6% of children may present with febrile seizures after five years old<sup>1</sup>.

We did not look into the predisposing effects of perinatal factors on febrile seizures. Other studies have shown that neonatal asphyxia, coiling of umbilical cord round neck and breech delivery were possible predisposing factors<sup>3,15</sup>.

Interestingly in this study only 0.9% of our children were premature babies. In Wallace's review the rate of prematurity among children with febrile seizures varied from 2.3% to 12.6%<sup>10</sup>.

As for parental education, the mean duration of education in the parents was about nine years and most had at least secondary education. These figures reflect the education policy in this country of providing at least six years of primary education and three years of secondary education up to Form three. This information would facilitate planning on how to educate our parents.

In 15 (12.8%) of this patients there was a history of febrile seizures in the siblings. This was lower than the figures quoted by Wallace which were 14% to 31%<sup>10</sup>.

However a review of six family studies in the Consensus Statement showed that between 9 to 17% of siblings of probands with febrile seizures were similarly affected<sup>2</sup>. Therefore our figures were consistent with these studies.

A very small proportion of parents gave a past history of febrile seizures. The figures from other studies have been as low as 8% to a high of 22%<sup>2</sup> and Wallace's view is that about 20% of probands have parents with febrile seizures<sup>10</sup>. Our figures would seem low in comparison. One reason could be that parents were unaware that they had febrile seizures during their childhood as they were either too young to remember or that they were subsequently not told by their parents.

There was a family history of seizures whether febrile or afebrile in 26.5% of our patients. This is compared with figures of 26 to 45% quoted in the literature<sup>4,10,17</sup>.

The rate of complex febrile seizures 33.3% was higher than most other studies<sup>4,7,9</sup> even though we used the same definitions as Nelson & Ellenberg's (18.1%)<sup>7</sup> and Verity *et al* (20%)<sup>4</sup>. Forsgren's figure was even lower at 8.6%<sup>9</sup>.

Considering the duration of seizure alone, 12.6% of the patients had prolonged seizures (>15 minutes). Nelson and Ellenberg's figure was lower at 7.6%<sup>6</sup>. Surprisingly more of Forsgren's patients, 10.9%<sup>9</sup> had prolonged seizures even though in his study the definition of a prolonged seizure was one which was longer than 30 minutes. In Wallace's review of 18 studies, 55% to 90% of febrile seizures lasted <15 minutes<sup>10</sup>. There is no agreement about what is the actual duration of seizure needed to define it as a complex seizure; authors have used durations ranging from 10 minutes to one hour<sup>10</sup>.

There were more than one episode of febrile seizure in 24 hours in 23.9% of our patients. Since the use of diazepam became common<sup>18,19</sup>, the reported rate of recurrence of febrile seizures within one episode of fever has decreased from 44% to around 13 to 16%<sup>6,10</sup>.

Focal seizures were very uncommon in the patients making up only 1.8%. This was lower than published studies which showed figures ranging from 1 to 29% with the majority more than 5%<sup>4,10</sup>. Nelson and

Ellenberg's study had 4% with febrile seizures<sup>6</sup>. This clinical feature was very dependent on the parents power of observation. One study showed that even among neurologists, the greatest disagreement occurred with observation for the focality of a febrile seizure<sup>20</sup>.

Upper respiratory tract infections were the most common cause of fever in the patients. One study showed that 62.4% of children with febrile seizures had either upper respiratory tract infection or "flu" or otitis media<sup>7</sup>.

This study has shown that children with febrile seizures are similar to those elsewhere with regard to age of presentation, family history of seizures and the cause of fever in febrile seizures.

The main difference from the other studies was in the area of complex febrile seizures where there is a higher prevalence. The timing of the duration of seizures

might have been inaccurate and the parents might not have been able to tell whether a seizure was focal or generalised. This is one of the limitations of our study. The other limitation was that the parents may not have been able to give us an accurate past history of whether they had seizures as children.

In conclusion, though there were some limitations in our study, we have been able to provide a guide to the clinical and social profile of our children with febrile seizures in Malaysia.

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