

Febrile Seizures, Electroencephalographic and Follow-up Study

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ABSTRACT

The EEG records of all referrals to the EEG unit of Salmaniya Medical Centre (SMC) in one year — 75 in number — were examined. Epileptogenic abnormality was observed in 30% at the first examination. The parents of 53 patients were interviewed 2 years after obtaining EEG records for identification of factors that might contribute to the recurrence of febrile seizures and the development of non-febrile seizures. Development from febrile into non-febrile seizures was detected in 9.5% of the cases. The high incidence of EEG abnormality and non-febrile seizures in the study group could be explained by the assumption that more children at risk of developing non-febrile seizures were referred for EEG study.

Febrile seizure is a term used to describe a seizure that occurs in a young child early in the course of a feverish illness excluding intracranial infection¹. Upper respiratory infections, otitis media, pharyngitis and roseola are the most common causes of high fever which provoke febrile seizure in susceptible youngsters.

The prevalence of a history of febrile seizures varies from 0.1–15% of the general population under 5 years of age². However, the most accurate figures are probably those derived from population of children followed up longitudinally i.e. 2–4%^{3,4,5}. This is the highest incidence of any of the childhood neurological diseases.

The risk of recurrence of febrile seizures have varied from a quarter to a third to almost a half⁶. Age at onset below one year and positive family history of febrile seizures were proven repeatedly to be among the predictive causes of recurrences^{3,5,6,7,8}.

Febrile seizures are often familial. Expression is incomplete since fever at the critical age is a necessary precipitating event. The mode of inheritance is most likely polygenic in nature as no simple

mendelian pattern of inheritance has been demonstrated^{2,8}. It is agreed upon by most researchers that children who have had febrile seizures are more likely to become epileptic than children who have had no febrile seizures. However, the magnitude of this increase in risk varied in different studies. Relatively older studies showed a much greater risk compared with more recent one which showed the risk to be less than 6%^{9,10,11}.

The Electroencephalographic study is usually normal in the majority of cases of febrile seizures. The occurrence of specific epileptogenic abnormalities varies in different studies¹². The significance of such EEG abnormalities in predicting future epilepsy is non-conclusive.

In this study some of the above concepts were examined in a group of children referred to the EEG unit of Salmaniya Medical Centre (SMC) with seizures associated with fever.

METHODS

All referrals to the EEG unit of Salmaniya Medical Centre for seizure associated with fever during the period July 1984 to June 1985 formed the study sample (75 cases). The diagnosis of febrile seizure was made by a qualified paediatrician. The initial clinical information was obtained from the EEG request form which doesn't specify the type of the seizure, hence it was not possible to make a subtype diagnosis. There was no limit on the age of the children included in the study.

The electroencephalographic study was of routine type, done after 48 hours of the attack in all cases. The EEG records of all the 75 cases were examined for specific epileptogenic abnormalities i.e. spikes or sharp transients with or without slow wave component that can be detected above the background rhythm^{13,14}.

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Two years later parents of the 53 cases (70%) were interviewed. A special form was completed by the end of the interview. This form was designed to obtain information about the number of repeated attacks, the occurrence of non-febrile seizure, presence of similar condition among near-relatives, prophylactic use of anticonvulsant drugs, prevalence of behaviour disorders and parental prospective view of the nature of this illness.

RESULTS

Electroencephalographic Study

75 cases (47 male, 28 female) were investigated for possible organic causes or for the presence of seizure disorders in the EEG unit in the year 1984–85. Thirty-six children were examined for the first time. Epileptogenic abnormalities were present in eleven children (30%) on the first examination and in thirty-nine (53%) on repeated examinations.

The following results have been derived from the follow-up of 53 cases (27 patients were examined for the first time and 26 had repeated EEG study) 2 years after the first attack.

Age at Onset

More than half the children with febrile seizure had their first attack in the first two years of their life (Fig 1), and 39 (nearly 75%) before their third birthday. The mean age at onset for the non-recurrent group was 2.2 and 2.1 for the recurrent group. The difference did not reach statistical significance at the 5% level.

Frequency of the Attacks and Recurrence Rate

Nearly a third of the children (19 or 36%) had only a single attack and a quarter (14 or 26%) developed a second attack (Table 1). Those who developed more than 4 attacks constituted eleven (21%) of the whole sample of children.

Eight children (30%) of the first examination group (27 cases) developed further febrile seizures in the two-year period.

Family History

In the whole sample a positive family history was obtained in eighteen children (34%) (Table 2). The

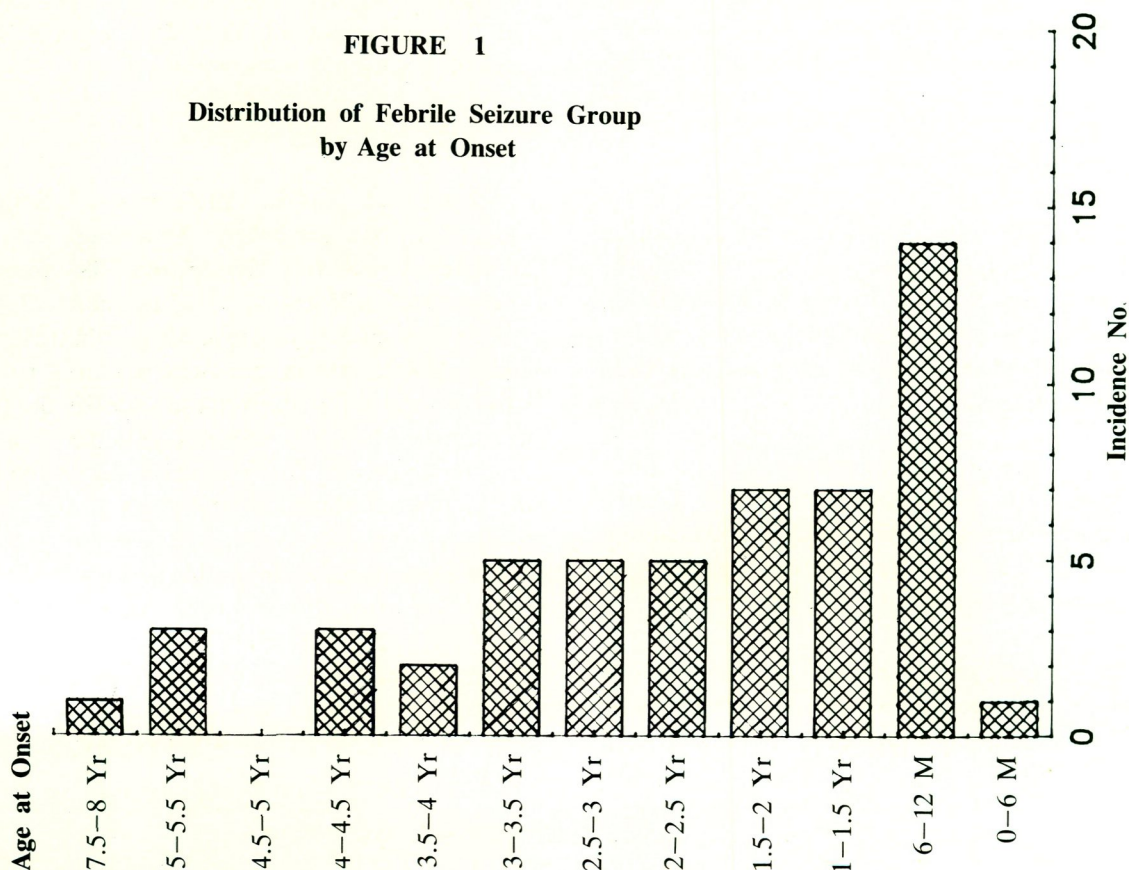


TABLE 1

Distribution by Number of Seizures

<i>No. of Seizures</i>	<i>No</i>	<i>%</i>
One	19	36
Two	14	26
Three	5	9
Four	4	8
More	11	21
TOTAL	53	100

TABLE 2

Incidence of Febrile Seizure Among Near-Relatives of the Febrile Seizure Group

	<i>No</i>	<i>%</i>
Parents	3	6
Siblings	3	6
Others	8	15
Parents and siblings	3	6
Siblings and others	1	1
Parents and others	0	0
None	35	66
TOTAL	53	100

positive family history was found in one or more parents or siblings in nine children (17%), and among other near relatives in the other nine (17%). More children from the recurrent group had a family history of febrile seizure in comparison to the non-recurrent group. Such difference did not reach statistical significance.

Prediction of Non-Febrile Seizure

Five children (10%) developed non-febrile seizure following febrile seizure. On close examination of these cases, mean age at onset was similar to the recurrent group (2.1), three cases had more than 4 recurrent attacks and three cases revealed epileptogenic activity in EEG examination. One child was diagnosed as cerebral palsy. The signifi-

cance of these findings could not be evaluated statistically because of the small sample.

Prophylactic Treatment With Anticonvulsant Medication

Anticonvulsant medication (Phenobarbitone) was prescribed for thirty-eight children (72%). The criteria used to initiate prophylactic treatment in these cases were unknown. The majority (20–53%) of the children used medication for less than 6 months (Table 3) and only eight children (15%) continued to use the drugs for the two-year period. Only two children received non-medical treatment in addition to the clinic visits.

TABLE 3

Distribution by Duration of Prophylactic Treatment

<i>Time Period</i>	<i>No</i>	<i>%</i>
0–6 Months	20	37
6 Months – 1 year	3	6
1 – 1.5 years	3	6
1.5 – 2 years	4	8
More than 2 years	8	15
No treatment	15	28
TOTAL	53	100

Parents' View of the Natural History of the Illness

Parents' of thirty children (56%) believed their children would recover permanently in the future while twenty-three (44%) were uncertain about the outcome. None of the parents interviewed felt that their child's condition was progressive and might not improve at all.

Behaviour Disorder

The occurrence of severe behaviour disorder was reported in 12 children (19%). The parents of these children were concerned about their children's normal development and scholastic achievement. The common type of unwanted behaviour is an increase in activity and lack of impulse control.

DISCUSSION

Electroencephalogram

The incidence of specific EEG abnormality (30%)

was higher than in previous studies (1.4% Frantzen, 12% Millichap and 10% Lennox)^{15,16,17}.

Tsuboi² reported higher incidence of epileptogenic abnormalities (40%) in the first examination and (63%) in repeated examination due to the fact that EEG was done using natural sleep activation². The high incidence of EEG abnormality in this study can be partially explained by the fact that referrals to the EEG unit constituted a high risk group for seizure disorder. As expected the EEG abnormality was lower than that reported for a diagnosed seizure disorder group (60%) and slightly more than the control group obtained in previous study¹⁸.

Age at Onset

The majority of children developed their first seizure in the first three years of their life, a findings supported by many previous publications^{3,5,6,7,8}.

The age of onset for the non-recurrent group was lower than in recurrent group which is now an accepted fact. However, the difference between the two groups was found to be insignificant.

Frequency of the Attacks and Recurrence Rate

The frequency of the seizure among the study group differs from other reported samples in those who had more than four attacks. This might explain the high incidence of EEG abnormalities in the repeated examination (53%). The two-year recurrence rate was similar to the literature^{1,3,5}.

Family History

The incidence of a history of febrile seizure among near-relatives seems to be high. However, the interpretation of such finding is difficult without control data. Besides, its significance in the development of seizure disorder is not clear in the published reports. In our inquiry, the history of seizure disorder among near-relatives was not included. Therefore the relationship of the two groups could not be evaluated in regard to the family history. In contrast to other reports, history of seizure among family members was not significant in predicting recurrence.

Prediction of Non-Febrile Seizure

The high incidence of non-febrile seizures among febrile seizure cases in the two years (10%) probably

indicates the presence of high risk group for seizure disorder due to the nature of the referral pattern. Clinical characteristics that previous investigators have found useful as predictors of non-febrile seizures in children with febrile seizure e.g. age at onset, number of febrile seizures, mental retardation and EEG abnormalities, were evaluated. The results obtained could not be validated because of the relatively small number of cases. In order to overcome this problem we either increase the study sample or postpone the study of this topic to a later date as more cases will develop non-febrile seizure attacks.

Prophylactic Use of Anticonvulsant Medication

The important findings in this study are that paediatricians use chronic prophylaxis in all recurrent attacks and occasionally after a single attack although there was no evidence that such treatment prevents the long-term sequelae of febrile seizure^{1,10}. Only a minority of the children (15%) continued to use the drug as prescribed. This might be due to the parents' belief that the illness is self-limiting in many cases and that usually the children will recover as they advance in age.

Behaviour Disorder

The prevalence of behaviour disorder in the study group was lower than in most previous publications^{5,8,16,19}. This study of behaviour disorder is imprecise because the data were based on parental observation and tolerance. It would be important to compare this frequency of behaviour disorders with that in the general paediatric population. Such a step should be considered in the future, using a standardized behaviour measuring scale.

CONCLUSION

Children who had presented with febrile seizure and been referred for EEG were evaluated, in two-third of the subjects. Their status 2 years later were examined. Children with EEG abnormalities were characterized by being more likely to have recurrent seizures.

However due to the limited knowledge of the children's initial clinical features and factors that determine the referral process to the EEG unit, it was doubtful if the cases were typical febrile seizure. This

is borne out by the wide age span, the frequency with which anticonvulsants were used and the frequency with which seizure recurred. Hence further generalization is limited.

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