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RESEARCH ARTICLE

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Pattern of Electroencephalography in Recurrent Febrile Seizure Patient

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ABSTRACT

Background: Febrile seizures are seizures that often occur in children, usually of a non-hazardous nature and do not have a prolonged effect. Febrile seizures most often occur in children under five years of age and are reported to occur in 2-5% of the pediatric population. Febrile seizures are categorized as simple, complex and plus febrile seizures. In some patients, EEG is needed to ascertain whether a true febrile seizure occurs. **Objective:** This study aims to determine the EEG pattern in recurrent febrile seizure patients at the Child Inpatient Installation of Dr. Soetomo Surabaya. **Method:** This study used a retrospective descriptive method with medical record instruments. **Results:** This study showed that of 46 recurrent febrile seizures, only 21 patients could see the EEG results. Of the 18 patients with complicated febrile seizures there were 27.78% abnormal and 72.22% normal. One simple febrile seizure patient obtained a normal EEG result. Of the two patients with febrile seizures plus 50% abnormal results and 50% normal results. **Conclusions:** The EEG pattern in patients with recurring complex febrile seizure obtains the most abnormal result.

Keywords: recurrent febrile seizure; electroencephalography; prevalence

INTRODUCTION

Febrile seizure most frequently occurs in children under five years old and is reported to occur in 2-5% of the pediatric population. International League against Epilepsy (ILAE) defines febrile seizures as seizures that occurs in children or infants and are characterized by a body temperature above 38°C that is not caused by infection of the central nervous system (CNS). Children with febrile seizure usually lose consciousness, tremble, and move their whole body. The direct cause of febrile seizure remains unknown, but there are several important factors that potentially affect it; for instance fever, respiratory infections, hypoglycemia, hypocalcaemia, head trauma, poisoning and over-use of drugs, epilepsy, or gastroenteritis⁽¹⁾.

There are 3 categories of febrile seizure, which are: simple, complex, and plus. Based on the latest evidences, a small proportion of children who have febrile seizure are more likely to have recurrent seizures or even epilepsy. According to a research in Korea, as many as 10% of children with febrile seizure are found to have additional febrile seizures and are later diagnosed with epilepsy⁽²⁾. There is no difference in criteria for children who can be affected by simple or complex febrile seizure, such as age, nerve conditions, or fever conditions. Children who have febrile seizure usually do not have significant neurological abnormalities both before and after the seizure. Febrile seizure can be categorized as simple if the seizures last briefly under 15 minutes and are comprehensive. Meanwhile, febrile seizure can be determined as complex if the seizures last for less than 15 minutes and are comprehensive. In other hand, febrile seizure is categorized as plus if the seizures last more than 15 minutes or occurs more than once during a fever in usually one point⁽³⁾.

Family history of febrile seizure, neonatal discharge for more than 28 days, developmental disorders, certain viral infections, and the possibility of iron and zinc deficiency are some of febrile seizure risk factors. Febrile seizures can occur before or shortly after the onset of fever⁽⁴⁾. It mostly occurs between the ages of 6 months to 5 years old with 18 months old as its peak.

Evaluation of febrile seizure can be done in several ways, such as laboratory tests, which are: Lumbar Puncture (LP) and complete blood tests, Electroencephalography (EEG), and Magnetic Resonance Imaging (MRI). However, not all febrile seizures require evaluation, such as simple febrile seizure. The evaluation is

only carried out if the child has a complex febrile seizure or there is a suspicion that the febrile seizure can develop into epilepsy⁽³⁾.

METHODS

This research was a retrospective descriptive study by collecting medical records or from secondary data from patients. The technique of taking research subjects using a total sampling technique. The study comprised 46 children at the RSUD Dr. Soetomo who presented with febrile seizures. We analyzed data from the inpatient installation of Dr. Soetomo for the period from January 1, 2017 to 31 June, 2018 with exclusion criteria for incomplete medical record data. The data obtained were analyzed using the observational analysis method and presented descriptively.

RESULTS

Based on the results of the study, out of 137 medical record data obtained, only 46 patients experienced recurrent febrile seizure and only 21 patients obtained the results of the EEG examination.

Age and Gender Distribution of Patients with Recurrent Febrile Seizure

Table 1 shows that from a total of 46 patients with recurrent febrile seizure at RSUD Dr. Soetomo, the youngest age was 8 months and the oldest was 9 years old. The age distribution of most recurrent febrile seizure is in the age range of 1-3 years as many as 29 children (63.04%). Table 1 also shows that recurrent febrile seizure were more common in boys, with a percentage of 63.04%, out of the total of 46 patients with recurrent febrile seizure at RSUD Dr. Soetomo.

Table 1. Age and gender distribution of patients with recurrent febrile seizure

Variables	N (%)
Age (year)	
<1	7 (15.22)
1-3	29 (63.04)
3-5	5 (10.87)
>5	5 (10.87)
Total	46 (100)
Gender	
Girls	29 (63.04)
Boys	17 (36.96)
Total	46 (100)

Distribution of Types of Recurrent Febrile Seizure

Febrile seizure divided in three categories which are complex, simple, and plus febrile seizure. The diagram above shows that from a total of 46 patients with recurrent febrile seizure, complex febrile seizure is the most common type (72%) in RSUD Dr. Soetomo.

Table 2. Distribution of types of recurrent febrile seizure

Type of febrile seizure	N (%)
Simple FS	11 (24)
Complex FS	33 (72)
FS Plus	2 (4)
Total	46 (100)

Distribution of EEG Examination Result

From a total of 46 patients with recurrent febrile seizure at RSUD Dr. Soetomo, only 21 patients had their EEG examination results and only 6 patients resulting abnormal in EEG examination. The abnormal results are most common in complex febrile seizure that followed by plus febrile seizure. Meanwhile, in simple febrile seizure no abnormal results are obtained.

Table 3. Distribution of EEG examination result

Febrile seizure types	N (%)
Complex FS	
Normal	13 (72,22)
Abnormal I	2 (11,11)
Abnormal II	2 (11,11)
Abnormal III	1 (5,56)
Total	18 (100)
Simple FS	
Normal	1 (100)
Abnormal I	0 (0)
Abnormal II	0 (0)
Abnormal III	0 (0)
Total	1 (100)
FS Plus	
Normal	1 (50)
Abnormal I	1 (50)
Abnormal II	0 (0)
Abnormal III	0 (0)
Total	2 (100)

DISCUSSION

From a total of 46 medical records of recurrent febrile seizure patients at RSUD Dr. Soetomo, the youngest age was 8 months and the oldest was 9 years. According to the age distribution of recurrent febrile seizure patients, it is mostly found in the group of 1-3 years old, as many as 29 children (63.04%), followed by the age group under 1 year, as many as 7 children (15.22%). While those in the age range of 3-5 years old and group over 5 years old occupying the same position, with each of them as many as 5 children (10.87%).

Research conducted in India divided children into two groups, which are 1 month to 3 years and 3-6 years. From a total of 545 children, there are 333 children (61%) aged 1 month to 3 years and 212 children (39%) aged 3-6 years, which means children with febrile seizure are more common in children under the age of 3 years⁽⁵⁾.

Another study conducted in Korea divided children into five groups, which are: less than 1 year, 1 year, 2 years, 3 years, and 4 years. Mostly, febrile seizures are found in the 2-year age group, which is 27.5%. However, for recurrent febrile seizure, there are more common to be found in the 3-year age group⁽⁶⁾. This indicates that there is a majority of age differences between first febrile seizure and recurrent febrile seizure.

According to research conducted in America, out of a total of 347 children with febrile seizure, 94 of children (27%) had recurrent febrile seizure. The risk of recurrence is 14% in children aged 24 months⁽⁷⁾. The results of several studies that have been carried out in various countries have similar results, which the peak is in the age range of 1-3 years.

Fever seizures are divided into three categories, namely: complicated febrile seizure, simple febrile seizure, and plus febrile seizure. The diagram above shows that from a total of 46 patients with recurrent febrile seizure at RSUD Dr. Soetomo, the most types of febrile seizure were complicated febrile seizure, as many as 33 patients (72%), followed by simple febrile seizure in 11 patients (24%), and plus febrile seizure, as many as 2 patients (4%).

Research results in several journals have different results. In a study conducted in Indonesia, precisely at RSHS Bandung, out of 58 children with recurrent febrile seizure, 38 (65%) of those suffer complicated febrile seizure, and 16 children (28%) suffer simple febrile seizure, while in 4 children (7%) the type of febrile seizure cannot be identified⁽⁸⁾. This is similar to the results of this study.

The results of another study conducted in India, out of 288 patients were found as many as 231 children (80.2%) with a diagnosis of simple febrile seizure, and 57 (19.8%) children with a diagnosis of complicated febrile seizure⁽⁹⁾. In another study conducted in Iran, patients with complicated febrile seizure were as many as 63 children (18.86%) and simple febrile seizure were 271 (81.14%) out of 334 children in total⁽¹⁰⁾. This study is only focusing on patients with recurrent febrile seizure that might cause the different results. Meanwhile, the other studies included all febrile seizures, both first and recurrent febrile seizures.

Out of 46 patients with recurrent febrile seizure at RSUD Dr. Dr. Soetomo, only 21 patients obtained the results of the EEG examination. From the 21 patients only 6 patients were found with abnormal EEG examination results. After seeing the distribution of abnormal and normal results from the three groups of patients with simple febrile seizure, complex febrile seizure and plus febrile seizure; Abnormal results are most

common in patients with complicated febrile seizure, as many as 5 patients and followed by plus febrile seizure as many as 1 patient, while in simple febrile seizure no abnormal results are obtained.

The abnormal results obtained in complicated fever seizure, which as much as 27.78%, is divided into abnormal I (2 patients), abnormal II (2 patients), and abnormal III. A normal result as much as 72.22% shows that normal results predominate in complicated febrile seizure. In two of the EEG abnormal complicated febrile seizure were found Excessive Beta impression results indicating mild diffuse encephalopathy. In addition, one of the EEG abnormal results in complicated febrile seizure obtained the Background Slow Activity impression that indicates the presence of moderate diffuse encephalopathy that potentially generates general epileptogenic.

This research is similar to some of the literature that has been done. A study in Romania stated that abnormal EEG results were obtained in all patients with a type of complicated febrile seizure (100%) in as many as 12 patients, compared with simple febrile seizure which only found as many as 30 (31%) abnormal results out of 96 patients with simple febrile seizure⁽¹¹⁾.

The results of this study indicate recurrent febrile seizures at Dr. Soetomo Surabaya are more common in boys. Out of 46 children with recurrent febrile seizure, were found that as many as 29 (63.04%) are boys and 17 (36.96%) are girls.

Some journals have the same majority result, which boys dominate febrile seizure. Research conducted in Bandung states that boys have a greater percentage of recurrent febrile seizure than girls, which is 72% boys and 28% girls^{(7) indriani}. Another study conducted in India results 308 (56.5%) boys and 237 (43.5%) girls with a diagnosis of febrile seizure, both recurrent and not⁽⁵⁾.

CONCLUSION

EEG examination results in patients with recurrent febrile seizures obtained the most abnormalities in complicated febrile seizures followed by febrile seizures plus, while in simple febrile seizures there are no abnormalities. The results of this study generally have similarities with studies that have been carried out before all over the world.

For the development of science, it is better if in the future it will conduct research with the same purpose, using primary and secondary data as well as research material, so that more information can be obtained and minimize blank data. The use of descriptive research methods around febrile seizures also needs to be increased because there is still little information available, especially in Indonesia.

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