

The Relationship Between Genetic Factors and the Incidence of Fever Seizures in Children at Bhayangkara Setukpa Hospital Lemdiklat Polri Sukabumi City Year 2022

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ARTICLE INFO

Keywords: Genetic Factors, Febrile Seizures, Child Development

Received : 5 March

Revised : 20 March

Accepted: 17 April

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ABSTRACT

Febrile seizures can be caused by various factors, genetic factors or a family history of seizures, an immature brain, and infection, so the cause of febrile seizures is called multifactorial. (Veisani Y. 2013). One of the factors, namely genetic factors, has a major influence on the incidence of febrile seizures. Based on previous studies, one-third of all febrile seizure patients have a history of seizures in their families.

ObjectiveThis study aims to determine the relationship between genetic factors and the incidence of febrile seizures in children at Bhayangkara Setukpa Hospital, Sukabumi Police Education and Training Center, in 2022

INTRODUCTION

Febrile seizures are convulsive conditions followed by a fever with a temperature of over 38 degrees Celsius, without being accompanied by disease outside the brain tissue. (dr. Ariana, 2022) Febrile seizures are a common disease affecting children, especially children aged six months - 5 years, around 2% -4% 1,2. Seizures are caused by a sudden increase in body temperature ($> 38^{\circ}\text{C}$), without other causes or diseases that trigger seizures, such as central nervous system (CNS) infections, electrolyte disturbances, trauma, or epilepsy. Febrile seizures are said to be recurrent if the seizures occur in more than one episode of fever. The types of febrile seizures consist of simple febrile seizures (KDS), which account for up to 80% of all febrile seizures, and complex febrile seizures (KDK). (Puspongoro H, et al. 2017)

The World Health Organization (WHO) estimates that more than 21.65 million sufferers from febrile seizures, and more than 216 thousand of them die. In addition, in Kuwait, out of 400 children aged one month - 13 years with a history of seizures, around 77% had febrile seizures (Nofia, 2019), and the incidence of febrile seizures per year was recorded at 2-4% in Western Europe and America, amounting to 5 -10% in India and 8.8% in Japan. However, in Asia, the incidence rate is higher, around 80% -90% of all febrile seizures (Hapsari & Susilaningsih, 2020).

The incidence of febrile seizures in Indonesia in 2016 reached 2-5%, with 85% caused by respiratory tract infections. In 2017, 17.4% of children had febrile seizures and experienced an increase in 2018, with seizures of 22.2%.

In the province of West Java in 2012, there were 7,916 patients with febrile seizures in the hospital for ages 0-5 years. Meanwhile, in Sukabumi, fever cases for unknown reasons were included in the top 10 outpatient diseases in 2020, with 1,508 people in all hospitals in Sukabumi City (Dikesjabarprov, 2020). Meanwhile, data on pediatric patients with febrile seizures at the Bhayangkara Setukpa Hospital, Education and Training Center of the Sukabumi Police in 2021 were 101 pediatric patients.

Febrile seizures can be caused by various factors, genetic factors or a family history of seizures, an immature brain, and infection, so the cause of febrile seizures is called multifactorial. (Veisani Y. 2013). One of the factors, namely genetic factors, has a major influence on the incidence of febrile seizures. Based on previous studies, one-third of all patients with febrile seizures have a family history of seizures. (Veisani Y.2013).

Febrile seizures tend to run in the same family, although the inheritance pattern is unclear. However, several studies suggest a strong genetic influence on the frequency of febrile seizures among family members. The incidence in parents ranges between 8% and 22% and in siblings between 9% and 17%. (Rudolph A., Hoffman., et al. 2014). However, this was also conveyed by Lennox-Buchtal, who argued that a dominant gene determined sensitivity to febrile seizures. Lennox argues that 41.2% of sufferers' family members have a history of seizures, while in normal children, only 3%. (Rudolph A., Hoffman., et al. 2014).

Previous studies have shown that the average age at the onset of febrile seizures is 22 months, and in children with a family history of febrile seizures, it is 14 months. So that children will experience weakness in thinking (Rimadhanty et al., 2018). Families with offspring who have had febrile seizures are a risk factor for the occurrence of the first febrile seizure, namely the biological mother and biological father or siblings (first-degree relative) (Fitriana, 2021)

Another study by Rimadhanti et al. (2018) showed that children aged one year often had febrile seizures (40%). Boys (64%) have more frequent febrile seizures than girls (56%). The type of febrile seizure is often found in complex febrile seizures (70%). Chi-Square analysis proved a relationship between a family history of seizures and the incidence of febrile seizures (CI=2.647-167.868; $p=0.000$), and children with a family history of seizures often had simple febrile seizures ($p=0.029$).

Preliminary Study Results On 24 - 26 May 2022 at Rs. Bhayangkara Setukpa interviewed eight parents with children with febrile seizures, 5 of whom had a family history of febrile seizures, and febrile seizures in their children were recurrent.

THEORETICAL REVIEW

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METHODOLOGY

The research design used in this study is correlation analytic using a cross-sectional approach. Techniquetakingsample in this studyusing accidental sampling as many as 23 respondents.Bivariate analysis in this study used the Chi-Square test.

RESULTS

Univariate Analysis

1. Characteristics of Children with Febrile Seizures Based on Age in the Children's Inpatient Room at Bhayangkara Setukpa Hospital, Sukabumi Police Education and Training Center

From the results of the research on the characteristics of children with febrile seizures based on age at the study site, it can be seen in table 1 below:

Table 1. Distribution of Respondents in Children with Febrile Seizures by AgeIn the Children's Inpatient Room at the Bhayangkara Setukpa Hospital, the Education and Training Center of the Sukabumi Police for the July 2022 Period

Age	N	%
< 12 months	15	65,2
> 12 months	8	34,8
Total	23	100

Table 1 shows that the distribution of child respondents with febrile seizures based on age is mostly <12 months old with 15 people (65.2%) and the smallest is > 12 months old with 8 people (34.8%) out of a total of 23 respondents

2. Characteristics of Children with Febrile Seizures Based on Gender in the Children's Inpatient Room at Bhayangkara Setukpa Hospital, Education and Training Center, Sukabumi Police

From the results of the research on the characteristics of children with febrile seizures based on sex at the study site, it can be seen in table 2 below:

Table 2. Distribution of Respondents in Children with Febrile Seizures Based on Gender in Children's Inpatient Rooms at Bhayangkara Setukpa Hospital, Education and Training Center, Sukabumi Police, July 2022 Period

Age	N	%
Man	13	56,52
Woman	10	43,48
Total	23	100

Table 2 shows that the distribution of children with febrile seizures based on sex was mostly male, 13 people (56.52%) and the least female, 10 people (43.48%).

3. Characteristics of Respondents Parents with Children with Fever Convulsions Based on Age in Children's Inpatient Room at Bhayangkara Setukpa Hospital Sukabumi Police Education and Training Center

Table 3. Distribution of Respondents by Age in Children's Inpatient Room at Bhayangkara Setukpa Hospital, Education and Training Center, Sukabumi Police, July 2022 Period

Age	N	%
20-30 Years	8	34,8
31- 40 Years	11	47,8
41-50 Years	4	17,4
Total	23	100

Table 3 shows that the distribution of respondents based on age is mostly in the 31-40 year age group, namely 11 people (47.8%), and the least in the 41-50 year age group, namely 4 people (17.4%)) from a total of 23 respondents.

4. Characteristics of Respondents Mothers with Children having febrile seizures based on Education in Children's Inpatient Room at Bhayangkara Setukpa Hospital, Education and Training Center, Sukabumi Police

From the results of the research on the characteristics of respondents based on education at the research location, it can be seen in table 4 below:

Table 4. Distribution of Respondents Based on Education in Children's Inpatient Room at Bhayangkara Setukpa Hospital, Education and Training Center, Sukabumi Police, July 2022 Period

Education	N	%
SD	3	13.0
JUNIOR HIGH SCHOOL	6	26,1
SENIOR HIGH SCHOOL	8	34,8
College	6	26,1
Total	23	100

Table 4 shows that the distribution of respondents based on education was mostly high school educated, namely as many as 8 people (34.8%) and those with at least elementary school education were 3 people (13.0%), out of a total of 23 respondents.

5. Characteristics of Respondents Mothers with children having febrile seizures based on work in the Children's Inpatient Room at Bhayangkara Setukpa Hospital Sukabumi Police Education and Training Center

From the results of the research on the characteristics of respondents based on education at the research site, it can be seen in table 5 below:

Table 5. Distribution of Respondents Based on Occupation in Children's Inpatient Room at Bhayangkara Setukpa Hospital Sukabumi Police Education and Training Center July 2022 Period

Work	N	%
civil servant	4	17,4
Self-employed	8	34,8
Farmer	7	30,4
Etc	4	17,4
Total	23	100

Table 5 shows that the distribution of respondents based on work is mostly self-employed, 8 people (34.8%) and the least are civil servants and others, each 4 people (17.4%) of the total 23 respondents.

6. Overview of the Genetic Factors of Febrile Seizures in Children at the Bhayangkara Setukpa Hospital, Education and Training Center of the Sukabumi Police in 2022

Table 6. Frequency Distribution of Genetic Factors Description of Febrile Seizures in Children at Bhayangkara Setukpa Hospital, Sukabumi Police Education and Training Center Year 2022 Period July 2022

genetic factor	F	Percentage
Yes	7	30,4
No	16	69,6
Total	23	100

Based on the data table 6, it is obtained data on the description of genetic factors for febrile seizures in children at Bhayangkara Setukpa Hospital, Education and Training Center Police Sukabumi Year 2022 is Those with genetic factors 7 people (30.4%) and no genetic factors 16 people (69.6%). For those with genetic factors from 7 people 3 of them are genetic from father, 2 people from mother, 1 genetic person from siblings and 1 genetic person from uncle.

7. Description Fever Seizures in Children at Bhayangkara Setukpa Hospital, Sukabumi Police Education and Training Center in 2022

Table 7. Frequency Distribution of Fever Seizures in Children at Bhayangkara Setukpa Hospital, Sukabumi Police Education and Training Center Period July 2022

Febrile seizures	F	Percentage
First	13	56.5
Repeat	10	43.5
Total	23	100

Based on the data table 7, data obtained from the Description of Fever Seizures in Children at Bhayangkara Setukpa Hospital, Education and Training Center for the Police Sukabumi The year 2022 is the first 13 people (56.5%) and recurrent febrile seizures 10 people (43.5%)..

Bivariate Analysis

Variables related to this study are genetic factors as the independent variable and the occurrence of seizures as the dependent variable. In looking for a correlation tested using the Chi Square test. The results of the research are presented in the following table:

Table 8. Analysis of the Relationship between Genetic Factors and the Incidence of Febrile Seizures in Children at Bhayangkara Setukpa Hospital, Sukabumi Police Education and Training Center for the July 2022 Period

No	Genetic Factors	Febrile seizures				Total		P
		Repeat		First		n	%	
		n	%	n	%			
1	Yes	6	26.08	1	4,34	7	30,4	0.007
2	No	4	17,39	12	52,17	16	69,6	
	Total	10	43,47	13	56.5	23	100	

Chi Square Test

Based on Table 8, Children who had febrile seizures with genetic factors totaled seven people, with details of the incidence of recurrent febrile seizures in six people (26.08%) and the first occurrence of febrile seizures in one person (4.34%), Details of children without genetic factors were 16 people with the incidence of recurrent febrile seizures four people (17.39%) and the first occurrence of febrile seizures 12 people (52.17%).

From the results of data analysis using the chi-square test, it was found that the p-value (0.007) is smaller than the alpha (α) value, which is <0.05 . So it can be concluded that the results of this study indicate that H_a is accepted, which means that there is a relationship between genetic factors and the incidence of febrile seizures in children at Bhayangkara Setukpa Hospital, Education and Training Center of the Sukabumi Police in 2022.

DISCUSSION

1. Characteristics of Respondents

Based on the study's results, the distribution of child respondents with febrile seizures based on age was mostly <12 months old, with 15 people (65.2%).

Similar results were also obtained in the study of Dewanti et al. (2012), who stated that younger age is a factor associated with an increased risk of recurring febrile seizures, where the younger the child's seizures are when they first experience seizures, the greater the risk that the child will experience febrile seizures.

The results showed that the distribution of child respondents with febrile seizures based on sex was mostly male, with 13 people (56.52%).

These results align with the research by Gunawan and Saharso (2012) and Tosun et al. (2010), who found no significant effect between gender and the

recurrence of febrile seizures. However, different results were obtained by Indriani et al. (2017) and Manika et al. (2020), who found that the male gender affected the recurrence of febrile seizures. This can happen because, compared to girls, nerve maturation in boys occurs more slowly. (Hardika MSP, Mahailni DS.2019)Based on the results of the study, the distribution of child respondents with febrile seizures based on age was mostly <12 months old with 15 people (65.2%).

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2. Description Genetic Factors Febrile Seizures in Children at Bhayangkara Setukpa Hospital Sukabumi Police Education and Training Center in 2022

Based on Table 5 data, data on the description of genetic factors for febrile seizures in children at Bhayangkara Setukpa Hospital, Education and Training Center of the Sukabumi Police in 2022 that there is a history of genetic factors in 7 people (30.4%) and there are no genetic factors in 16 people (69.6%). Of those who have genetic factors from 7 people, three are genetic from the father, two from the mother, one from a sibling, and one person is genetic from an uncle.

This study is conducted by Alwan and Hussein (2013), who found 181 patients with febrile seizures and 92 patients with recurrent febrile seizures. It is known that 59% of patients with recurrent febrile seizures have a family history of febrile seizures, and 41% of patients with recurrent febrile seizures have no family history of febrile seizures.

First-degree relatives, fathers, mothers, and siblings are family members who can be a risk factor for recurring febrile seizures³. It has not been proven with certainty about the genetic inheritance associated with febrile seizures. However, previous studies have found a link between febrile seizures and gene mutations on chromosomes 1q31, 8q13-21, 18p11.2, 19p, and 21q22¹. Such genetic makeup may contribute to neurodevelopmental susceptibility and hypothalamic dysregulation, alter sodium channel expression, and induce hippocampal excitability¹. Mothers inherit more febrile seizures than fathers. If only one of the parents has a history of seizures, the child's risk of having another febrile seizure is 20% -22%³.

The results of this study were reinforced by the results of a study by Talebian et al. in Amalia, Fatimah, and Bennu (2013), who obtained the result that a

positive family history of febrile seizures caused 42.1% of the incidence of febrile seizures in toddlers. Research by Amalia et al. also found that 81.3% of children with febrile seizures had a history of febrile seizures. Likewise, the results of the study by Indriani, Risan, and Nurhayati (2017) stated that 57% of recurrent febrile seizure patients had a family history of febrile seizures, 28% of recurrent febrile seizure patients had no family history of febrile seizures, and 15% were not identified. Febrile seizures are inherited in an autosomal dominant manner, so many patients with febrile seizures come from parents who have had febrile seizures. However,

Febrile seizures are seizures that occur due to increased body temperature, usually in children aged six months to 5 years. These seizures have nothing to do with electrolyte or metabolic disorders; one of the contributing factors is genetic factors, namely a family history of febrile seizures can increase the risk of experiencing the same condition (Fadhli, 2022)

3. Description of Seizures Fever in Children at Bhayangkara Setukpa Hospital, Education and Training Center of the Sukabumi Police in 2022

Based on Table 6 data, it was obtained data on the incidence of febrile seizures in children at Bhayangkara Setukpa Hospital, Education and Training Center of the Sukabumi Police in 2022 that as many as 13 people (56.5%) had their first seizure and ten people (43.5%) had recurrent febrile seizures.

This is confirmed by Helena's research (2020). Research results from 106 respondents obtained results that 72% of recurrent febrile seizures in toddlers occurred aged 0-24 months, 73.8%

Seizures with fever are seizures that occur in children with fever due to other causes, such as meningitis, encephalitis, or cerebral malaria, where they are not febrile seizures but have seizures with fever. The same is true for neurological disease and severe mental retardation. Children with simple febrile seizures are at risk for recurrent seizures in about one-third of cases. Children aged <12 months with the first febrile seizure have a 50% chance of having a second seizure. Meanwhile, if the age is > 12 months reduced to about 30%. Children with simple febrile seizures have an increased likelihood of developing epilepsy at 25 by around 2.4%, which is two times the risk compared to the population. (Nurcahaya Sinaga, 2021)

4. The Relationship between Genetic Factors and the Incidence of Febrile Seizures in Children at Bhayangkara Setukpa Hospital, Sukabumi Police Education and Training Center for the July 2022 Period

From the results of data analysis using the chi-square test, it was found that the p-value (0.007) is smaller than the alpha (α) value, which is <0.05. So it can be concluded that the results of this study indicate that H_a is accepted, which means that there is a relationship between genetic factors and the incidence of febrile seizures in children at Bhayangkara Setukpa Hospital, Education and Training Center of the Sukabumi Police in 2022.

Ni's research confirmed this, made (2018), where the results of his study showed that children with a history of seizures in the family more often suffered from simple types of febrile seizures (7%) than complex types of febrile seizures (12%). The chi-square analysis found a relationship between a family history of seizures and the type of febrile seizures in children with $p=0.029$ ($p=0.029 < 0.05$). Times more likely to have a type of complex febrile seizure than children without a history of seizures in the family.

According to research conducted by Bethune et, a history of seizures in the family is a risk factor that can cause febrile seizures in the family. Al in Halifax, Nova Scotia, Canada, stated that hereditary factors caused 17% of febrile seizures. It is not yet certain how the inheritance of genetic traits is related to febrile seizures. Autosomal dominant penetration is estimated to be around 60%-80%. Several studies have stated that the mapping results of several families with a history of seizures show that febrile seizures are associated with gene mutations on chromosomes 19p and 8q13-21, which have an autosomal dominant pattern.

Based on the results of the study, children with febrile seizures had genetic factors, totaling three people with recurrent febrile seizures, three people (30%), and no first febrile seizures; for those without genetic factors, the incidence of recurrent febrile seizures were five people (50%) and the incidence first febrile seizure in 5 people (50%). Then there is no relationship because there is less genetic history than those without.

Several studies have stated that if both parents do not have a history of febrile seizures, the risk of febrile seizures is only 9%. If one of the patient's parents has a history of having had a febrile seizure, the risk of having a febrile seizure is 20% -22%. If both parents of the patient have a history of having had a febrile seizure, the risk of having a febrile seizure increases to 59% -64%. Mothers inherit febrile seizures more than fathers, 27% versus 7%. Research by Hauser et al. in America showed that cases of derma seizures having relatives who had suffered from febrile seizures had a risk of 2.7% (95% CI 2.0-3.6), whereas if the patient has one parent with a history of having had a febrile seizure, the risk of having a febrile seizure increases to 10% (95% CI 6.3-15) and if both of the sufferer's parents have a history of having had a febrile seizure the risk increased to 20% (95% CI 9.6-36.8). The results of research conducted by Fuadi et al. found that in the first febrile seizure case with a family with a history of having had a febrile seizure, each mother 7.3%, father 1.2%, sibling 6.1%, and first-degree relative as much as 14.6 %. Family history (first-degree relative) of having had a febrile seizure was significant as a risk factor for febrile seizures with an OR of 4.51 (95% CI 1.22-16.65, $p=0.02$). 3-15), and if both parents of the patient have a history of febrile seizures, the risk increases to 20% (95% CI 9.6-36.8). The results of research conducted by Fuadi et al. found that in the first febrile seizure case with a family with a history of having had a febrile seizure, each mother 7.3%, father 1.2%, sibling 6.1%, and first-degree relative as much as 14.6 %. Family history (first-degree relative) of having had a febrile seizure was significant as a risk factor for febrile seizures with an OR of 4.51 (95% CI 1.22-16.65, $p=0.02$). 3-15), and if both parents of the patient have a history of febrile seizures, the risk increases to 20% (95% CI 9.6-36.8). The results of research conducted by Fuadi et al. found that in

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CONCLUSIONS AND RECOMMENDATIONS

The following conclusions can be drawn based on the description and analysis of the research results obtained in this study.

1. An overview of genetic factors for febrile seizures in children at Bhayangkara Setukpa Hospital, Sukabumi Police Education and Training Center in 2022, 7 people (30.4%) have genetic factors, and 16 people (69.6%) have no genetic factors.
2. An overview of the incidence of febrile seizures in children at Bhayangkara Setukpa Hospital, Sukabumi Police Education and Training Center in 2022 is the first, 13 people (56.5%) and recurrent febrile seizures in 10 people (43.5%).
3. There is a relationship between genetic factors and the incidence of febrile seizures in children under five in the Children's Inpatient Room at Bhayangkara Setukpa Hospital, Education and Training Center for the Sukabumi City Police in 2022 with a P-Value of 0.007, less than α 0.05.

FURTHER STUDY

Future researchers can conduct research with a larger number of samples with more than one group so that the data obtained can be more complete with various developments that will add information about the factors that influence the incidence of febrile seizures in toddlers.

ACKNOWLEDGMENT

The results of this study can be used as a reference to add learning resources for all students at the Yapkesbi Sukabumi Poltekes, and it is hoped that the books in the library will be equipped with a new published year so that it will make it easier for researchers and students to make KTI.

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