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Original Article

Identification of risk factors for recurrent febrile convulsion

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Abstract

Background Febrile convulsion (FC) occurs in about 2 to 4 percent of all children, approximately one third of whom will then develop recurrent febrile convulsion (RFC). Risk factors for RFC are family history of convulsions, an age of less than 18 months, a relatively lower temperature and shorter duration of fever preceeding the first FC.

Objective The aim of the study was to determine the risk factors for RFC.

Methods One hundred children aged 6 months to 5 years with FC or RFC were included in this case-controlled study, which was carried out from July 2006 to June 2007. Data on the children's first FC were collected from medical records and the family history was taken directly from the parents.

Results Fifty children with RFC and 50 children without recurrence were included in this study. An age of less than 18 months ($P < 0.0001$, COR = 71.37), a family history of FC ($P < 0.0001$, COR = 6.00), and a fever duration of less than 12 hours preceding the first FC ($P < 0.0001$, COR = 4.96) were associated with a risk of recurrence. A relatively lower degree of temperature at first febrile convulsion did not increase the risk for RFC ($P = 1.21$). Multivariate logistic regression showed that younger age and shorter duration of fever preceding the first FC were associated with RFC.

Conclusion Younger age and shorter duration of fever preceding the first FC are associated with an increased risk of RFC. **[Paediatr Indones. 2009;49:87-90]**.

Keywords: *febrile convulsion, recurrent febrile convulsion*

Febrile convulsion (FC) is the most common type of convulsion in childhood, occurring in 2% to 5% of children younger than five years of age.[1-3] Febrile convulsion is defined as a seizure associated with a febrile illness in the absence of a CNS infection.[4-6] Simple febrile convulsion is defined as a brief (<15 min) generalized seizure that occurs only once during a 24 hour period in a febrile child without evidence of intracranial infection.[7-9]

Approximately one third of children with FC will experience recurrent febrile convulsion (RFC) later on. Risk factors for RFC are younger age at onset, family history of FC, shorter duration of fever and a relatively mild fever preceding the initial FC.[11] Children with RFC are at an increased risk for developing mental retardation and epilepsy.[4,12-15] The purpose of this study was to identify risk factors for RFC.

Methods

The hospital records of patients admitted for first

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FC to the Wahidin Sudirohusodo and Labuang Baji hospitals from June 2006 to July 2007 were reviewed. Inclusion criteria were children aged from 6 months to 5 years who had convulsions associated with fever (>38°C) but with no evidence of either intracranial infection or a distinct cause (e.g. metabolic dysfunction), and who were otherwise neurologically normal. Convulsions associated with fever in children with abnormal neurological status or previous afebrile convulsions were excluded from the study.

Simple FC was defined as a primary generalized convulsion lasting less than 15 minutes and not recurring within 24 hours. In contrast, complex FC was defined as a focal or prolonged (> 15 minutes) convulsion, or more than one convulsion within 24 hours. This study was approved by the Ethics Committee for Health Studies of the Hasanuddin University Medical School in Makassar, Indonesia.

The data obtained from medical records on the first FC occurrence in children with or without recurrent FC were compared. The differences in age, temperature at onset or first known temperature, and duration of fever were compared between the two groups using the student's t-test. If the data were not normally distributed, as determined by the Kolomogrov-Smirnov test, the differences were examined using the Mann-Whitney U test.

Parameter with P<0.05 in univariate analysis were subjected to bivariate and multivariate logistic regression analysis without any automatic elimination process. SPSS v. 15.0 statistical analysis software was used in all analyses. P<0.05 was considered as statistically significant.

Results

During one year period from July 2006 to June 2007, 50 children with RFC and 50 children without recurrent convulsions were identified, comprising 68% males and 32% females in the case group, and 64% males and 34% females in the control group. The baseline characteristics of the children from both groups are shown in **Table 1.**

Table 1. Subjects' characteristics

Characteristics	Recurrent Febrile Convulsion		
	(+)	(-)	
	N (%) = 50 (50%)	N (%) = 50 (50%)	
1. Sex Male : Female	34:16 (68:32)	32:18 (64:36)	P=0.673
2. Family hystory of FC			
Positive	30 (60)	10 (20)	
Negative	20 (40)	40 (80)	
3. Age			
Range	0.50 - 2.25	0.83 - 4.92	
Mean (SD*)	1.03 (0.39)	2.89 (1.21)	
4. Degree of temperature			P=0.121
Range	38 - 41	38.3 - 40.8	
Mean (SD*)	39.17(0.61)	39.36 (0.64)	
5. Duration of fever			
Range	1.0 - 24	3.0 - 72	
Mean (SD*)	9.54 (9.45)	21.98 (16.99)	

In this study, an age of less than 18 months (P< 0.0001, COR = 71.37), a family history of FC (P<0.0001, COR = 6.00) and a duration of fever of less than 12 hours preceding the first FC (P<0.0001, COR = 4.96) were associated with a risk of recurrence. A relatively lower temperature at onset was not a risk for RFC (P = 1.21) **(Table 2)**. Based on multivariate logistic regression analysis,

Table 2. Lipid profile of obese students before and after the intervention of both groups

LABORATORY	INTERVENTION			CONTROL		
	Before	After	P	Before	After	P
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
Total Cholesterol mg/dl	184.5 (34.9)	181.0 (33.4)	0.405	192.4 (30.2)	191.2 (29.9)	0.237
LDL mg/dl	121.7 (33.2)	125.5 (34.1)	0.441	124.8 (25.5)	129.1 (29.9)	0.079
HDLmg/dl	47.2 (6.6)	48.0 (6.8)	0.01*	48.0 (6.4)	48.8 (6.6)	0.005
Tryglyceride mg/dl	101.2 (36.1)	100.5 (35.6)	0.04*	105.7 (39.8)	105.1 (39.6)	0.053
Apo B mg/dl	83.4 (26.4)	86.7 (26.3)	0.56	82.2 (21.2)	83.1 (22.5)	0.819
Ratio HDL/ Cholesterol Total	3.9 (0.8)	3.7 (0.6)	0.125	3.9 (0.6)	3.9 (0.5)	0.638
LDL /ApoB	1.6 (0.3)	1.5 (0.5)	0.415	1.6 (0.3)	1.6 (0.5)	0.662

* P < 0.05

Table 3. Association between age and duration of fever preceding the first FC and reoccurence of convulsions

No	Characteristics	b	S.E.	df	Exp (B)
1	Age	5.359	1.125	1	212.419
2	Duration of fever	3.069	1.073	1	21.521
3	Constant (a)	-12.145	3.037	1	0.000

age (AOR= 212.419) and duration of fever (AOR=21.521) were determined as risk factors for RFC (**Table 3)**.

Discussion

Our study revealed that subjects with a family history of FC were six times more likely to develop RFC than those without a family history of the condition. This result is similar to another study, but after our data were analyzed using logistic regression analysis, it appeared that a family history of FC is not a risk factor for RFC; this contradictory finding may be due to differences in the research method used.

In this study, we found that an age of less than 18 months was a risk factor for RFC. Patients developing the first FC at less than 18 months old had a 71.37 times higher risk of developing RFC with a CI of 95% (18.09 to 281.47). This finding is similar to the results of Berg, *et al*. [16,17]

The mean body temperature in both groups was similar with a P value of 0.102 (P>0.05). The inability to determine the exact temperature triggering the convulsion, for the patients admitted to the hospital because of seizure, may explain this condition. This result differs from that of Berg *et al*.[16,17]

Our study revealed that a shorter duration of fever preceding the first FC was associated with RFC, with a crude odds ratio (COR) of 4.96 and a CI of 95% (2.12 to 11.58). In both groups, subjects with fever duration of less than 12 hours preceding FC had a five times higher risk of developing RFC compared to those who had a fever for more than 12 hours preceding FC. This result conforms with that of Shinnar S *et al*.[18]

Multivariate logistic regression showed that a younger age and a shorter duration of fever preceding the first FC were associated with RFC. A limitation in our study is that the family history of FC could only be confirmed by interviewing the parents. In conclusion, a younger age and a shorter duration of fever preceding the first FC are associated with an increased risk of RFC.

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