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Serum Sodium Levels Predict the Recurrence of Febrile Seizure within 24 Hours

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Abstract:

Objective: Febrile seizure is a common disorder in children that occurs in 2.5% of children 6–60 months of age. The study was conducted to ascertain the role of serum sodium as a predictor of seizure recurrence within the same febrile illness.

Material and Methods: A retrospective study was conducted in children with febrile seizures who were admitted to Kaengkhro Hospital between 1 January 2014 and 31 December 2017. The data collected from medical records included age, gender, serum sodium level, body temperature, duration of fever, and family history of febrile seizures.

Results: Two hundred ten children were diagnosed with febrile seizures; 190 had a single febrile seizure and 20 had recurrent febrile seizures. Mean±standard deviation ages of children with a single febrile seizure and recurrent febrile seizures were 22.95±0.95 and 22.34±0.89 months, respectively. Serum sodium levels in children with recurrent seizures within 24 hours (130.80 mmol/L) were significantly lower than in children with a single febrile seizure (132.37 mmol/L, p–value=0.02). A family history of febrile seizures was significant for predicting recurrent seizures within 24 hours (p–value= 0.006).

Conclusion: Serum sodium levels predict the recurrence of febrile seizure within 24 hours.

Keywords: febrile seizures, recurrence febrile seizures, serum sodium levels, simple febrile seizure

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Introduction

Febrile seizure is the common disorder in childhood. The incidence of febrile seizures in the United States is 2.0–5.0% in children aged 6–60 months.[1,2] The febrile seizure is a seizure occurring without central nervous system infection or acute electrolyte imbalance or no previous history of seizures or epilepsy. Febrile seizures are divided into two subgroups: simple febrile seizure and complex febrile seizures. The simple febrile seizure does not occur more than 15 minutes and is more common that occurs 65.0–90.0%.[3] The complex febrile seizure occurs more than 15 minutes or recurrent seizures within 24 hours. High fever plays the important role in causing electrolyte disturbance. Hyponatremia has been enhancing the susceptibility to seizures. The complex febrile seizure is common in patient with hyponatremia.[4] There were still inconclusive previous studies in patients with recurrent febrile seizure and serum sodium levels.[5–11] This study was conducted to assess the serum sodium levels are predictive risk of the recurrence of febrile seizure within 24 hours.

Materail and Methods

This is a retrospective study collecting data from medical records of all patients, admitted with a diagnosis of febrile seizures to pediatric ward of Kaengkhro Hospital between 1 January 2014–31 December 2017. This study analyzed serum sodium levels of the children aged 6–60 months with febrile seizures. Children with history of afebrile seizure, evidence of central nervous system infection, gastroenteritis, developmental delay and neurologic disorder were excluded.

The data were analyzed using SPSS 14.0. Student's t-test and the X^2 test were used to analyze the continuous variables, p-value<0.05 is considered statistically significant.

Results

Between 1 January 2014–31 December 2017, 210 children were diagnosed with febrile seizures at Kaengkhro Hospital. The mean age of children diagnosed with a single febrile seizure were 22.95±0.95 months and 22.34±0.89 months in the recurrence febrile seizure, respectively. There was a significant difference between serum sodium levels of a single febrile seizure and recurrent febrile seizures (p–value=0.02) as shown in Table 1. Patients with recurrent febrile seizures who had a family history of febrile seizures more than patients with single febrile seizure [odds ratio (95% confidence interval)=3.57

Table 1 Characteristics and serum sodium of patients with single or recurrent febrile seizures

Correlation factors of recurrent febrile seizure	Single febrile seizure (n=190) Number (%)	Recurrent febrile seizure (n=20) Number (%)	p-value
Age (months), mean±S.D.	22.95±0.95	22.34±0.89	0.41
Age<12 months, n (%)	34 (17.9)	2 (10.0)	0.37
Male	116 (61.0)	14 (70.0)	0.43
Family history of febrile seizures	65 (34.2)	13 (65.0)	0.006
Temperature<39 °C	75 (39.5)	8 (40.0)	0.57
Duration of fever<24 hours	84 (44.2)	12 (60.0)	0.17
Serum sodium (mmol/L), mean±S.D.	132.37±2.57	130.80±2.61	0.02

S.D.=standard deviation

(1.31–7.54), p–value=0.006] whereas there was not a significant difference in age, gender, temperature, or duration of fever between both groups as shown in Table 1.

Discussion

Febrile seizure is the common problem in children. During the patients have fever, dehydration and electrolyte disturbance may occur frequently.[1] Our study showed the serum sodium level are affect to the recurrent seizures in patients with febrile seizure. Similarly, the previous studies showed serum sodium level was lower in the patients with recurrent febrile seizures and was the significant risk factor of seizure recurrence within 24 hours.[5–7,10] Conversely, three studies reported serum sodium level did not increase risk of recurrent seizures.[8,9,11]

These differences could be due to size of population studies and genetic variation. However, serum sodium levels are lower than normal level (134–144 mmol/L)[12] between both groups as shown in Table 2. Poor oral intake in children have illness or high graded fever may cause of hyponatremia before or during admission. Neurological symptoms could be worsen if serum level of sodium is below 120 mmol/L in children with febrile seizure.[13] During fever, dehydration and electrolyte imbalance may occur frequently therefore serum sodium level in children with febrile seizure are lower than the normal range.[6,8]

A family history of febrile seizure can predict recurrent seizures within 24 hours which is similar to the previous studies.[14,15] The lower of serum sodium level and history of family history of febrile seizure are higher the probability of recurrent seizures. A previous study showed the lower serum calcium levels predict recurrent of febrile seizures.[16] Moreover, further studies are needed to other factors such as hypoglycemia or hyperglycemia in recurrent febrile seizures.

The limitations of this study are the retrospective medical records review and data which depend on the accuracy of medical records and a small sample size, hence further prospective trial involving larger sample size is warranted.

Although the American Academy of Pediatrics recommendation on neurodiagnostic evaluation of a child with simple febrile seizure recommend that measurement of electrolytes should not be routinely performed, our study demonstrates that lower serum sodium levels and family history of febrile seizure could be predict recurrent seizure episode therefore serum sodium is a valuable investigation in the children with febrile seizures. There

Table 2 The previous studies compared serum sodium levels between single and recurrent febrile seizures

Author, Country[Reference]	Number of patients	Serum sodium in single febrile seizure, mmol/L	Serum sodium in recurrence febrile seizure, mmol/L	p–value
		No significant difference between two groups		
Heydarian F, Netherlands[9]	226	133.39	134.40	0.47
Maksikharin A, Thailand[11]	315	134.94	134.39	0.41
Thoman JE, USA[8]	136	135.56	135.48	>0.05
		The lower of serum sodium level in recurrence febrile seizure		
Kiviranta T, Finland[5]	113	137.62	136.07	<0.01
Kulandaivel M, India[7]	190	140.29	132.26	0.003
Nadkarni J, India[10]	70	138.20	134.31	<0.01

are useful in monitoring and advising parents or caregivers of the risk of recurrent seizures.

Conclusion

Lower serum sodium levels and a positive family history of febrile seizures are the predictors of recurrent seizures within 24 hours.

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Conflict of interest

No potential conflict of interest relevant to this article was reported.

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