Evaluation of Serum Sodium Levels in Simple, Multiple and Recurrent Febrile Convulsions

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Abstract- Febrile seizure is the most common form of childhood seizures that occur in 2–5% of them. The purpose of this study was to compare serum sodium level in first simple, multiple and recurrent febrile convulsions to answer whether serum sodium levels can predict febrile seizure recurrence in 24 hours and in other febrile episodes? In a retrospective study, sodium serum levels of all children aged 6 months to 6 years with final diagnosis of first febrile seizure admitted between March 2004 and August 2005 to Yazd Shaheed Sadoughi Hospital, were compared in simple, multiple and recurrence febrile convulsions. 139 cases with final diagnosis of first febrile seizure found among whom serum sodium checked in 112.54 girls and 58 boys with mean age of 2.01 ± 1.2 years evaluated. Type of febrile convulsions was complex in 36.6% of them. 18% had multiple (occurrence of more than one seizure during the febrile illness) seizures and 35.7% showed seizure recurrence in other fever episodes among whom 88% occurred in first year. Mean survival recurrence rate was 6.7 ± 5.9 months. There is no significant differences in age and serum sodium level among the three groups. Association of relative hyponatremia and febrile seizure recurrence was not confirmed. These findings reaffirm the recommendation of the American Academy of Pediatrics to not routinely obtain electrolytes in febrile convulsion unless clinically indicated.

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Key words: Febrile seizure, multiple febrile seizure, recurrent febrile seizure, serum sodium level

Introduction

Febrile seizure is the most common form of childhood seizures (1). Population studies in Western Europe and the USA report its cumulative incidence of 2–5%. It varies elsewhere in the world between 5–10% (India), 8.8% (Japan), and 14% (Guam) (1, 2). A febrile seizure is defined by the International League against Epilepsy as a seizure occurring in association with a febrile illness in the absence of CNS infections or acute electrolyte imbalance in children older than 1 month without prior afebrile seizures (3). While according to Berg, Febrile seizures are defined as seizures occurring between 6 months and 6 years of age (4). They are further classified as simple or complex. A febrile seizure is complex if it is focal or focal findings are present during the postictal period, lasting more than 10-15 minutes or multiple (occurrence of more than one seizure during the febrile illness). Approximately 30-50% of children have recurrent seizures with later episodes of fever (5, 6).

The American Academy of Pediatrics Practice Parameter does not recommend serum electrolytes be obtained routinely in evaluation of a child with a first febrile seizure, unless clinically indicated (7).

Two studies in Europe have demonstrated a relationship between low serum sodium levels and an increased risk of developing recurrent seizures within the same febrile illness. One study by Kiviranta and Airaksinen (1995) reported that sodium levels were significantly lower in children with recurrent febrile seizures as compared with simple febrile seizures without recurrences (8). They concluded that relative hyponatremia may increase the risk for multiple seizures during the same febrile illness. Moreover, a prospective study published by Hugen et al. (1995) concluded that the probability of a repeated episode of seizure within the same febrile period appeared to be related to the lower serum sodium level (9). In another study, sodium serum levels in febrile convulsive patients was significantly lower than those obtained in children with fever and of a group of

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healthy and fever free children (10). If hyponatremia is as a risk factor for febrile seizure recurrence within 24 hours, this would have potential impact on the approach to these patients.

The purpose of this study was to evaluate serum sodium level in first simple, multiple (repeated) and recurrent febrile convulsions.

Patients and Methods

In a retrospective study, sodium serum levels of all children aged 6 months to 6 years with final diagnosis of first febrile seizure admitted between March 2004 and August 2005 to Yazd Shaheed Sadoughi Hospital, were compared in simple, multiple and recurrence febrile convulsions.

Children with history of afebrile seizure, evidence of central nervous infection, shigellosis encephalopathy and underlying neurologic disorders were excluded.

One-way analysis of variance (ANOVA) or student's t-test was used to test for differences in sodium levels among the groups. We considered differences significant at *P* values less than 0.05. Data are presented as Mean ± Standard Deviation (SD).

Results

One hundred and thirty nine cases with final diagnosis of first febrile seizure found; among them serum sodium was checked in 112.

Fifty four girls (48%) and 58 boys (58%) with age range of 6 months to 6 years (2 ± 1.2 years) were evaluated. Type of febrile convulsions was complex in 41 cases (36.6%). Twenty cases (18%) had multiple (occurrence of more than one seizure during the febrile illness) seizures. 40 children (35.7%) showed seizure recurrence, among whom 88% occurred in first year. No recurrence was seen after two years. Mean survival recurrence rate was 6.7 ± 5.9 months.

Table 1. Means and standard deviations for age and sodium levels in groups

Groups	Age (year) Mean ± SD	Serum sodium (Meq/L) Mean ± SD
Simple febrile seizure (n = 71)	2.22 ± 1.25	137.37 ± 4.07
Multiple febrile seizure (n = 20)	1.63 ± 0.92	136.55 ± 4.01
Recurrence febrile seizure (n = 40)	1.64 ± 0.93	136.73 ± 3.24

Mean ages and sodium levels in the groups are presented in Table 1.

One-way analysis of variance revealed no significant differences in age and serum sodium levels among the three groups, but t-test showed that mean age of patients is statistically significant lower in recurrent febrile seizure. ($P = 0.014$).

Discussion

The main objective of this study was to compare the serum sodium levels of children with first simple febrile seizure, repeated seizures (multiple) and recurrent febrile convulsions. This study showed that febrile seizure was more in boys that supports other studies (11). In this study one third of febrile convulsions were complex which is in agreement with Berg *et al.* (1996) results (12). Also, seizure recurrence was seen in 36% of patients that supported by other studies (1, 3, 13). We observed no significant differences in the serum sodium levels among children with simple, multiple and recurrent febrile seizures. Thus we have negated the hypothesis that serum sodium levels are a predictor of seizure recurrence. This result supports Thoman *et al.* (2004) study that compared sodium level in children who had afebrile generalized seizures lasting less than 15 minutes and in whom with febrile generalized seizures lasting less than 15 minutes (with or without recurrence within 24 hours) (14). Our result was contrary to the results of two other studies that demonstrated a relationship between lower serum sodium levels and an increased risk of developing recurrent seizures within the same febrile illness (8,9). It is notable that our study groups differed from those of other studies. The control groups in the Hugen *et al* (1995) study consisted of age-matched children presented to the emergency room with fever but without seizures and a group of healthy afebrile children (9). Kiviranta and Airaksinen's study included no control group (8).

We did not confirm association of relative hyponatremia and febrile seizure recurrence. These findings reaffirm the recommendation of the American Academy of Pediatrics Practice Parameter to not routinely obtain electrolytes unless clinically indicated.

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