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ROLE OF SERUM SODIUM LEVELS IN RECURRENCE AND RECURRENT EPISODES OF FEBRILE SEIZURES

Paediatrics

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ABSTRACT

Background: Simple febrile seizures are the most common type of childhood seizures . The objective of the present study was to determine the role of serum sodium levels in predicting seizure recurrence within 24 hours and recurrent episodes of febrile seizures in children.

Materials and Methods: It is a cross – sectional study, performed on 100 children with febrile seizures aged between 6 months -60months, admitted to the department of Paediatrics of MOSC medical college, Kolenchery for a period of one year.

Results: Out of 100 children, 33 % had recurrences in 24 hours and 16% had recurrent episodes. Only 31% had sodium level below 130mmol/l and out of that, 29 had seizure recurrence within 24 hours, which was not statistically significant. The sodium levels of 16%children who had recurrent episodes of seizure, was also between 130.1-135mmol/l. No significant differences were seen between the serum sodium levels in simple febrile seizures and recurrent episodes.

Conclusion: Overall analysis showed that low serum sodium levels was not statistically significant to predict a seizure recurrence within 24 hours, but a relative hyponatremia can predispose a febrile child to occurrence of simple febrile seizure.

KEYWORDS

Febrile seizure, serum sodium levels

INTRODUCTION

Febrile convulsion is the most common seizure disorder in the paediatric age group.

A febrile seizure is a seizure accompanied by fever (temperature 100.4*f or 38*c by any method),between age of 6 months to 60 months, without CNS infection or metabolic imbalance ,and that occurs in the absence of a history of prior afebrile seizures[1]. Risk of recurrences in febrile convulsion is 30- 40%, after first episode, 50% after 2nd or more episodes, 50% in infants less than 1year old.

SIMPLE FEBRILE SEIZURES:
a primary generalized, usually tonic – clonic ,attack associated with fever, lasting for a maximum of 15 minutes & not recurrent within a 24hr period[1,2]

COMPLEX FEBRILE SEIZURE:
more prolonged, lasting >15mts <is focal & recurs within 24hrs.

FEBRILE STATUS EPILEPTICUS:
Is a febrile seizure lasting more than 30 minutes[1]

Previously in early mid – nineteenth century febrile seizures were treated as a separate disease entity compared to other types of seizures. Later by late 19 th century, many studies were conducted to know the background and risk factors for febrile seizure and its progression to epilepsy. Lennox was the first person to perform this study. These studies classified febrile seizure as a benign condition, however emerging febrile seizure syndromes behave differently.

Epidemiology: About 2-5% of children will have febrile seizures by the time they reach school age. Peak incidence was seen at the age of 18 months of age [3]. Male predominance was found as higher incidence [4] Genetic predisposition is thought to be a major contributor. A strong family history of febrile convulsions in siblings and parents suggests a role of genetic influences. Genetic studies show a multi factorial mode of inheritance. Siblings with history of Febrile Seizure , showed 10-20% of recurrences.[5]. If one of the parents had history of Febrile Seizure chance of recurrence is about 40%. In case of twins, about 70% had shown risk of developing Febrile Seizure.[1,5]

Certain channelopathies have shown association with febrile convulsion [5].Mutations in sodium channel receptor and gamma-aminobutyric acid(GABA) receptor genes suggest that febrile seizures are channelopathies. There are a number of known linkages for febrile seizures.FEB1 and FEB2 have been suggested on chromosome 8 and 19p respectively and involve only FS. Three other loci on chromosome 2, 19Q and 5 involve generalized epilepsy with FS syndrome (GEFS plus)[6].

Various literatures showed that sodium plays an important role in cell physiology and neuronal stimulation in developing seizures.[7] . Nerve cells are particularly sensitive to the amount of sodium in the blood because they need electrolytes to function properly . Too much or too less of sodium can cause problems with the nerves in our brain or elsewhere in our body.[8] Sodium has an important role in cell physiology , neuronal cell depolarization, production of electrical discharge and finally seizures, hence the need to evaluate the serum sodium levels in febrile seizures has become significant[9]. Influx of sodium ions through special sodium channels of neurons creates the action potential and thus neuronal activity.

In 1993, Lennox suggested the importance of hydration and increased permeability of cell membranes as a mechanism of febrile seizures.[10] Elevation of the "threshold" to febrile seizures occurs with increasing age, which is associated with developmental changes in the balance of water and electrolytes, especially hyponatremia.[5]

MATERIALS AND METHODS

This is a cross – sectional study, performed on all children with febrile seizures aged between 6 months -60months, admitted to the department of paediatrics of MOSC medical college, Kolenchery for a period of one year. Following were inclusion criteria -Children with first febrile seizures, age group between 6 months – 60 months, estimation of sodium levels{≤130,130.1-135,135.1-140,140-145,>145.Children with Neurodevelopmental delay, Meningitis, encephalitis, malabsorption syndromes, pseudohyponatremia due to high glucose, conditions with loss of electrolytes , SIADH ,severe malnutrition, unprovoked seizures, children on diuretics were excluded from the study. A total of 100 children were selected and screened for the study .The parents /caretaker of the child were well informed about the study and written informed consent was taken from them prior to sampling and other data was collected using a proforma which includes demographic data, history & nature of illness, family history, clinical findings and serum sodium levels. Ethical approval for the study was taken from our institutional review board. In the present study-Recurrence is defined as seizure occurring within 24 hours during same febrile illness. Recurrent episode is defined as a seizure occurring any time after first episode with fever or after 24 hours of fever. Low sodium level (hyponatremia) is defined as serum sodium less than 130meq/l.

Statistical Analysis

The study was analyzed with SPSS software version 24.The sample

size was calculated based on a study done by Jayasree nadkarni [11]which noted that 27% of children with febrile seizures had a sodium less than 135. Our sample was calculated for a single proportion using n master sample size calculator computer software using the formula n=Z21-α/2P(1-P)/d2.The sample size was found to be 76 for an absolute precision of 10% for a confidence interval of 95%.

Data were summarized in frequency tables, pie charts and histograms. For all the tests, p value of < 0.05 was considered as statistically significant.

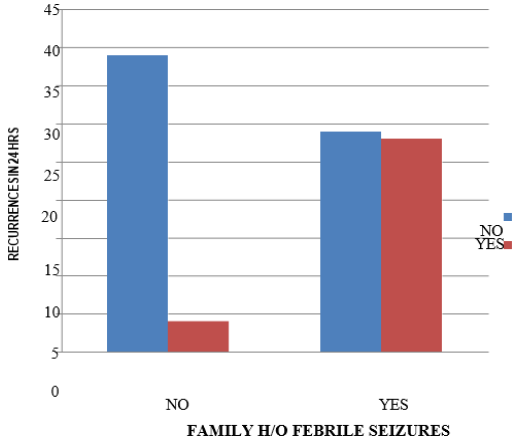
RESULTS AND OBSERVATIONS

Among the 100 children with first episode of febrile seizures , 68 % children with febrile seizures were between the age group of 6 months to 24 months , peaking at 15- 19 months ,22% were between 24 months to 42 months and 10 % between 42 months to 60 months.

57% were males and 43% were females. Male to female ratio was 1.3:1. Male gender predominance was noted in our study. 62 % children had temperature between 100 ^{F}- 101^{F}, at the time of presentation. No statistical significance was noted between temperature at the time of presentation and recurrence of febrile seizure. Among the causes of fever, 38 % had upper respiratory tract infection , 32% had viral fever and 30% had other causes (ASOM 6, herpangina 17 , Urinary tract infection 6 , a/c tonsillitis 2).

Relation between family history of febrile seizure and recurrence of seizure, 57 children had family history of febrile seizures, of which 28 children had recurrences within 24 hours ,which was found statistically significant (p<0.5).

Figure 1 Relation between family history of febrile seizure and recurrence of seizure

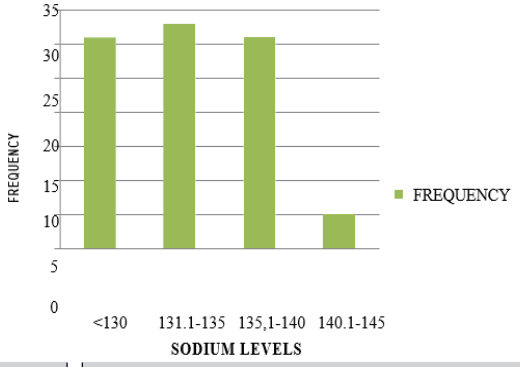


Relation between family history of epilepsy and recurrence of seizure: 26 children had family history of epilepsy, of which 8 had recurrence in 24 hours and 5 had recurrent episodes. This was not statistically significant (p=0.778)

DISTRIBUTION OF SODIUM LEVELS:

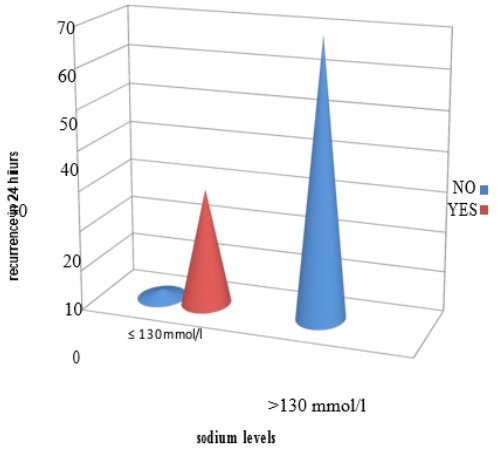
Among all children, 33% had sodium level between 130.1-135mmol/l, 31% had sodium levels between ≤ 130mmol/l and 36% had sodium levels > 135mmol/l.

Figure 2 Distribution of sodium levels



Relation between sodium levels and seizure recurrences: Among the 31% children with low serum sodium levels <130 mmol/l ,29 had seizure recurrence within 24 hours .Rest 69% children sodium levels were >130mmol/l. This was not statistically significant (p>0.05). Hence serum sodium levels in patients with febrile seizure were not a predictor factor for seizure recurrence.

Figure 3- Relation between sodium and febrile seizure recurrence



DISCUSSION

In the present study, 100 children with first febrile seizures between the age group of 6 months to 60 months where assessed, of which 68 % children had febrile seizures between the age group of 6 months to 24 months peaking at 15 – 19 months, which was in agreement with results of other studies . A study done by Al – Eissa , found mean age of presentation was 15 months [12,13]. Male to female ratio was 57:43 (1.3:1).

Male gender predominance was almost well documented in previous studies [4] In our study 62 % children had temperature between 100 * F- 101* F, at the time of presentation. A study done by El – Radhi found that children with lower temperature have highest chance of recurrence than higher temperatures [14]. But in our study only 23 had recurrence, which was not statistically significant. From 100 children 33 had recurrences within 24 hours and 16 had recurrent episodes. About 57 children had family history of febrile seizures, out which 28 children had recurrences within 24 hours. 26 children had family history of epilepsy,from which only 8 had recurrences in 24 hours and 5 had recurrent episodes. Family history of febrile seizures was found as a significant risk factor for febrile seizures ,which was found to be in agreement with studies done by Essam J Al –Zwaini & collegues where 33% had family h/o febrile seizure [15] .Another study by Doose H,showed a multifactorial polygenic mode of inheritance and offsprings with maternal history of febrile seizure had shown increased risk[16] .Genetic origin of febrile seizure with autosomal dominant inheritance is also seen [17]. Degree of fever, gender, family history of febrile seizures were not found as risk factors in the study done by Al-Eissa [13]. Regarding the causes of fever 38 % had upper respiratory infection, 32% had viral fever and 30 % had other causes (ASOM 6, herpangina 17, UTI 6, a/c tonsillitis 2) . From our study upper respiratory infection was not a significant predisposing factor for febrile seizure .The finding was similar with study done by Essam J[15] ,but it differs from a study done by Tang J[18] to know the relationship between upper respiratory infections and febrile seizures in china showed ##. From 100 children with febrile seizure, the serum sodium levels of 69 was above 130 mmol/l and 31 had below 130mmol/l. Of the 31 with low serum sodium levels (<130mmol/l), 29 had seizure recurrence within 24 hours, which was not statistically significant . Sayedzadeh, S.A , Hemati, M. also reconfirmed that serum sodium level in patients with febrile convulsion is not a predictor factor for recurrence of seizure.[19]. F Heydrian ,in his study also stated that although serum sodium levels cannot assist in prediction of recurrence of simple febrile seizure in children, relative hyponatremia may predispose the febrile child to occurrence of simple febrile seizure [20].Our study was in contrary to the study done by Hugen C A, also found that measurement of serum sodium was a valuable investigation in the child with febrile seizure . Lower the serum sodium levels, the higher the probability of a repeat convulsion .[21]. Kiviranta T and Airaksinen E M , showed that sodium concentrations were lowest in children with repeated seizures and that

hyponatraemia may increase the risk for multiple convulsions during the same febrile illness.[22] . Majority of the children in our study had serum sodium levels between 130.1-135 mmol/l. The sodium levels of sixteen children who had recurrent episodes of seizure, were also between 130.1-135mmol/l. No significant differences were seen between the serum sodium levels in simple febrile seizures and recurrent episodes.

The main limitation of our study was being a hospital based study and it didn't have an additional group which included febrile patients without seizures.

CONCLUSION

There was no statistical significant co- relation between serum sodium levels in recurrence and recurrent episodes of febrile seizures. Hence there is no need to evaluate serum sodium levels in patients with simple febrile seizures.

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