



## A STUDY ON RELATIONSHIP BETWEEN SERUM ELECTROLYTE LEVELS AND FEBRILE CONVULSION IN CHILDREN IN A TERTIARY CARE CENTRE

### Paediatrics

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### ABSTRACT

**Introduction:** Febrile seizure (FS) is the most common cause of convulsions in children seen in between 6 to 60 months of age. Fever plays an important role in causing disturbances in fluid and electrolyte balance which alters the mechanism of seizure activity and its threshold. **Aim:** To find out the relationship between serum electrolytes (calcium, magnesium, sodium, potassium) and simple febrile convulsion. **Materials and Method:** This cross sectional study was conducted on 120 children of age between 6 to 60 months. 60 children had fever with convulsion (cases) and 60 children had fever without convulsion (control). Serum level of sodium, potassium, calcium, magnesium were statistically analysed between both the groups. **Results:** In our study the difference in serum sodium, potassium, calcium levels in between case and control group are statistically significant, the p-value being <0.001, 0.017, 0.03 respectively. **Conclusion:** Our study concludes that changes in serum electrolytes may have a role in the development of simple febrile convulsion and measurement of the serum electrolytes in a child with febrile seizures may help in predicting seizure recurrence within the same febrile illness.

### KEYWORDS

Febrile Convulsion, Serum Electrolytes, Seizure Recurrence

#### INTRODUCTION:

Febrile Convulsions are convulsions that occur between the age of 6 and 60 months with a temperature of 38 degree C (100.4 degree F) or higher, that are not the result of CNS infection or any metabolic imbalance, and that occur in the absence of a history of prior afebrile seizures. Febrile seizure (FS) is the most common cause of convulsions in children. Seizure activity can begin in a very discrete region of cortex and then spread to neighboring regions. Fever plays an important role in causing disturbances in fluid and electrolyte balance. The mechanism of seizure activity is altered in hyponatremia, more calcium ion influx and generation of repetitive action potential which will cause repetitive seizure initiation. It also lowers the threshold of neuromuscular excitability. Hypomagnesemia releases the inhibition of NMDA receptor which leads to glutamate-mediated depolarization of membrane and the postsynaptic enhancement of epileptiform electrical activity. Acute and/or severe electrolyte imbalances can manifest with rapidly progressive neurologic symptoms or seizures, which may be the sole presenting symptom. An accurate and prompt diagnosis should be established for successful management of seizures, as rapid identification and correction of the underlying electrolyte disturbance are of crucial importance in the control of seizures and prevention of permanent brain damage.

#### AIM:

To find out the relationship between serum electrolytes (calcium, magnesium, sodium, potassium) and Simple Febrile Convulsion.

#### MATERIALS AND METHODS:

This cross-sectional study was conducted after taking consent from guardians of 120 children in the age group of 6 to 60 months in a tertiary care hospital. Out of this 60 children had febrile convulsion (Case) and 60 children had fever without convulsion (Control). The demographic profile and clinical characteristics of each children were recorded. Blood parameters of electrolytes like serum sodium, potassium, calcium and magnesium were documented and analysed statistically.

#### OBSERVATION AND RESULTS:

**Table 1: showing distribution according to demographic profile and clinical characteristics**

characteristics	Case Mean±SD	Control Mean ± SD	P-Value
Age (in months)	30.93±16.45	30.25±15.66	0.8 (insignificant)
Duration of fever (in hours)	12.48±7.95	26.75±12.5	0.04 (significant)
Body temperature (in degree Fahrenheit)	102.83±1.03	100.17±1.03	0.001 (significant)

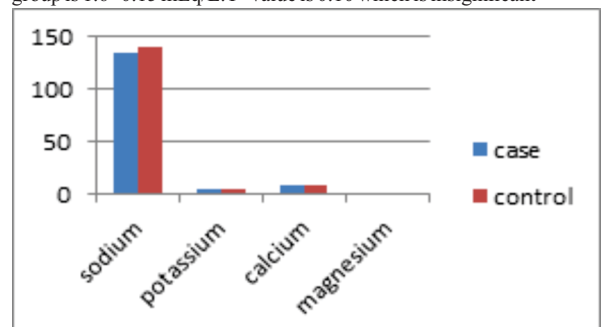
**Table 2: showing distribution according to serum electrolyte levels**

Serum electrolytes	Case Mean±SD	Control Mean ± SD	P-Value
Sodium (mEq/L)	134.9±5.7	139.5±4.3	<0.0001 significant
Potassium(mEq/l)	4.6± 0.62	4.3± 0.6	0.017 significant
Calcium (mg/dl)	8.84±0.48	9.2±0.46	0.03 significant
Magnesium (mEq/L)	1.6±0.15	1.6±0.15	0.10 insignificant

Table no.1 shows that the mean age difference between the 2 groups is not statistically significant. The difference between duration of fever and mean body temperature between two groups is 0.04 and 0.001 respectively, which is statistically significant.

Table no.2 depicts relationship with febrile convulsion and serum electrolytes level in between cases and control group.

The mean serum level of sodium in case and control group is 134.9±5.7 and 139.5±4.3 mEq/L respectively. P-value is <0.0001 which is significant. The mean serum potassium level in cases and control group is 4.6±0.62 and 4.3±0.6 mEq/L respectively. P-value of 0.017 is significant. The mean serum calcium level in cases and control group is 8.84±0.48 and 9.2±0.46 mg/dL respectively. P-value is 0.03 which is significant. The mean serum magnesium level in both cases and control group is 1.6±0.15 mEq/L. P-Value is 0.10 which is insignificant.



**Diag 1: showing distribution of serum electrolyte level in between cases and control group**

#### DISCUSSIONS:

In our study in case Group, the mean age (months) (mean± s.d.) of patients was 30.9333± 16.4635. In Control Group, the mean age (months) (mean± s.d.) of patients was 30.2667± 15.6583. Difference of

mean age (months) with both Group was not statistically significant ( $p=0.8206$ ).

Afsharakas L et al (2014) found that the mean age was  $24.4 \pm 14.6$  months. Fallah R et al (2009) found that the mean age was  $2.01 \pm 1.2$  years.

Kulandaivel M et al (2017) found that the mean sodium level in the group with repeat convulsion was  $132.26$  mmol/l which was significantly lower than the mean in the group without repeat convulsions. The increase in the probability of a repeat convulsion when the serum sodium level decreases are significant ( $P = 0.0025$  [ $<0.05$ ]). When the serum sodium level Nadkarni J et al (2011) found that serum sodium levels were evaluated in all the children. There was no significant difference in the mean serum sodium between the study group and controls. The mean serum sodium level of children with recurrent seizures is significantly lower than the mean serum sodium level of children with a single seizure. In our study the p-value for serum sodium level is  $<0.0001$  which is significant In Case Group, the mean K (mmol/L) (mean  $\pm$  s.d.) of patients was  $4.5850 \pm .6219$ . In Control Group, the mean K (mmol/L) (mean  $\pm$  s.d.) of patients was  $4.3150 \pm .6075$ .

Difference of mean K with both Group was statistically significant ( $p=0.0177$ ). We found that the serum Potassium level was higher in the cases than controls, though the higher Potassium values were not in the hyperkalemic range, but it was statistically significant. Our findings didn't match with many studies, matched with very few studies. The only possible explanation to this higher potassium may be due to vigorous muscle contraction during the seizure period, which may have given the result. Khalaf DK et al (2018) found that serum electrolyte disturbance  $Na^+$  is decreased (66.7%),  $K^+$  is increased (16.7%) and  $nCa^{+2}$  is decreased (6.7%).

Our study showed that in Case Group, the mean Ca (mg/L) (mean  $\pm$  s.d.) of patients was  $8.8467 \pm .4813$ . In Control Group, the mean Ca (mg/dL) (mean  $\pm$  s.d.) of patients was  $9.2633 \pm .4690$ . Difference of mean Ca with both Group was statistically significant (p-value 0.03). Usha kiran CB et al (2017) found that serum Calcium levels in children with febrile seizures were reduced and this observation was statistically significant.

Definite association was found between serum calcium levels and the occurrence of febrile seizures. Although serum calcium levels were not in the hypocalcemic range, they were decreased enough to cause a statistical significance in precipitating febrile seizures.

In our Case Group, the mean Mg (mEq/l) (mean  $\pm$  s.d.) of patients was  $1.5950 \pm .1489$ . In Control Group, the mean Mg (mEq/l) (mean  $\pm$  s.d.) of patients was  $1.6400 \pm .1498$ . Difference of mean Mg with both Group was not statistically significant ( $p=0.1016$ ).

In a study by Bharathi S et al (2016) complete Blood Counts, Serum Magnesium and Serum Calcium levels were done. Out of 120 children Hypomagnesemia was seen in 19 (16%) children. Out of 104 Typical Febrile 17 cases were shown having hypomagnesemia, 87 were shown Normal magnesium levels.

## CONCLUSION:

The study concludes that changes in serum electrolytes could have a role in the development of simple febrile convulsion and measurement of the serum electrolytes in a child with febrile seizures may help in predicting seizure recurrence within the same febrile illness. This will decrease the chances of morbidity as well as mortality in children due to febrile convulsion

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