

# Examining the Deficiency of Zinc in Febrile Seizures

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## ABSTRACT

**Aim:** To examine the deficiency of zinc in febrile seizure cases.

**Study Design:** Prospective study

**Place and duration of study:** Department of Pediatric Medicine Unit 1, Balochistan Institute of Child Health Quetta from 1<sup>st</sup> January 2022 to 30<sup>th</sup> June 2022.

**Methodology:** Fifty children suffering from febrile seizures and 50 controls were age and gender matched. The age of the children was between 6 months to 5 years. Each febrile seizure child was clinically diagnosed after the radiological computerized tomography scan imaging as well as electroencephalogram testing and through balanced electrolytes followed by zinc analysis in cases and control.

**Results:** The mean age of the patients with febrile seizures was 35.2±12 months while the controls 35.7±11 months with no significant difference in the age of the both. The majority of the patients were boys (54%) with only 46% girls suffering from febrile seizures. The zinc levels in boys were measured as mean 69.42±20.47 in febrile seizure cases and 92.74±17.63 in controls while in girls they were 71.42±21.02 in febrile seizure cases and 91.73±17.64 in controls respectively.

**Conclusion:** Serum zinc levels found in febrile seizures is lower than the values found in controls with a significant difference suggesting an association of zinc to stimulation and formation of febrile seizures in children.

**Keywords:** Deficiency, Zinc, Febrile seizures

## INTRODUCTION

The most prevalent form of seizure associated with paediatric abnormalities is febrile seizures, which can happen anywhere in the world. Additionally called febrile-convulsion, they are. Feverish seizures first appear between the ages of half a month and five years<sup>1,2,3</sup>. The febrile seizures are a general, age-limited condition. After ruling out any infections of the central nervous system, a comprehensive electrolyte profile is run to look for any abnormalities before the diagnosis of febrile seizures is made. Additionally, patients are disqualified if they have ever experienced an afebrile seizure<sup>4,5</sup>.

Based on how straightforward or complicated the condition is, febrile seizures are divided into two categories. Every 24 hours, simple febrile seizures last 10 to 15 minutes. On the other hand, many episodes within a 24-hour period characterise the complicated kind of febrile seizures<sup>5</sup>.

Investigations into the pathogenesis of febrile seizures are ongoing. Environmental factors and trace elements like zinc may also contribute to the development of genetic alteration, even though it is believed that generic components do play a significant role in its production. Changes in growth, as well as in neurological and developmental processes, follow<sup>5,6,7</sup>. The initiation of febrile seizures is caused by the regulation of gamma-aminobutyric acid through pyridoxal kinase activation<sup>8,9</sup>. The goal of the current study was to better understand how trace elements like zinc contribute to febrile seizures.

The study's findings make it easier to comprehend and treat people who experience febrile seizures.

## MATERIALS AND METHODS

This prospective study conducted in the Department of Pediatric Medicine Unit 1, Balochistan Institute of Child Health Quetta from 1<sup>st</sup> January 2022 to 30<sup>th</sup> June 2022. Permission was obtained from Institutional Ethical Committee. Fifty children suffering from febrile seizures and 50 controls were age and gender matched. The age of the children was between 6 months to 5 years. The study was approved from review committee and parents/guardian informed written consent was gained prior to data collection. The sample size was calculated through WHO sample size calculation protocol requiring 95% CI and 80% power of test. The exclusion criteria were based on congenital anomalies and previous history of seizures since long. Children having imbalance on their electrolyte levels were also excluded from the study. Each febrile seizure child was clinically diagnosed after the radiological CT imaging as

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well as EEG testing. The generic age was recorded and 2cc blood was withdrawn from each patient for electrolyte profiling and zinc analysis. Serum was separated through 3000 rpm centrifugation. Trace element zinc was analyzed through atomic spectrophotometry method in cases and controls. The normal value for serum zinc was 70-110mcg/dL, whereas levels <40mcg/dL were suggestive for the deficiency of zinc. The complete details of clinical symptoms, history and assessment were entered on a well-structured questionnaire. Data was analysed using SPSS-25 using odds ratio and Chi square analysis. P value<0.05 was taken as significant.

## RESULTS

The mean age of the patients with febrile seizures (FS) was 35.2±12 months while of the controls was 35.7±11 months with no significant difference in the age of the both. The majority of the patients were boys (54%) with only 46% girls suffering from febrile seizures. The control group was matched with by gender with the febrile seizure cases keeping 56% boys in the study and 44% girls respectively (Table 1).

The zinc levels in boys were measured as mean 69.42±20.47 in FS cases and 92.74±17.63 in controls while in girls they were 71.42±21.02 in FS cases and 91.73±17.64 in controls respectively. There was a significant difference in both FS cases and control zinc levels, however none of the cases or controls have a mean decrease <40 mcg/dl in zinc levels (Table 2).

There was no significant (p=0.801) difference in the zinc levels of simple and complex febrile seizures. However, there was a slight decrease in the levels of zinc observed in complex febrile seizure in comparison to the simple FS cases (Fig. 1).

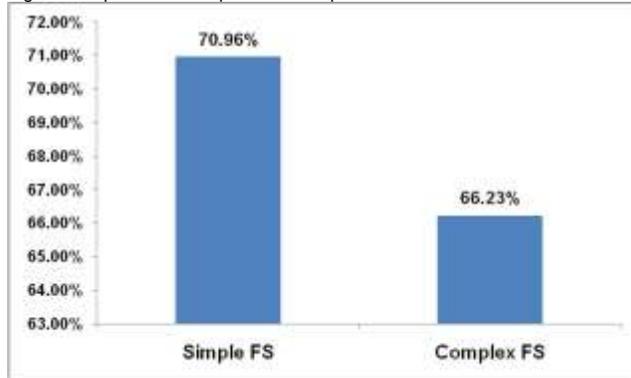
Table 1: Age and gender comparison between febrile seizure patients and Controls (n=100)

Variable	Febrile seizure patients (n=50)	Controls n=50	P value
Age (months)	35.2±12	35.7±11	0.56
<b>Gender</b>			
Boys	27 (54%)	28 (56%)	0.61
Girls	23 (46%)	22 (44%)	0.62

Table 2: Comparison of zinc levels (mcg/dL) in gender

Gender	FS patients (n=50)	Controls (n=50)	P value
Boys	69.42±20.47	92.74±17.63	0.046
Girls	71.42±21.02	91.73±17.64	0.045

Fig. 1: Comparison of simple and complex febrile seizures



## DISCUSSION

Febrile seizures are reported widely among children with an unclear pathogenesis. There are few factors which have been identified to influence its stimulation and genetic-predisposition. Zinc being a cofactor for the glutamic acid-decarboxylase modulates production of GABA in the central nervous system. The glutamic acid-decarboxylase is rate limiting enzyme in the gamma aminobutyric acid synthetic pathway. In cases where there is a zinc deficiency the reaction of glutamic acid-decarboxylase is controlled. Therefore, the GABA synthesis is consequently disrupted. This process may further results in the formation of the febrile seizures in children with deficient zinc<sup>9-11</sup>.

In the present study there were more boys suffering from febrile seizures than girls. Various studies have reported the similar results presenting the justification of such gender bias pattern to be related with genetic causes. A study by Hosseini et al<sup>12</sup> in 2020 also reported similar findings with more boys than girls suffering from febrile seizures. The levels of zinc in this study were not as low to be defined as deficient, however they were still found to be lower in the cases than controls with more decrease found in the complex febrile seizures than the simple febrile seizure cases. Salehiomran et al<sup>11</sup> reported that mean serum zinc levels in febrile cases are lower than the levels measured in normal control children of similar age. They reported a level of 58 mcg/dl in febrile seizure patients and 71 mcg/dl in normal controls. The results of their study are in similarity with the present study results.

Another research by Heydarian et al<sup>13</sup> also found similar findings where the mean serum zinc levels were lower in febrile seizure cases than normal healthy controls. The same results have also been reported in other literature as well<sup>14-21</sup> establishing the finding of the current study.

## CONCLUSION

Serum zinc levels found in febrile seizures is lower than the values found in controls with a significant difference suggesting an association of zinc to stimulation and formation of febrile seizures in children.

**Conflict of interest:** Nothing to declare

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