

# Effect of Zinc on Febrile Seizure in Children: A Cross-Sectional Study

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## Abstract

**Background:** Febrile seizures are the most frequent kind of seizure associated with childhood abnormalities. Usually, children between the ages of six months and five years' experience these seizures. There are two types of febrile seizures, each with a different level of complexity or simplicity. Simple febrile seizures usually happen once per 24 hours and last for 10 to 15 minutes on average. Complex febrile seizures, on the other hand, occur over the course of a single 24-hour period and involve several episodes. **Objective:** To find out how trace minerals like zinc affect febrile seizures in children. **Study design:** A case-control study **Place and Duration:** This study was conducted in Al-Aleem Medical College, Ghulab Devi Teaching Hospital Lahore from October 2022 to October 2023. **Methodology:** To ensure age and gender homogeneity, 40 children with febrile seizures were matched with 40 control children. The children that were part of the study ranged in age from 6 months to 5 years. Every child exhibiting febrile seizures had a clinical diagnosis made after radiological CT imaging and EEG testing. Every patient provided a 2-cc blood sample for zinc analysis and electrolyte profiling, and each participant's age was recorded as well. **Results:** The average age of the controls was 3.56 years, while the average age of people with febrile seizures was 3.53 years. There was no significant difference in the age of both groups. In the total number of participants, the majority were boys in both groups. The zinc levels of the children with febrile seizures and the control group differed significantly. Zinc levels did not significantly differ between simple and complex febrile seizures. **Conclusion:** Zinc levels in the blood are lower in children experiencing febrile seizures than in children who are not experiencing seizures.

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## Keywords

Febrile Seizures, Simple Febrile Seizures, Complex Febrile Seizures, Children, Serum Zinc Level.

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Febrile seizures are the most frequent kind of seizure associated with childhood abnormalities [1, 2]. Usually, children between the ages of six months and five years' experience these seizures [3, 4]. A common ailment limited to a specific age range is febrile seizures [5]. Medical practitioners usually

perform extensive testing to rule out central nervous system infections and look for any electrolyte imbalances before making a diagnosis of febrile seizures [6]. Furthermore, people who have experienced seizures unrelated to a fever are not given this diagnosis.

There are two types of febrile seizures, which differ in their complexity or simplicity [7]. Simple febrile seizures usually happen once per 24 hours and last for 10 to 15 minutes on average [8]. Complex febrile seizures, on the other hand, occur over the course of a single 24-hour period and involve several episodes [9].

The goal of the ongoing study is to determine the cause of febrile seizures. While genetic variables are thought to have a major influence, environmental conditions and specific elements like zinc are thought to be potential contributors to genetic alterations [9, 10]. Developmental processes, brain functions, and growth are all altered by this disorder. Pyridoxal kinase activation regulates gamma-aminobutyric acid, which in turn causes the beginning of febrile seizures. The latest study's main goal was to find out how trace minerals like zinc affect febrile seizures. The results of this study help us understand this illness better and may lead to better treatments for those who have febrile seizures.

## Methodology

The hospital's Ethical Review Committee approved of this study. Patients were briefed about the study, and their informed written consent was obtained. To ensure age and gender homogeneity, 40 children with febrile seizures were matched with 40 control patients. The children that were part of the study ranged in age from 6 months to 5 years.

**Exclusion criteria:** The exclusion criteria were based on seizure history and congenital anomalies. Furthermore, the study did not include children whose electrolyte levels were abnormal.

The WHO sample size calculation recommendations, which demand a 95% confidence interval and an 80% power for the test, were used to establish the sample size. Every child exhibiting febrile seizures had a clinical diagnosis made after radiological CT imaging and EEG testing. Every patient provided a 2-cc blood sample for zinc analysis and electrolyte profiling, and each participant's age was recorded as well. The serum was extracted using a 3000-rpm centrifuge.

Atomic spectrophotometry was used to analyze the trace element zinc in both the cases and the controls. Serum zinc was shown to have a typical range of 70–110 mcg/dL, with readings below 40 mcg/dL suggesting a zinc insufficiency. To obtain complete data on clinical symptoms, medical history, and evaluations, a comprehensive questionnaire was utilized. Using SPSS-25, the gathered data was analyzed using Chi-square and odds ratio analysis techniques. A statistical significance threshold of  $P < 0.05$  was applied to ascertain the results.

## Results

To ensure age and gender homogeneity, 40 children with febrile seizures were matched with 40 control children. The children that were part of the study ranged in age from 6 months to 5 years. The average age of the controls was 3.56 years, while the average age for children with febrile seizures was 3.53 years. There was no significant difference in the age of both groups. In the total number of participants, the majority were boys in both groups. Table 1 shows the comparison between both groups according to their demographics.

Table No. 1: Comparison Between Both Groups According to Their Demographics.

Variables	Controls (n=40)	Febrile seizures (n=40)
Age in years (mean)	3.56	3.53
Gender		
• Female	16	18
• Male	24	22

The zinc levels of the children with febrile seizures and the control group differed significantly. Nevertheless, there was no average drop in zinc levels below 40 mcg/dl in either the patients or the controls. Table number 2 shows the comparison of zinc levels (mcg/dL) between genders.

Table No. 2: Comparison of Zinc Levels (Mcg/Dl) Between Genders.

Gender	Controls (n=40)	Febrile seizures (n=40)
Female	91.7	69.4
Male	92.7	71.4

Zinc levels did not significantly differ between simple and complex febrile seizures. Comparing patients with complicated febrile seizures to those with simple febrile seizures, a little decrease in zinc levels was seen. Table number 3 shows the comparison of simplex and complex febrile seizures.

Table No. 3: Comparison of Simplex and Complex Febrile Seizures.

Febrile seizures	%
Complex	66.23
Simple	70.96

## Discussion

The etiology of febrile seizures, a common ailment among youngsters, is yet unknown [11]. Genetic predisposition is one of the elements that

have been identified as potentially influencing its onset [12]. Zinc controls the production of GABA (gamma-aminobutyric acid) in the brain and spinal cord by working with glutamic acid decarboxylase [13, 14]. Glutamic acid decarboxylase is the primary enzyme involved in the synthesis of GABA. Zinc deficiencies have an impact on glutamic acid decarboxylase activity, which in turn controls GABA production [15]. Therefore, in children with low zinc levels, a disruption in GABA production may result in the development of febrile seizures.

The results of the current study, which found that males were more likely than females to experience febrile seizures, are consistent with findings from other studies that link hereditary variables to this gender bias. According to a 2020 study by Hosseini et al., boys are more likely than girls to get febrile seizures [16]. Zinc levels in the cases were lower than in the controls, even though they did not fulfil the criteria for a deficiency in this study. The drop was more pronounced in cases of complicated febrile seizures than in cases of simple febrile convulsions [17].

According to Salehiomran et al., children with febrile seizures had lower average serum zinc levels than children of the same age who did not have the convulsions [18]. In contrast to the control group of healthy children, who had a value of 71 mcg/dl, the patients with febrile seizures had a reading of 58 mcg/dl. These results from their investigation align with the outcomes of the current investigation.

A different study by Heydarian et al. observed similar findings, showing decreased mean serum zinc levels in febrile seizure cases compared to healthy children acting as controls [19]. Consistently positive results have been reported in other publications, supporting the results found in this investigation [20].

## Conclusion

Zinc levels in the blood are lower in children experiencing febrile seizures than in children who are not experiencing seizures. This implies that zinc may have a role in the development of these childhood seizures.

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**Conflict of Interest:**  
None

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