

ORIGINAL ARTICLE

Frequency of hypocalcemia in children aged 6 months to 5 years presenting with febrile convulsions at a Secondary Care Hospital.

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ABSTRACT... Objective: To determine the frequency of hypocalcemia among children presenting with febrile seizures and to identify clinical predictors associated with low serum calcium levels. **Study Design:** Cross-sectional Observational study. **Setting:** Department of Pediatric, Pakistan Air Force Hospital, Sargodha. **Period:** 1st September 2024 to 31st August 2025. **Methods:** A total of 147 children aged 6 months to 5 years presenting with febrile seizures were enrolled using a non-probability consecutive sampling technique. Children with known neurological disorders, metabolic diseases, renal disease, or those receiving calcium/vitamin D supplementation were excluded. The demographic and clinical data including age, gender, weight, height, body temperature, and frequency of seizure episodes were recorded using a structured proforma. Serum calcium levels were measured in laboratory using Atomic Absorption Spectrometry and hypocalcemia was defined as serum calcium <8.5 mg/dL. Data were analyzed using SPSS version 25. Descriptive statistics and binary logistic regression were used to identify predictors of hypocalcemia. **Results:** Among 147 children 85 (57.8%) were males and 44 (29.9%) were female. Hypocalcemia was observed in 44(29.9%). Children with hypocalcemia were younger (median 2.5 vs. 3.5 years) and had lower median weight and height compared with normocalcemic children. Multiple seizure episodes and younger age were significant predictors of hypocalcemia ($p = 0.001$ and 0.024 , respectively). **Conclusion:** Hypocalcemia is relatively common among children presenting with febrile seizures particularly in young children and those with recurrent seizure episodes. Early recognition and monitoring are essential to prevent complications. The need of early recognition and correction of hypocalcemia may help reducing seizure recurrence and associated complications.

Key words: Children, Febrile Seizures, Hypocalcemia, Pediatric Emergency, Serum Calcium.

Article Citation: Asghar A, Siddiqui BH, Anwar W, Khalid S, Iqbal R, Nahal S. Frequency of hypocalcemia in children aged 6 months to 5 years presenting with febrile convulsions at a Secondary Care Hospital. Professional Med J 2026; 33(08):1459-1463.
<https://doi.org/10.29309/TPMJ/2026.33.08.10372>

INTRODUCTION

Febrile seizures are defined as the seizures occurring in children aged 6 months to 5 years alongwith fever ($\geq 100.4^{\circ}\text{F}$ or 38°C) and in the absence of a central nervous system or metabolic cause.¹ The global prevalence of febrile seizures is higher in Asian societies (3-10%) as compared to Western countries (2-5%).² It is a multifactorial disease and is considered as the response of developing brain to neuronal excitability.³ It can be a simple febrile seizure being generalized, brief in duration, and non-recurrent within 24 hours, or a complex febrile seizure being prolonged or focal activity, recurrent within the same day and followed by a longer recovery time.⁴ Low serum Calcium level is considered as a strong marker of disease course.⁵ Serum calcium controls the neuronal excitability by stabilizing the resting membrane potential of neurons.⁶ The nerves are prone to produce spontaneous firing of action

potentials in reduced calcium levels leading to a hyper-excitabile neuronal state.³ The raised body temperature is thought to bring the calcium out of bony reserve in the blood circulation and in the status of low calcium, involuntary spontaneous peripheral skeletal muscle movements occur.⁶ Data suggest, febrile seizures are more prevalent among less privileged societies with under nourished children.⁷ Their prevalence in Pakistan is recorded upto 30.5%⁸, and the prevalence of hypocalcemia in children with febrile seizure is recorded up to 41.4% in another study.⁹ To the best of author's knowledge, there is lack of data on this topic from Sargodha region. Considering the burden of disease, the rationale of this study was to collect the evidence based regional data to help healthcare provider identify at-risk patients, guide early intervention, and potentially reduce recurrence and complications.

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Article received on:

07/02/2026

Date of revision:

16/06/2026

Accepted for publication:

17/06/2026



METHODS

This cross-sectional observational study was conducted at the pediatric department of Pakistan Air-force Hospital, Sargodha, from 1st September 2024 to 31st August 2025. An approval was obtained from institutional review board before commencement of the study (Reference: 308/3/1/Trg). The sample size of 147 participants was calculated by assuming the frequency of hypocalcemia in children with febrile seizures as 58%¹⁰, taking confidence level of 95% and confidence limit of 8%. The children aged 6 months to 5 years who presented with febrile seizures in department were recruited for the study after taking an informed consent from study participants. A non-probability consecutive sampling technique was employed, regardless of gender and race. Children with known neurological diseases like epilepsy, cerebral palsy, metabolic disorders, renal disease, or those already receiving calcium or vitamin D supplementation were excluded from the study.

Demographic and clinical information including age, gender, weight, height, core body temperature, and number of seizure episodes was recorded using a pre-designed proforma. Hypocalcemia was defined according to age-appropriate reference ranges Serum calcium level was considered normal between the ranges of 8.5 to 10.5 mg/dl.¹¹ The serum level below 8.5mg/dl was considered as hypocalcemia. All the samples were taken using aseptic technique in standardized laboratory and assessment was done using Atomic Absorption Spectrometry.

Data were analyzed using SPSS version 25. The descriptive statistics were calculated for demographic and clinical variables. The continuous variables (age, corebody temperature, weight, height and serum calcium) were not normally distributed (Shapiro wilk $p < 0.05$), so median and Interquartile range (IQR: 25th-75th Percentile i.e. Q1-Q3) were expressed. Categorical variables were expressed as percentages. Binary logistic regression was performed to identify independent predictors of hypocalcemia alongwith adjusted odds ratio (aOR). A p -value ≤ 0.05 was considered statistically significant. The rules of declaration of Helsinki were followed throughout the study.

RESULTS

A total of 147 participants were recruited in our study, comprised of 85 (57.8%) males and 62 (42.2%) females. Hypocalcemia was observed in 44(29.9%) and normocalcemic participants were 103(70.1%). A total 98 (66.7%) patients had only 1 episode of seizures, while 49 (33.3%) had more than 1 episode.

TABLE-I demonstrates the basic profile of study participants.

Binary logistic regression showed a significant model fit (Omnibus Chi-square = 36.82, $df = 6$, $p < 0.001$) with -2 Log Likelihood = 142.61, Cox & Snell $R^2 = 0.222$, and Nagelkerke $R^2 = 0.314$. Table II presents the results of the logistic regression analysis. Logistic regression analysis indicates that seizure number ($p=0.001$) and age ($p=0.024$) are significant predictors of hypocalcemia, with more than one seizure episode and younger age associated with higher odds of the condition.

TABLE-I

Basic Profile of study population (n=147)

Study Variables	Hypocalcemic Participants N=44	Normocalcemic Participants N=103
Demographics		
Males (Frequency)	24(54.5%)	61 (59.2%)
Females (Frequency)	20(45.5%)	42 (40.8%)
Median age (IQR*)	2.50 (1.5-3.0)	3.50 (3.0-4.0)
Anthropometrics		
Median Weight (IQR*)	9.0 (7.0-10.75)	11.00 (8.0-14.0)
Median Height (IQR*)	76.50 (65.00-85.75)	90.0 (76.0-98.0)
Median core body temperature		
(IQR*)	103.25 (103.0-104.0)	103.20(102.10-104.0)
Median Serum Calcium level		
(IQR*)	6.72 (6.26-7.03)	9.0 (8.80-9.50)
Seizure episodes (Frequency)		
1	21(47.7%)	77(74.8%)
>1	23(52.3%)	26(25.2%)

IQR* : Interquartile range Q1-Q3

TABLE-II

Logistic regression analysis of study variables

Study Variables	B	SE	Wald	P-Value	Exp (B)
Number of seizures (>1 episode)	-1.482	0.438	11.460	0.001	0.227
Gender	-0.163	0.428	0.145	0.703	0.849
Age	-0.535	0.237	5.111	0.024	0.586
Core-body temperature	-0.043	0.047	0.852	0.356	0.958
Weight	0.117	0.106	1.231	0.267	1.124
Height	-.049	0.027	3.350	0.067	0.952
Constant	8.978	5.088	3.113	0.078	7923.512

DISCUSSION

Serum calcium is an integral component of numerous metabolic processes and is vital for the normal functioning of the nervous system.¹² In our study cohort, hypocalcemia was more prevalent among younger children (median age 2.50, aOR 0.586), also the median weight of hypocalcemic children was slightly lower (9.0) than Normocalcemic participants. Existing literature consistently shows that hypocalcemia is more common in younger children from socioeconomically disadvantaged communities, largely due to calcium-deficient lactating mothers and limited access to fortified foods or supplements for both mothers and children.¹³ In Sargodha, disparities in living standards contribute substantially to this issue: rural poverty accounts for 39% of households compared to 19% in the city, approximately 30.3% of urban houses are classified as slums, and nearly 75% of residents in certain clusters lack proper sanitation.¹⁴ These socioeconomic and environmental factors likely exacerbate the risk of hypocalcemia in vulnerable populations.

Hyperthermia did not prove a statistically meaningful relationship in our study cohort ($p > 0.05$). Literature suggests, although raised body temperature releases interleukin 1 β which trigger neuronal excitability and in presence of low serum calcium level it turns into a FS.¹⁵

Comparing our results with Rahman et al., they reported that cases of hypocalcemic fits associated with young age upto 2–12 months (68%), lower body weight in the range of 3–9 kg (75%), while the mean serum calcium level in hypocalcemic was 6.97 ± 0.69 mg/dL.¹⁶

Sahin et al. in their study, evident prevalence of hypocalcemia in 81% of children with febrile seizures ($p = 0.005$), whereas only 48% of children in control group were hypocalcemic.¹⁷

Amjad et al. in their study verified hypocalcemia as a predictor for seizure propensity during fever, as they documented a 68.5% prevalence of hypocalcemia among children presenting with their first afebrile seizure, and a mean serum calcium level of 7.9 ± 1.1 mg/dL.¹⁸

In contrast to above findings, Pabani et al. did not find a significant difference in serum calcium levels between children with febrile seizures and febrile controls, in both their groups 3.3% participants had serum calcium level < 8.8 mg/dL, while 96.66% participants in each group were normocalcemic (8.9 to 11 mg/dL).¹⁹ The variability in data highlights that hypocalcemia may not uniformly contribute to seizure susceptibility across all populations.

Our results showed that the number of seizure episodes proved to be a strong predictor of low serum calcium level (adjusted OR = 0.227). Children who experienced multiple seizure episodes tend to have lower serum levels as compared to other participants.

Similarly, Sarker et al. in their results reported recurrent febrile seizures in 42% of cases, with a mean serum calcium level of 8.28 ± 1.09 mg/dL.¹⁰

In our study, serum calcium levels were analyzed using standardized biochemical methods to minimize the measurement bias. Identification of seizure frequency as the strongest predictor of hypocalcemia, our study produced clinically actionable insights useful for pediatric emergency management.

The single-center study design limits the

generalizability of our findings to broader pediatric populations. Additionally, the absence of long-term follow-up restricted our ability to evaluate post-treatment calcium trends and clinical course of these cases. Future multicenter studies with longitudinal study design for longterm follow up are recommended. Additionally the assessment of ionized calcium (physiologically active fraction) is also desirable for more accurate correlations.

CONCLUSION

Younger age and recurrent seizure episodes are significant predictors of hypocalcemia in children presenting with febrile seizures. These findings emphasize the importance of early detection and timely correction to reduce seizure recurrence and prevent associated complications.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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REFERENCES

1. Leung AK, Hon KL, Leung TN. **Febrile seizures: An overview.** *Drugs Context.* 2018; 7:212536.
2. Jiang Z, Fang C, Peng F, Fan W. **Comparison of clinical characteristics and disease burden of febrile seizures in children with and without COVID-19.** *BMC Pediatr.* 2024 May; 24(1):329.
3. Abbari I, Gueddari W, Bousfiha AA. **An overview of risk factors in children with febrile seizures.** *Tunis Med.* 2024; 102(3):129-33.
4. Tarhani F, Nezami A, Heidari G, Dalvand N. **Factors associated with febrile seizures among children.** *Ann. Med. Surg. (Lond.).* 2022; 75:103360.
5. Al-Ashou SM, Alashou OM, Azeez YT. **The association of serum vitamin D and calcium level with febrile convulsions.** *Regul Mech Biosyst.* 2025; 16(2):e25066.
6. Sultana S, Waheed I, Ahmad SM, Qureshi MN, Siddiqui TS. **Frequency of hypocalcemic seizures in children with afebrile seizure: From 2 months - 2 years in a Tertiary Care Hospital.** *J Islamabad Med Dental Coll.* 2024; 13(2):199-202.
7. Shajari H, Shajari A, Azizkhan H, Barzegari R. **Correlation of serum ferritin and calcium level with febrile seizures: A Hospital-Based Prospective Case-Control Study.** *Maedica (Bucur).* 2021; 16(3):420-5.
8. Zafar N, Javed S, Mandokhel S, Anwar U, Khan Z, Khan AG. **Etiology of seizures in children aged 6 months to 10 years presenting to Tertiary Care Hospital.** *JHRR.* 2024; 4(1):1-6. DOI
9. AbbasiAN, IkramF, ZamanS, NawazSH, HussainS, ShahidH. **Calcium and magnesium levels in children with febrile seizures admitted in a Tertiary Care Hospital.** *PAFMJ.* 2023; 73(5):1364-7.
10. Sarker A, Islam MK, Pal N, Aman S, Sajib MK, Banu NA, et al. **Association of serum calcium and magnesium level with febrile seizure.** *SSMC J.* 2022; 30(1):14-22.
11. Bharill S, Wu M. **Hypocalcemia and hypercalcemia in children.** *Pediatr Rev.* 2023; 44(9):533-6.
12. Kusumi K, Narla D, Mahan JD. **Evaluation and treatment of pediatric calcium disorders.** *Curr. Treat. Options Pediatr.* 2021; 7(2):60-81.
13. Ramdasi AV, Wade M, Inamdar NR. **Clinical spectrum of hypocalcaemia in children.** *Int J Res Med Sci.* 2024; 12(7):2398-409.
14. Abbas A, Ashraf A. **Multidimensional poverty: Quantitative and qualitative analysis from District Sargodha, Pakistan.** *Journal of Asian Development Studies.* 2024; 13(2):1391-1409.
15. Mosili P, Maikoo S, Mabandla MV, Qulu L. **The pathogenesis of fever-induced febrile seizures and its current state.** *Neurosci Insights.* 2020; 15:2633105520956973.
16. Rahman W, Lohana H, Urooj S, Ahmed S, Moeed A, Humayun KN. **Frequency of hypocalcemic fits in children 2 months to 2 years of age, presenting with the first episode of afebrile seizures at hospital settings in urban Pakistan: A cross-sectional study.** *OJPED.* 2020; 10(3):411.
17. Şahin S, Yıldız N, Esenülkü G, Kart PÖ, Kamasak T, Özkaya AK, et . **Serum calcium levels, erythrocyte indices, and associated factors in children with febrile seizures.** *FARABIMEDJ.* 2025; 4(2):17-26.
18. Amjad Z, Afridi JK, Hussain I, Noor H, Ullah S, Ahmadzai MH. **Frequency of hypocalcemia in children aged less than two years presenting with first afebrile seizure.** *IJBR.* 2025; 3(5):1075-80.
19. Pabani GD, Khanna PPC. **Comparison of serum biochemical parameters in children with febrile seizures.** *IJCH.* 2021; 8(5):187-9.

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2	Hina Batool Siddiqui: Data analysis.
3	Waqar Anwar: Data interpretation.
4	Sara Khalid: Critically analysis.
5	Rimsha Iqbal: Data collection.
6	Shanzay Nahal: Critical revision.