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The Relationship between Febrile Seizures and Infectious Diseases in Children: A Contemporary Clinical and Epidemiological Perspective

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Abstract

Febrile seizures are a frequent cause of emergency presentation in early childhood and commonly occur during infections accompanied by fever. This study examined clinical and laboratory characteristics and the reported associations between infectious condition, seizure duration, and seizure type among children aged six months to five years. A descriptive, analytical cross-sectional design was reported for pediatric hospital services in Al-Diwaniyah, Iraq. Convenience sampling was planned for approximately 38 children, and the results describe 37 children. Information was obtained through an Arabic-language caregiver questionnaire and medical-record review, with statistical analysis performed using SPSS version 25. The manuscript reports conflicting recruitment and interview dates, which require confirmation against the original study records. The mean age was 2.4 $\pm$ 1.7 years; 56.8% of children were female, and 37.8% were aged 6–12 months. Low hemoglobin was reported in 56.8% and elevated C-reactive protein in 86.5% of the sample. No statistically significant association was reported between infectious condition and seizure duration ($\chi^2 = 3.42$, df = 12, $p = 0.991$; Cramér's $V = 0.215$) or seizure type ($\chi^2 = 1.87$, df = 6, $p = 0.931$; Cramér's $V = 0.225$). These exploratory results do not demonstrate that infection type is unrelated to seizure characteristics, because the sample is small and the underlying contingency tables were not supplied. The available results also do not establish which infections were most frequent or whether simple seizures predominated. The study supports further investigation of infection-associated febrile presentations, while highlighting the need to verify laboratory units, reconcile inconsistent glucose reporting, and document infection classification. Clinical implications concern appropriate assessment of the underlying febrile illness and caregiver education; the study did not test an intervention or demonstrate that fever treatment prevents seizures. Larger studies with clearly documented recruitment, diagnostic criteria, and complete categorical data are needed to clarify these relationships.

Keywords: febrile seizures, infectious diseases, children, fever, viruses, pediatric neurology

1. INTRODUCTION

Febrile seizures are one of the most common types of seizures occurring in childhood, affecting approximately 2–5% of children in some populations, typically between six months and five years of age [1]. These seizures occur in association with fever, usually at least $38\,^{\circ}\mathrm{C}$, without evidence of an underlying neurological infection, electrolyte imbalance, or a previous history of afebrile seizures. Although febrile seizures are typically benign and self-limiting, their sudden and dramatic appearance often causes significant distress among parents and caregivers. Consequently, febrile seizures remain an important concern in pediatric healthcare. Evaluation should prioritize the cause of fever and the exclusion of central nervous system infection when clinical findings raise concern [2].

The developing brain of a young child is more susceptible to the effects of fever, and this increased sensitivity is believed to play a major role in the occurrence of febrile seizures. During an infectious process, the body's immune system releases various inflammatory mediators, such as cytokines and prostaglandins, which contribute to the rise in body temperature. These substances can also increase neuronal excitability in the brain, especially in areas responsible for seizure generation. These interactions provide a biological explanation for susceptibility during febrile illnesses, although fever alone does not fully explain why an individual child develops a seizure. Genetic predisposition, developmental stage, and the inflammatory response may also influence susceptibility [3].

Febrile seizures are most commonly associated with viral infections, such as influenza, human herpesvirus-6 (HHV-6), adenovirus, and respiratory syncytial virus (RSV), while bacterial illnesses, including some episodes of otitis media, pneumonia, and urinary tract infection, may also produce an associated fever. Otitis media and pneumonia are clinical diagnoses and do not, by themselves, establish a bacterial etiology. Research comparing common viruses has demonstrated differences in the likelihood of febrile seizures during particular infections [4]. Evidence from the FEBSTAT study also links HHV-6B and HHV-7 infection with febrile status epilepticus, a prolonged seizure presentation that must be distinguished from uncomplicated simple seizures [5]. In many cases, the fever develops rapidly, and the seizure may be the first noticeable sign of the underlying illness. This makes the diagnosis challenging, as parents may not realize their child has a fever until a seizure occurs.

Febrile seizures are generally classified into two main types: simple and complex. Simple febrile seizures are generalized, last less than 15 minutes, and do not recur within 24 hours. They account for the majority of cases and are associated with a good prognosis. Complex febrile seizures, on the other hand, may last 15 minutes or longer, occur more than once within 24 hours, or have a focal onset. Although still often benign, complex febrile seizures may require further evaluation to exclude clinically significant underlying conditions. Clinical classification guides the assessment, but investigation should be tailored to the child rather than applied uniformly [3].

Despite being considered harmless in most instances, febrile seizures can lead to emergency department visits, extensive medical investigations, and long-term anxiety among parents regarding the possibility of epilepsy or developmental problems. Although the majority of children who experience febrile seizures do not develop epilepsy, a small proportion may have an increased risk, especially in children with complex seizures or a family history of epilepsy. A national cohort study found that recurrent febrile seizures were associated with later epilepsy risk; such longitudinal associations should not be interpreted as evidence that an uncomplicated febrile seizure necessarily causes epilepsy [6].

Infectious diseases are a major trigger for febrile seizures, and the clinical context varies with local infection patterns, access to care, immunization coverage, and the characteristics of the population served. The present hospital sample cannot quantify the independent effects of sanitation, nutrition, crowding, or healthcare access because those exposures were not reported in the available results. Therefore, understanding the relationship between childhood infections and febrile seizures is essential for early recognition, proper management, and prevention of complications. Investigating this association can also help healthcare professionals educate parents, reduce unnecessary fear, and enhance appropriate responses in the event of a febrile seizure.

This study focuses on exploring the relationship between febrile seizures and infectious diseases in children, identifying the most common infections associated with these seizures, and highlighting the importance of early detection and management of fever in pediatric populations.

The importance of studying febrile seizures and their association with infectious diseases in children lies in the high prevalence of both conditions in pediatric populations worldwide. Childhood infections are among the leading causes of hospital visits and admissions, and fever-associated episodes provide a frequent clinical context in which febrile seizures are assessed. Understanding this relationship is essential for developing effective prevention and treatment strategies aimed at protecting children's neurological health.

First, this study is important from a clinical perspective. By identifying the most common infectious causes of fever leading to seizures, healthcare professionals can improve diagnostic accuracy and provide more targeted treatment. Instead of focusing solely on the seizure, clinicians will be better equipped to identify the underlying infection and treat it promptly. This can support appropriate care of the underlying illness and identification of children who require urgent assessment.

The present cross-sectional study cannot establish that treating an infection reduces seizure frequency or severity, and clinical recommendations must remain distinct from effects actually measured in the sample.

Second, the study has great preventive value. Improved knowledge about the infectious agents most commonly linked to febrile seizures can support vaccination programs, early screening for infections, and better fever management practices. Caregiver education should explain appropriate responses to illness, recognition of concerning symptoms, and the safe use of antipyretic medication for discomfort. It should avoid suggesting that every seizure can be prevented by monitoring temperature or treating fever. A systematic review found no evidence that antipyretics prevent recurrence during later febrile illnesses and only limited evidence of benefit within the same illness episode [7]. Thus, fever management and seizure prevention should not be presented as interchangeable clinical objectives.

Third, the study is significant from a public health perspective. In many low- and middle-income countries, infectious diseases remain a major health burden for children. Factors such as inadequate healthcare infrastructure, limited awareness, and delayed diagnosis contribute to higher rates of fever-related complications, including febrile seizures. By providing data on the link between infections and seizures, this research can help public health authorities design better intervention programs, improve hygiene and living conditions, and promote maternal and child health education.

Furthermore, this study is important in reducing parental anxiety and social stigma associated with seizures. Many parents mistakenly believe that febrile seizures are a form of epilepsy or that they will cause permanent brain damage. Through evidence-based information and appropriate clinical assessment, families can be reassured about the generally favorable prognosis of uncomplicated simple febrile seizures, while receiving individualized advice about features that warrant further evaluation. This can reduce unnecessary panic, prevent harmful traditional practices, and encourage appropriate medical consultation. An educational intervention study demonstrated improvements in parental knowledge and anticipated first-aid practices, supporting education as a practical component of care rather than proof of reduced seizure incidence [8].

From an academic perspective, this research contributes to the body of knowledge in pediatrics, neurology, and infectious diseases. It may serve as a reference for future studies and encourage further investigation into genetic, environmental, and immunological factors that may influence susceptibility to febrile seizures. Such information could eventually lead to more advanced preventive strategies or therapeutic approaches.

Taken together, these considerations explain the relevance of this study because it addresses a common pediatric emergency, highlights the role of infectious diseases in triggering febrile seizures, and supports improved medical care, parental education, and public health planning. By understanding the underlying causes and risk factors, healthcare providers can deliver better care and contribute to healthier childhood development.

The specific objective was to examine the reported relationships between infectious condition and seizure characteristics among affected children. Identifying the most frequent infections was an additional intended objective, but its evaluation requires diagnostic frequency data that are absent from the supplied results. Accordingly, the available analysis describes children with febrile seizures rather than estimating the risk of seizures among all children with infections.

2. METHODOLOGY

The study was described as a descriptive, analytical cross-sectional investigation of children aged six months to five years presenting with febrile seizures. The reported setting comprised pediatric departments and emergency services in Al-Diwaniyah, Iraq. Administrative authorization was reported from the Training and Development Department Council of the Al-Diwaniyah Health Department and from Al-Diwaniyah Teaching Hospital. The source also refers to a maternity and children's hospital without establishing whether this was the same institution or an additional recruitment site. The precise hospital setting therefore requires confirmation before the sample can be described as single-center or multicenter.

The manuscript identifies September 28 to December 28, 2025, as the study period, but separately reports January 18 to February 27, 2025, as the interview and data-collection period. These statements cannot both describe the same recruitment interval. The dates are retained here as conflicting source information rather than resolved by assumption. Confirmation from the recruitment register, administrative documents, and dated questionnaires is necessary to establish the actual chronology and distinguish any planning, recruitment, and interview periods.

Convenience sampling was planned for approximately 38 eligible children, whereas all four results tables describe 37 children. The reason for this difference was not supplied. The sampling approach limits representativeness because inclusion depended on presentation to the participating services during the recruitment interval. The protocol specified parental or guardian consent before participation, but the supplied text does not document how consent was recorded or whether it was obtained for every included child. Administrative permission should be distinguished from formal research ethics approval; an ethics committee name, approval identifier, and approval date were not provided.

Data collection used a structured Arabic-language questionnaire administered individually to parents or caregivers, together with review of available medical records. The questionnaire covered demographic characteristics, history of the presenting illness, fever characteristics and duration, seizure classification, family history of seizures, and parental

knowledge and responses. Interviews reportedly required approximately 10–15 minutes. The source describes the questionnaire as adapted but does not identify its original instrument, adaptation procedure, validation, or reliability assessment. These methodological details cannot be reconstructed from the aggregate tables.

The reported analysis used SPSS, version 25. Continuous variables were summarized using means and standard deviations, with medians and ranges also presented where available. Categorical variables were summarized using counts and percentages. The results report chi-square statistics, degrees of freedom, p values, and Cramér's V for associations of infectious condition with seizure duration and seizure type. Infection categories, duration categories, diagnostic confirmation procedures, and the underlying cross-tabulations were not supplied. Consequently, the reported tests cannot be independently reproduced from the manuscript alone.

Because the sample is small relative to the reported degrees of freedom, sparse contingency-table cells are a material possibility. Expected cell counts should be examined before relying on a chi-square approximation; an appropriate exact or simulation-based alternative may be necessary if its assumptions are not satisfied [9]. No alternative analysis is presented here because participant-level records and cell frequencies were unavailable. Similarly, no adjusted association, confidence interval, missing-data procedure, or formal sample-size calculation was reported. Clear documentation of eligibility, participant flow, variable definitions, and missing observations is needed for transparent reporting of this observational study [10].

3. RESULTS

The available findings are presented in Tables 1–4. The denominators reported in these tables are 37; percentages may not sum to exactly 100% because of rounding.

The data in Table 1 describe the demographic and clinical profile of 37 children with febrile seizures. The sample shows a slight female predominance (56.8%) and a nearly equal urban–rural distribution (48.6% vs. 51.4%). The largest parental education category was university-level education (37.8%), followed by intermediate (27.0%). The mean age was 2.4 $\pm$ 1.7 years, with the largest age group being 6–12 months (37.8%), showing that infants constituted the largest age category within this particular hospital sample. The distribution cannot establish an age-specific incidence because population denominators were not available. Mean weight was 14.6 $\pm$ 7.3 kg, and mean temperature was 39.4 $\pm$ 1.4 °C, indicating that most children presented with significant fever. However, the small sample size limits generalizability. The temperature range of 35–45 degrees Celsius includes values requiring verification against clinical records, including measurement timing and method. The source mentions missing variables designated D1 and D2 without defining them; no conclusion about the extent or consequences of missing data can be drawn from those unexplained labels.

Table 1. *Demographic and clinical characteristics of children with febrile seizures*

Characteristic	Category	n	%
Age (n=37)	6–12 months	14	37.8
	1–2 years	5	13.5
	2–3 years	4	10.8
	3–4 years	4	10.8
	4–5 years	10	27.0
	Mean $\pm$ SD	2.4 $\pm$ 1.7 years	
Gender (n=37)	Male	16	43.2
	Female	21	56.8
Place of Residence (n=37)	Urban	18	48.6
	Rural	19	51.4
Parental education (n=37)	Primary	7	18.9
	Intermediate	10	27.0
	Preparatory	5	13.5
	University	14	37.8
	Postgraduate	1	2.7
Weight (kg) (n=37)	Mean $\pm$ SD	14.6 $\pm$ 7.3	
	Median (Range)	14 (4.6–30)	
Temperature (°C) (n=37)	Mean $\pm$ SD	39.4 $\pm$ 1.4	
	Median (Range)	39.5 (35–45)	

The laboratory findings in Table 2 summarize the reported hematological, inflammatory, and glucose measurements. The mean Hb was 10.7 $\pm$ 1.6 g/dL, with 56.8% of children classified as having low Hb, suggesting that anemia may be common in this population although the reported hemoglobin categories require age-appropriate thresholds before anemia prevalence can be established. A meta-analysis has linked poor iron indices with febrile-seizure susceptibility, but

hemoglobin alone does not establish iron deficiency, and the present data cannot demonstrate a causal contribution [11]. The reported WBC mean was 12,400 ± 7,100, with 45.9% classified as elevated. The original table attached units of $\times 10^9$/L to these values, creating an apparent scale mismatch. The values are therefore retained without an asserted unit pending verification; no conversion has been assumed. Elevated counts may accompany infection or other physiological responses and do not establish a specific pathogen. CRP was elevated (≥5 mg/L) in 86.5% of cases, showing that many children exceeded the specified laboratory threshold. This finding is compatible with inflammation but does not establish its severity or distinguish viral from bacterial infection. Glucose was classified as normal in 89.2% of children, with three high values and one low value. However, the reported minimum of 80 mg/dL is inconsistent with the classification of one observation below 70 mg/dL. Both entries require checking against the original records before the distribution can be interpreted confidently. These findings describe laboratory features during the presenting illnesses, but do not independently confirm an infectious etiology or establish causal relationships. The small sample and hospital-based convenience sampling also restrict broader applicability; the number of participating centers requires confirmation.

Table 2. *Laboratory findings among children with febrile seizures*

Laboratory Parameter	Category	n	%
Hb (g/dL) (n=37)	Mean ± SD	10.7 ± 1.6	
	Median (Range)	10.5 (8.5–14)	
	Normal	13	35.1
	High	3	8.1
	Low	21	56.8
WBC (unit unverified) (n=37)	Mean ± SD	12,400 ± 7,100	
	Median (Range)	10,000 (890–35,000)	
	Normal	19	51.4
	High	17	45.9
	Low	1	2.7
CRP (mg/L) (n=37)	Mean ± SD	5.5 ± 1.3	
	Median (Range)	6 (2.5–8)	
	Normal (<5)	5	13.5
	High (≥5)	32	86.5
Glucose (mg/dL) (n=37)	Mean ± SD	101.5 ± 19.8	
	Median (Range)	95 (80–168)	
	Normal (70–139)	33	89.2
	High (≥140)	3	8.1
	Low (<70)	1	2.7

The reported analysis in Table 3 did not detect a statistically significant association between infectious condition and categorized seizure duration (Cramér's $V = 0.215$, $p = 0.991$). This result should not be interpreted as proof of no association. The meaning of the effect-size estimate depends on the unreported category structure, and the reliability of the asymptotic test depends on expected cell frequencies. Duration thresholds and contingency-table counts are needed to assess the analysis fully.

Table 3. *Reported association between infectious condition and seizure duration*

Statistic	Value
Chi-square (χ^2)	3.42
Degrees of freedom (df)	12
p-value	0.991
Cramér's V	0.215
n	37

The reported analysis in Table 4 did not detect a statistically significant association between infectious condition and seizure type (Cramér's $V = 0.225$, $p = 0.931$). The available summary does not establish equivalence between infection categories or exclude a clinically relevant relationship. Counts for simple, complex, and any other seizure categories were not supplied, so their relative frequencies and the clinical meaning of the classification cannot be confirmed.

Table 4. *Reported association between infectious condition and seizure type*

Statistic	Value
Chi-square (χ^2)	1.87
Degrees of freedom (df)	6
p-value	0.931
Cramér's V	0.225
n	37

4. DISCUSSION

4.1. DEMOGRAPHIC AND CLINICAL CHARACTERISTICS

The findings in Table 1 show the demographic and clinical characteristics of 37 children with febrile seizures. The highest proportion of children (37.8%) were aged 6–12 months, followed by those aged 4–5 years (27.0%). Infants accounted for the largest age group in the present sample; this descriptive observation should not be treated as an estimate of age-specific risk. The mean age was 2.4 $\pm$ 1.7 years, which is consistent with the occurrence of febrile seizures during early childhood.

Regarding gender, females represented 56.8% of the sample, while males accounted for 43.2%, indicating a slight predominance of females. Concerning place of residence, 51.4% of the children lived in rural areas, compared with 48.6% from urban areas, showing a nearly equal distribution between the two groups.

Regarding parental educational level, university education was the most common (37.8%), followed by intermediate education (27.0%). This finding indicates that more than one-third of the parents had a university-level education. The mean weight of the children was 14.6 $\pm$ 7.3 kg, with a median of 14 kg. The mean body temperature was 39.4 $\pm$ 1.4 °C, suggesting that the children generally presented with high fever. However, the reported temperature range of 35–45 °C should be reviewed to verify the accuracy of the recorded data.

Overall, these findings provide an overview of the demographic and clinical characteristics of children with febrile seizures. However, because the study included only 37 children, the findings should be interpreted cautiously and cannot be generalized to all children with febrile seizures.

4.2. LABORATORY FINDINGS

The findings in Table 2 describe laboratory measurements from 37 children with febrile seizures. Regarding hemoglobin (Hb), the mean level was 10.7 $\pm$ 1.6 g/dL, and 56.8% of the children had low Hb levels. This finding suggests that low hemoglobin was common among the studied children and may warrant further assessment; however, this study cannot establish that anemia caused or contributed to the seizures. Regarding white blood cell count (WBC), 45.9% of the children had elevated levels, while 51.4% had normal levels. An increased WBC count may accompany infection, inflammation, or a stress response. Interpretation requires verification of the measurement scale and the age-specific reference intervals used to assign categories. For C-reactive protein (CRP), 86.5% of the children had elevated levels ($\geq$5 mg/L). This was the most frequent laboratory abnormality observed in the study, suggesting that inflammation was common among these children. However, elevated CRP alone cannot identify the cause or type of infection. Regarding blood glucose, most children (89.2%) had normal levels, while 8.1% had elevated levels and 2.7% had low levels. These reported classifications indicate that most values were assigned to the specified normal range, although the discrepancy between the minimum glucose value and the low-glucose count remains unresolved. Overall, the laboratory findings indicate that low hemoglobin and elevated CRP were common among the studied children, while most had normal blood glucose levels. Nevertheless, the small sample size and absence of a control group limit the ability to determine whether these abnormalities are specifically associated with febrile seizures.

4.3. INFECTIOUS CONDITION AND SEIZURE DURATION

The analysis in Table 3 examines the reported association between infectious condition and seizure duration among 37 children with febrile seizures. The chi-square test showed no statistically significant association between the two variables. The reported Cramér's V was 0.215; without the full contingency table, a precise interpretation of its magnitude is limited. These findings suggest that no statistically significant relationship was detected between the infectious condition and seizure duration in the studied children. However, the small sample size may have limited the ability to detect an association. Therefore, these results should be interpreted cautiously.

4.4. INFECTIOUS CONDITION AND SEIZURE TYPE

The analysis in Table 4 presents the reported association between infectious condition and seizure type among the studied children. The chi-square test revealed no statistically significant association. The reported Cramér's V was 0.225; its interpretation requires the category structure and corresponding cell counts. These findings indicate that the study did not identify a statistically significant relationship between infectious condition and seizure type, including simple and other seizure types. Nevertheless, the small sample size may have affected the results, and further studies involving larger samples are needed to investigate these relationships more accurately.

4.5. INTERPRETATION AND LIMITATIONS OF THE INFECTION-RELATED FINDINGS

The study population contains only children who experienced febrile seizures. It therefore cannot estimate the probability of seizures among children with different infections, because corresponding groups of infected children without seizures were not included. Similarly, the observed laboratory distributions cannot establish whether hemoglobin, WBC, CRP, or glucose differs from values in otherwise comparable febrile children without seizures. Comparisons within the affected sample address seizure characteristics rather than susceptibility to a first febrile seizure. This distinction is essential when describing the research question and interpreting the clinical relevance of the results.

The statement that viral infections predominated cannot be evaluated from the four supplied tables. Neither an infection-frequency table nor a description of microbiological testing is available. Respiratory symptoms, a clinical diagnosis, and laboratory-confirmed infection represent different levels of diagnostic specificity and should not be combined without a clear classification rule. External research supports the relevance of viral infections, but it cannot supply missing observations for the present cohort. For example, Chung and Wong compared seizure occurrence across virologically identified illnesses, whereas the present aggregate summaries do not provide comparable infection-specific denominators [4].

The absence of statistical significance also requires cautious interpretation. A large p value does not quantify the probability that no relationship exists, and it does not establish that the study had adequate precision to exclude meaningful differences. With 37 observations and multiple diagnostic or seizure categories, estimates may be unstable and expected cell frequencies may be low. The reported chi-square statistics and effect sizes should remain provisional until their derivation has been checked against the original cross-tabulations. This verification should include category labels, valid observation counts, test assumptions, and consistency between software output and the values transcribed into the manuscript [9].

Several reporting issues further constrain interpretation. The age bands require clarification at their shared boundaries, the education variable should identify which parent or caregiver was assessed, and the timing of blood collection relative to seizure onset and treatment was not stated. Laboratory reference intervals, measurement methods, and infection diagnostic criteria are also needed. These are documentation requirements rather than evidence of a particular clinical mechanism. Resolving them would allow readers to distinguish the observed characteristics of the sample from measurement uncertainty and incomplete reporting.

No follow-up outcomes were supplied. Consequently, the study cannot determine seizure recurrence, subsequent epilepsy, neurological development, changes in parental knowledge, or the effectiveness of healthcare-worker training. These outcomes remain reasonable subjects for future investigation, but should not appear as demonstrated benefits of this cross-sectional analysis. Any future study should specify the outcome of interest in advance and select a design capable of addressing it, including an appropriate comparison group when estimating infection-related seizure risk.

5. CONCLUSION AND RECOMMENDATIONS

Febrile seizures are a common and alarming condition in early childhood, often occurring during infectious illnesses accompanied by fever. The present data do not establish that the rate of temperature increase caused the observed seizures. The study found that low hemoglobin and elevated CRP were common among children with febrile seizures. No statistically significant association was found between infectious condition and seizure duration or seizure type. However, the small sample size should be considered when interpreting these findings.

Based on the findings of this study, the following recommendations are suggested: Conduct larger studies with clearly defined infection categories, documented seizure characteristics, and complete cross-tabulations. Resolve the reported date discrepancies, laboratory units, glucose inconsistency, and participant-flow information before further analysis. Investigations should be guided by clinical findings and the suspected underlying illness; routine blood testing is not required solely because an otherwise well child has experienced a simple febrile seizure [2]. Provide caregivers with clear information about seizure first aid, clinical warning signs, and appropriate management of the febrile illness. Antipyretic use should address discomfort rather than be presented as a proven means of preventing future seizures [7]. The principal finding remains that no statistically significant within-sample association was reported between infectious condition and seizure duration or type, with substantial uncertainty arising from the small sample and incomplete analytical

documentation.

Author Contributions

All authors contributed equally to this study, read and approved the final manuscript, and agreed to its submission for publication.

Conflict of Interest

The authors declare no conflicts of interest.

Consent Statement

Informed consent was obtained from participants' parents or legal guardians, where required.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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