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Frequency of Respiratory Tract Infections in Children of 6 Months to 6 Years Admitted with Simple Febrile Seizures at Ayub Teaching Hospital Abbottabad

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ABSTRACT

Background: Febrile seizures among children are common and can be influential for the family and child alike. Determination of underlying factors, especially respiratory tract infections (RTIs), is critical in the determination of the likely precipitating factors for febrile seizures. RTIs as precipitating factors for febrile seizures have been studied extensively, but the link between RTIs and demographic factors is still unclear. **Objective:**To determine the frequency of respiratory tract infection in children of 6 months to 6 years admitted with simple febrile seizure at Ayub Teaching Hospital, Abbottabad. **Study Design:** Cross-sectional study. **Duration and Place of Study:** The study was conducted from May 2024 to November 2024 at the Department of Pediatrics Medicine, MTI-Ayub Teaching Hospital in Abbottabad. **Methodology:** 111 children aged between 6 months and 6 years were selected. Children with fever and diagnosed with simple febrile seizure by a pediatrician were included. Central nervous system infections, gastroenteritis with dehydration, and metabolic and developmental disorders were excluded. **Results:** Our study found that 30.6% of the children diagnosed with simple febrile seizures also had an RTI. The demographic findings indicated that most were male (54.1%), urban residents (65.8%), and from low-income families (45%). The mean was 3.45 ± 1.72 years, with a mean duration of symptoms of 30.53 ± 11.01 hours and mean time for convulsions of 57.07 ± 32.95 seconds. **Conclusion:** This study concluded that respiratory tract infections are a significant marker for febrile seizures, particularly in children with a family history of such seizures.

INTRODUCTION

Respiratory tract infections (RTIs) represent the majority of cases of morbidity in children and most frequently occur in the winter and most often in conjunction with febrile seizures.[1] The respiratory tract is either the upper respiratory tract made up of the nose, the throat, and the sinuses or the lower respiratory tract made up of the bronchi and the lung.[2] The most common etiologic reasons for RTIs are viruses such as respiratory syncytial virus (RSV), influenza, and rhinovirus but also bacterial etiologic reasons such as Streptococcus pneumoniae and Haemophilus influenzae.[3] The fever induced by the infection may predispose the child towards the development of the condition of febrile seizures, which typically occurs between the latter half of the first 6 months and 5 years of life.[4] The seizures are typically alarming but otherwise not harmful and have no sequelae.

The febrile seizures in the child with an RTI occur in the context of feverish acute illness and the fever due to the infection triggers the seizure.[5] However, the mechanism whereby fever triggers the seizure is not well understood, but is thought related to the acute rise in body temperature which the immature brain is known to be sensitive to.[6] Febrile seizures are generally not treatable and self-limiting, however distressing to the parents and child.[7] In most cases, the underlying infection resolves with appropriate supportive care, including antipyretics to manage fever, hydration, and rest.[8] However, it is essential to differentiate between a febrile seizure and other more serious conditions such as meningitis or encephalitis, which may also present with fever and seizures.[9]

Treatment of respiratory tract infection with fever and seizure in children includes treatment of the causative infection and seizure.[10] If fever is present, reduction of fever with antipyretic medication (acetaminophen or ibuprofen) reduces the risk of seizures.[11] First ensure the surroundings are safe, roll the child onto their side to prevent aspiration, and do not stick anything into the child's mouth. In cases where a child experiences a prolonged seizure or multiple seizures, medical therapy with anticonvulsants may be needed.[12] Usually with febrile seizures, there are no problems with brain

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complications after a long interval, but those with a previous medical history of febrile seizures are especially monitored if the seizures are recurrent or suggestive of severe infections.[13]

A study found that 17 out of 100 children (17%) admitted with simple febrile seizures had lower respiratory tract infections, which was identified as the most common site of infection.[14]

The frequency of respiratory tract infections in children aged 6 months to 6 years admitted with simple febrile seizures remains underexplored. Understanding the prevalence and nature of respiratory infections in this group is essential for early detection, effective treatment, and reducing complications. Given the potential overlap between febrile seizures and respiratory infections, this study aims to provide valuable insights into the relationship between the two, ultimately improving clinical management and outcomes for affected children.

METHODOLOGY

This cross-sectional study was conducted from May 2024 to November 2024 at the Department of Pediatrics Medicine, MTI-Ayub Teaching Hospital in Abbottabad. A total of 111 children, aged 6 months to 6 years, were selected based on a 17% prevalence of respiratory tract infections in children admitted with simple febrile seizures.[14] The sample size was determined using a 95% confidence level and a 7% margin of error, based on the WHO formula for sample size calculation.

The inclusion criteria included children admitted to the Pediatrics Ward with fever (body temperature >100.4°F) for the past 24 to 48 hours and diagnosed with simple febrile seizure based on clinical evaluation by a consultant pediatrician. Children of both genders, within the age range of 6 months to 6 years, were included in the study. Exclusion criteria encompassed children with signs of central nervous system infections, gastroenteritis with dehydration, developmental delays, neurometabolic disorders, a history of afebrile seizures, prior administration of intravenous fluids or diuretics, or conditions like malabsorption syndrome or severe acute malnutrition.

After approval from the Hospital Ethical Committee and the REU Department of CPSP Karachi, informed consent was obtained from the parents or guardians of the participants. Demographic data, including age, gender, residence, and social class, were recorded. Children who presented with clinical symptoms such as cough, runny nose, nasal congestion, sore throat, or difficulty breathing, along with objective signs of infection (fever ≥100.4°F or 38°C) recorded at the time of seizure or within 24 hours, were diagnosed with respiratory tract infection. Data regarding age, body temperature, gender, convulsion time, family history of febrile seizures, duration of symptoms, and other relevant factors were collected and documented.

The data were analyzed using SPSS software (version 23.0). Descriptive statistics were employed, with mean ± standard deviation or median (interquartile range) calculated for continuous variables, after assessing normality using the Shapiro-Wilk test. Categorical variables, were summarized as frequencies and percentages. The association between respiratory tract infection and demographic factors was examined using chi-square or Fischer's Exact Test, with statistical significance set at $P \leq 0.05$. The results were presented in the form of charts, tables, or graphs.

RESULTS

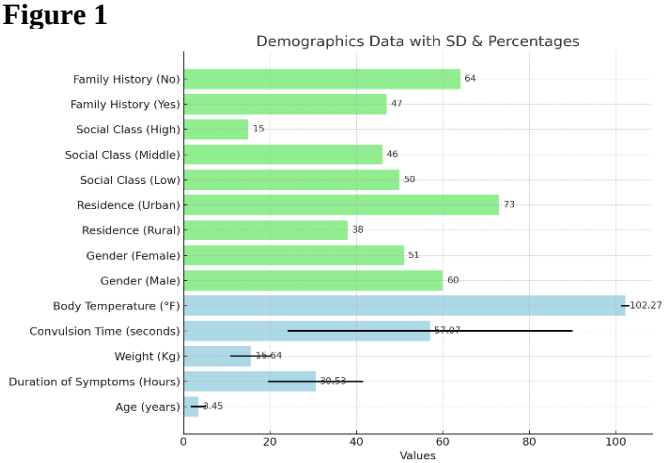
Patient demographics include a mean age of 3.45 ± 1.72 years, a symptom duration of 30.53 ± 11.01 hours, and a weight of 15.64 ± 4.83 kg. The convulsion time has a mean of 57.07 ± 32.95 seconds, with an average body temperature of 102.27 ± 0.99°F. Regarding gender, 60 (54.1%) of the patients were male, while 51 (45.9%) were female. In terms of residence, 38 (34.2%) lived in rural areas, and 73 (65.8%) were from urban areas. For social class distribution, 50 (45%) patients were from low-income families, 46 (41.4%) were from middle-income families, and 15 (13.5%) were from high-income families. A family history of simple febrile seizures was reported in 47 (42.3%) of the patients, while 64 (57.7%) did not have such a history (as shown in Table-1).

Table 1

Patient Demographics

Demographics		Mean ± SD / n (%)
Age (years)		3.450±1.72
Duration of Symptoms (Hours)		30.531±11.01
Weight (Kg)		15.641±4.83
Convulsion Time (seconds)		57.072±32.95
Body Temperature (°F)		102.273±0.99
Gender	Male	60 (54.1%)
	Female	51 (45.9%)
Residence	Rural	38 (34.2%)
	Urban	73 (65.8%)
Social Class	Low	50 (45%)
	Middle	46 (41.4%)
	High	15 (13.5%)
Family History of Simple Febrile Seizures	Yes	47 (42.3%)
	No	64 (57.7%)

Figure 1



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The prevalence of respiratory tract infections among the patients showed that 34 (30.6%) had an RTI, while 77 (69.4%) did not (as shown in Table-2).

Table 2
Respiratory Tract Infection

Respiratory Tract Infection	Frequency	Percentage
Yes	34	30.6%
No	77	69.4%
Total	111	100%

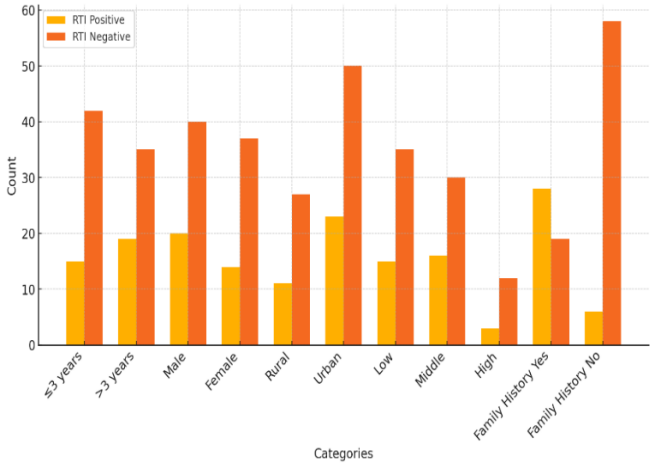
The age group ≤3 years had 15 (26.3%) cases of RTI, while 42 (73.7%) did not; for the age group >3 years, 19 (35.2%) had RTI, and 35 (64.8%) did not, with a p-value of 0.311, indicating no significant association. In terms of gender, 20 (33.3%) males had RTI, while 40 (66.7%) did not, compared to 14 (27.5%) females with RTI and 37 (72.5%) without, with a p-value of 0.503, showing no significant gender difference. Regarding residence, 11 (28.9%) rural patients had RTI, and 27 (71.1%) did not, while 23 (31.5%) urban patients had RTI, and 50 (68.5%) did not, with a p-value of 0.781, suggesting no significant difference based on residence. For social class, 15 (30%) from the low-income group had RTI, 16 (34.8%) from the middle-income group, and 3 (20%) from the high-income group, with p = 0.561 (Fisher's Exact Test), indicating no significant association with social class. However, there was a significant association with family history of simple febrile seizures, where 28 (59.6%) of those with a family history had RTI, compared to 6 (9.4%) without a family history, with a p-value of <0.001, indicating a highly significant association (as shown in Table-3).

Table 3
Association of Respiratory Tract Infection with Demographic Factors

Demographic Factors		Respiratory Tract Infection		p-value
		YES n (%)	NO n (%)	
Age (years)	≤3	15 (26.3%)	42 (73.7%)	0.311
	>3	19 (35.2%)	35 (64.8%)	
Gender	Male	20 (33.3%)	40 (66.7%)	0.503
	Female	14 (27.5%)	37 (72.5%)	
Residence	Rural	11 (28.9%)	27 (71.1%)	0.781
	Urban	23 (31.5%)	50 (68.5%)	
Social Class	Low	15 (30%)	35 (70%)	0.561*
	Middle	16 (34.8%)	30 (65.2%)	
	High	3 (20%)	12 (80%)	
Family History of Simple Febrile Seizures	Yes	28 (59.6%)	19 (40.4%)	<0.001
	No	6 (9.4%)	58 (90.6%)	

*Fischer Exact Test

Graph 1: *Stratification of Respiratory Tract Infection with Demographic Factors*



DISCUSSION

In our study, 30.6% of the children with simple febrile seizures also had an RTI, with none of the correlations between RTI and gender, residence, social class, or age being statistically significant. However, there was a statistically significant correlation between family history of simple febrile seizures and having an RTI. This would be consistent with the hypothesis that children with a family history of febrile seizures would be more vulnerable to infections through genetic or environmental factors that make them susceptible to both conditions.

Our patient population was defined by a mean age of 3.45 ± 1.72 years, a duration of symptoms of 30.53 ± 11.01 hours, and a weight of 15.64 ± 4.83 kg, with a mean time of seizure being 57.07 ± 32.95 seconds. The mean body temperature was 102.27 ± 0.99°F. With respect to gender, we had 54.1% male and 45.9% female patients. Our population was comprised of more urban residents (65.8% vs. 34.2% in the countryside), and most (45%) were from the lower classes, with 42.3% having family history of simple febrile seizures. Our demographic pattern is in agreement with that described in various studies, particularly with respect to gender, age, and frequency of febrile seizures in male children.[15-17] The prevalence of respiratory tract infections (RTI) among our study population was 30.6%, with no difference observed with respect to age, gender, residence, or social class, with the exception that there was a strong correlation with family history of febrile seizures, with 59.6% having RTI among the family history group compared with a paltry 9.4% among the non-family history group (p < 0.001).

Compared with previous studies, there is a notable level of similarity, particularly in the prevalence of RTIs as the precipitating factor for febrile seizures. For instance, Eskandarifar et al. reported that the most common cause of febrile seizures in their population was upper respiratory tract infections, in 42.8% of children.[18]

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Changty et al. also reported that respiratory infections were the most common precipitants for febrile seizures in their population of 50 children, also supporting the link between RTIs and febrile seizures.[15] Pradeep G.C. et al. (2021) also reported that the most common cause of febrile seizures was upper respiratory tract infections, a finding that is in agreement with our study, indicating a global trend that RTIs is a major precipitating factor.[19] Further, Rahman et al. in Bangladesh reported respiratory infections as a major precipitant for febrile seizures, a finding in agreement with our study, which found that there was no gender nor residence but a strong link with family history.[18]

However, our study finding that there was no statistically significant correlation between RTIs and gender, age, social class, or residence contradicts studies that report demographic differences in the occurrence of febrile seizures in relation to these variables. In Laishram et al., for example, occurrence of febrile seizure was significantly more in children less than two years, and male preponderance was reported.[21] Similarly, Biswas et al. found that febrile seizure was more in males and that the most frequent etiology of fever was the upper respiratory tract infections.[16] The absence of demographic correlations in our study could be attributed to the small sample population, which was also comparatively homogenous in gender and social class, thus resulting in these demographic variables having no statistically significant difference in our population.

One of the most important findings in our study was the strong connection between family history of simple febrile seizures and occurrence of RTI. This is consistent with reports by Eskandarifar et al. and Gourabi et al., which found that family history was a primary risk factor for febrile seizures.[18,22] In both studies, children with a family history of febrile seizures were more likely to experience febrile seizures, suggesting that genetic susceptibility was a primary factor in the occurrence of febrile seizures, particularly when coupled with environmental triggers such as respiratory infections.

Furthermore, in Rahman et al., the study found that seasonal variations, particularly in the winter and monsoon seasons, contributed to the higher incidence of febrile seizures. Our study did not specifically investigate seasonal patterns, but it would be valuable to explore this aspect in future studies, particularly given the prominence of respiratory infections as a common cause of febrile seizures.[20]

Our results highlight the importance of considering genetic predispositions alongside environmental factors such as infections in understanding the incidence and recurrence of febrile seizures. Further multicenter and longitudinal studies would provide more robust data and help refine our understanding of the risk factors and triggers for febrile seizures.

As with any study, there were certain limitations that must be mentioned. First, this was a single-center study, which might restrict generalizability of the findings to a larger population. The sample size in the study, which was fairly modest, might also be a factor in the inability to attain statistical significance with respect to certain demographic variables, such as residence and age. Second, the cross-sectional nature of the study excludes evaluating causal relationships between the observed factors and the occurrence of febrile seizures. Finally, the lack of long-term or seasonal information excludes comprehensive exploration of patterns in febrile seizures by time of year or over extended periods. Larger, multicenter populations and longer durations of follow-up in subsequent studies would be required to address these deficiencies.

CONCLUSION

Our results have confirmed that respiratory tract infections are a primary precipitant for febrile seizures in children, with a strong relationship demonstrated in children with a family history of febrile seizures. With the prevalence of RTI as a precipitating factor, our results emphasize the importance of early diagnosis and control of such infections in the prevention of febrile seizures, particularly in children with a family history.

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***Author Contributions**

The authors have played key roles in the development of this manuscript as outlined below:

Dr. Maria Khalid was responsible for the initial study design, drafting the manuscript, and gathering hospital data.

Dr. Shahzad Najeeb provided valuable input in refining the article, conceptualizing the study, and analyzing and interpreting the data.

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