Febrile Seizures in Children and its Association with Bacterial Infection - A Hospital based Study

Mahesh Awariwar¹, Shiv Narayan Panda²

ABSTRACT

Introduction: Simple febrile seizures are the most common convulsive disorder of childhood. As bacterial infection and febrile seizures are common during early childhood, it was postulated that some association may exist between these two clinical conditions. So this research was undertaken to study the association of bacterial infection with febrile seizures in children.

Material and Methods: 100 children between 6 months to 05 years of age admitted with febrile seizures were included in this study. Patients were divided into three age groups: age group 6 months to 1 years, age group more than 1 to 2 years and age group more than 2 years to 5 years. Variables including age, sex, type of seizure, associated symptoms, family history of seizure or epilepsy, past history of seizures, laboratory test including blood and urine cultures were recorded.

Results: Total 15% had positive blood culture. *Streptococcus pneumoniae* was the most common organism in blood culture. Total 7% had positive Urine culture. *E. coli* was found to be the common organism in urine culture.

Conclusion: Even though viruses form major precipitating agents for febrile convulsions, bacterial infection should be ruled out in all children presenting with febrile seizures.

Keywords: Febrile Seizures, Bacterial Infection

INTRODUCTION

Simple febrile seizures are the most common convulsive disorder of childhood and a frequent cause of visits to the emergency department (ED).¹ Febrile seizures (FS) are typically divided into two types, “simple” and “complex”. A simple FS comprises of generalised tonic-clonic activity without focal features, of less than 15 minutes duration, without a recurrence in the subsequent 24 hours and resolving spontaneously.²,³,⁴,⁶

The incidence in the world varies between 5–10% (India), 8.8% (Japan), and 14% (Guam).³ Between 9% and 35% of all first FS are complex.⁵,⁸

Febrile seizures occur when a susceptible child of a critical age has fever. The fever is typically higher than in control children with a similar illness, although the seizure does not always occur at the same time as the peak temperature or necessarily at the onset of fever.⁵ Any viral or bacterial illness may provoke FS, and this is also (rarely) true for immunisation.⁹,¹⁰

In addition pyrexia may follow an afebrile tonic-clonic seizure, although this will rarely exceed 38°C. Ear, throat, lower respiratory, urinary tract, and a CNS infection should be considered as possible sources of any febrile illness. Routine blood tests are not recommended unless where clinically indicated.¹¹,¹² Interestingly, the risk of bacteraemia would appear to be the same in children with fever with or without simple febrile seizures.¹¹ Each child must therefore be evaluated individually and carefully.

So this research was undertaken to study the association of bacterial infection with febrile seizures in children.

MATERIAL AND METHODS

The study was done on 100 consecutive cases of simple febrile seizures admitted to paediatric ward of a tertiary care hospital in southern India to study epidemiological and precipitating factors of febrile seizures and to study incidence of bacterial infection in case of febrile seizure in children between the age group of 6 month to 5 years. Ethical clearance was taken from the hospital ethical committee.

Patients were divided into three age groups: age group 6 months to 1 years, more than 1 to 2 years and 2 to 5 years. Variables including age, sex, associated symptoms, laboratory test including blood and urine cultures were recorded. Culture samples were collected before starting antibiotics.

The following definitions, terms and diagnostic criteria were used in accordance with specifications given in standard textbooks.

1. A simple febrile seizure is a primary generalized, usually tonic-clonic, attack associated with fever, lasting for a maximum of 15 min, and not recurrent within a 24-hour period. A complex febrile seizure is more prolonged (>15 min), is focal, and/or recurs within 24 hr. Febrile status epilepticus is a febrile seizure lasting >30 min.²

2. Fever: Measurements of axillary temperature more than 37.2°C or 99°F

3. Bacteraemia was defined as a blood culture obtained from a patient at initial presentation that was positive for pathogenic bacteria.

4. UTI - Growth of single urinary pathogen at a concentration of 10⁵ CFU/ml

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Clinical History
- Patients Name, Age, Sex.
- History of fever.
- History of precipitating factors (like cough, cold rash, loose stools, vomiting, irritability, ear discharged etc).

Clinical Examination
A detailed general and systemic examination will be done in all cases to find out the foci of infection.

Laboratory Investigations
Necessary investigations were done by obtaining informed consent from the patient’s parents.
- Blood culture and sensitivity.
- Urine culture and sensitivity.
- Stool routine, culture and sensitivity.

Inclusion criteria
a) Children between 6 month to 5 years who presented with febrile seizures.

Exclusion criteria
a Who have history of Afebrile Seizures.
b Those who have received antibiotics prior to hospitalisation.
c Children less than 6 month and more than 5 years of age.
d Those who have signs and symptoms of meningitis (e.g., neck stiffness, Kernig sign, Brudzinski sign), or history or examination suggests the presence of meningitis or intracranial infection.

STATISTICAL ANALYSIS
Following statistical methods were employed in the present study.
i. Chi – square test
ii. Anova test
iii. Student t-Test
iv. All the statistical calculations were done through SPSS (statistical Presentation System Software).

RESULTS
Prevalence of seizures in different age groups: Occurrence of seizures was highest (35%) in the age group between 6 month to 1 year, followed by 34% in age group of more than 1year to 2 year and 31% in age group of more than 2 year to 5 year.(Table 1)

Febrile seizures- precipitating factors: Fever was the predominant symptom (100%) followed by cough (51%), cold (32%), rash (31%), loose stools (27%) and vomiting (26%). In majority of cases, the precipitating factor found to be Upper respiratory tract infection (51%) followed by Viral exanthematous fever (31%) and acute gastroenteritis (27%). (Table. 2)

<table>
<thead>
<tr>
<th>Age group</th>
<th>No. of cases (n=100)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Months – 1 Year</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>&gt;1 Year – 2 Years</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>&gt;2 Years - 5 Years</td>
<td>31</td>
<td>31</td>
</tr>
</tbody>
</table>

Table-1: Prevalence of febrile seizures in different age groups

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>6 months to 1 year (n=35)</th>
<th>&gt;1 to 2 years (n=34)</th>
<th>&gt;2 to 5 years (n=31)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>35</td>
<td>34</td>
<td>31</td>
<td>100</td>
</tr>
<tr>
<td>Cough</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>51</td>
</tr>
<tr>
<td>Cold</td>
<td>16</td>
<td>7</td>
<td>9</td>
<td>32</td>
</tr>
<tr>
<td>Vomiting</td>
<td>12</td>
<td>9</td>
<td>5</td>
<td>26</td>
</tr>
<tr>
<td>Rash</td>
<td>14</td>
<td>5</td>
<td>12</td>
<td>31</td>
</tr>
<tr>
<td>Irritability</td>
<td>12</td>
<td>4</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Ear discharge</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Loose motion</td>
<td>12</td>
<td>9</td>
<td>6</td>
<td>27</td>
</tr>
</tbody>
</table>

Table-2: Febrile seizures – precipitating factors

<table>
<thead>
<tr>
<th>Blood Culture</th>
<th>6 months to 1 year (n=35)</th>
<th>&gt;1 to 2 years (n=34)</th>
<th>&gt;2 to 5 years (n=31)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Growth</td>
<td>31</td>
<td>29</td>
<td>25</td>
<td>85</td>
</tr>
<tr>
<td>Growth present</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>15</td>
</tr>
</tbody>
</table>

Table-3: Blood culture in febrile seizures

<table>
<thead>
<tr>
<th>Organism</th>
<th>6 month to 1 year (n=35)</th>
<th>&gt;1 to 2 years (n=34)</th>
<th>&gt;2 to 5 years (n=31)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No growth</td>
<td>31</td>
<td>29</td>
<td>25</td>
<td>85</td>
</tr>
<tr>
<td>Streptococcus pneumonia</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Enterobacteriacae</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

Table-4: Type of Organisms in Blood culture of febrile seizures children

<table>
<thead>
<tr>
<th>Urine Culture</th>
<th>6mths to 1 year(n=35)</th>
<th>&gt;1 to 2 years(n=34)</th>
<th>&gt;2 to 5 years(n=31)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Growth</td>
<td>33</td>
<td>31</td>
<td>29</td>
<td>93</td>
</tr>
<tr>
<td>Growth</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

Table-5: Urine culture in febrile seizure children
The statistical test used was ANOVA test to find the strength between the variables. The P Value for fever-0.936, cough-0.357, cold-0.953, vomiting-0.218, irritability-0.223, ear discharge- 0.096, loose motion-0.199. These are insignificant and shows that there exists no correlation between the age and precipitating factors in present study.

### Blood culture in febrile seizures:
Out of 100 consecutive cases admitted to the hospital with convulsions, total 15 (15%) had positive blood culture. According to age, (14.70%) in age group of more than 1 year to 2 year and (19.35%) in age group of more than 2 year to 5 years shown growth in their blood culture.(Table 3)

The statistical test used was ANOVA test to find the strength between the variables. The P Value was 0.695. It is insignificant and shows that there exists no correlation between the age and Blood Culture in the present study.

### Organisms isolated in blood culture:
Out of 100 consecutive cases admitted to the hospital with febrile convulsions, total (15%) had positive blood culture. Common organisms isolated were Streptococcus Pneumonia, Staphylococcus Aureus and Enterobacteriacae. (Table 4)

### Urine Culture in febrile seizures:
Out of 100 consecutive cases admitted to the hospital with convulsions, total (7%) had positive urine culture. Common organisms isolated were Streptococcus Pneumonia, Staphylococcus Aureus and Enterobacteriacae. (Table 4)

The statistical test used was ANOVA test to find the strength between the variables. The P Value was 0.855. It is insignificant and shows that there exists no correlation between the age and Urine Culture in the present study.

### Organisms isolated in Urine culture:
Out of 100 consecutive cases admitted to the hospital with febrile convulsions, total (7%) had positive urine culture. Of positive urine culture all cases grew E.Coli.(Table 6)

### Stool analysis and stool culture:
Of 100 cases 27 cases present with loose motions. Stool analysis and Stool culture was ordered for these cases. 5 (5%) of cases showed more than 10 pus cell per high power field. Of these cases 2 cases grew E.coli in their culture (P=0.780). (Table 7)
gastroenteritis are implicated. In study done by Dr Amarendra et al17, they reported common presentation for febrile convulsion were upper respiratory tract infection(86%) followed by acute gastroenteritis(8%). In our study we found that (45%) with Cough, (30%) Cold, (29%) Rash, (28%) loose motions,(25%) vomiting, (15%) irritability and (7%) with Ear Discharge.

Incidence of occult bacteremia in case of Febrile convulsions: In present study blood and urine were sent in all cases of which (15%) had positive blood culture and (7%) had positive urine culture. Blood culture grew Streptococcus pneumonia in 6 cases, Staphylococcus aureus in 4 cases, and Enterobacteriaceae in 5 cases respectively. The P Value was 0.695.

In study done by Teran CG of the 219 patients included in the study, 135 (61.4%) cases had the aetiology of the FS diagnosed. Upper respiratory tract infection, otitis media, urinary infection, and pneumonia were the most common diagnoses attributed to the fever. Only 1 blood culture was positive for Salmonella.21

In study done by Richard Idro et al in 200822, studied two hundred and forty eight children out of 4,602 (5.4%) had positive blood cultures. Streptococcus pneumoniae was the commonest cause of bacteraemia in both groups of children but was more common among patients with seizures, (10/23 [43.5%] vs 31/225 [13.8%], p < 0.001).

In study done by Teach SJ, Geil PA23 and Trainor JL, Hampers LC-Acad24 reported positive blood culture with Streptococcus Pneumoniae in 3% and 1.3% of study group,1% and 6% had urinary tract infection respectively. Of 100 cases studied, total (7%) had positive Urine culture. Of culture positive cases all grew E.Coli bacteria. The P Value was 0.855. It is insignificant and shows that there exists no correlation between the age and Urine Culture.

Khan WA, Dhar U et al25 found out in their study that 23/41 with documented febrile seizures had >50 leukocytes/HPF (p=2) and 13 cases had Shigella dysenteriae type 1, 26 cases had Shigella flexneri and 2 cases had other shigella species in their stool cultures(p-0.015).

CONCLUSION

Febrile seizures are the most common seizures seen in children between 6 months to 5 years of age. Most common age group remain between 6 months to 2 years. Most common precipitating cause for fever in febrile seizures are Upper respiratory tract infection, Acute gastroenteritis, and Urinary tract infections. 15% cases were positive for blood culture, common bacteria being streptococcus pneumonia and staphylococcus aureus while 7% were positive for urine culture, E.coli being common pathogen. Even though viruses form major precipitating agents for febrile convulsions, bacterial infection should be ruled out in all children presenting with febrile seizures.

REFERENCES

2. ILAE. Guidelines for epidemiologic studies on epilepsy. Epilepsia 1993;34:592–6.

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