# A Study on Febrile Seizures with Special Reference to Laboratory Evaluation

# Tanveer Begum<sup>1</sup>, Ganivada Sirisha<sup>2</sup>, Rachabattuni Siva Tejaswini<sup>3</sup>

Katuri Medical College and Hospital, Guntur, Andhra Pradesh, India

Abstract: <u>Background</u>: The most common cause of convulsions in children is febrile seizures. They are mostly benign in nature, but it is imperative for the physician to evaluate the child completely, so as to allay the associated parental anxiety, and to identify the focus of infection and any associated preventable risk factors. It is important to exclude meningitis either clinically or by CSF analysis. This study evaluated laboratory tests in children presenting with febrile seizures. <u>Aims and objectives of the study</u>: 1) Laboratory evaluation in patients with febrile seizures. 2) Significance of investigations in a child with febrile seizures. <u>Methodology</u>: 50 Neurologically normal children between 6 months to 5 years of age with febrile seizures occurring once or more in a 24 hour period with an axillary temperature of more than 38°C were included in this study. These children were evaluated for laboratory profile and to identify the aetiological aspects causing fever leading to the development of febrile seizures. <u>Results</u>: In this study, febrile seizures were more common in children less than 2 years of age (80%), it was more common in males (62%), On investigation (96%) of the cases had haemoglobin of less than 11gm/dl, and (44%) of the cases had microcytic hypochromic picture; CT scan and CSF analysis was done in all cases of complex febrile seizures and were found to be normal. <u>Conclusion</u>: Age less than 2 years and male gender are considered to be risk factors, for the development of febrile seizures. Laboratory investigations are to be directed in identifying the focus of fever and not for the evaluation of seizures.

Keywords: Febrile Seizures, Iron deficiency Anaemia

# 1. Introduction

Seizure associated with fever is the commonest type of seizure seen in children, associated with good prognosis and is mostly of benign nature. Febrile seizure is one the most common cause of admission at paediatric hospitals.

Hippocrates have described febrile seizures in ancient greek1, that there are convulsions associated with hyperpyrexia and it is a common disease in children less than five years of age, and it is not frequently seen in older children and adults and the parents need not be worried as the child will not develop epilepsy in later life.1, 2The prevalence of febrile seizures is different among various communities and is usually between 2% - 4%3, in a field study done at Bombay in India, there was a prevalence of 1.8% noted in the community4. The prevalence of febrile fits at 7 years was found to be 3.5% in white children and 4.2% in black children, in a study done by Nelson and Ellenberg of the US. Studies generally suggest that around 10% of the children experience a convulsion associated with fever at least once in a life time. The incidence of febrile seizures in India is between 5 - 10% 5.

The clinician has to differentiate between febrile seizures and those with epilepsy syndromes in order to explain the associated prognosis to the parents6. Overtime, it has come to light that the benign nature of this disease has to be carefully revaluated, since there are a large number of atypical presentations with different outcomes7.

Recently, the American Academy of Paediatrics (AAP) gave a standard working definition of febrile seizures, as seizures occurring between the ages of 6 months - 60 months, without any intracranial infections, metabolic disturbances / history of afebrile seizures8. Children with seizures that are due to a CNS infection or those children with previous afebrile seizures or with CNS Abnormality are not included under Febrile Seizures.

The prevalence of febrile seizures is found to be more in the boys than in the girls9, 10, 11, 12, many studies show that febrile seizures are more common in children between 6 months - 3 years of age with peak incidence in second year of life.

Many studies have proven that there is an attributable factors of inheritance in febrile seizures, and the most common modes are Autosomal Dominant inheritance and Polygenic Multifactorial Inheritance11, 13, 14.

# 2. Methodology

This study includes 50 cases of children admitted with febrile seizures; admitted at Katuri medical College and Hospital, Guntur from November 2021 to November 2022.

## Study

A thorough history was elicited, and complete physical examination was done, at the time of admission.

#### **Inclusion criteria:**

Neurologically normal children between 6 months to 5 years of age with febrile seizures occurring once or more in a 24 hour period with an axillary temperature of more than 38°C.

## **Exclusion criteria:**

- 1) Children admitted with seizures found to have CNS infection based on CSF analysis.
- 2) Children admitted with seizures, and without fever.
- 3) Children with previous neurodevelopmental abnormalities.

# Volume 12 Issue 1, January 2023

## <u>www.ijsr.net</u>

Licensed Under Creative Commons Attribution CC BY

- 4) Children admitted with both febrile and afebrile seizures.
- 5) Children who have received antibiotics before reaching the hospital.
- 6) Children with chronic seizure disorder with increased seizure activity during febrile episodes.

A thorough and detailed history was elicited and complete physical and general examination was done in all cases; to find out the focus of the fever.

### **Investigations**:

Informed consent was taken and the following investigations were done in all the cases

- 1) Complete blood picture.
- 2) Peripheral smear examination.
- 3) Serum electrolytes, blood sugar, serum calcium.
- 4) Blood culture and sensitivity. (if required)
- 5) Urine routine, urine microscopy and culture and sensitivity.
- 6) Stool routine, microscopy, and culture sensitivity (If required).
- 7) Lumbar puncture and CSF examination. (If required)
- 8) Chest x ray (if required).
- 9) Neuroimaging (if required).

#### Statistical analysis:

The study is assessed for lab findings associated with febrile seizures, descriptive statistics, percentages, mean, bar graphs, histograms and pie charts are used to express the results.

In the present study conducted at Department of Paediatrics in Katuri medical College and hospitals from November 2021 to November 2022, 50 children between the age group of 6 months to 5 years with febrile seizures have been included. Results regarding the socio - demographic characteristics have been deducted and compared with similar studies.

## 3. Results

#### 1) Fever

The mean temperature recorded was  $38.39\square$  C and all the cases had temperature more than  $38\square$  C

#### 2) Presence of Convulsions

	Frequency	Percentage
Present	50	100%
Total	50	100%

Convulsions are present in all the cases with fever **Peripheral smear examination** 

	Frequency	Percentage
Microcytic hypochromic	22	44%
Normocytic ypochromic	8	16%
Normocytic normochromic	20	40%
Total	50	100%

In the present study, upon peripheral smear examination it was observed that 44% had microcytic hypochromic

anaemia, 16% had normocytic hypochromic anaemia and 40% had a normal peripheral smear appearance.

#### 3) Distribution of Haemoglobin

	Frequency	Percentage
<7	17	34%
7 - 11	31	62%
>11	2	4%
Total	50	100%
Mean $\pm$ SD	$8.08 \pm 1.83$	

In the present study the mean Hb observed was  $8.08 \pm 1.83$  gm%. In majority of the cases Hb is between 7 - 11 gm and in 34% it was <7 and in 4% of the cases hb was >11 gm%.

#### 4) Total lecucocyte count

	Frequency	Percentage
<4000	7	14%
4000 - 11000	35	70%
>11000	8	16%
Total	50	100%

In 70% of the cases TLC was between 4000 - 11000, in 14% of the cases TLC was <4000, in 16% of the cases TLC was >11000.

#### 5) Random Blood Sugar

	Frequency	Percentage
<200	50	100%
Total	50	100%

All the cases had a RBS of >200.

#### 6) S. Calcium Distribution

	Frequency	Percentage
<8.6	13	26%
>10.3	37	74%
Total	50	100%
Mean $\pm$ SD	9.35 ± 0.87	

The Mean Serum Calcium observed in he present study was  $9.35 \pm 0.87$ . in 26% of the cases serum calcium was <8.6, and in 74% of the cases serum calcium was >10.3

#### 7) Serum Electrolytes Distribution

	Frequency	Percentage
Normal	50	100%
Total	50	100%

The levels of serum electrolytes was normal in all the cases.

#### 8) Urine Analysis

	Frequency	Percentage
Pus cells	3	6%
Normal	47	94%
Total	50	100%

Urine examination was normal in a majority (94%) of the

# Volume 12 Issue 1, January 2023 www.ijsr.net

Licensed Under Creative Commons Attribution CC BY

cases, and pus cells were seen in 6% of the cases.

#### 9) Neuroimaging

	Frequency	Percentage
Normal	17	34%
Not done	33	66%
Total	50	100%

In 66% of the cases CT scan was not done. In 34% of the cases CT scan was done and was normal.

## 4. Discussion

#### Fever:

The mean temperature recorded in this present study is  $38.39^{\circ}$ C; this study is in correlation with the study done by ShaikhAbdul muqeet et al., 15 with the mean temperature recorded to be  $38.35 \pm 1.9^{\circ}$ C median temperature was  $38.5^{\circ}$ C; and also with the study done by Vaswani R K et al., 16 showed the mean temperature at the time of admission to be  $38.6^{\circ}$ C.

All the 50 cases have presented with history of seizures with history of fever either given by the parents or recorded at the time of hospital admission.

#### **Evaluation**:

All cases of febrile seizures do not require extensive investigations and they should be tailor specific to each patient based on their history and clinical presentation.

Routine blood examinations like complete blood picture, serum electrolytes, blood urea and creatinine and blood cultures are as such not useful for the febrile seizures evaluation but they help us in identifying the focus of infection.

Other blood investigations that can be done are iron studies, like serum iron, serum ferritin, total iron binding capacity and along with haemoglobin, MCV, MCH and MCHC; Iron deficiency anaemia can be evaluated which has important correlation with febrile seizures.

Complete urine examination and urine culture is done in cases with no other focus of infection has been established to rule out the urinary tract infections. In the present study, Pallor has been found in 32 cases (64%), decreased haemoglobin with decreased MCV and MCH mostly point towards microcytic hypochromic anaemia, which might be due to iron deficiency.

Anaemia is the most common underlying abnormality with febrile seizures.

The correlation of iron deficiency anaemia with the febrile seizures was also confirmed in the studies done by Papageorgiou V et al., 17 and Srinivasa S R et al., 18

Another case control method of study was conducted in 2005 by Naveed ur Rehman in Karachi to find the correlation between iron deficiency anaemia and febrile seizure and the results have found to have correlation19.

Iron is an important micronutrient which is useful in brain metabolism, metabolism of the neurotransmitters and for the myelination of neurons which can cause a change of threshold in the stimulation of neurons.

The major neurotransmitter that uses iron as a cofactor is monoamine oxidase and aldehyde oxidase.

In this study, the mean haemoglobin observed was  $8.08 \pm 1.83$  gm% and the majority of the cases had haemoglobin in between 7 to 11 g/dL and in 34% of the cases it was less than 7gm/dl and in 4% of the cases haemoglobin was more than 11 g/dl. In this study, upon peripheral smear examination, 44% of cases had microcytic hypochromic anaemia, 16% had Normocytic normochromic anaemia and 40% of the cases had a normal peripheral smear examination.

In a similar study done by Hartfield et al., iron deficiency anaemia is considered as a significant risk factor for development of febrile seizures.20

Mean total leucocyte count found in the study is 7536.58  $\pm$  4390.7, in 70% of the cases TLC was in between 4000 to 11, 000 and in 14% of the cases TLC was less than 4000 and in 16% of the cases TLC was more than 11, 000. Further when the role of investigations in evaluation of febrile seizures, have been studied the leucocyte count has been helpful in evaluating the aetiology of fever whether it is bacterial or viral.

#### Random blood sugar:

In all the cases, blood sugar was more than 200mg/dl; and it was imperative for checking the blood sugar levels when a case of seizures was admitted at casualty.

## Calcium:

The mean serum calcium observed in the study was  $9.35 \pm 0.87$ ; in 26% of the cases, Serum calcium was less than 8.6, and in 74% of the cases serum calcium was more than 10.3. Serum sodium and potassium and serum chloride levels are found to be normal in all cases; this is in concordance with the study done by Carlos et al., where no corelation has been seen with biochemical abnormality attributed to febrile seizures.

## Urine and stool examination:

Urine examination is normal in majority (94%) of the cases, and pus cells were seen in 6% of the cases; and in stool examination pus cells was seen in 3 cases (6%) and was normal in 4 cases (8%), not done in remaining cases

#### Neuroimaging:

CT scan was done in 17 cases (34%) and was found to be normal; it was done in cases of complex febrile seizures. CT scan was not done in 33 (66%) of the cases. In the study done by Warden R C et al., 21 abnormal CT findings were present in 12% of the cases and in the study done by A L Sulaiman AA et al., CT was normal in 60.5% of the cases and the main associated abnormality was found to be cerebral atrophy in 25.3% of the cases22.

Volume 12 Issue 1, January 2023 www.ijsr.net Licensed Under Creative Commons Attribution CC BY

## International Journal of Science and Research (IJSR) ISSN: 2319-7064 SJIF (2022): 7.942

# 5. Conclusion

- Febrile seizures were more common in children of less than 24 months of age.
- Febrile seizures were found to be more common in males.
- Anaemia was seen in many cases of febrile seizures; and it was found to be of iron deficiency anaemia based on the peripheral smear examination however an association couldn't be made; as serum ferritin was required to diagnose iron deficiency anaemia and a large sample size was required; thus further studies are required in this direction for better correlation, and management with iron can thus help in decreasing the incidence of febrile seizures.
- After a thorough history and physical examination laboratory investigations were directed towards the identification of focus of infection; serum electrolytes and monitoring of blood sugar along with routine blood Investigations were done in all cases, and there were no significant results.

# References

- [1] Ouellette E. M. The child who convulses with fever. Ped Clin N Am.1974; 21: 467 - 481.
- [2] Andrew Sparman. Convulsions. In Von Resentein. The Diseases of Children and Their Remedies 10th Ed. London. London classics of Medicine 2004: 345.
- [3] Wallace SJ. The child with febrile seizures. London: Butterworths & Co 1988.
- [4] Bharucha NE, Bharucha E P, Bharucha A E. Febrile seizures. Neuroepidemiology.1991; 10 (3): 138 42.
- [5] Waruiru C, Appleton R. Febrile seizures: an update. Archives of Disease in childhood.2004 Aug 1; 89 (8): 751 - 6.
- [6] Verity, Christopher M. Do Seizures Damage Brain? The Epidemiological Evidence. Arch. Dis. Child.1998; 78: 78 - 84.
- [7] S. J. Wallace, "They don't do very well," Pediatrics, vol.65, no.3, pp.678 679, 1980.
- [8] Steering Committee on Quality Improvement and Managementand Subcommittee on Febrile Seizures American Academyof Pediatrics, "Febrile seizures: clinical practice guideline for the long - term management of the child with simple febrile seizures," Pediatrics, vol.121, pp.1281 - 1286, 2008.
- [9] G. Capovilla, M. Mastrangelo, A. Romeo, and F. Vigevano, "Recommendations for the management of 'febrile seizures': AdHoc Task Force of LICE Guidelines Commission, " Epilepsia, vol.50, supplement 1, pp.2 6, 2009.
- [10] A. T. Berg and S. Shinnar, "Complex febrile seizures, "Epilepsia, vol.37, no.2, pp.126 - 133, 1996.
- [11] D. Shrestha, A. K. Dhakal, H. Shakya, A. Shakya, S. C. Shah, and S. Mehata, "Clinical characteristics of children with febrile seizure," Journal of Nepal Health Research Council, vol.12, no.28, pp.162 166, 2014.
- [12] L. Forsgren, R. Sidenvall, H. K. Blomquist, and J. Heijbel, "A prospective incidence study of febrile convulsions," Acta Paediatrica Scandinavica, vol.79, no.5, pp.550 - 557, 1990.

- [13] B. J. Van der Berg and J. Yerushalmy, "Studies on convulsive disorders in young children. I. Incidence of febrile and nonfebrile convulsions by age and other factors," Pediatric Research, vol.3, no.4, pp.298 - 304, 1969.
- [14] Consensus statement. Febrile seizures: long term management of children with fever - associated seizures, "Pediatrics, vol.66, no.6, pp.1009 M - 1012, 1980.
- [15] Shaikh Abdul Muqeet et al., febrile seizures: DEMOGRAPHIC, CLINICAL AND ETIOLOGICAL PROFILE OF CHILDREN ADMITTED WITH FEBRILE SEIZURES IN A TERTIARY CARE HOSPITAL VOLUME - 6, ISSUE - 12, DECEMBER - 2017 • ISSN No 2277 - 8160.
- [16] Vaswani RK, Dharaskar PG, Kulkarni S, Ghosh K. . Iron deöciency as a risk factor for first febrile seizure. Indian Pediatr.2010 May; 47 (5): 437 - 9. Epub 2009 Sep 03.
- [17] Papageorgiou V, Vargiami E, Kontopoulos E, Kardaras P, Economou M, Athanassiou M. Association between iron deficiency and febrile seizures. Eur J Paediatr Neuro 2015; 19: 591 - 6.
- [18] SrinivasaS R. Iron defeiciency anemia in children with simple febrileseizures - a cohort study. Curr Pediatr.2014; 18.
- [19] Naveed Ur Rehman, Billoo A G. Association Between Iron Defieciency Anemia and Febrile Seizures. J Coll Physicians Surg Park.2005; 15 (6): 338 - 340.
- [20] Hartfield DS, Tan J, Yager J Y, Rosychk r j, Spady D, Hainer C et al. The Association between Iron Deficiency Anemia and Febrile Seizures in Childhood. Clinical Pediatrics.2009; 48: 420 - 426.
- [21] Warden CR, Brownstein DR, Del Beccardo MA. Predictors of abnormal findings of computed tomography of the head in pediatric patients presenting with seizures. Annals of emergency medicine.1997 Apr 1; 29 (4): 518 - 23.
- [22] Al Sulaiman AA, Ismail HM. Clinical pattern of newly - diagnosed seizures in Saudi Arabia: a prospective study of 263 children. Child's Nervous System.1999 Sep; 15 (9): 468 - 71

## Volume 12 Issue 1, January 2023 www.ijsr.net

# Licensed Under Creative Commons Attribution CC BY DOI: 10.21275/MR23128104955