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FEBRILE SEIZURES AMONG CHILDREN: INSIGHTS FROM A DISTRICT CIVIL HOSPITAL IN OSMANABAD

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ABSTRACT

Febrile seizure (FS) is a neurologic condition affecting 2-5 % of children between the ages of 6 months to 5 years. It is also known as a fever-induced seizure. This retrospective study analyzed the prevalence and management of FS in the East Marathwada region. FS is the most common presentation in the pediatric and emergency departments. The objective of the current study was to investigate the epidemiology, clinical and non-clinical presentation, and to understand the new potential risk factors for prevention, enhanced prognosis, and management of FS. This study was conducted on the patients of FS from March 2022 to February 2023 in the District Civil Hospital, Osmanabad. The data was collected in the specially designed case record form approved by the hospital administration. These data were compiled on a patient information sheet and analyzed using descriptive statistics such as percentage, mean, and standard deviation. There are a total of 124 (N) cases of FS among which the majority of the

patients were male children (59.67%) and simple FS is the most common presentation (70.96%). The annual prevalence rate of FS was found to be 10.3% per 1000 people. Children living in rural areas have a greater chance of FS occurrence, so there's a need to educate the children and their families regarding a healthy and hygienic lifestyle to prevent seizures due to the fever. Spreading awareness and prevention strategies through the government amongst healthcare professionals and patient caregivers will help us achieve a lower prevalence rate of FS in India.

Keywords: Febrile seizure, Simple febrile seizure, Hyponatremia, Clobazam

INTRODUCTION:

Febrile seizures (FS) are the most common type of seizures that are provoked in children between the age group of 6 months to 5 years of age due to fever which is not caused by any central nervous system infection or any other metabolic disturbance **[1-3]**. FS are generally classified as either simple or complex forms **[5]**. Simple FS are generalized seizure that involves the shaking/stiffening of the whole body, they usually last for less than 15 minutes whereas complex FS are Focal seizure (usually affecting a single limb or single side of the body) and last for more than 15 minutes. A complex form of FS shows longer periods of drowsiness as compared to the simple form **[4, 6]**. Furthermore, the risk of developing epilepsy after complex FS is about 3–7% compared with an estimated risk of ∼1.5% in the general population, which makes such seizures a significant health problem **[7]**. The global prevalence of FS is about 2-5%. The prevalence rate was found to be between 5-10 % among Indians, although there are no state-by-state statistics available for India **[9]**. Epidemiological studies examining the occurrence of FS in India are quite rare, which makes it difficult to examine the exact prevalence of FS among Indian children **[10]**. It is well established that environmental, genetic, and sociodemographic variables influence the occurrence of FS. Few recent studies have explored how environmental and sociodemographic factors affect the prevalence of FS, although these parameters change over time and place **[8]**. Considering this, the retrospective study was planned and conducted to collect the clinical and epidemiological profile of FS cases admitted to District Civil Hospitals, Osmanabad.

MATERIALS AND METHODS:

A retrospective observational study was designed to obtain the data from the hospital administrative database, interact with the patient's parents, review the patient's charts, and consult with the physician during daily ward rounds at the pediatric and emergency department of the district civil hospital. The data was collected from March 2022 to

February 2023. The methodology was developed using references from several databases like PubMed, Delnet, Medline, Science Direct, and National Library, etc. By examining different national and international papers, the patient information form and necessary information were gathered **[6, 7, 11]**. Prior permission from the hospital administration was taken for the data collection and for taking ward rounds with pediatricians. To gather clinical data, each case of a febrile seizure was documented on a specially designed case report form. In front of an attending doctor, prior oral consent was gained from the patient's legally acceptable representative. Approval for a case study and a case report form were taken from hospital authorities before the commencement of the study. To frame constructive outcomes several parameters have been considered and presented in patient information form to address the clinical-epidemiological status of a FS in the east Marathwada region of Maharashtra. A piece of detailed information regarding sociodemographic and epidemiological parameters such as age, weight, gender, religion, residence, family educational status, financial status, diet, peak temperature, and comorbid infection. Data was subjected to descriptive statistics such as percentage, mean, and standard deviation.

Inclusion criteria are set as a male/female child in the age group from 6 months to 5 years, a child with a previous history of FS, and patients who are referred from Secondary District Hospitals (SDH) or private hospitals. Exclusion criteria are the subjects do not come under the pre-defined area, male/ female children below 6 months & above 5 years; Children are diagnosed with meningitis, encephalitis, or other central nervous system infections, Children with gross structural abnormalities of the brain and child with a history of afebrile seizure.

RESULT:

The average age of occurrence was 2.08 years (± 1.19 years). Among 124 children, 59.67% (74N) were male and 40.32% (50N) were female. The highest number of children fell in the 02 to 03-year age group (33.06%, N=41), followed by 01-02 years (26.61%, N=33). The lowest number was in the 03-04 years group (8.87%, N=11) **(Figure 1 A)**. The major symptoms observed at the time of seizure were fever (24.93%, N=89), locked jaw (21.29%, N=76), up rolling to eyeballs (20.73%, N=74), and stiffening of limbs (17.37%, N=62). A moderate no of children experienced shaking of limbs (9.80%, N= 35) and foaming of mouth (5.88%, N=21) **(Table 3-j)**. URTI (27.41%, N=34) was the most common comorbid condition in children with FS followed by the LRTI

(18.54%, N=23). To a certain extent, typhoid (15.32%, N=19) and malaria is also an important consideration of comorbidity. 13.70% (17N) of children with conditions such as pneumonia, acute gastroenteritis, and acute febrile illness such cases are taken under the others, due to less number of observed cases.12.09% (15N) children present with no comorbid state **(Figure 1 B)**. Among the following tests, widal (19.75%, N=79) is most prescribed followed by a complete blood count with C-reactive protein (19.25%, N=77) to assess any kind of infectious state **(Table 3-k)**. Abnormal serum electrolytes and hemoglobin are strongly associated with an FS that includes sodium, potassium calcium, and chloride levels **(Table 1)**. The management of children with FS should be done symptomatically as the FS is self-limiting and usually benign. Various classes of drugs are used including anticonvulsants, antimicrobials, and NSAIDs. Apart from the anticonvulsants the child is managed symptomatically. Most of the incidence of FS was recorded in the rural area (55.64%, N=55) while 44.35% (69N) occurred in the semi-urban area of the eastern Marathwada region **(Table 3-a)**. Among 124 children 70.96% (88N) had a simple type of FS and the remaining 29.03% (36N) children had complex forms of seizure **(Table 3-b)**. Out of a total of 124 children, 60.48% (75N) were found to be illiterate whereas 39.51% (49N) were of literate guardians **(Table 3-c)**. Out of 124 children, 54.83% (68N) children present with a positive history of past FS and the remaining 45.16% (56N) children had no history of previous FS. Children with a history of afebrile seizures are excluded from the study **(Table 1-d)**. 57.25% (71N) of the children have a family history and the rest of the 42.74% (53N) children do not have a family history. A positive family history is an indication that the occurrence in the child might be caused due to a genetic predisposition **(Table 3-e)**. 57.87% (73N) of the children were on a vegetarian diet and the remaining 41.12% (51N) followed the non-vegetarian diet which includes eggs, fish, and meat **(Table 1-f)**. 36.29% (45N) belong to Above Poverty Level (APL) while 63.7% (79N) children belong to Below Poverty Level (BPL) economic status (Table No. 3-g). Among 124 children, 48.38% (60N) belonged to the Muslim religion, while 38.7% (48N) were Hindu (38.7%, N=48) and the remaining all belonged to the Christian category (12.9%, N=16) **(Table 3-h)**.

Most children (50.80%, N=63) were discharged within 1-2 days of admission, as a minimum 24-hour observation is required to diagnose FS type. About 35.48% (44N) were discharged within 3-5 days, and 13.70% (17N) were discharged after 5 days of hospitalization **(Table 3-i)**.

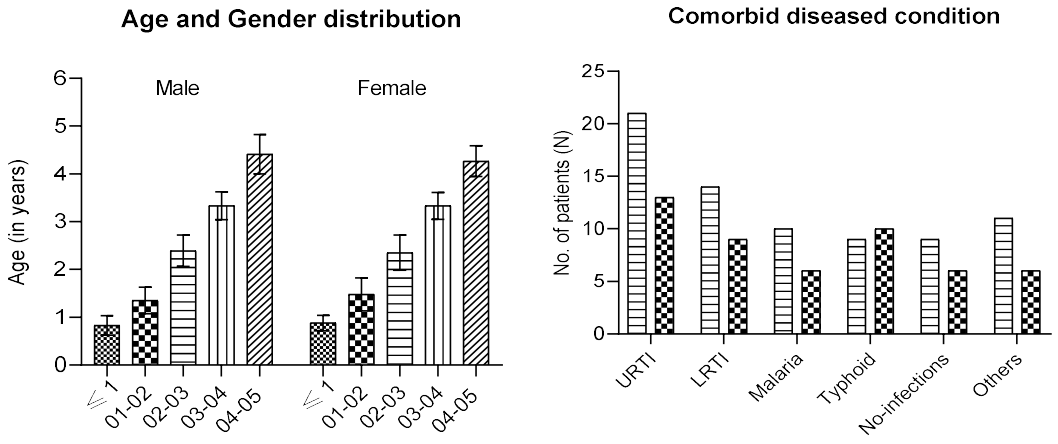

Figure 1: Age group with the gender-wise distribution (A) Comorbid diseased conditions (B)

Table 1: Laboratory Investigations

Laboratory Parameters	No. of patients (N)	Mean ± SD
a. Haemoglobin		
6.5-6.9gm/dl	**1**	**6.8±00**
7.0-7.4 gm/dl	**0**	**0**
7.5-7.9 gm/dl	**3**	**7.8 ± 0.1**
8.0 - 8.4 gm/dl	**4**	**8.17 ±0.20**
8.5 – 8.9 gm/dl	**24**	**8.70±0.14**
9.0 – 9.4 gm/dl	**17**	**9.19 ± 0.12**
9.5 - 14 gm/dl	**75**	**10.94 ± 1.15**
b. Serum Sodium		
125-134 mmol/L	**48**	**130.41 ± 2.80**
135 -144 mmol/L	**76**	**139.61 ± 2.76**
145-150 mmol/L	**0**	**0**
c. Serum Potassium		
3.0-3.4 mmol/L	**4**	**3.3 ± 0.14**
3.5-5.4 mmol/L	**117**	**4.39 ± 055**
5.5-6.0 mmol/L	**3**	**5.63 ± 0.15**
d. Serum Calcium		
7.5-8.5 mg/dl	**0**	**0**
8.6 - 10.1 mg/dl	**103**	**9.34 ± 0.48**
10.2-11.2 mg/dl	**21**	**10.71 ± 0.32**
e. Serum Chloride		
98-106 mmol/L	**46**	**101.85± 2.61**
107-115 mmol/L	**78**	**110.12 ± 2.50**

Where N=124 and the values are expressed in mean ± SD.

Table. 2: Treatment provided for FS

Treatment	No. of patients (N)	Percentage of patients (%)
a. Anticonvulsants used		
i. Clobazam	**97**	**78.22**
ii. Midazolam	**54**	**43.54**
iii. Phenytoin	**41**	**33.06**
iv. Phenobarbitone	**46**	**37.09**
v. Sodium valproate	**27**	**21.77**
b. Antimicrobial used		
i. Ceftriaxone	**102**	**82.25**
ii. Amikacin	**23**	**18.54**
iii. Cefotaxime	**22**	**17.74**
iv. Metronidazole	**47**	**37.9**
c. NSAID's used		
i. PCM	**122**	**98.38**
ii. Ibuprofen	**96**	**77.41**
iii. Mefenamic acid	**83**	**66.93**

Where N=124 and the values are expressed in number and percentage.

Table 3: Clinical and Non-clinical observations

Parameters	No. of Patients (N)	Percentage of patients (%)
a. Geographical location		
i. Semi-urban	**55**	**44.35**
ii. Rural	**69**	**55.64**
b. Type of the Seizures		
i. Simple	**88**	**70.96**
ii. Complex	**36**	**29.03**
c. Educational status		
i. Literate	**49**	**39.51**
ii. Illiterate	**75**	**60.48**
d. Past convulsive history of child		
i. Yes	**68**	**54.83**
ii. No	**56**	**45.16**
e. Family History		
i. Yes	**71**	**57.25**
ii. No	**53**	**42.74**
f. Diet		
i. Vegetarian	**73**	**58.87**
ii. Non-vegetarian	**51**	**41.12**
g. Economic Status		
i. APL	**45**	**36.29**
ii. BPL	**79**	**63.70**
h. Religion		
i. Hindu	**48**	**38.70**
ii. Muslim	**60**	**48.38**
iii. Christian	**16**	**12.90**
i. Duration of hospital stay		
i. 1-2 days	**63**	**50.8**
ii. 3-5 days	**44**	**35.48**
iii. >5 days	**17**	**13.7**
j. Symptoms		
i. Shaking of limbs	**35**	**9.80**
ii. Stiffening of limbs	**62**	**17.37**
iii. Uprolling of eyeballs	**74**	**20.73**
iv. Foaming of mouth	**21**	**5.88**
v. Locked jaw	**76**	**21.29**
vi. Fever	**89**	**24.93**
k. Diagnostic aids		
i. Lumbar puncture	**7**	**1.75**
ii. MRI	**12**	**3.00**
iii. CT-scan	**6**	**1.50**
iv. X-ray	**65**	**16.25**
v. EEG	**16**	**4.00**
vi. CBC with CRP	**77**	**19.25**
vii. Blood sugar	**64**	**16.00**
viii. Widal	**79**	**19.75**
ix. Malarial parasite	**74**	**18.50**

Where N=124 and the values are expressed in number and percentage

DISCUSSION:

The annual prevalence rate of FS was found to be 10.3% per 1000 people. In the current study, male children accounted for 59.67% (74N), while female children were 40.32% (50N). The male-to-female ratio was 1.48:1, which is similar to Plöchl E *et al.,* 1992 research study with an observed ratio of 1.43:1 **[11]**. The high FS prevalence in males was also reported by Khanian *et al.,* 2010. The study conducted by Mahyar *et al.,*2010 observed that 66% of the newborns with FS in the study were male, indicating that gender has a significant influence on FS **[12]**. The mean age of the sample population was 2.08 years ± 1.19 years and this value was much more closely related to the study reported by Mayan M. *et al.,* 2020 with the mean age of occurrence to be 2.4 years (± 1.5 years) **[13]**. In the study by Mayan M. *et al.,* 2020 conducted on 96 infants with FS, 81.25% of patients had simple whereas 18.75 % of children had complex forms of seizure **[13]**. The current study advocated that simple and complex forms of FS were 70.96% and 29.03% respectively. According to studies by Gourabi HE *et al.,* 2012 (59%), Talebian A. *et a*l., 2000 (55%) and Hosseini NA *et al.,* 2006 (50%), and others, this child's positive family history was found to be the most notable risk factor **[24-26]**. In the current study, 57.25% (71N) of the children had a positive family history of FS, which shows that the prevalence rate of positive family history is almost like that of the study by Gourabi HE *et al.,* 2012 **[14]**. Hyponatremia was the most common serum trace elements abnormality which occurs in 38.7% of the study population, which is similar to the study conducted by Kiviranta T *et al.*, 1995 this study also concluded that hyponatremia is responsible for multiple seizures during the same Febrile illness **[15]**. The risk of neurological symptoms is higher when there is a rapid decline in the sodium level. Cerebral edema is also a provoking factor for FS **[16]**. In our study, URTI (27.41 %) was the main provoking factor of FS followed by LRTI (18.54 %) and typhoid (15.32 %), however, some studies also report that acute gastroenteritis (22.9 %) was the important cause of the fever **[13]**. The present study demonstrated that parental education level was highly correlated with the prevalence of FS, supporting the previous findings **[17, 18]**. We speculated that parents with higher educational status would be substantially more aware of the health and symptoms of their children. The current study advocated that there is a higher number of patients in the Muslim religion (48.38%) due to the marriage practice between two blood-related individuals like cousins or interfamilial union. This is supported by the study conducted by Alqadi KS *et al.,* 2020and Bingol CA. *et al.,* 2021**[19, 20]**. In the management of FS, diazepam derivatives like clobazam are

most frequently used in prophylaxis due to their lesser side effects as compared to other anticonvulsants. Intravenous phenytoin is associated high risk of injection site necrosis, irritation, and hypotension **[21]**. Along with anticonvulsants antimicrobial is also used to treat any comorbidities associated with FS like malaria, LRTI, URTI, acute gastroenteritis, pneumonia, etc. The current study advocated that children with a vegetarian diet are highly prone to the development of FS. 58.87% (73N) of children follow a vegetarian diet and the remaining 41.12% (51N) follow a non-vegetarian diet which includes eggs, fish, and meat. Several studies state vegetarian diet is associated with occurrence of the FS and developmental delay. 39.51% (49N) of children in the current study are anaemic which is also associated with the deficiency of iron and Vit. B12. This result is similar to the research study published by Turay S. *et al.,* 2021 **[22, 23]** which advocated that deficiency in these micronutrients serum iron, ferritin, folate, and vitamin B12 are highly associated with the occurrence of FS. In the current study,50.8% of the patients were discharged within 2 days of their hospital admission which is similar to the research study conducted by Potdar P. *et al.,* 2018 **[27]** which reports 54.2% of children discharged within 3 days of hospital admission. 24 - 48 hour close monitoring of the patients with FS is of great importance to assess whether the FS is a simple or complex form.

CONCLUSION:

The current study concludes that FS is very common in boys as compared to girls. Family history and systemic microbial infections are important comorbidity considerations. The majority of patients had simple FS compared to complex forms. Children living in rural areas have a greater chance of FS occurrence, so there's a need to educate the children and their families regarding a healthy and hygienic lifestyle to prevent seizures due to the fever and deficiency of essential micronutrients and vitamins. Interfamilial marriage should be avoided to prevent FS due to genetic predisposition. Several potential risk factors are associated with FS that should be avoided like malaria, typhoid, and respiratory tract infections through vaccinating the child on time, maintaining a healthy diet, and hygienic conditions. Spreading awareness and prevention strategies through the government amongst healthcare professionals and patient caregivers will help us achieve a lower prevalence rate of FS in India.

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