

Articles

Clinical profile of admitted children with febrile seizures

Norah A. Al-Khathlan, MBChB, Arab Board, Mohammed M. Jan, MBChB, FRCP(C).

ABSTRACT

Objective: The objectives of this study were to evaluate the clinical profile, investigations, treatments and outcome of hospitalized children with febrile seizures.

Methods: A series of 69 consecutive children with febrile seizures was identified by chart review from 1st January 1997 to 1st January 2002 at King Abdul-Aziz University Hospital in Jeddah, Kingdom of Saudi Arabia. Clinical, laboratory, EEG, and neuroimaging data were evaluated by one investigator using a structured data collection form.

Results: The children's ages ranged between 7-70 months (mean 20, SD 14), and 59.5% were males. The source of the febrile illness was evident in 65%, however, most admitted children (60 out of 69) had atypical seizures (55%), were ill looking (24.5%), had febrile status (17.5%), or positive meningeal irritation signs (4%). Electrolyte abnormalities were uncommon (10%), however, complete blood count was abnormal in 45%,

which increased the likelihood of receiving intravenous antibiotics ($p=0.01$). Lumbar puncture was performed on 75%, particularly those with a first seizure (odds ratio [OR] 3.8, 95% confidence interval [CI] 0.9-15) or younger than 2 years of age (OR 3.4, 95% CI 0.7-17). Brain CT was performed in 13% and EEG in 33%. Obtaining an EEG was less likely if the seizures were typical (13% versus 50% in atypical, $p=0.002$). Duration of hospitalization ranged between 1-14 days (mean 4.7, SD 3.2), and only one child had meningitis, which was predicted clinically.

Conclusions: Pediatricians are selective in admitting and investigating children with febrile seizures. The children frequently had atypical seizures, status epilepticus, or were ill looking. The yield of investigations remains low and does not justify extensive work-up or prolonged hospitalization.

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Febrile seizures are the most common seizure disorder in children younger than 5 years of age. Most febrile seizures are brief, do not require any specific treatment or workup, and have benign prognosis.¹ Elective admission on a routine basis increases the tendency to perform unnecessary investigations and therefore should be discouraged. It is generally accepted that admitting such a child should be reserved for those with recurrent or long atypical seizures, with an underlying serious infection, or where parental anxiety and other social

circumstances indicate.² Despite the progress in the understanding of this benign epilepsy syndrome, a wide variation in physician evaluation and management persists when the child is admitted to hospital.³ Sweeney et al⁴ found marked variation in the investigations performed in each hospital of a regional population.⁴ Blood cultures were performed in 6-56% of children and complete blood count (CBC) in 8-70%. The yield of such investigations remains low and 23-78% of children were prescribed antibiotics. In one study, the risk of

From the Department of Pediatrics (Al-Khathlan, Jan), King Abdul-Aziz University Hospital, Jeddah and the Department of Neurosciences (Jan), King Faisal Specialist Hospital and Research Centre, Jeddah, Kingdom of Saudi Arabia.

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Address correspondence and reprint request to: Dr. Mohammed M. S. Jan, Associate Professor of Pediatric Neurology, Department of Pediatrics (Neurology), King Abdul-Aziz University Hospital, PO Box 80215, Jeddah 21589, Kingdom of Saudi Arabia. Tel. +966 (2) 6401000 Ext. 20208. Fax. +966 (2) 6403975. E-mail: mmsjan@yahoo.ca

occult bacteremia was 2.1%, which is similar to those with fever alone.⁵ Other investigators who performed routine blood and urine cultures on all admitted children with febrile seizures found positive results in only 4.3% (blood) and 2.6% (urine) of the children.⁶ In addition, the rates of serious bacterial illness were low and consistent with those published in the literature for febrile children without seizures.⁷ Electrolyte abnormalities are also extremely uncommon in infants and children with febrile seizures as compared to those with afebrile seizures.⁸ The yield of EEG is also low in neurologically normal children with febrile seizures even if the seizure were atypical.^{9,10} This led to the conclusion that the routine practice of obtaining EEG in neurologically normal children with febrile seizures is not justified.^{9,10}

Given all the above information, we hypothesized that pediatricians are becoming selective in admitting such children and in obtaining various investigations. The objectives of our study were to evaluate the clinical profile, investigations, treatments and outcome of hospitalized children with febrile seizures.

Methods. A series of consecutive children admitted with febrile seizures was identified from 1st January 1997 to 1st January 2002 at King Abdul-Aziz University Hospital (KAUH) in Jeddah, Kingdom of Saudi Arabia. The KAUH is a multispecialty adult and pediatric hospital providing tertiary medical care for most of the regional population of Western Saudi Arabia. The KAUH is also the main teaching center of the western region in conjunction with King Abdul-Aziz Medical School. All admissions are kept in a logbook placed in the pediatric ward. Children admitted with febrile seizures were identified, and the principle investigator reviewed their charts. A structured data collection form was designed and used to gather clinical, laboratory, EEG, and neuroimaging data. The medical board of KAUH and the hospital ethics committee approved the study design. A febrile seizure was defined as a seizure accompanied by fever without central nervous system infection, occurring in infants and children 6 months to 5 years of age.³ The febrile seizure was considered atypical (complex) if it were focal or prolonged (> 15 minutes), occurring in a flurry, or both.¹¹ The data were tabulated using Epi Info, version 6,¹² and the results were examined by Chi-square statistics. The magnitude of significant associations is presented as *p* values, odds ratios (OR), and 95% confidence interval for the OR. A *p*-value of less than 0.05 was considered statistically significant.

Results. Sixty-nine children with febrile seizures were included. There were 41 (59.5%) males and 28

(40.5%) females. Forty-nine (71%) were of Saudi ethnic origin. The children's ages ranged between 7-70 months (mean 20, SD 14) as shown in **Table 1**, which also shows the distribution of febrile seizure patients over the 5-year period by year and season. The duration of hospitalization ranged between 1-14 days (mean 4.7, SD 3.2) as shown in **Table 1**. The admitting consultant was a general pediatrician in 77%, neurologist in 4%, or another subspecialist in 19% of the cases. Fifteen (22%) had history of a previous febrile seizure and 23 (33%) had positive family histories of febrile seizures. Most admitted children (60 out of 69) had atypical seizures (55%), were ill looking (24.5%), had febrile status epilepticus (17.5%), or positive meningeal irritation signs (4%). Meningeal irritation signs were not documented in the chart in 44 (64%) of the cases. Infants younger than 2 years of age were 6.6 times more likely to have these signs not documented (95% CI 1.6-33, *p*=0.005). When meningeal irritation signs were not documented, the infant was 3 times more likely to have a lumbar puncture (LP) (95% CI 0.9-11, *p*=0.04). The source of the febrile illness was evident in 65%, mostly resulting from upper respiratory tract infection.

Investigations including CBC and serum electrolytes were performed on all children. Electrolyte abnormalities were uncommon and minor in 10%, however, the CBC showed abnormalities suggestive of an infection in 45%. An abnormal CBC increased the likelihood of receiving intravenous (IV) antibiotics during the hospitalization (*p*=0.01), however, only 2 had a

Table 1 - Distribution of febrile seizure patients over the 5-year period by year and season, age distribution, and duration of hospitalization (N=69).

Variable	N (%)
Year of admission	
1997	20 (29)
1998	11 (16)
1999	19 (27.5)
2000	7 (10)
2001	12 (17.5)
Season at admission	
Summer	15 (22)
Fall	15 (22)
Winter	14 (20)
Spring	25 (36)
Age distribution	
6-12 months	27 (39)
12-24 months	28 (40.5)
2-5 years	12 (17.5)
> 5 years	2 (3)
Duration of hospitalization	
1-2 days	19 (27.5)
3-5 days	31 (45)
6-10 days	13 (19)
> 10 days	6 (8.5)

positive blood culture. The LP was performed on 75%, particularly those who presented with a first seizure compared to recurrent seizures (81% versus 53%, $p=0.04$) or younger than 2 years of age (OR 3.4, 95% CI 0.7-17). Only one child had a positive cerebrospinal fluid (CSF) culture confirming meningitis. He presented with febrile status, looked ill, and had positive meningeal irritation signs. Ten (19%) children had mild nonspecific CSF abnormalities. Partially treated meningitis was suspected in 2 children but was never confirmed. An EEG was performed on 23 (33%) children, which were normal in 12 or showed minor nonspecific changes in 6. Epileptiform discharges were noted in 4 EEGs. Obtaining an EEG was less likely if the seizures were typical (13% versus 50% in atypical, $p=0.002$). However, EEG abnormality did not correlate with the seizure type. Brain CT scans were performed in 9 (13%) children and were normal in 7 cases. Two CT scans showed mild brain edema, however, no focal lesions were identified. One of these 2 patients had a prior LP, which confirmed meningitis. The other child was suspected as having a partially treated meningitis, however, LP was not carried out because of the brain edema.

Regarding the management, 25 (36%) received intravenous fluids (IVF) in the emergency room (ER) and 47 (68%) during the hospitalization. Patients who were ill-looking were 10.8 times more likely to receive IVF in the ER (95% CI 2.6-52, $p=0.0002$) or during hospitalization ($p=0.01$). Only 5 (7%) children received IV antibiotics in the ER, however, 62 (90%) received them during hospitalization. An abnormal CBC increased the likelihood of receiving IV antibiotics during the hospitalization ($p=0.01$). Twenty-five (36%) children received an antiepileptic drug (AED) in the ER, mostly for ongoing seizures or status epilepticus ($p=0.02$). However, only 9 (13%) continued to receive an AED during the hospitalization. These children were more likely to have atypical febrile seizure ($p=0.03$) or status epilepticus at presentation ($p=0.04$).

Discussion. The study results suggest that pediatricians are selective in admitting children with febrile seizures in the KAUH setting. Most admitted children had atypical seizures, were ill looking, had febrile status epilepticus, or positive meningeal irritation signs. These features were more common in our sample when compared to earlier studies from other developing countries.¹³ Deng et al,¹³ found 33% of their admitted febrile seizure children to have atypical features. Albeit our sample was small, it was representative of admitted children with febrile seizures to our institution as we included all admitted children consecutively over a 5-year period. Almost 60% of our patients were males. The higher incidence in males has been

earlier documented with a male to female ratio of approximately 1.5-2:1.^{7,13}

Of interest was the high rate of undocumented meningeal irritation signs, particularly in infants (64%). These infants were more likely to have LP, reflecting that these signs were not considered in that decision. However, young infants and those who presented with a first seizure were more likely to be subjected to an LP. Overall, 75% had LP in contrast to an earlier study in 1977 documenting that 96% of admitted children with febrile seizure had LP.¹⁴ Again this reflects the trend of being more selective. The yield of LP remains low as we had only one child with a positive CSF culture confirming meningitis and 2 with suspected partially treated meningitis. All 3 cases had atypical febrile seizures and other clinical features suggestive of meningitis instead of a simple febrile seizure. Other investigators also concluded that excluding meningitis and encephalitis through careful history, examination, observation, and occasionally LP in children less than 2 years of age is all that is needed.^{1,15}

A CBC and serum electrolytes were performed on all children. Both were not clinically useful, however, an abnormally high white blood cell (WBC) count resulted in increased exposure to IV antibiotics unnecessarily (the high WBC count is most likely seizure related). Other investigators also found a low yield of such investigations.^{4,7,8,14} An EEG was performed selectively on one third of our children, mostly those with atypical febrile seizures but again with a low yield. The EEG abnormalities did not correlate with the seizure type. We recently reported our prospective experience in 438 consecutive pediatric EEGs over a one-year period.¹⁰ Twenty percent had febrile seizures (including atypical) and all had a normal EEG result. This is again consistent with other reports recommending that the practice of obtaining an EEG in neurologically normal children with atypical febrile seizures is not justified.⁹ Brain CT scans were obtained on a minority of our cohort and were normal in all except 2 who had meningitis. The current American Academy of Pediatrics (AAP) recommendations published in 1996 recommend that neuroimaging not be performed routinely in febrile seizures.³ Regarding the management, there is evidence that the use of IVF in the ER or during the hospitalization was not routine and reserved to ill-looking children. However, 90% received IV antibiotics during hospitalization, namely, more or less routinely, which should be discouraged given the low risk of bacteremia and meningitis in these children. Alternately, AEDs were used judiciously in the ER and during hospitalization, which is consistent with the latest AAP recommendations published in 2000 recommending that AEDs should not be used routinely to prevent febrile seizure recurrence.¹⁶

To conclude, pediatricians are selective in admitting children with febrile seizures to hospital. They frequently had a good reason for admission; however, the yield of investigations remains low and does not justify extensive work-up or prolonged hospitalization.

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