A Hospital Based Study on Clinicoetiological Profile of Seizures in Children – A Kanpur (U.P., India) Experience

Rupa Dalmia Singh[1], Shashank Suryavanshi[2]

ABSTRACT

Introduction: Better understanding of seizures in terms of clinical presentation and etiology is required not only for abortion of acute attack but also for long term control of epilepsy. Also several preventive measures need to be undertaken at community level so as to decrease the burden of epilepsy in the community. With this background in mind we carried out the present study to understand the clinicoetiological profile of seizures in infants and children.

Material and Methods: This retrospective study was organized in the Department of Pediatrics, GSVM Medical College, Kanpur from 1st October 2013 to 30th September 2015. Variables including age, sex, type of seizure, laboratory test results, neuroimaging, EEG findings, duration of hospital stay, diagnosis and final outcome were studied.

Results: Incidence of seizures decreased with increasing age. The most common type of seizure was generalized tonic clonic seizure. Aetiological analysis revealed CNS infections to be commonest cause of seizure in pediatric age group, followed by Space occupying lesions, epilepsy, febrile seizures and metabolic causes. Febrile seizures had best outcome while CNS infections had highest morbidity and mortality.

Conclusion: Although youngest age group of children has highest incidence of seizures, most common cause among them is febrile convulsions with best outcome. Being a developing nation, strict measures to prevent infection through interventions at home and community can reduce the occurrence of seizures in children thus preventing long term neurological sequelae in children

Keywords: Febrile convulsions, CNS infections, Space occupying lesions, developing nation

INTRODUCTION

A seizure is an impermanent occurrence of signs or symptoms due to abnormal excessive or synchronous neuronal activity in the brain. When the above is associated with motor component then they are known as convulsions. Epilepsy is a condition characterized by recurrent (two or more) unprovoked seizures occurring 24 hours apart.[1] Seizures contribute to about 1 % admissions in pediatric emergency and approximately 4-10 % children have seizures during first 16 years of life.[2] While febrile seizures are considered most common type of seizures in children worldwide developing countries have a large proportion of patients with CNS infections and SOL as a major cause of acquired epilepsy.[3-5]

Usually non febrile patients are subjected to CT scan as first investigation.[6] But some studies have shown that CT scan is not always required in these patients.[7] An emergency pediatrician has to decide about the required investigations including workup for infections and metabolic disorders, CSF studies and electroencephalogram (EEG) when a child comes with first episode of seizure. In a developing country like ours there is always a concern regarding cost and radiation exposure.[8]

Better understanding of seizures in terms of clinical presentation and etiology is required not only for abortion of acute attack but also for long term control of epilepsy. Also several preventive measures need to be undertaken at community level so as to decrease the burden of epilepsy in the community. With this background in mind we carried out the present study to understand the clinicoetiological profile of seizures in pediatric patients.

MATERIAL AND METHODS

This was a retrospective study conducted in Department of Pediatrics, GSVM Medical College, Kanpur. We inspected medical records of children admitted with seizures from 1st October 2013 to 30th September 2015. The information was obtained regarding age (from 6 months to 18 years), sex, and type of seizure, no. of seizure episodes, with or without status epilepticus, associated symptoms (fever, headache, vomiting, altered sensorium), developmental history and family history of seizure or epilepsy. Investigations like complete blood count, blood glucose, serum electrolytes, cerebrospinal fluid (CSF) analysis, Malaria parasite test, Chest X-ray, Montoux test, neuroimaging including CT scan head or cranial Magnetic Resonance Imaging (MRI), electroencephalography (EEG) and other tests were taken into account. Other parameters like duration of hospital stay, final diagnosis, and final outcome in five categories; discharged after recovery, discharged with deficits, left against medical advice, mortality and referral to other institutions were also recorded.

Classification of seizures, including generalized tonic-clonic (GTC), absence, myoclonic, focal and other seizures types was based on the Commission on Epidemiology and Prognosis, 2010 International League against Epilepsy(ILAE).[9] According to the ILAE, status epilepticus is a single epileptic seizure which lasts more than 30 minutes or a series of epileptic seizures in which function is not retrieved between ictal events for more than 30 minutes.[10] ILAE in 1993 defined febrile seizure as an epileptic seizure which occurs in childhood post neonatal age, associated with fever not caused central nervous system (CNS) infection, with no history of seizures during neonatal period or previous unprovoked seizure, and not fulfilling criteria for other acute symptomatic seizure. Also, febrile seizures were divided into simple and complex febrile seizures. A simple febrile seizure occurs not more than 15 minutes and is generalized initially,

[1]Associate Professor, [2]Junior Resident, Department of Pediatrics, GSVM Medical College, Kanpur, India

Corresponding author: Dr. Shashank Suryavanshi, Flat no 301, Lotus apartment, Suryanagar Colony, Gurubagh, Varanasi-221010, India

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and occurs one time during a 24-hour interval. In contrast, a complex febrile seizure occurs for more than 15 minutes, can has focal features at any time, or there is recurrence within a 24-hour interval.[10]

Etiologies of seizures like meningitis and encephalitis were analyzed on the basis of clinical presentation and laboratory investigation and verified with standard reference. Moreover, the cases were classified into three age groups: 6 months−5 years, 6–10 years and 11–18 years. Items like age, sex, seizure type, related symptoms, family history of seizure or epilepsy, neurodevelopmental history, lab test results, neuroimaging findings, EEG, hospital stay duration, medical diagnosis and final outcome were analogized among children of different age groups.

Analysis of data was made using descriptive statistics and hypothesis testing. We applied Statistical Package for the Social Sciences (SPSS) for Windows Version 16.0 (SPSS Inc; Chicago, IL, USA) and online Graphpad software for data scrutiny. The Chi-square test and Fisher test were used to examine the association between different variables and strength of the relationship. P value less than 0.05 was considered as statistically significant.

RESULTS

331 patients were admitted in our hospital with seizures during the period of our study. Out of 331 children 192 (58%) were males and 139 (42%) were females (Male: Female ratio =1.38:1). Maximum 165(50%) belonged to 6m-5yrs age group, 90(27%) were between 5-10 yrs age group, and 76(23%) were between 10-18 yrs age group. 249(75%) had generalized seizures and 82(25%) patients had focal seizures. GTCS occurred in 177(71%) patients, Tonic seizures occurred in 58(23%) patients, Myoclonic seizures occurred in 10 (4%) patients, and others types occurred in 4(2%) patients. 28(8%) patients had status epilepticus.(Table 1)

Etiology-wise out of 331 children CNS infections contributed 31% of all. Febrile seizures; SOLs and seizure disorder accounted 21% each. Metabolic causes and others inclusive of hypertensive encephalopathy and head injury accounted for 3% of all patients. Febrile seizures(68/165, 41%) were commonest etiology in 6 months to 5 yrs age group, CNS infection(32/90, 35%) was most common etiology in 5-10 yrs age group while SOL(26/76,34%) and epilepsy (26/76,34%) were equally most common in 10-18 yrs age group. In febrile seizures 48(71%) children had simple febrile seizures while 20 (29%) patients had complex febrile seizures. Amongst CNS infections viral infection was found to be most common infectious etiology (49/102, 48%), followed by pyogenic meningitis (24/102, 23.5%), TBM (20/102, 19.6%), Cerebral malaria (7/102, 7%) and SSPE (2/102, 1.9%). Inflammatory granuloma (64/70, 91%) was most common SOL at our centre of which probable NCC accounted for most of cases. Other SOL at our centre were brain tumors all of which were brain stem glioma. In seizure disorder category; 35(50%) had idiopathic epilepsy, 10(14%) had cerebral palsy, 9(13%) had 1st unprovoked seizure, 6(9%) neurocutaneous syndrome (2 cases of Sturge Weber syndrome and 4 cases of Tuberous sclerosis) 6 (8.5%) had infantile spasm, 2(3%) had Dravet syndrome, and 1 case each of Vein of Galen malformation and 1 of Rasmussen's encephalitis. Metabolic causes (11/165, 3%) were found among 6months to 5 yrs comprising of hypocalcaemia, hyponatremia and hypoglycemia. (Table 2)

Although 228 patients presented with fever with seizures, we conducted lumbar puncture in 197 patients as per indication. CSF was abnormal in 91(46%) cases and normal in 106(54%) cases out of 197 patients. The lower no. of abnormal CSF in cases of CNS infections was probably due to normal finding in cases of serous TBM, viral encephalitis, cerebral malaria cases and SSPE. We also found that out of 267 cases in which we performed CT head, 120 had normal scans while 147 had abnormal scan. CT scans were abnormal in 70% cases with focal seizures in comparison to generalized seizure cases where it was abnormal in 42% cases. (p value<.001). In patients with generalized seizures 49% had abnormal EEG while 51% had normal EEG pattern whereas in patients with focal seizures 42% had normal EEG while 48% had abnormal EEG. There was no significant difference in EEG abnormalities in both groups (p value 0.3309).

Regarding outcome of patients 277(83, 7%) patients got discharged without deficit, 10(3%) with deficits at discharge, 17(5%) went LAMA, 6 were referred, and 21(7%) patients expired (maximum expired because of serious CNS infections.) (Table 3)

DISCUSSION

In this study male to female ratio of affections was 1.38:1. Worldwide literature supports the same fact.[5,11] Seizure occurrence was commonest in 6m-5 yrs age group as compared to 5-10 yrs age group and 10-18 yrs. Incidence of seizures decreased with increasing age. 6 months to 5 yrs age group seems to be more susceptible because this is the age group which has high incidence of febrile seizures as well they are more prone to CNS infections and metabolic derangements. The commonest seizure was generalized seizure of which the most common subtype was GTCS followed by generalized tonic and then myoclonic seizures. These findings were similar to other studies.[5,11,12] But the proportion of patients with absence seizures was higher in other studies.[11] We did not have any patient

	No. of cases	%
Sex		
Male	192	58
Female	139	42
Age group		
6months- 5 years	165	50
5-10 years	90	27
10-18 years	76	23
Type of seizures		
Generalized	249	75
GTCS	177	71
Tonic	58	23
Myoclonic	10	4
Others	4	2
Focal	82	25
Status epilepticus		
Yes	28	8
No	303	92

Table-1: Demographic and clinical profile

Diagnosis	6m-5 yrs	5-10yrs	10-18 yrs	Overall
	No. of pts	No. of pts	No. of pts	No. of pts
1. Febrile	68	-	-	68
Simple	48			48
Complex	20			20
2. CNS infections	50	32	20	102
Pyogenic meningitis	14	4	6	24
Tubercular	8	6	6	20
Viral	28	16	5	49
Cerebral malaria	0	4	3	7
SSPE	0	2	0	2
3. Space occupying lesions	16	28	26	70
NCC	14	20	21	55
Tuberculoma	2	4	3	9
Brain tumors	0	4	2	6
4. Seizure disorder	19	25	26	70
1STunprovoked	2	7	0	9
Idiopathic Epilepsy	2	7	26	35
Cerebral palsy	4	6	0	10
Infantile spasm	6	0	0	6
Dravet Syndrome	2	0	0	2
Neurocutaneous syndromes	2	4	0	6
Vein of Galen Malformation	1	0	0	1
Rasmussen's encephalitis	0	1	0	1
5. Metabolic	11	0	0	11
Hypocalcaemia	4	0	0	4
Hyponatremia	4	0	0	4
Hypoglycemia	3	0	0	3
5. Others	1	5	4	10
Hypertensive encephalopathy	1	2	2	5
Head injury	0	3	2	5
Total	165	90	76	331

Table-2. Etiological distribution of seizure patients in different age groups (n=331)

Etiology	Discharged without deficit (%)	Discharged with deficit (%)	LAMA (%)	Referred (%)	Expired (%)
Febrile Seizures (n=68)	68(100)	0(0)	0(0)	0(0)	0(0)
CNS infections (n=102)	65(63.7)	10(9.8)	12(11.8)	0(0)	15(14.7)
SOL (n=70)	65(93)	(0)	3(4)	2(3)	0(0)
Seizure disorder (n=70)	59(84)	(0)	2(3)	4(6)	5(7)
Metabolic causes (n=11)	10(91)	(0)	0(0)	0(0)	1(9)
Others (n=10)	10(100)	(0)	0(0)	0(0)	0(0)
Total (n=331)	277(83.7)	10(3%)	17(5)	6(2)	21(6)

Table-3: Etiology wise outcome in patients with seizures (n=331)

of absence seizures because of inclusion of only admitted patients rather than OPD patients and also absence seizures are more often missed by parents. 8% of our patients had status epilepticus. While some studies reported 10.9%[13], and 7.3%[11] of status epilepticus which was comparable to our study. However others[5] reported only 0.3% of patients with status epilepticus. The reason for such a low incidence in their study population could be due to maximum number of febrile seizure patients of which 76% were simple febrile where incidence of status epilepticus itself is negligible. Contrary to this; high incidence of CNS infection and epilepsy in our study can explain higher occurrence of status epilepticus in our study. Only 25% children presented with recurrent seizures while the rest came as first time presentation. Of the recurrent category maximum were cases of either epilepsy or inflammatory granuloma with breakthrough (80%) or withdrawal (20%) seizures. Some studies reported 19%[14] patients with recurrence (most were epilepsy followed by febrile seizures), while others reported higher recurrence (29-44%) with increasing age. The lower recurrence in our study might be due to higher cases with infectious etiology in our hospital rather than epilepsy.

Aetiological analysis revealed CNS infections to be commonest cause of seizure in pediatric age group, followed by SOL, epilepsy, febrile seizures and metabolic causes. Our findings were contrary to Chen et al[5] where febrile seizures were commonest cause followed by trauma, epilepsy and CNS infections. The reasons behind this discrepancy could be several, like median age in their study was 2 yrs while in our study it was 6 yrs, the later being less susceptible to febrile seizures. Secondly, being a developing and tropical country we have high occurrence

of CNS infections and infestations. Thirdly we are amongst major referral centre for CNS infections in Uttar Pradesh and that febrile seizures are managed at primary level itself. Lastly, region wise we have seasonal outbreaks of viral encephalitis in Uttar Pradesh hence large numbers of viral encephalitis cases are referred to our centre. Among CNS infections we found viral encephalitis as the most common cause followed by pyogenic meningitis, TBM, cerebral malaria and SSPE. The studies[13] from tropical countries had Cerebral malaria as most common cause of seizures where Malaria prevalence is much higher as compared to that of India. SOLs were a leading cause of seizures after CNS infections. NCC was the most common SOL followed by tuberculoma and brain tumors. Only 3% patients were found to have a metabolic cause for seizure. Such a low incidence may be due to exclusion of less than 6 month old children from our study who contributes maximally to metabolic causes of seizures. The study of Huang et al[15] reported 11% cases with metabolic etiology for seizures but their study population was comprised children up to only 3 yrs of age. Chen et al[5] reported only 3 out 319 as metabolic etiology for seizures because of which they made a suggestion that routine examination for glucose and electrolytes as being unnecessary investigation in seizure workup. However our submission is that the recommendations cannot be generalized. This is because in our country metabolic causes such as electrolyte imbalances, hypoglycemia and hypocalcemia are seen in patients less than 6 months age group and also in older children with PEM and serious CNS infections. So not doing metabolic tests for these entities will underestimate their real incidence as well as affect management issues.

Worldwide literature reveals that abnormal neuroimaging seems to be more associated with focal seizures than generalized seizures.[16] We performed neuroimaging in as many cases as possible (276/331). We too observed the same. We would like to remark that 30% of febrile seizure patients who underwent neuroimaging as a part of workup had normal CT findings in all. Thus we suggest that neuroimaging is a definite first line investigation in patients with focal seizures and that in other patients it could be considered after detailed physical and neurological examination. By this we can avoid unnecessary radiation to the children. In fact Chen et al[5] reported normal CT findings in all patients with complex febrile seizures. Some study reported abnormal EEG only in 22% of patients which could be due to very high proportion of febrile seizure patients in their study. Our study has lower number of abnormal EEG which is contrary to other studies. This could be due to resource limitation like ours where bed side EEG is not available and most patients get an EEG done during interictal periods.

While febrile seizures had the best outcome with all patients discharged without any deficits, CNS infections need to be focused more because of highest morbidity and mortality. Although immediate outcome in SOL and epilepsy patients seems good in terms of discharge (93% and 84% respectively), long term effects on developmental and intellectual outcome is not so good when compared with febrile convulsions. Total neurological outcome needs to be studied with good follow-up, since our study was not a follow-up study we could not comment upon long term neurological sequlae.

CONCLUSION

Seizures are not only the cause of high morbidity and mortality in children but also are the reasons of physical, mental and financial distress for their parents. Male preponderance and younger age at presentation were the highlights. Generalized seizures were the far most common type of all seizures. CNS infections, followed by SOL (NCC and tuberculoma), epilepsy and febrile seizures were commonest etiological reasons especially in context of a developing country and regional considerations. Being a developing nation, strict measures to prevent infection through interventions at home and community can reduce the occurrence of seizures in children thus preventing long term neurological sequelae in children. CSF analysis, Neuroimaging and EEG have the most important role in diagnosis of seizures however we suggest a good clinical evaluation should be ensured before advising these investigation especially CT scans where exposure of pediatric patients to radiation and its effects are still an area of study. We suggest a long term follow-up study in patients with seizures with regards to their neuro-behavioural outcomes.

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