

## Original Research Article

# Profile of children with seizures in a tertiary care hospital at VCSGGIMS and R Srinagar Pauri, Gharwal, Uttarakhand, India

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## ABSTRACT

**Background:** Seizure is one of the common causes of childhood hospitalization with significant mortality and morbidity. Current study is to find the etiology of seizure and classify seizure into various types and age groups presenting to tertiary center in Department of pediatrics VCSGGIMS and R Srinagar Pauri, Gharwal, Uttarakhand, India.

**Methods:** This was a hospital based prospective study carried out from 1st Jan. 2014 to 31st Dec 2014. Variables collected were demographics, clinical presentations, laboratory tests, brain imaging studies, electroencephalography, diagnosis and hospital course.

**Results:** A total of 276 patients were admitted for seizures with 172 (62.3%) males and 104 (37.7%) females. Among these patients, 148 (53.5%) presented with fever and 157 (56.8%) of children were less than 5 years of age. Generalized tonic-clonic seizure was the most common seizure type (69.2%) followed by partial (19.2%), absence (2.8%), myoclonus (1.6%) and others (6.9%). Seizure disorder (33.7%), febrile seizures (30%), CNS infections (meningitis 6.1%, encephalitis 6.5% and Tubercular meningitis 1.8%) and neurocysticercosis were other common etiologies. Abnormal brain images were noted in 55 (45.45%) out of 121 patients and most common abnormality was neurocysticercosis 33(12%).

**Conclusions:** Acute episode of seizure is one of the causes for hospitalization. It can be concluded from present study that most of seizures caused by febrile seizures and CNS infections (meningitis and encephalitis, neurocysticercosis) can be managed better with prompt interventions. Children presenting with unprovoked seizure need prolonged follow up with neurophysiologic studies and neuroimaging (CT or MRI) for better understanding of childhood seizure.

**Keywords:** Generalized tonic-clonic seizure, Neurocysticercosis, Seizures

## INTRODUCTION

Acute seizures are a common neurological symptom in sick children. In patients with fever, they include febrile seizures, acute symptomatic seizures (e.g. in a child with meningitis) or initial seizures in a child with epilepsy or epilepsy syndrome.<sup>1-3</sup> Worldwide, febrile seizures are the most common type of acute seizures in children.<sup>4</sup> Most are associated with infections and have a good outcome.<sup>5</sup>

In tropical countries, febrile seizures are common but the prevalence of acute symptomatic seizures (which have a poorer outcome) may be higher than Western countries.<sup>6-8</sup> The incidence of both acute seizures and febrile status epilepticus is higher and the outcome is worse since the etiology is different.<sup>2,6,8-11</sup> Acute seizures are therefore a major risk factor for neurological and cognitive impairment and for the development of epilepsy.<sup>12-17</sup> The incidence is highest in children less than 3 years of age,

with a decreasing frequency in older children.<sup>18</sup> Seizures account for about 1% of all emergency department visits, and about 2% of visits of children's hospital emergency department visits.<sup>19</sup> In most of the studies, febrile seizures were reported to be the most common type seen in the pediatric population and account for the majority of seizures seen in children younger than 5 years of age.<sup>19,20</sup> Central nervous system (CNS) infections are the main cause of seizures and acquired epilepsy in the developing world.<sup>20,21</sup> Geographical variations determine the common causes in a particular region. Acute seizures are common in meningitis, viral encephalitis and neurocysticercosis and in most cases are associated with increased mortality and morbidity, including subsequent epilepsy.<sup>22-24</sup> The standardized mortality rate (SMR) is highest in the youngest patients and in those with symptomatic seizure.<sup>25</sup> It is not always immediately clear which laboratory and imaging examinations should be performed when children are admitted with seizures. Children admitted in emergency department with new onset of non-febrile seizure are often evaluated using cranial computed tomography (CT).<sup>26,27</sup> Treating physician have to decide for further investigations including septic screen, metabolic studies, lumbar puncture and electroencephalogram (EEG) for patients who present with a first attack of seizure.

## METHODS

This was a prospective hospital-based study conducted in the Department of pediatrics VCSGGIMS and R Srinagar Pauri, Gharwal, Uttarakhand, India, during period of 1<sup>st</sup> January 2014 to 31<sup>st</sup> December 2014. A total of 2173 children in the age group 6 months to 15 years were admitted in the Pediatric Department.

### Inclusion criteria

- Among these, 276 children (12.7%) were admitted with presenting complain of seizure and were included in the study.

### Exclusion criteria

- Children with seizures onset after hospitalization were excluded.

The following information was obtained from the medical records of each patient: age (range from 6 months to 15 years), sex, type of seizure, associated symptoms (fever, cough, rhinorrhea, vomiting, diarrhea and headache), family history of seizure or epilepsy, developmental history, laboratory test results (white blood count, C-reactive protein, serum electrolytes, blood sugar and cerebrospinal fluid (CSF) analysis, neuroimaging; CT scan head or cranial magnetic resonance imaging (MRI), electroencephalography (EEG) findings, duration of hospital stay, final diagnosis. Final outcome was recorded in four categories: discharged after recovery, left against medical advice

(LAMA), mortality and referral to other institutions were also recorded. Patients were divided into two groups based on whether the seizure was with or without fever, comprised patients with temperature recorded greater than or equal to 38°C, and less than 38°C. Seizure type classification, including generalized tonic-clonic (GTC), absence, myoclonic, partial and other seizures types was based on the Commission on Epidemiology and Prognosis, 1993 International League Against Epilepsy.<sup>28</sup> Febrile seizure was defined by the 1993 International League Against Epilepsy as, "an epileptic seizure occurring in childhood after 1 month of age, associated with febrile illness not caused by an infection of the central nervous system (CNS), without previous neonatal seizure or previous unprovoked seizure, and not meeting criteria for other acute symptomatic seizure". In addition, febrile seizures were classified as simple febrile seizures or complex febrile seizures. A simple febrile seizure lasts less than 15-minutes, is initially generalized in nature, and occurs once during a 24-hour period. In contrast, a complex febrile seizure lasts more than 15 minutes, has focal features at any time, or recurs within a 24-hour period.<sup>28</sup> Other etiologies including meningitis and encephalitis were diagnosed on the basis of recorded clinical and laboratory investigation and verified with standard reference.<sup>29</sup> Furthermore, patients were divided into three age groups: age group (6 months-5 years), age group (6-10 years) and age group (11-15 years). Variables including age, sex, type of seizure, associated symptoms, family history of seizure or epilepsy, developmental history, laboratory test results, neuroimaging examinations, EEG findings, duration of hospital stay, diagnosis and final outcome were compared between febrile and afebrile group. These variables were also compared among children of different age groups.

### Statistical analysis

Descriptive statistics and testing of hypothesis were used for the analysis. The data was analyzed using Statistical Package for the Social Sciences (SPSS) for Windows Version 16.0 (SPSS Inc; Chicago, IL, USA).  $P < 0.05$  was considered as statistically significant.<sup>28</sup>

## RESULTS

There were a total of 2173 patients admitted to the ward between 6 months to 15 years of age during the study period. As shown in Table 1, out of 2173 patients only 276 (12.7%) children fulfilled the inclusion criteria, of seizures as a presenting complaint. Among 276 children 157 (56.8%) were in the age group 6 months to 5 years and were associated with fever in 115 (78%) of cases ( $p < 0.05$ ). Fever was present on admission in 148 (53.5%) of children. Afebrile seizure were common 48 (78.7%) in age group 11 to 15 years. There were 172 (62.3%) males and 104 (37.7%) female, male to female ratio ( $p$  value  $\leq 0.05$ ). Generalized tonic clonic seizures were the commonest seizure type in this study 191 (69.2%), these were followed by partial seizure 55 (19.2%), absence 8

(2.8%), myoclonic 3 (1.6%) and 121 (82%) of GTC seizures were febrile (p <0.05). Other seizure types

including tonic, atonic comprised remaining 19 (6.9%) of cases.

**Table 1: Demographic data of patients presenting with seizure and type of seizure.**

Variables	Sub variables	No fever n=128 (%)	Fever n=148 (%)	Total n=276 (%)
Sex	Male	73 (57)	99 (67)	172 (62.3)
	Female	55 (43)	49 (33)	104 (37.7)
Age	6 months to 5 year	42 (33)	115 (78)	157 (56.8)
	6 year to 10 year	38 (30)	20 (13.6)	58 (21.1)
	11 year to 15 year	48 (37.5)	13 (8.7)	61 (22.1)
Type of seizure	GTC	70 (55)	121 (82)	191 (69.2)
	Partial	36 (28)	19 (12.5)	55 (19.2)
	Absence	7 (5)	1 (0.7)	8 (2.8)
	Myoclonic	3 (2.3)	0	3 (1.6)
	Others	12 (9.3)	7 (4.7)	19 (6.9)

**Table 2: Patient analysis with seizures in terms of sex, CSF analysis, brain imaging, EEG and diagnosis.**

Variables	Sub variables	6 months to 5 years n (%)	6 years to 10 years n (%)	11 years to 15 years n (%)	Total n (%)
Sex	Male	106 (67.5)	36 (62)	30 (49.2)	172 (62.3)
	Female	51 (32.4)	22 (37.9)	31 (50.8)	104(37.7)
CSF analysis	Normal	86 (80.3)	18 (60)	13 (62)	117 (74)
	Abnormal	21 (19.6)	12 (40)	8 (38)	41 (25.9)
Brain image	Normal	32 (64)	17 (51.5)	17 (44.7)	66 (54.5)
	Abnormal	18 (36)	16 (48.5)	21 (55.3)	55 (45.45)
EEG	Normal	40 (52.6)	18 (39.1)	17 (33.3)	75 (43.3)
	Abnormal	36 (47.3)	28 (60.9)	34 (66.7)	98 (56.6)
Diagnosis	Febrile seizure	83 (52.9)	-	-	83 (30)
	Seizure disorder	34 (21.6)	28 (48)	31 (50.8)	93 (33.7)
	Neurocysticercosis	5 (3)	11 (19)	17 (28)	33 (12)
	Meningitis	9 (5.7)	5 (8.6)	3 (4.9)	17 (6.1)
	Encephalitis	10 (6.3)	5 (8.6)	3 (4.9)	18 (6.5)
	Cerebral palsy	3 (1.9)	2 (3.4)	1 (1.6)	6 (2.2)
	Tubercular meningitis	2 (1.3)	2 (3.4)	1 (1.6)	5 (1.8)
	Hypertensive encephalopathy	1 (0.6)	3 (5.2)	1 (1.6)	5 (1.8)
	Others	10 (6.4)	2 (3.4)	4 (6.6)	16 (5.8)

**Table 3: Outcome in relation to gender, fever and diagnosis.**

Variables	Sub variables	Discharged n (%)	LAMA n (%)	Died n (%)	Referred n (%)
Sex	Male	157 (91.3)	4 (2.3)	9 (5.2)	2 (1.2)
	Female	91 (87.5)	7 (6.7)	4 (3.8)	2 (1.9)
Fever	Present	131 (88.5)	6 (4)	9 (6.1)	2 (1.3)
	Absent	117 (91.4)	5 (3.9)	4 (3.1)	2 (1.6)
Diagnosis	Febrile seizure	82 (98.7)	1 (1.2)	-	-
	Seizure disorder	88 (94.6)	2 (2.1)	2 (2.2)	1 (1.1)
	Neurocysticercosis	32 (97)	1 (3)	-	-
	Meningitis	13 (76.4)	2 (11.8)	2 (11.7)	-
	Encephalitis	12 (66.6)	2 (11.1)	3 (16.6)	1 (5.6)
	Cerebral palsy	4 (66.7)	1 (16.7)	-	1 (16.7)
	Tubercular meningitis	2 (40)	1 (20)	2 (40)	-
	Hypertensive encephalopathy	5 (100)	-	-	-
	Others	10 (62.5)	1 (6.2)	4 (25)	1 (6.2)
Total		248 (90)	11 (4)	13 (4.7)	4 (1.4)

Seizures were more common in males in age group 6 months to 5 years 157 (56.8%) followed by 58 (21.1%) in 6 year to 10 years and (22.10%) in the age group 11 to 15 years.

Table 2 showing lumbar puncture was performed in 158 (57.2%) children with abnormal reports in 41 (25.9%). CSF was reported abnormal only in (19.6%) of children in the younger age group (6 months to 5 years) as compared to patients in older age groups.

Neuroimaging was done in 121 (43.8%) children admitted with seizures, 21 (55.3%) patients were showing abnormal neuroimaging in age group 11 to 15 years. so, frequency of abnormal neuroimaging was noticed more in older than younger age groups patients. Neuroimaging had revealed abnormalities in total 55 (45.5%) patients and most common finding was neurocysticercosis in 33 children, more common in higher age groups. Electroencephalogram (EEG) was done in 173 (62.7%) children and had abnormal reports in 98 (56.6%) of cases. Percentage of abnormal EEG patients was more in age group 11 year-15 year 34(66.7%).

Table 2 showing childhood seizure disorder was commonest diagnosis 93(33.7%) followed by febrile seizures 83 (30%), neurocysticercosis 33 (12%), meningitis 17 (6.1%) and encephalitis 18 (6.5%). Other diagnosis made were cerebral palsy 6 (2.2%), tubercular meningitis 5 (1.8%), hypertensive encephalopathy 5 (1.8%). Miscellaneous etiologies including electrolyte imbalance (hypoglycemia, hypocalcaemia), hydrocephalus, neurocutaneous syndrome, intracranial hemorrhage, brain abscess, congenital malformations of central nervous system, hepatic and enteric encephalopathy accounted for remaining 10 (6.4%) of cases. Final outcome was noted as discharge, death during hospital stay, left against medical advice and those referred to other specialty center for further management.

Table 3 showing thirteen (4.7%) of children died in hospital, 11 (3.9%) had left against medical advice, 4 (1.4%) cases were referred and remaining were discharged after successful treatment. There was an insignificant difference in outcome between male and female, those with or without fever.

## DISCUSSION

This was a hospital based prospective study of children admitted with acute episode of seizure in a tertiary care center in the Department of Pediatrics, VCSGGIMS and R Srinagar Pauri, Gharwal, Uttarakhand, India. It aimed in studying demographics, clinical seizure types, etiologies and outcome during the hospital stay of those children. Neonates and infants under 6-months of age were excluded from the study because frequently they have conditions like septicemia, hypoxic ischemic

encephalopathy, metabolic disorders which comprise one spectrum of diseases.<sup>30</sup>

Most studies show high incidence of seizures in younger children with a decreasing frequency in older age group and more common in males.<sup>19,21</sup> Most children with seizures in present prospective study were younger than 5 years of age. Seizure was associated with fever in 53.6% of cases. Most studies show generalized seizures are much more common compared to partial seizure.<sup>20,21</sup> In the current study generalized tonic-clonic was commonest seizure type and found to have higher incidence among febrile children. Partial seizure was common among children of developing countries with the setting of high incidence of neurocysticercosis.<sup>23</sup>

Partial seizures represented only 55 (19.2%) of children in the current study. In this study abnormal neuroimaging was present in 55 (45.5%). There seems role of routine neuroimaging in afebrile children with seizures in age group more than 5 years in developing countries with high prevalence of neurocysticercosis. AAP recommends lumbar puncture for febrile seizure children aged less than 12-months.<sup>30</sup> CSF abnormality was more in children of age groups more than 5 years compared to younger age group. Lumbar puncture may be done in selected children guided by physical finding to rule out CNS infections in older children. There are many possible etiologies of a first seizure attack in children, including infection, neurologic/ developmental causes, traumatic head injury, toxins, and metabolic disturbances.<sup>20</sup> Febrile seizures have been reported to be one of the most common causes of seizure attack in children.<sup>20</sup> Authors found that febrile seizures (52.9%) were the main etiology of a first attack of seizure in children less than 5 years of age. Overall, seizure disorder was commonest etiology in children aged 6 months to 15 years (33.7%) followed by febrile seizure (30%).

There was no significant difference in the outcome among male and female. Meningitis and encephalitis cause significant childhood mortality and morbidity.<sup>20</sup> Children with diagnosis of encephalitis and those with status epilepticus had poor outcome with high mortality.<sup>31</sup>

Febrile seizure, neurocysticercosis and hypertensive encephalopathy had good outcome with majority of children discharged after recovery. As evident from current study provoked seizures including CNS infections and neurocysticercosis account for majority of cases. Most of these might be prevented with imparting health education to the community and early medical consultation.

Limitations of the study were defined as mortality during hospital stay and authors were unable to study morbidities like neurological dysfunction. The details of other causes contributing for seizures like inborn error of metabolism could not be specified due lack of

investigations. Multi centric prospective study is needed to find out details regarding these problems.

## CONCLUSION

Acute episode of seizure is one of the causes for hospitalization. It can be concluded from present study that most of seizures caused by febrile seizures, CNS infections like meningitis and encephalitis, neurocysticercosis can be managed better with prompt interventions. Children presenting with unprovoked seizure need prolonged follow up with neurophysiologic studies and neuroimaging (CT or MRI) for better understanding of childhood seizure.

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## REFERENCES

- Nelson KB, Ellenberg JH. In: Febrile Seizures. Nelson KBEJH, ed. New York, Raven Press; 1981.
- adleir LG, Scheffer IE. Febrile seizures. *BMJ.* 2007; 334:307-11.
- Huang CC, Chang YC, Wang ST. Acute symptomatic seizure disorders in young children-a population study in southern Taiwan. *Epilepsia.* 1998;39:960-4.
- Hauser WA. The prevalence and incidence of convulsive disorders in children. *Epilepsia.* 1994;35(Suppl 2):S1-6.
- Verity CM, Greenwood R, Golding J. Long-term intellectual and behavioral outcomes of children with febrile convulsions. *N Engl J Med.* 1998;338:1723-8.
- Akpede GO, Abiodun PO, Sykes RM. Pattern of infections in children under-six years old presenting with convulsions associated with fever of acute onset in a children's emergency room in Benin City, Nigeria. *J Trop Pediatr.* 1993;39:11-5.
- Birbeck GL. Seizures in rural Zambia. *Epilepsia.* 2000;41:277-81.
- Waruiru CM, Newton CR, Forster D, New L, Winstanley P, Mwangi I, et al. Epileptic seizures and malaria in Kenyan children. *Trans R Soc Trop Med Hyg.* 1996;90:152-5.
- Iloeje SO. Febrile convulsions in a rural and an urban population. *East Afr Med J.* 1991;68:43-51.
- Owusu-Ofori A, Agbenyega T, Ansong D, Scheld WM. Routine lumbar puncture in children with febrile seizures in Ghana: should it continue? *Int J Infect Dis.* 2004;8:353-61.
- Iloeje SO. Paediatric neurologic emergencies at the University of Nigeria Teaching Hospital, Enugu. *West Afr J Med.* 1997;16:80-4.
- Carter JA, Mung'ala-Odera V, Neville BG, Murira G, Mturi N, Musumba C, et al. Persistent neurocognitive impairments associated with severe falciparum malaria in Kenyan children. *J Neurol Neurosurg Psychiatry.* 2005;76:476-81.
- Boivin MJ, Bangirana P, Byarugaba J, Opoka RO, Idro R, Jurek AM, et al. Cognitive impairment after cerebral malaria in children: a prospective study. *Pediatr.* 2007;119:e360-6.
- Annegers JF, Hauser WA, Elveback LR, Kurland LT. The risk of epilepsy following febrile convulsions. *Neurol.* 1979;29:297-303.
- Carter JA, Neville BG, White S, Ross AJ, Otieno G, Mturi N, et al. Increased prevalence of epilepsy associated with severe falciparum malaria in children. *Epilepsia.* 2004;45:978-81.
- Ngougou EB, Dulac O, Poudiougou B, Druet-Cabanac M, Dicko A, Mamadou Traore A, et al. Epilepsy as a consequence of cerebral malaria in area in which malaria is endemic in Mali, West Africa. *Epilepsia.* 2006;47:873-9.
- Ngougou EB, Koko J, Druet-Cabanac M, Assengone-Zeh-Nguema Y, Launay MN, Engohang E, et al. Cerebral malaria and sequela epilepsy: first matched case-control study in Gabon. *Epilepsia.* 2006;47:2147-53.
- Friedman MJ, Shariieff GQ. Seizures in children. *Pediatr Clin North Am.* 2006;13:257-77.
- Martindale JL, Goldstein JN, Pallin DJ. Emergency department seizure epidemiology. *Emerg Med Clin North Am.* 2011;13(1):15-27.
- Idro R, Gwer S, Kahindi M. The incidence, aetiology and outcome of acute seizures in children admitted to a rural Kenyan district hospital. *BMC Pediatr.* 2008;13:5.
- Chen CY, Chang YJ, Wu HP. New-onset seizures in pediatric emergency. *Pediatr Neonatol.* 2010;13(2):103-11.
- Murthy JMK, Yangala R. Acute symptomatic seizures-incidence and etiological spectrum: a hospital-based study from South India. *Seizure.* 1999;13:162-5.
- Basu S, Ramchandran U, Thapliyal A. Clinical profile and outcome of pediatric neurocysticercosis: A study from Western Nepal. *J Pediatr Neurol.* 2007;13:45-52.
- Rayamajhi A, Singh R, Prasad R, Khanal B, Singhi S. Study of Japanese encephalitis and other viral encephalitis in Nepali children. *Pediatr Int.* 2007;13(6):978-84.
- Allen Hauser W, Beghi E. First seizure definitions and worldwide incidence and mortality. *Epilepsia.* 2008;13(Suppl 1):8-12.
- Goldstein JL. Evaluating new onset of seizures in children. *Pediatr Ann.* 2004;33(6):368-74.
- Bautovich T, Numa A. Role of head computed tomography in the evaluation of children admitted to the paediatric intensive care unit with new-onset seizure. *Emerg Med Australas.* 2012;24(3):313-20.
- Commission on Epidemiology and Prognosis: International League Against Epilepsy. Guideline for epidemiologic studies on epilepsy. *Epilepsia.* 1993;34:592-6.

29. Prober CG, Dynler LL. Central nervous system infections. In: Nelson Textbook of Pediatrics; 19<sup>th</sup> ed; chapter 603.1. 2940.
30. Academy of Pediatrics. Provisional Committee on Quality Improvement, Subcommittee on Febrile Seizures: Practice parameter: the neuro diagnostic evaluation of the child with a first simple febrile seizure. *Pediatrics*. 1996;97:769-72.
31. Santos MI, Nzwalo H, Monteiro JP, Fonseca MJ. Convulsive status epilepticus in the pediatric

emergency department: five year retrospective analysis. *Acta Med Port*. 2012;25(4):203-6.

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