

## Clinical Profile of Seizures in Children between 1 Month to 12 Years of Age Admitted to Tertiary Care Center

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### Abstract

**Background:** A seizure is a paroxysmal involuntary disturbance of brain functions. Seizures are broadly divided into generalized and partial seizures. Generalized tonic-clonic seizures are the most common type of seizures in childhood. **Aim:** To study the clinical profile and probable etiology of children presenting with seizures. **Material And Methods:** A Prospective observational study in tertiary care during February 2013 to 2016. A total of 527 cases presenting with seizures between 1 month and 12 years of age were included. A detailed history with demographic details and clinical examination were noted in a preformed structured proforma. **Results:** Generalized Tonic Clonic 214 (62.02%) was the most common type of seizure type followed by generalized tonic 111 (32.17%) and myoclonic 08 (2.31%). Simple partial seizure was the most common type observed in 110 (60.4%) patients followed by complex partial seizure 58 (31.8%) and complex partial seizures with secondary generalization in 14 (7.69%) patients. Most common symptom apart from seizure was fever in 381 (72.2%) patients and etiology for seizure was febrile seizures in 204 (38.7%) followed by acute symptomatic seizures 178 (33.77%). The most common etiology was acute bacterial meningitis in 71 (39.88%), viral encephalitis 53 (29.77%), tubercular meningitis 28 (15.73%). **Conclusion:** Febrile seizures and CNS infections are common causes of seizures in febrile children. Neuroimaging should be advised in all patients with partial and afebrile seizures.

**Keyword:** Seizure; Febrile; CNS Infections.

### Introduction

A seizure is defined as a paroxysmal involuntary disturbance of brain functions that may manifest as an impairment or loss of consciousness, abnormal motor activity, behavioral abnormality, sensory disturbances or autonomic dysfunction. Seizures are broadly divided into generalized and partial seizures. Generalized seizures may be tonic-clonic, tonic, clonic, absence, atonic and myoclonic [1,2]. Generalised tonic-clonic seizures are the most common type of seizures in childhood. Tonic seizures are characterized by extension and stiffening of the body with an upward deviation of eyeballs. Absence seizures are characterized by brief abrupt lapse of

awareness or consciousness, sudden discontinuation of activity being performed with staring spells, eye fluttering or rhythmic movements. Myoclonic seizures are characterized by brief repeated extension and flexion movements of arms, legs or all four limbs [1]. Partial seizures are classified into simple partial, complex partial and partial seizures with secondary generalization. Partial seizures can be purely motor, purely sensory or may affect higher functions [2].

Complex partial seizures are associated with automatisms or with the loss of consciousness. Any seizure that originates in the cortex may discharge into the brain stem, causing a generalized tonic-clonic seizure. Causes of seizures in children are broadly classified into associated with fever and without the association of fever. Without association of fever could be metabolic disorders, space occupying lesions, vascular defects like AV malformations, epilepsy syndromes, congenital malformations of central nervous system, drug poisonings, encephalopathies, storage disorders, neuronal migration defects or as sequelae of birth trauma and asphyxia [1,2]. Seizures are an important cause of childhood admission in hospital.

The aim of the present study was to study the

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clinical profile and probable etiology of children presenting with seizures.

## Material and Methods

*Design:* Prospective observational study.

*Setting:* Tertiary care.

*Period:* February 2013 to 2016.

### Inclusion Criteria

All cases presenting with seizures between 1 month and 12 years of age.

### Exclusion Criteria

Children less than 1 month of age and Children with a known history of seizure disorder

Total 527 patients children presented to pediatric ward with the history of seizures and satisfying inclusion and exclusion criteria were enrolled in the study after obtaining informed consent. This study was approved by institutional ethical committee no. Pharma/IEC-GMCA/445/2013. A detailed history with demographic details and clinical examination were noted in a preformed structured proforma; CBC (complete blood count), CSF (cerebrospinal fluid) biochemical, CSF microscopy, Gram stain, ZN stain CSF culture, PS for malarial parasite and expert opinion and Random blood sugar were done in all patients.

### Febrile Seizures

Patient was diagnosed as simple febrile seizure who presented between 6 months to 5 years of age, that are not the result of central nervous system infection or any metabolic imbalance and that occur in the absence of prior afebrile seizures [2,3]. Simple febrile seizure is primary generalized, usual tonic-clonic attack associated with fever, lasting for a maximum 15 min and not recurrent in a 24 hour

period. A complex febrile seizure is >15 min, is focal and recurred within 24 hours [2,3].

*Acute Bacterial Meningitis:* Patients were diagnosed as acute bacterial meningitis on the basis of CSF leucocytes more than 5 cells/hpf, demonstration of organisms on gram staining, CSF proteins more than 45 mg/dl and sugar less than 40 mg/dl, isolation of organisms on CSF culture [2,4].

*Tubercular Meningitis:* Diagnosed on the basis of clinical suspicion, clinical examination, documentation of focus of tuberculosis in other parts of the body, CSF cellular response lymphocytosis, acid-fast staining, CSF protein markedly raised and sugar less than 50 and neuroimaging showing basilar enhancement and communicating hydrocephalus with signs of cerebral edema or focal ischemia [2,5].

*Cerebral Malaria:* Was diagnosed in patients having clinical features along with positive peripheral smear or serology for Plasmodium falciparum [6,7].

*Viral Encephalitis:* Was diagnosed on the clinical basis and the absence of organism on microscopy and culture or when no other alternative diagnosis identifiable with or without CSF pleocytosis, after ruling out metabolic derangement [2,7].

*Hyponatremia:* Is diagnosed when serum sodium is below 135 after ruling out other possible causes [7,8].

*Hypernatremia:* Is diagnosed when serum sodium is more than 150 after ruling out other possible causes [7,8].

*Hypocalcemia:* Is diagnosed when serum calcium level is less than 2 mmol/lit [9]. ADEM: Is diagnosed on the basis of clinical and MRI Brain finding [2,10].

*SPACE Occupying Lesion:* Is diagnosed on the basis of clinical findings with neuroimaging demonstration of space occupying lesion.

*Epilepsy:* It was diagnosed in patients with more than or equal to two unprovoked seizures in a time frame of >24 hours. Seizures were classified according to ILAE classification [2]. Outcome is defined as died or survive.

## Observations and Results

**Table 1:** Distribution of patients according to their Age

Age Distribution (years)	No of Patients (n=527)	Percentage (%)
1 month - Below 1 year	107	20.3
1-5	254	48.19
6-12	166	31.49
Total	527	100

**Table 2:** Distribution of patients according to types of generalized seizures

Generalized Seizures	No. of Patients (n=345)	Percentage (%)
GTCT	214	62.02
Generalized Tonic	111	32.17
Myoclonic	08	2.31
Clonic	05	1.44
Absence	04	1.15
Atonic	03	0.86
Total	345	100%

**Table 3:** Distribution of patients according to types of partial seizures

Types of partial seizure	No. of patients (n=182)	Percentage (%)
Simple partial seizures	110	60.4
Complex partial seizures	58	31.8
Complex partial seizures with secondary generalization	14	7.69
Total	182	100

**Table 4:** Distribution of patients according to clinical profile apart from seizure

Presentation	No. of Patients	Percentage (%)
Fever	381	72.2
Altered sensorium	180	34.15
Status epilepticus	39	7.4
Rash	24	4.5

**Table 5:** Distribution of patients according to Aetiology of seizures

Aetiology	No of Patients (n=527)	Percentage (%)
Febrile seizures	204	38.70
Acute symptomatic seizures	178	33.77
epilepsy	113	21.44
Space occupying lesion	29	5.50
Others	03	0.56
Total	527	100

**Table 6:** Distribution of patients according to causes of acute symptomatic seizures

Etiology	Out of 178 Patients	Percentage (%)
Acute Bacterial Meningitis	71	39.88
Viral encephalitis	53	29.77
Tubercular meningitis	28	15.73
Hypocalcemic seizures	07	3.93
Hyponatremia	06	3.37
Cerebral malaria	05	2.80
ADEM	04	2.24
Rickettsial encephalopathy	02	1.12
Enteric encephalopathy	01	0.56
Dengue encephalopathy	01	0.56
Total	178	100

ADEM(acute disseminated encephalomyelitis)

**Table 7:** Different etiologies of seizures in children in various studies

Etiology	Present study (n=527)	Saravanan <sup>11</sup> (n=520)	Sudhir et al <sup>12</sup> (n=551)	Garg et al <sup>13</sup> (n=96)
Febrile seizures	204(38.7%)	190(36.5%)	168(30.5%)	33%
Acute symptomatic seizures	178(33.77%)	106(20%)	99(17.9%)	47%
Epilepsy	113(21.44%)	174(33%)	185(33.5%)	
Space occupying lesion(SOL)	29(5.5%)	42(8%)	66(12%)	4%
Others	03(0.56%)	8(2%)	33(6%)	1%

## Discussion

There are only a few studies in the literature which have included all the causes of seizures. In the present study, the age distribution is 1-5 years 254 (48.19%), above 5 years 166 (31.49%) and less than one year 107 (20.3%). The most commonly affected age group of patients was between 1-5 years. In Saravanan S [11] most commonly affected group was 1-5 years 234 (45%), followed by less than 1 year 152 (29.2%). Sudhir et al [12] showed age group 6 months to 5 years was most commonly affected 317 (57.5%) then 6-10 years 117 (21.2%) and 11-15 years in 117 (21.2%) patients.

In the present study, it was noted a male predominance with males constituted 306 (58.06%) and females constituted 221 (41.94%) of the study population with 1.38:1 male: female ratio. This finding was similar to previous studies like Saravanan S<sup>11</sup> (male: female ratio 1.36:1), Sudhir et al [12] (male: female ratio 1.58:1), Garg et al [13] (male: female ratio 2.4:1), and Selina et al [14] (male: female ratio 1.84:1). Although none of the CNS infections were known to have a male predominance yet this apparent male predominance can be attributed to social reason.

In the present study most of the patients presented with generalized seizures 345 (65.4%) followed by partial seizures 182 (34.6%). In generalized seizure group, Generalized tonic-clonic seizures were the most common type of seizures [214/345 (62.02%)] and also the most common type of seizure overall [214/527 (40.6%)]. Other types of generalized seizures observed were generalized tonic 111 (32.17%), Myoclonic 08 (2.31%), Clonic 05 (1.44%), Absence 04 (1.15%), and Atonic in 03 (0.86%) number of patients. In partial seizure group, Simple partial seizure 110 (60.4%) was the most common type followed by Complex partial seizure 58 (31.8%) and complex partial seizure with secondary generalization in 14 (7.69%) number of patients. The similar finding was reported by Saravanan S [11] showing generalized seizures to be the most common type 308 (59.2%) followed by partial seizures 212 (40.7%), and generalized tonic-clonic was the most common type of seizure observed 154 (29.6%) overall.

Other types of generalized seizures noted in Saravanan S [11] study were Tonic 90 (29%), Clonic 18 (6%), Myoclonic 14 (5%), Absence 16 (5%) and Atonic in 16 (5%) number of patients. In Saravanan S study amongst partial seizure group, complex partial seizures with secondary generalization were seen in 92 (43.3%) patients followed by complex partial seizures 80 (37.7%) and simple partial seizures in 40 (18.8%) patients.

Sudhir et al [12] study has also found similar finding with generalized seizures 448 (80.4%) to be the most common type of seizure observed and generalized tonic-clonic seizure as the most common type 385 (69.9%) overall, followed by partial seizures 109 (19.78%) and others in 35 (6.4%) patients. Other types of generalized seizures in Sudhir et al [12] study were Absence 15 (2.7%) and Myoclonic in 7 (1.3%) number of patients. Selina et al [14] found generalized tonic-clonic 96 (63.6%) was the most common seizure type followed by partial seizure 38 (25.2%). Prakash et al [15] showed generalized seizures 240 (79.2%) to be the most common type of seizures and then partial seizures 44 (14%). All above studies are showing similar observations. Apart from seizure, fever was present in 381 (72.2%), altered sensorium 180 (34.15%), status epilepticus 39 (7.4%) and rash in 24 (4.5%) number of patients.

Fever was present in 381 (72.29%) patients. Fever was present in all cases of febrile seizures 204. In acute symptomatic seizures, fever was present in 171 patients. It was present in 05 cases of space occupying lesion and in 01 case of kerosene poisoning. Fever was present in 265 (51%) patients in Saravanan S [11] study and 295 (53.5%) patients in Sudhir et al [12] study. In the present study number of patients with fever was present due to more number of patients with intracranial infections.

In present study alteration of sensorium was seen in 180 (34.3%) patients. This can be attributed to more number of patients with intracranial infections, which includes all patients with acute bacterial meningitis, viral encephalitis, tubercular meningitis, ADEM, cerebral malaria, dengue encephalopathy, rickettsial encephalopathy and enteric encephalopathy. Other causes of alteration of sensorium were Hyponatremia 06 (3.3%), late HDN with intracranial bleed 05 (2.7%), kerosene poisoning 03 (0.1%) and hypocalcemia in 01 (0.05%) patient. Similar findings of altered sensorium were also reported by Karmarkar S et al [7] who studied children with acute febrile encephalopathy. In our study 39 (7.4%) patients presented with status epilepticus and results are comparable with Saravanan [11] 48 (9%) and Sudhir et al [12] 40 (7.2%) study.

Acute bacterial meningitis was the most common cause of status epilepticus 17 (43.5%) followed by viral encephalitis 10 (25.6%), epilepsy 05 (12.8%), tubercular meningitis 04 (10.2%), cerebral malaria 02 (5.1%) and hyponatremia in 01 (2.5%) case. In a study by Saravanan S [11] 48 (9%) patients presented with status epilepticus while in Sudhir et al [12] study 40 (7.2%) patients had status epilepticus. In present study 24 (4.5%) patients had rash as manifestation.

These patients presented with acute symptomatic seizures. Amongst these patients rash was the most common manifestation in viral encephalitis 15(62.5%), acute bacterial meningitis 05 (20.8%), rickettsial encephalopathy 02 (8.3%), dengue encephalopathy 01 (4.1%) and in tubercular meningitis 01 (4.1%). The occurrence of rash in viral encephalitis in our study was similar to study eluted by Karmarkar s. et al [7]. The rash was commonly associated with viral etiology as compared to other etiology because viral illnesses are more commonly associated with exanthema. Higher incidence of rash in Karmarkar s et al [7] was due to more focus was given on viral etiology.

In the present study in Febrile seizures group, Simple febrile seizures 122 (59.8%) were more common than complex febrile seizures 82 (40.2%). A similar finding was noted in a study done by Saravanan S [11] showing patients with simple febrile seizures 96 (50.5%) were more as compared to complex febrile seizures 94 (49.47%).

Amongst acute symptomatic seizures, acute bacterial meningitis 71 (39.88%) was the most common and then viral encephalitis 53 (29.77%). Tubercular meningitis 28(15.73%), hypocalcaemic seizure 07 (3.93%), hyponatremia 06 (3.37%), cerebral malaria 05 (2.8%), and ADEM in 04 (2.2%) patients. The number of acute bacterial meningitis cases in the present study can be attributed to lack of routine vaccination against H. influenza and pneumococcus. Other causes of acute symptomatic seizures in our study were rickettsial encephalopathy 01 (0.56%), enteric encephalopathy 01 (0.56%) and dengue encephalopathy in 01 (0.56%) patient.

Similar finding was reported in study by Saravanan [11] showing meningitis 46 (43%), encephalitis 20(18%), camphor poisoning 14 (13%), post-traumatic 12 (11%), hyponatremic 05 (6%), hypoglycaemia 04 (4%), hypocalcemia 04 (6%) were the common causes of acute symptomatic seizures. A similar finding was also noted by Sudhret al [12] showing meningitis 36 (6.5%), encephalitis 37 (6.7%), tubercular meningitis 08 (1.5%) to be the common causes apart from seizure disorder 185 (33.6%) and febrile seizures 168 (30.5%).

Chao Chinget al [16] found acute gastroenteritis 118 (25.5%) to be the most common cause of acute symptomatic seizures followed by encephalitis/ encephalopathy 104 (22.2%) and bacterial meningitis/ abscess in 96 (20.6%) number of patients. In Taiwan and Japan, rotavirus is an important cause of infantile diarrhoea. Frequent rotavirus infections in this highly populated island country contributed

acute gastroenteritis to be the most common etiology of acute symptomatic seizures. Richard et al [17] found cerebral malaria 479 (53.2%) followed by respiratory tract infections 138 (15.3%) followed by pyogenic meningitis 24 (2.7%) to be the most common etiologies in acute symptomatic seizures in children. The number of cerebral malaria cases was due to regional variation.

### Summary

There is male preponderance observed in our study. The generalized tonic-clonic seizure was the most common type of seizure observed. Febrile seizures are the most common cause of childhood seizures and then acute symptomatic seizures. Acute bacterial meningitis was the most common cause of the acute symptomatic seizure. Apart from seizure other clinical manifestations in our study were an alteration of sensorium, rash and status epilepticus. In acute bacterial meningitis, viral encephalitis, tubercular meningitis and cerebral malaria alteration of sensorium were most commonly observed. In viral encephalitis and acute bacterial meningitis, the rash was most commonly observed. In acute bacterial meningitis and viral encephalitis, Status epilepticus was most commonly present most common space occupying lesion was intracranial bleed with late onset haemorrhagic disease of the newborn.

### Conclusion

Acute episodes of seizures are one of the commonest cause of hospitalization with high mortality. Febrile seizures and CNS infections are common causes of seizures in febrile children. Neuroimaging should be advised in all patients with partial seizure and afebrile seizures. EEG should be done in all patients with unprovoked seizures and all patients with complex febrile seizure. Children presenting with unprovoked seizure require long-term follow-up.

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