Original Research Article

A Study of clinical profile of status epilepticus in pediatric age group at tertiary health care center

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Abstract

Background: Status epilepticus is a neurological emergency requiring immediate evaluation and management to prevent significant morbidity or mortality. An epileptic seizure is a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain. The short-term mortality (within 30 days) of SE ranges from 7.6% to 22% across all age groups and is highest amongst the elderly. Present study was aimed to study clinical profile and neurological outcome of children's presenting with status epilepticus at a tertiary health care center. **Material and Methods:** Present study was hospital based, prospective and observational study conducted in children of age 1month to 12 years who presented with status epilepticus. **Results:** In present study, male to female ratio was 1.38: 1. The mean age of patients was 3.75 ± 2.43 years, ranged from 1 month -12 years. Maximum number of cases age of 1st onset of seizure was 6-12 months (23%) followed by 2-6 months (22%) and 5-10 years (21%). GTCS was the commonest type of seizure seen in 97 cases (97%) and focal seizure with secondary GTCS observed in 3(3%) cases. Most common etiology associated with status epilepticus in children was seizure disorder (44%), followed by acute CNS infection (34%), fever provoked seizures (24%) and Quadriplegia (19%). Out of 20 children with abnormal neuroimaging, 7 children had refractory status epilepticus (RSE). Out of 100 cases, 76 cases (76%) recovered. Among those recovered, 6 cases (6%) recovered with new neurological sequel; 13 cases (13%) died and 5 cases (5%) discharged against medical advice (AMA). **Conclusion:** In present study, children below 5 years had a higher incidence of status epilepticus. The commonest type of seizure was a generalized tonic-clonic seizure. Seizure disorder, acute CNS infections, and febrile seizures were commonest etiological reasons. CSF analysis, Neuroimaging and EEG have the most important role in diagnosis of seizures.

Keywords: status epilepticus. generalised tonic-clonic seizure, Seizure disorder, acute CNS infections, febrile seizures

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INTRODUCTION

Status epilepticus is a neurological emergency requiring immediate evaluation and management to prevent significant morbidity or mortality. The Neurocritical Care Society guidelines defined seizure as with 5 minutes or more of continuous clinical and/or electrographic seizure activity, or recurrent seizure activity without recovery between seizures.[1,2] ILAE in 2014 suggested seizures and epilepsy are not the same. An epileptic seizure is a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain. Epilepsy is a disease characterized by an enduring predisposition to generate epileptic seizures and by the neurobiological, cognitive, psychological, and social consequences of this condition.[3] The reported mortality at hospital discharge in SE is 9–21%. The short-term mortality (all age groups) rates reported from India and other developing countries range between 10.5% and 28%.[4] Morbidity and mortality from status epilepticus seems to be due to CNS damage due to the underlying

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illness or acute insult causing the status epilepticus, due to repetitive electrical discharge of the seizure itself and systemic and metabolic factors related to repeated Generalized tonic-clonic seizures (GTCS) type of seizures.[5] The short-term mortality (within 30 days) of SE ranges from 7.6% to 22% across all age groups and is highest amongst the elderly.[6] Present study was aimed to study clinical profile and neurological outcome of children's presenting with status epilepticus at a tertiary health care center.

MATERIAL AND METHODS

Present study was hospital based, prospective and observational study conducted in Department of Paediatrics, Vilasrao Deshmukh Government Medical College, Latur, India. Study duration was of 2 years (1st November 2018 to 31st October 2020).

Inclusion criteria: Children of age 1month to 12 years who presented with status epilepticus.

Exclusion criteria: Child with status epilepticus with head injury. Children less than 1 month and more than 12 years of age. Patients whose parents do not give consent. The study was commenced after the institution ethical committee clearance. Informed consent was obtained from the concerned parents/guardian. All consecutive cases of status epilepticus-those admitted during the study period. A total 100 Children's of age 1month to 12 years who presented with status epilepticus were enrolled in the study.

All children who met the inclusion criteria were enrolled in the study and informed consent was obtained from their parents/guardian. A detailed history in all cases was taken with emphasis on the onset of seizure, duration of seizure, number of convulsion, type of seizure, antenatal, natal and post natal risk factors. Thorough clinical examination was done – vitals, general physical examination and systemic examination with special reference to central nervous system. All relevant investigations to arrive at the diagnosis and further management performed; children were followed up to evaluate their immediate outcome. i.e., till discharge or death.

Data entered in Microsoft-Excel sheet and its analysis performed by the statistical software SPSS. Chi square test and Fischer test are used for nominal data. 'P' value less than 0.05 was considered statistically significant.

RESULTS

In present study, out of total 100 patients participants 58% patients were males and 42% patients were females. This distribution shows the predominance of males with male to female ratio of 1.38: 1 and difference was not statistically significant, Maximum numbers of male and female patients were in the age group of 2 to 5 years (46%) followed by 5 to10 years (28%) then less than 2 years (20%) and 10-12 years (6%). The mean age of patients was 3.75 ± 2.43 years, ranged from 1 month -12 years. There was no statistically significant difference in male and female according to age distribution (p>0.05).

Table 1: Distribution of the Study subjects according to Age and gender

Age group (in years)	Males	Females	Total	Percentage
<2	13	07	20	20%
2 to 5	26	20	46	46%
5 to10	15	13	28	28%
10 to12	04	02	06	6%

In present study, maximum numbers of children were born after 37 weeks gestation (term pregnancy) while 5% children born before 37 weeks (pre-term), more commonly known as premature. Most of the children 55% were born as 1st child followed by 2nd order of birth were 35%. Institutional birth was most common in 99% cases. NICU candidate were 60% and most common factor for addition in NICU was respiratory distress syndrome (RDS) 16% followed by neonatal sepsis (NNS) 13% and early onset sepsis (EOS) 11%. Duration of breastfeeding <6 months was in 44% cases and 6-12months in 45%.

Table 2: Distribution of study subjects according to Birth characteristics

Birth characteristics		No. of Cases	Percentage
Term	Small for Gestational Age	05	95%
	Average Gestational Age	90	
Preterm	Small for Gestational Age	02	5%
	Average Gestational Age	03	
Order of birth	1	55	55%
	2	35	35%
	3	08	8%
	>3	02	2%
Place of birth	Home	01	1%
	Institution	99	99%

NICU Candidate	Neonatal Hyperbilirubinemia	13	13%
	Respiratory Distress Syndrome	16	16%
	Early Onset Sepsis	11	11%
	Neonatal Sepsis	09	9%
	Low Birth Weight /Very Low Birth Weight	06	6%
	Meconium Aspiration Syndrome	05	5%
Duration of breastfeeding	<6 months	44	44%
	6-12 months	45	45%
	1-2 years	10	10%
	>2 years	01	1%

History of iron deficiency anaemia was observed in 5% cases, Stroke in 11%, space occupying lesion in 6%, CNS Malformation 6%, Immunization appropriate in 96%, milestones appropriate for age in 73% and delay in 27%. History of failure to thrive observed in 24% and vitamin/micronutrient deficiency was observed in 20%.

Table 3: Distribution of study subjects according to Past history

Past history	No. of Cases	Percentage
H/O Iron deficiency anaemia	5	5%
H/O Stroke	11	11%
space occupying lesion	6	6%
CNS Malformation	6	6%
Appropriate	96	96%
Not appropriate Immunization as per national immunization programme	04	4%
Delayed milestones	27	27%
H/O failure to thrive	24	24%
Vitamin/Micronutrient deficiency	20	20%

Maximum number of cases age of 1st onset of seizure was 6-12 months (23%) followed by 2-6 months (22%) and 5-10 years (21%). GTCS was the commonest type of seizure seen in 97 cases (97%) and focal seizure with secondary GTCS observed in 3(3%) cases. In most of the cases (24%) 2-4 times recurrence of seizure was observed since 1st diagnosis followed by 10-20 times in 15%, 5-10 times in 14, <2 times in 9 and >20 times in only one child. Focal Neurological deficit was seen in 24% cases, Positive family history in 11%, preceding aura 46%. The maximum number of children presented with fever of 100-104 F (53%) and 8% child with 105-106 F. Duration of fever was <2 days in 40% cases, between 4-8 days in 14% , 2-4 days in 13% and in one child duration of fever was >8days

Table 4: Spectrum of clinical presentation

Clinical presentation	No. of Cases	Percentage
Age of 1st Onset		
< 2 month	11	11%
2-6 months	22	22%
6-12 months	23	23%
1-5 years	19	19%
5-10 years	21	21%
>10 years	04	4%
Seizure presentation		
general tonic clonic seizures	97	97%
Focal with secondary general tonic clonic seizures	03	3%
Recurrence since 1st diagnosis		
<2 times	09	9%
2-4 times	24	24%
5-10 times	14	14%
10-20 times	15	15%
>20 times	01	1%
Focal Neurological deficit	24	24%
No	76	76%
Positive family history	11	11%
No	89	89%
Preceding aura	46	46%
No	54	54%

Temperature		
<100^{0}F	08	8%
100-104^{0}F	53	53%
105-106^{0}F	08	8%
Fever duration		
< 2 days	40	40%
2-4 days	13	13%
4-8 days	14	14%
>8 days	01	1%

In present study prehospital resuscitation was done in 31% cases. Most common symptom was vomiting (35%) followed by fever with URI (22%) and ALOC (20%) while the commonest sign was pallor (70%) followed by abnormal skull shape in 19% and syndromic appearance (10%). Majority of patients had- CBG in the ranged from 120 to 200 mg/dl (50%) followed by from 54 to 120 mg/dl. Sodium, potassium and calcium were low in 18%, 21% and 33% of cases respectively. Ongoing NCSE was present in 66% patients and intracranial pressure in 36%, clinical meningeal signs in 31%, involuntary movements was seen in 38%, Cerebellar signs in 6%. Sensory system activity involved in all i.e. 100% cases of status epilepticus which may have an important role in both generation and inhibition of seizures.Urinary incontinence (Incontinence bowel/bladder) occurs in 38% child with status epilepticus

Table 5: Clinical examination profile of study population

Clinical Examination	No. of Cases	Percentage
Prehospital resuscitation	31	31%
Predominant post ictal presentation		
Vomiting	35	35%
Fever	8	8%
Acute watery diarrhea	18	18%
Abdominal pain	10	10%
Lethargy	13	13%
Crying during micturation	05	5%
Fever + Upper respiratory infection	22	22%
Fever + Urinary tract infection	01	1%
Fever + Acute gastro-enteritis	03	3%
Altered Level of Consciousness	20	20%
Oliguria	01	1%
Clinical signs		
Pallor	70	70%
Icterus	03	3%
Clubbing	01	15%
Lymphadenopathy	00	0.0%
Oedema	01	1%
Abnormal skull shape	19	19%
Syndromic appearance	10	10%
Cutaneous markers	01	1%
Others	06	6%
capillary blood glucose (mg/dl)		
<54	01	1%
54-120	40	40%
120-200	50	50%
>200	09	9%
Nonconvulsive status epilepticus	66	66%
intracranial pressure clinical features	36	36%
Clinical meningeal signs	31	31%
Involuntary movements	38	38%
Cerebellar signs	06	6%
Sensory system	100	100%
Incontinence bowel/bladder +	38	38%

Most common etiology associated with status epilepticus in children was seizure disorder (44%), followed by acute CNS infection (34%), fever provoked seizures (24%) and Quadriplegia (19%).

Table 6: Etiology and diagnosis profile

Diagnosis	No. of Cases	Percentage
Seizure disorder	44	44%
Fever provoked seizures	24	24%
Unprovoked seizures	09	9%
Toxic encephalopathy	03	3%
Autoimmune encephalitis	04	4%
Acute CNS infection	34	34%
Stroke	08	8%
Quadriplegia	19	19%
Other - Systemic illness	03	3%

SEPSIS Screen positive in 93% cases, TORCH Screen positive in 8%, Viral Serology positive in 13% and Blood culture positive in 11%. CSF analysis was done for 81 children, cytology positive in 25%, Biochemistry positive in 30%, Culture/Sensitivity positive in 25% and CBNAAT positive for TB in 1 child. USG imaging study was done for 32 cases and USG abnormal in 26% cases, CT brain was done for 84 cases and 48 cases had abnormal findings. MRI done for 52 cases, 43% showed abnormal findings. Majority of children had abnormal epileptiform activity (73%).

Table 7: Investigation profile of study population

Parameters	No. of patients	Percentage
SEPSIS Screen positive	93	93%
TORCH Screen positive	08	8%
Viral Serology positive	13	13%
Blood culture positive	11	11%
CSF analysis		
Cytology positive	25	25%
Biochemistry positive	30	30%
Culture/Sensitivity positive	25	25%
CBNAAT positive for TB	01	1%
Imaging study		
USG positive	26	26%
USG normal	06	6%
CT brain positive	48	48%
CT brain normal	36	36%
MRI brain positive	43	43%
MRI brain normal	09	9%
EEG- Abnormal epileptiform activity	73	73%

Out of 20 children with abnormal neuroimaging, 7 children had refractory status epilepticus (RSE). Among the structural abnormality, most common was cystic encephalomalacia (6%), followed by porencephaly (4%), space occupying lesion-DNET (4%), polymicrogyria cortex (4%), and arachnoid cyst in temporal region (2%).

Table 8: Neuroimaging of children with status epilepticus

Neuroimaging	No. of Patients	Percentage
Normal	80	80%
Structural abnormality	20	20%
Cystic encephalomalacia	06	6%
Porencephaly	04	4%
Space occupying lesion-DNET	04	4%
Polymicrogyria cortex	04	4%
Arachnoid cyst in temporal region	02	2%

Mean duration of hospital stay was 7 days and 16 hours and maximum duration was 27 days, which was observed in one child who had RSE with prolonged respiratory failure and died on 27th day. Out of 100 cases, 76 cases (76%) recovered. Among those recovered, 6 cases (6%) recovered with new neurological sequel; 13 cases (13%) died and 5 cases (5%) discharged against medical advice (AMA).

Table 9: Final outcome

Outcome	No. of Patients	Percentage
Recovered without sequel	76	76%
Recovered with sequel	06	6%
Death	13	13%
AMA	05	5%

Of the 100 cases enrolled in the study, 87(87%) children survived and 13(13%) cases were died. The overall mortality rate among children with SE was 13 per 100. The various factors that influenced the morbidity and mortality following SE were selected and analyzed statistically. 13.79% of the boys and 11.90% of the girls treated for SE expired. But this gender difference was statistically insignificant (p Value = 0.435).

Table 10: Gender Distribution and Final Outcome

Gender	Survived	Expired	Total
Male	50 (86.20%)	08 (13.79%)	58 (100%)
Female	37 (88.09%)	05 (11.90%)	42 (100%)
Total	87 (87%)	13 (13%)	100 (100%)
P value	0.435		-

The mortality associated with SE was greatest (46%) in children between 2 to 5 years of age followed by 5 to 10 years (28%), less than 2 years (20%) and in children between 10 to 12 years of age (6%). This age difference was statistically significant with p value of 0.039.

Table 11: Age Distribution and Final Outcome

Age group (in years)	Survived	Expired	Total
<2	19 (95%)	01 (5%)	20 (20%)
2 to 5	41 (68.75%)	05 (31.25%)	46 (46%)
5 to10	22 (78.57%)	06 (21.42%)	28 (28%)
10 to12	05 (83.33%)	01 (16.66%)	06 (6%)

DISCUSSION

Status epilepticus is a condition resulting from a failure of mechanisms that terminate a seizure or from strong seizure predisposition or irritative mechanisms which may being flammatory, genetic, and cellularor sub-cellular, that perpetuate the seizure cycle. SE is often recurrent in epileptic children with structural malformations, resistant epilepsies, certain genotypes, recurrent inter-current illnesses and drug complianceissues.[5] Status epilepticus is a common pediatric neurological emergency with an estimated incidence of 18–23 per 100,000 children per year and a mortality of 2%–7%.18 Access to specialist care is a major limiting factor in developing countries because of poor health infrastructure, connectivity, and delays in transportation.[7] Thandavarayan *et al.*,[8] noted that out of 92 children, male children were 46 (50%) and female children were 46 (50%). In Vafaee-Shahi *et al.*,[9] study the prevalence of S.E in male and female children was 57.1% and 42.9%, respectively. Similar findings were noted in present study. In Thandavarayan *et al.*,[9] study the mean age of the patient was 4.9 years and 58.6 % cases were children < 5 years. In Madhu *et al.*,[10] study 63.2% cases were from the age group less than 5 years. Median age was 4 years. In Das *et al.*,[11] study, it was found that children less than five years of age comprised the majority of the cases (63.8%) and median age was 3 (1-7) years. Admuthe *et al.*,[12] in his study showed mean age was 4.5yrs and weak evidence of difference of sex. In Singh *et al.*,[13] study the mean age of patients was 3.4 yrs. which is comparable with our study. Probably, mechanisms for control of seizure activity are fragile in younger children and may get disrupted with minimal abnormalities in neurofunction. Also, younger age is more vulnerable for acute etiologies including febrile seizures. Herdorffer *et al.*,[14] reported when SE was associated with epilepsy it tended to be the first unprovoked seizure in 30% or it tended to be the seizure leading to diagnosis of epilepsy in 35%. They also reported 18% of unprovoked SE occurred in people with established epilepsy. Purusothaman and Kumar.,[15] reported 40.7% children presented as SE without a prior history of seizures. 53.3% by Gulati *et al.*,[16] in Kumar *et al.*,[17] study 74.2% cases presented with SE without any prior history of seizures and 18 patients (25.7%) had one or more seizure episodes in the past. The aetiological spectrum of SE in developing countries is distinctly different when compared to developed countries. In developing countries CNS infections accounted for 28–67% of aetiological spectrum[18,19] and this was much more so in the pediatric age group[2,19]. In the studies from developed countries, the reported frequency of CNS infections as the risk factor varied from 4% to 19%14. In Thandavarayan *et al.*,[8] study the most common etiology associated with SE in 92 children was remote causes 27.2% (25 cases), next being

acute CNS infection 19.6% (18 cases), febrile seizure 18.5% (17 cases) and cryptogenic/idiopathic SD 16.3% (15 cases). Murthy *et al.*,[20] reported CNS infection accounts for significant number of cases. The etiology of seizures is usually analysed because this has been shown to affect the morality of SE and can affect the duration of seizures.[21] Oliviera *et al.*,[22] has made an observation similar to ours with 53% of their cases being symptomatic seizures. Majority of our children had abnormal epileptiform activity (73%) which is comparable with the study done by Purusothaman and Kumar.,[15] where they reported abnormal epileptiform activity in 74.2% cases. In current study, it was observed that among the structural abnormality, most common was cystic encephalomalacia seen in 30% cases followed by porencephaly 20%, space occupying lesion-DNET 20%, polymicrogyria cortex 20 and arachnoid cyst in temporal region seen in 10% cases. This is in accordance with the study done by Purusothaman and Kumar.[15] In present study out of 100 cases, 76 cases (76%) recovered. Among those recovered, 6 cases (6%) recovered with new neurological sequel; 13 cases (13%) died and 5 cases (5%) discharged against medical advice (AMA). In Thandavarayan *et al.*,[8] study out of 92 cases, 74 cases (75%) recovered. Among those recovered, 5 cases (5.5%) recovered with new neurological sequel; 13 cases (14%) died and 5 cases (5.5%) discharged against medical advice (AMA) and acute CNS infection was commonest cause. In current study, the overall mortality rate among children with SE was 13 per 100. The studies from developed countries reported mortality between 9-24%.[23,24] The various factors that influenced the morbidity and mortality following SE were selected and analyzed statistically. 13.79% of the boys and 11.90% of the girls treated for SE expired andgender difference was statistically insignificant. Similar findings were noted in other studies.[10,11] The major determinants of fatal outcome identified by Sagduyu *et al.*,[25] were increasing age, longer duration of SE before initiating therapy, CNS infection as a cause for SE. These factors correlate well with our study. Moreover the mortality rate in SE can vary significantly depending on study population and the settings in which the study is carried out. Proper prehospital therapy, early referral, proper care while transporting, anticipating risk factors involved, and protocol based approach uniformly at all hospital can reduce the mortality due to status epilepticus in children. Also considering the large number of referrals, upgradation of intensive care facilities even in tertiary care hospital is much sought to improve the overall outcome of SE.

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. In present study, children below 5 years had a higher incidence of status epilepticus. The commonest type of seizure was a generalised tonic-clonic seizure. Seizure disorder, acute CNS infections, and febrile seizures were commonest etiological reasons. CSF analysis, Neuroimaging and EEG have the most important role in diagnosis of seizures. We suggest a long term follow-up study in patients with seizures with regards to their neuro-behavioral outcomes.

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