

Original Research Article

Convulsive status epilepticus in children: clinical profile and outcome in a tertiary care hospital

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ABSTRACT

Background: The outcome of status epilepticus (SE) depends on various determinants such as age, type and duration of SE, etiology, management and associated comorbidities. This study was undertaken to describe the clinical profile and outcome of children with convulsive status epilepticus presenting to pediatric intensive care unit (PICU).

Methods: Eighty-seven children between the age group 1 month to 12 years who at presentation or during the PICU stay had convulsive status epilepticus (CSE) were included in the study. Clinical profile, etiological spectrum and outcome at the end of hospital stay were analysed.

Results: Median age of CSE was 4 years and 55 (63.2%) were below 5 years of age. Acute symptomatic etiology of CSE was a significant risk factor ($p=0.03$) for refractory status epilepticus (RSE) which was seen in 31 patients (39%). Acute symptomatic etiology was the cause of CSE in 46 (59.2%) children. Remote symptomatic (26.4%), cryptogenic (18.4%) and progressive (2.3%) were other etiologies. Neuro-infection (29.8%) and febrile seizures (11.5%) were the most common acute symptomatic causes. Mortality and morbidity occurred in 23 (26.4%) and 8 (9.2%) patients respectively. Remaining 56 (64.6%) returned to baseline condition at the end of hospital stay. Longer duration ($p=0.03$) and acute symptomatic etiology ($p=0.049$) were significant risk factors for mortality.

Conclusions: Most common causes of CSE in children are acute symptomatic. Longer duration of status is associated with higher mortality. Hence, termination of seizure activity at the earliest, prudent management of respiratory or circulatory impairments in these children and improving the overall health care to prevent neuro-infections are important steps to improve outcome.

Keywords: Children, Etiology, Outcome, Status epilepticus

INTRODUCTION

Status epilepticus (SE) is a common life-threatening emergency that requires prompt recognition and management.¹ SE can represent an exacerbation of a pre-existing seizure disorder, the initial manifestation of a seizure disorder, or an insult other than a seizure disorder resulting in seizures.

The classical definition of SE requires that seizures (continuous or intermittent without return to baseline

mental status) last for a minimum of 30 minutes. However, seizures which last longer than 5 minutes are unlikely to stop spontaneously.² As part of operational definition put forth within the past few years, status epilepticus is defined as continuous seizure activity or recurrent seizure activity without regaining consciousness, lasting for more than 5 minutes.³ The use of operational definition allows early treatment before the seizure becomes refractory to antiepileptic drugs.⁴ Prolonged status epilepticus can lead to various complications such as cardiac dysrhythmia, metabolic

derangements, autonomic dysfunction, neurogenic pulmonary oedema, hyperthermia, pulmonary aspiration and even permanent neurological damage. Approximately 4-10% of children experience one episode of seizure within first 16 years of life. Approximately 30% of patients presenting with status epilepticus are having their first seizure. Status epilepticus is most common in children younger than 5 years of age with an incidence of >100 per 100,000 children. Convulsive status epilepticus (CSE) is most common form of status epilepticus and accounts for about 90% of all SE in children. Mortality from status epilepticus varies from 3-50% in different studies.²

Status epilepticus also results in severe neurological or cognitive sequelae in 11-16% of patients.⁵ The outcome of SE depends on various determinants such as age, type and duration of SE, etiology, management and associated comorbidities. Given that etiology is an important determinant of outcome, it can be hypothesized that early identification and prompt, effective treatment of the underlying etiology may improve the outcome of CSE. SE is commonly due to cryptogenic or remote symptomatic causes in older children and febrile or acute symptomatic cause in younger children.⁶

Epidemiological data on childhood SE in India is limited to a few studies reporting high proportion of acute symptomatic etiology, delayed presentation and poor outcome.⁷⁻⁹ Multiple protocols for management of status epilepticus in children are available without much consensus. In view of this, the 'Multi-disciplinary Group on Management of Status Epilepticus in Children in India' in a consensus guideline has highlighted the need

for research on epidemiology and outcome of SE in Indian children.⁴ This study was undertaken as an attempt to describe clinical profile and outcome of children with convulsive status epilepticus presenting to pediatric intensive care unit (PICU) in a tertiary care hospital.

METHODS

Prospective observational study was conducted at Pediatric intensive care unit, Karnataka Institute of Medical Sciences, Hubballi, Karnataka from January 2017 to December 2017.

Inclusion criteria

- All children aged between 1 month to 12 years who at presentation or during the PICU stay had convulsive status epilepticus - defined as continuous seizure activity or recurrent seizure activity without regaining consciousness lasting for >5 min.

Exclusion criteria

- Patients in whom the information regarding seizure duration was incomplete or unclear.

Informed consent was obtained from parents or guardians of the children included in the study. The duration of status epilepticus was ascertained from a reliable patient's relative or attendant, medical records and referring physician's note. After securing airway, breathing and circulation all the patients were managed with standard treatment protocol.⁴

Table 1: ILAE etiological classification.

Type	Etiology
Acute symptomatic	It refers to seizures in a previously neurologically normal child within a week of onset of an identified neurological insult such as CNS infection, trauma, ischemia, prolonged febrile seizures, metabolic disturbances (hypoglycaemia, hypocalcaemia, hyponatremia, and hypomagnesemia) or systemic disorder (such as hypertensive encephalopathy, posterior reversible encephalopathy, renal or hepatic encephalopathy).
Remote symptomatic	It refers to seizures occurring in the absence of acute insult but with history of pre-existing central neurological abnormality which has occurred more than 1 week before the onset of seizures (e.g., posttraumatic, post encephalitic, post-stroke, presence of static encephalopathy etc.)
Progressive	It refers to seizures occurring at any time during progressive neurologic diseases. In this group neurodegenerative disease, malignancies not in remission, neurocutaneous syndromes are included.
Cryptogenic	It refers to occurrence of seizures that is not symptomatic and occurred in children with a prior diagnosis of cryptogenic epilepsy or when the episode of SE is the second unprovoked seizure that has led to a diagnosis of cryptogenic epilepsy.

Once the child was stabilized, data which included age, sex, duration of seizures before and after admission, type

and number of antiepileptic drugs (AEDs) used for control of status epilepticus (SE), history of previous

seizure pattern, adherence to treatment, perinatal, developmental, family history and history of coexisting medical conditions were recorded. General physical examination and detailed neurological examination was performed.

Investigations like complete blood count, blood chemistries including serum calcium, random blood sugar, serum sodium, urea and creatinine, neuroimaging, CSF examination, Electroencephalography (EEG) were performed as required to ascertain etiology and guide management. Further, during the hospital stay, recurrence of seizures, subsequent need for intubation and mechanical ventilation and days spent in PICU were noted.

Type and etiology of status epilepticus were classified as per report of the International League Against Epilepsy (ILAE) task force on classification of status epilepticus (Table 1).³ Refractory status epilepticus (RSE) was defined as seizures which persist despite the administration of two appropriate anticonvulsants at acceptable doses, with a minimum duration of status of 60 minutes (by history or on observation). Though febrile seizures are a part of acute symptomatic etiology, it has been considered separately for analysis as it is likely to erroneously amplify the severity of febrile seizures and dilute the severity of acute neurological insults.

Sample size, with previous year data of 100 patients with status epilepticus admitted to PICU and mortality of 30%, to ensure 95% confidence and 5% error was estimated to be 77. Data was entered into Microsoft Excel sheet and statistical analysis was done using SPSS version 22 software. Relationship of various demographic, clinical characteristics and etiology with outcome was evaluated employing Chi-square test, Fischer's exact test for categorical data and independent t test for continuous data with normal distribution.

Further, univariate analysis was used for testing the influence of different variables in the outcome of present study. p value was considered significant if less than 0.05.

RESULTS

Eighty-seven children who met the inclusion criteria were included into the study. Age of the children in the study group ranged from 2 months to 12 years.

The median age was 4 years. Number of children less than 5 years were 55 (63.2%) and 32 (36.8%) children were more than 5 years. Males were 47 (54%) and 40 (46%) were females. Male to female ratio was 1.17:1.

Out of hospital seizure onset was present in 70 (80.2%) cases and only 25 (35.7%) patients received prehospital treatment. Anticonvulsants used were IM/IV benzodiazepines mainly Intramuscular Diazepam (in 15

cases) and eight patients received second line drugs i.e. phenytoin/phenobarbitone.

Table 2: Clinical features.

	No. of cases	%
Out of hospital onset of seizures	70	80.2
Pre-hospital treatment (n= 70)		
Received	25	35.7
Not received	45	64.3
History of fever before onset of seizures (n=87)		
Present	76	87.4
Absent	11	12.6
Family history of seizures (n=87)		
Present	9	10.3
Absent	78	89.7
History of perinatal insult (n=87)		
Present	10	11.5
Absent	77	88.5
Pre-existing neurological deficits (n=87)		
Present	29	34.5
Absent	58	65.5
Prior history of seizures (n=87)		
Present	35	40.2
Absent	52	59.8
Treatment history in patients with prior history of seizures (n=35)		
Not on treatment	5	16.6
On oral anticonvulsant medication	30	83.3
Skipping of medication	20	55.5
Duration of SE at presentation (n=87) Median_(p25-p75)=30₍₁₀₋₁₂₀₎ minutes		
< 30 minutes	53	60.9
30-60 minutes	8	9.2
>60 minutes	26	29.9
Lag time in receiving first antiepileptic drug (n=87)		
<30 minutes	56	64.4
30-60 minutes	8	9.2
>60 minutes	23	26.4
Total duration of convulsive status epilepticus (n=87) Median_(p25-p75)=60₍₂₅₋₁₄₀₎ minutes		
<30 minutes	26	30
30-60 minutes	19	21.84
>60 minutes	42	48.25

Fever was present in 76 (87.4%) cases prior to the onset of seizures. Prior history of seizures was present in 35 (40.2%) cases, while 52 (59.6%) cases presented with SE as first episode of seizure.

The median_(p25-p75) duration of seizures at presentation was 30₍₁₀₋₁₂₀₎ minutes with the duration ranging from 0 - 1440min. Twenty-three patients (26.4%) had lag time of more than 60 minutes for receiving first AED. Seizure duration was more than 60 minutes in 42 patients among whom in 23 patients it lasted for 1-6 hours, in 6 patients for 6-24 hours and in 4 patients for more than 24 hours. Overall the mean duration of convulsive status

epilepticus was 190 min (SD= 348.73), the median (p25p75) duration was 60 (25-140) minutes (Table 2).

Seizures terminated after administration of benzodiazepine in 15 (17.24%) and 31 (35.6%) patients progressed to refractory status epilepticus (RSE), 12 patients received midazolam infusion and one received thiopentone infusion. Patients with RSE required additional interventions like mechanical ventilation in 20 patients and inotropic support in 23 patients (Figure 1).

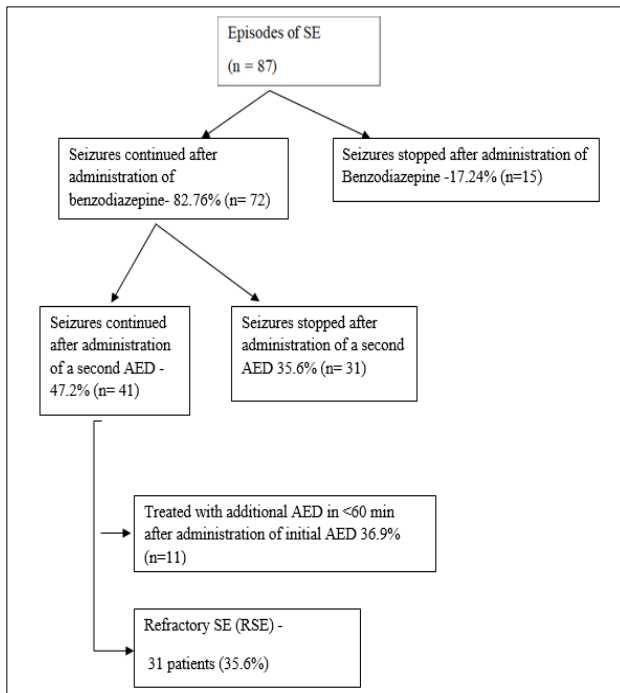


Figure 1: Response to treatment.

Focal seizures were observed in 14 (16%) children with CSE and 73(84%) had Generalized seizures. Generalized tonic clonic variety was the predominantly noticed type of seizures (Table 3).

Table 3: Seizure types.

Seizure type	No. of cases (87)
Focal	14 (16%)
With awareness	3
Impaired awareness	6
Secondary generalisation	5
Generalised	73 (84%)
Clonic	10
Tonic	19
Tonic clonic	44

Acute symptomatic etiology was the most common cause of CSE in 46 (52.9%) cases. Neuro-infections accounted for 26 (29.8%) cases and febrile seizures for 10 (11.5%) cases. Remote symptomatic and cryptogenic causes were found in 23 (26.4%) and 16(18.4%) respectively.

Table 4: Etiologies of CSE in children (n=87).

Etiology	No. of cases (%)
Acute symptomatic	46 (52.9%)
Viral encephalitis	17
Pyogenic meningitis	7
Tubercular meningitis	2
Metabolic	4
Hypertensive encephalopathy	1
Intracranial bleed	2
FIRES	1
Stroke	1
Febrile seizures	10
Remote symptomatic	23 (26.43%)
Cerebral palsy, post encephalitis	20
Hydrocephalus	2
Dandy walker syndrome	1
Progressive	2 (2.3%)
Cryptogenic	16 (18.4%)

Of the 40 children with first seizure as SE with history of fever, only in 10 children the etiology was febrile seizure. Remaining 30 children had other etiologies resulting in CSE, the most common being neuro-infection. Acute symptomatic etiologies were the major cause of CSE in children less than 5 years of age, while remote symptomatic causes were common in children aged 6-12 years (Table 4) (Figure 2).

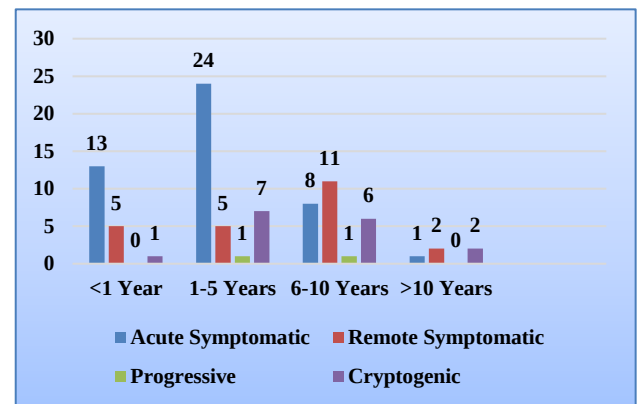


Figure 2: Age wise distribution of etiologies of CSE in children (n=87).

Age, type of seizures, past history of seizures, history of fever, prior neurological deficits, lag time for receiving first AED and etiology were analyzed for predicting response to first line AED and development of RSE. None of these risk factors had significant association with response to first line AED (i.e. benzodiazepines). Acute symptomatic etiology (other than febrile seizures) was a risk factor for development of RSE (p = 0.03) (Table 5).

Among 87 cases of CSE, 23 patients died which accounted for a mortality rate of 26.4%. Eight patients had residual morbidity (9.2%) (4 patients developed focal neurological deficits and 4 patients developed

neurocognitive impairment). Fifty-six patients (64.4%) returned to baseline neurological state at the end of hospital stay. Mortality was predominantly due to acute symptomatic etiology i.e. 14 cases (60.9%). This was statistically significant. ($p=0.049$, OR =2.96, CI= 1.10-7.9). Comorbidities contributing to mortality included intracranial bleed in 3, respiratory impairment (Pneumonia, pneumothorax, ARDS) in 7, multi-organ

dysfunction in 4 and circulatory impairment in 9 children (Table 6). Longer duration of status ($p=0.032$, OR =3.34, CI= 1.20 – 9.25), refractory status epilepticus ($p=0.002$, OR =7.446 CI= 2.58-21.54), requirement of ventilator support ($p=0.001$, OR =250, CI=27.7-2260.8) and circulatory impairment ($p=0.001$, OR=49.3, CI=5.75-405.70) were significant risk factors for mortality (Table 7).

Table 5: Factors predicting response to first line AED and progression to RSE.

Factors	No of children	Responded to first line AED (n=15)	P value (Chi square)	Progressed to RSE (n=31)	P value (Chi square)
Age (n=87)					
< 1 year	19	4 (21.9%)	0.95 (0.34)	6 (31.6%)	0.1 (5.72)
1-5 years	36	6 (16.7%)		16 (44.4%)	
6-10 years	27	4 (14.8%)		9 (33.3%)	
>10years	5	1 (20%)		0 (0%)	
Seizure type (n=87)					
Generalized	73	10 (13.7%)	0.17 (1.87)	28 (38.4%)	0.26 (0.87)
Focal	14	5 (35.71%)		3 (21.4%)	
Type of generalized seizures (n= 73)					
Tonic	19	4 (41.1%)	0.5 (1.18)	3 (30%)	0.57 (2.013)
Clonic	10	1 (10%)		7 (36.8%)	
Tonic clonic	44	5 (11.5%)		18 (40.9%)	
Pre-existing neurological deficits (n=87)					
Present	29	5 (17.25%)	1 (1)	6 (20.7%)	0.68 (4.36)
Absent	58	10 (17.24%)		25 (43.1%)	
Prior H/o seizures (n=87)					
Present	36	7 (19.4%)	0.78 (0.64)	10 (27.7%)	0.14 (3.87)
Absent	51	8 (15.7%)		21 (41.2%)	
H/O fever prior to seizures (n=87)					
Present	76	11(14.5%)	0.17 (1.87)	29 (38.2%)	0.34 (0.914)
Absent	11	4(36.4%)		2 (18.2%)	
Lag time for receiving first AED (n=87)					
< 30 min	56	12 (21.4%)	0.156 (3.70)	18 (32.1%)	0.16 (5.19)
30-60 min	8	2 (25%)		2 (25.6%)	
>60 min	23	1 (4%)		11 (47.9%)	
Etiology (n=87)					
Acute symptomatic (other than febrile seizures)	36	5 (13.8%)	0.7 (2.86)	18 (50%)	0.03 (4.5)*
Other etiologies	51	10 (19.6%)		13 (25.5%)	

* $p<0.05$

Table 6: Outcome at the end of hospital stay in children with CSE. (n= 87).

Etiology	No of Cases	Deaths (Mortality rate)	Morbidity	Recovered to baseline state
Acute symptomatic	36	14 (38.9%)	5	27
Febrile seizures	10	0 (0%)	0	10
Progressive	2	1 (50 %)	0	1
Remote symptomatic	23	5 (21.7%)	1	17
Cryptogenic	15	3 (20%)	2	10
Total	87	23 (26.4%)	8	56

Table 7: Analysis of Risk Factors for Mortality in children with CSE.

Risk factors	No. of children (n=87)	Mortality (n=23)	P value (chi square value)
Age			
<1 year	19	5 (26.3%)	0.16 (3.658)
1-5 years	36	13 (36.1%)	
>5 years	32	5 (15.6%)	
Seizure episode			
First episode	52	15 (28.8%)	0.53 (0.38)
Prior H/o seizures	35	8 (22.9%)	
Seizure type			
Focal	14	2 (14.3%)	0.24 (4.5)
Generalised tonic	19	5 (26.3%)	
Generalised clonic	10	1 (10%)	
Generalised tonic clonic	34	15 (34.1%)	
Lag time for first AED			
<30 minutes	56	11 (19.6%)	0.28 (3.78)
30 -60 minutes	9	3 (33.3.2%)	
>60 minutes	22	9 (40.9%)	
Response to treatment			
RSE	31	16 (51.6%)	0.002* (13.78)
NRSE	56	7 (12.5%)	
Total duration of CSE			
<60 minutes	45	7 (16.8%)	0.032 (4.57)
>60 minutes	42	16 (38.1%)	
Prior neurological deficits			
Present	29	7 (24.1%)	0.73 (0.12)
Absent	58	16 (27.6%)	
Requirement of ventilator support			
Yes	28	22 (78.6%)	0.001* (57.7)
No	59	1 (1.7%)	
Circulatory impairment			
Present	11	10 (90.9%)	0.001* (37.4)
Absent	76	13 (16.9%)	

*p<0.05

DISCUSSION

Status epilepticus is a common pediatric emergency that requires prompt recognition and management. Understanding the clinical profile and factors predicting morbidity and mortality in children with convulsive status epilepticus helps to modulate the management and improve prognosis.

Of the 87 children who presented with convulsive status epilepticus in the age range of 2 months to 12 years, 51 children (63.2%) were in the age group less than 5 years. Median age was 4 years. Increased prevalence in younger age group has been reported in various studies.^{8,10,11} In the present study, 52 patients (59.8%) presented with SE as the first episode of seizure while 35 (40.2%) had prior history of seizures. Studies report that, between 62% to 88% of children with first episode of seizure present with convulsive status epilepticus.^{10,12} The predominance in younger age group and for them to present as status during the first episode has been theorized to be due to

the underdeveloped mechanisms for control of seizure activity and disruption of these mechanisms with minimal abnormalities in neuronal function in younger children. Also, younger age is more vulnerable for acute etiologies including febrile seizures.

Present study had 70 cases (80.4%) with seizure onset outside the hospital with median duration of status before reaching to our PICU being 30min (range 15-1440 minutes). Of the 25 patients (36.5%) who had received pre-hospital treatment, it was noted that the route of administration and dosage of anticonvulsants were inappropriate. In a study by Fernandez et al., in 64 patients with out of hospital seizure onset, only 24 patients (37.5%) received AED prior to hospital arrival.¹³ In an Indian study by Gulati et al at a tertiary care hospital in New Delhi, 60% had received prehospital treatment.⁷ Treatment of SE needs to be initiated as early as 5 to 10 minutes. The longer the seizure episode the more chances of it going into refractoriness and development of complications.¹⁴ Lag time for receiving

first AED was more than 60 minutes in 23 patients (26.4%) and only one among them responded to first line AED. Hence the need for early initiation of AEDs and prehospital treatment is emphasized.

Generalized seizures were noticed in 84% of the patients in this study. Similarly, other studies have also reported predominance of generalized seizures.¹²⁻¹⁶ Acute etiologies usually have diffuse involvement which could describe the preponderance of generalized seizures.

Studies from developed countries report higher incidence of febrile seizures to be the case of CSE in children.^{10,11} Studies from India report higher incidence of acute symptomatic SE.^{7,8} In present study, acute symptomatic etiology was the cause in 46 (52.9%) patients. CNS infections accounted for 28.9% and febrile seizures for 11.5% of total cases.

The difference in etiological spectrum of SE in children between developed countries and developing countries could be as a result of high incidence of neuro-infection in the developing nations. Acute symptomatic etiology (other than febrile seizures) was the most common cause of CSE in children less than 5 years and remote symptomatic etiology was common in children aged 6-12 years. This may be because of high proportion of children with prior seizures in older age group.

Refractory Status epilepticus (RSE) developed in 31 cases (35.7%). Different studies have reported the prevalence of RSE to range from 11-43%.^{7,17} The differences among studies can be attributed to variability in the demographic characteristics of the study population and lack of consensus on standard definition for refractory status epilepticus.

Risk factors for RSE such as demographic characters, seizure type, fever association, prior neurological state, lag time for receiving first AED were analysed but no statistical significance was noted, except that RSE was significantly associated with acute symptomatic etiology. Barzegar et al also noted significantly high incidence of RSE with acute symptomatic etiology.¹⁷

Mortality rate in present study was 26.4%. Mortality rate in children with CSE ranged from 14- 33% in Indian studies while studies from developed countries report mortality of 9-11%.^{5,7,8,16,18} The risk factors for mortality that were significant in this study included longer duration of status, acute symptomatic etiology, requirement of ventilatory support and circulatory impairment.

Similar risk factors were found in other studies.^{5,7,11,16} Age, prior neurological status, lag time for receiving first AED and response to it did not have significant effect on mortality in present study. Gulati et al and Kumar et al reported high mortality in children less than 3 years with CSE.^{7,8} Children with prior neurological abnormality had

poor outcome in studies by Kwong et al, Kravljanc et al and Thandavarayan et al.^{19,20}

CONCLUSION

Most common causes of CSE in children are acute symptomatic, predominantly neuro-infections. Convulsive status epilepticus in children is associated with significant mortality and morbidity. Longer duration of status is associated with higher mortality. Hence, termination of seizure activity at the earliest, prudent management of associated co-morbidities like respiratory or circulatory impairment in these children would result in improved outcome. Improving the overall health care and implementation of vaccination strategies to prevent neuro-infections are important steps to prevent occurrence of CSE in childhood.

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REFERENCES

1. Pellock JM. Status epilepticus in children: update and review. *J Child Neurol.* 1994;9(2):27-35.
2. Mikati MA, Hani AJ. Status epilepticus. In: Kliegman R, Behrman R, Nelson W. *Nelson textbook of pediatrics*, 20e; Elsevier; 2016:2854-2855.
3. Trinka E, Cock H, Hesdorffer D, Rossetti AO, Scheffer IE, Shinnar S, et al. A definition and classification of status epilepticus-Report of the ILAE Task Force on Classification of Status Epilepticus. *Epilep.* 2015;56(10):1515-23.
4. Mishra D, Sharma S, Sankhyan N, Konanki R, Kamate M, Kanhere S, et al. Consensus guidelines on management of childhood convulsive status epilepticus. *Indian Pediatr.* 2014;51(12):975-90.
5. Murthy JM, Jayalaxmi SS, Kanikannan MA. Convulsive status epilepticus: clinical profile in a developing country. *Epileps.* 2007;48(12):2217-23.
6. Morton LD, Pellock JM. Status Epilepticus. In: Swaiman KF, Ashwal S, Ferriero DM, Nina F Schor NF. *Swaiman's Pediatric Neurology: Principles and Practice*, 5e; Elsevier 2012.p.798-810.
7. Gulati S, Kalra V, Sridhar MR. Status epilepticus in Indian children in a tertiary care center. *Indian J Pediatr.* 2005;72(2):105-8.
8. Kumar M, Kumari R, Narain NP. Clinical Profile of Status epilepticus (SE) in Children in a Tertiary Care Hospital in Bihar. *J Clin Diagn Res: JCDDR.* 2014;8(7):14-7.
9. Kumar MA, shrivastava K. Outcome and Determinants of Outcome of Status Epilepticus at Discharge in Indian Children. *European journal of pharmaceutical and medical research.* 2016;3(11): 498-501.
10. Chin RF, Neville BG, Peckham C, Bedford H, Wade A, Scott RC. Incidence, cause, and short-term

- outcome of convulsive status epilepticus in childhood: prospective population-based study. *Lancet*. 2006;368(9531):222-9.
11. Bergamo S, Parata F, Nosadini M, Boniver C, Toldo I, Suppiej A, et al. Children with convulsive epileptic seizures presenting to Padua Pediatric emergency department: the first retrospective population-based descriptive study in an Italian Health District. *J Child Neurol*. 2015;30(3):289-95.
 12. DeLorenzo RJ, Hauser WA, Towne AR, Boggs JG, Pellock JM, Penberthy L, et al. A prospective, population-based epidemiologic study of status epilepticus in Richmond, Virginia. *Neurol*. 1996;46(4):1029-35.
 13. Fernández IS, Klehm J, An S, Jillella D, Kapur K, Zelener J, Rotenberg A, Loddenkemper T. Comparison of risk factors for pediatric convulsive status epilepticus when defined as seizures $\geq$ 5min versus seizures $\geq$ 30min. *Seiz*. 2014;23(9):692-8.
 14. Chin RF, Verhulst L, Neville BG, Peters MJ, Scott RC. Inappropriate emergency management of status epilepticus in children contributes to need for intensive care. *J Neurol Neurosurg Psychiatr*. 2004;75(11):1584-8.
 15. Sadarangani M, Seaton C, Scott JA, Ogutu B, Edwards T, Prins A, et al. Incidence and outcome of convulsive status epilepticus in Kenyan children: a cohort study. *Lancet Neurol*. 2008;7(2):145-50.
 16. Das NK, Soren B, Gupta D. Clinical Profile, Aetiology, and Short-Term Outcome of Convulsive Status Epilepticus in Children in Eastern India. *JMSCR*. 2017; 5(1):15914
 17. Barzegar M, Mahdavi M, Galegolab Behbehani A, Tabrizi A. Refractory Convulsive Status Epilepticus in Children: Etiology, Associated Risk Factors and Outcome. *Iran J Child Neurol*. 2015;9(4):24-31.
 18. Thandavarayan M, Ramaswamy S, Bose P, Thirumalaikumarasamy S. Immediate outcome and risk factors determining the outcome of status epilepticus in children attending tertiary care centre. *Int J Contemp Pediatr*. 2017;4(4):1289-95
 19. Kwong KL, Lee SL, Yung A, Wong VC. Status epilepticus in 37 Chinese children: aetiology and outcome. *J Paediatr Child Health*. 1995;31(5):395-8.
 20. Kravljanc R, Jovic N, Djuric M, Jankovic B, Pekmezovic T. Outcome of status epilepticus in children treated in the intensive care unit: a study of 302 cases. *Epilep*. 2011;52(2):358-63.

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