STATUS EPILEPTICUS IN CHILDREN CLINICO ETIOLOGICAL PROFILE AND OUTCOME

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ABSTRACT: Status epilepticus is a common condition in acute medical care. Approximately 4.5 million SE events occur worldwide every year.SE in children differs from adult SE in aspects of epidemiology, pathophysiology and clinical presentations, which justifies a separate analysis. The incidence in children is about 18-20/100,000 children/year and distribution of etiologies is markedly age-dependent: Febrile and acute symptomatic convulsive SE is most common in children aged less than 2 years, whereas cryptogenic/idiopathic and remote symptomatic etiologies are more common in older children. A prospective study where 46 children, admitted in Pediatric Intensive Care Unit with seizures lasting >30 minutes in King George Hospital, Visakhapatnam, were studied over a period from 2012 June to 2013 oct. These patients were evaluated for their clinical presentation, laboratory parameters, treatment profile and immediate outcome. As mortality is higher in younger age groups and status with acute symptomatic etiology, there is a need to aggressively treat these groups. As the longer a seizure continues the harder it is to be controlled and as both the mortality and sequelae were found to be significantly lesser in the patients who attained good seizure control within 1 hour of presentation to the hospital.

INTRODUCTION: Status epilepticus (SE) is a major medical and neurological emergency. The first Adescription of SE in the medical literature was in a Babylonian text from the first millennium BC. Status epilepticus is a common condition in acute medical care. Approximately 4.5 million SE events occur worldwide every year.[1] SE in children differs from adult SE in aspects of epidemiology, pathophysiology and clinical presentations, which justifies a separate analysis. The incidence in children is about 18-20/100,000 children/year and distribution of aetiologies is markedly age-dependent: Febrile and acute symptomatic convulsive SE is most common in children aged less than 2 years, whereas cryptogenic/idiopathic and remote symptomatic aetiologies are more common in older children. Approximately 70% of SE occurs in children less than one year and 75% in less than three years of age.[2] the first episode most commonly occurs around 2.5years after initial diagnosis.[3]

Hauser reported that up to 70% of children who have epilepsy that begins before the age of 1 year experience an episode of SE, also it has been observed that 20% of individuals with epilepsy will have an episode of SE within 5 years of the initial diagnosis. SE before initial diagnosis of epilepsy, young age at onset and symptomatic etiology independently influence the risk. The numbers of studies that are annually published on SE have steadily increased during the last few years. But despite the socioeconomic burden of SE and the interest among the medical community, many questions concerning its pathogenesis, management and outcome remain unanswered.

Status epilepticus requires immediate and vigorous management and at times poses a therapeutic challenge to the treating physician. If not managed promptly, it may result in significant neuromorbidity and mortality.[4,5] Though systematic approach and prompt treatment have reduced the mortality and morbidity associated with SE over the years, it is still associated with significant morbidity and mortality

Mortality rates Children have a far lower mortality rate than do adults, with the exception of those in the first year of life. Age, etiology, and duration correlate directly with mortality. Multiple studies confirm the lower mortality rate in most children following adequate emergency treatment as high as 30% have been reported in overall studies.

MATERIALS AND METHODS: A prospective study where 46 children, admitted in Pediatric Intensive Care Unit with seizures lasting >30 minutes in King George Hospital, Visakhapatnam, were studied over a period from 2012 june to 2013 oct. These patients were evaluated for their clinical presentation, laboratory parameters, treatment profile and immediate outcome.

Inclusion Criteria for the Study:
1. Patients fulfilling the definition of SE as per International Classification of Epileptic Seizure as 'Continuous seizure activity lasting for more than 30 minutes of continuous seizure activity or two or more sequential seizures without full recovery of consciousness between seizures.
2. Patients in the age group of 2 months to 12 years.

Exclusion Criteria for the Study:
1. Patients with seizure activity lasting for less than 30 minutes.

2. Patients aged less than 2 month and more than 12 years
3. Patients where the duration of seizure activity could not be documented with or without regaining consciousness or patients whose case records had no time specification.
4. Patients in whom proper diagnosis could not be established (in cases where the duration from time of admission to death was too short for evaluation).

Definitions:
- Seizures were classified as per International League Against Epilepsy Group Definitions
- History of epilepsy is defined as two or more unprovoked seizures in the past whether on treatment or not.
- Initial seizure control was based on seizure control by drugs at the time of first contact with the emergency services.
- Good response was defined as seizure activity controlled with antiepileptic drugs (AED) within 60 minutes of contact with hospital and initiation of therapy.
- SE was defined as refractory, if the duration for control of seizure activity was >lhr, even after adequate treatment with two or more drugs (benzodiazepines, and phenytoin and/or phenobarbitone),
- Mortality was defined as death occurring in PICU during the course of treatment of SE irrespective of whether it was controlled or not.

Study Method: The details were based on information provided by parents, time of onset of seizures, their presentation to emergency department, documentation by the doctor on duty in PICU, so as to be very clear about the duration of seizure, as this was the most important criteria for definition. The information was carefully recorded in the proforma. A detailed physical examination was done with the consent of the parents. Investigations were done according to clinical suggestions Complete blood counts, Urine analysis, Blood sugar, Blood Urea Serum Creatinine, Serum electrolytes, Serum Calcium, Liver function tests, Peripheral Smear, QBC for Malarial parasite, Blood culture, Widal test, CSF analysis, Cheat X-ray, Mantoux test ,ECG, Electrencephalography, CT scan brain, MRI Brain, Blood gas analysis.

Diagnosis: Diagnoses were recorded for all patients according to the International Classification of Diseases, tenth revision.

Treatment: Immediate resuscitative measures were taken, Antiepileptic drugs for short term and long term control, as per the protocol of management of status epilepticus, were instituted and specific treatment modality was started and changed according to patient's course in the hospital.

Follow Up: Patients were evaluated daily till discharge/death. The degree of sequelae developed was assess.

OBSERVATION AND RESULTS:
Age and Sex Distribution: For the purpose of the study the patients were divided in the age groups of 2 months to 2 yrs, >2 yrs to 5 yrs and >5 yrs. The maximum number of cases was seen in the age group of less than 2 yrs. The mean age of presentation was 44.9+36.6 months and 33 cases (72%) were below the age of 5yrs. There was a statistically significant association between the occurrence of status in the age group of less than 5 years (p=<0.05). The number of males was 27, constituting 58.7% and the number of females was 19 constituting 41.3%. There was a slight male preponderance, however it was not statistically significant (p=>0.05).

AGE GROUP	MALE	FEMALE	TOTAL (%)
2 months - 2	11	7	18 (39.17%)
2-5 yr.	7	8	15 (32.6.3%)
>5 yr.	9	4	13 (28%)
Total (%)	**27 (58.7%)**	**19(41.3%)**	**46 (100%)**
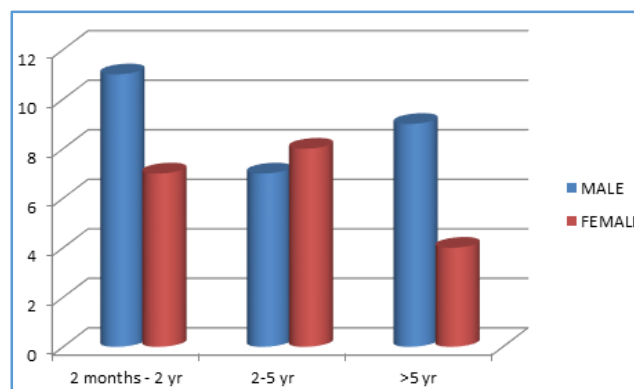
Time Lag of Presentation: The time taken from the onset of seizures to presentation to our hospital was recorded; the average time of presentation was 4.256 ±_3.59 hours. Twenty seven patients had received some type of treatment before arriving to the pediatric casualty. The average time of presentation to any kind of medical services was 3.09+2.74 hours. The reason for this gross delay was mainly ignorance about the seriousness of the disease, lack of nearby medical services, lack of transport facilities and poor financial status.

For the purpose of the study the duration of presentation to the hospital was divided into groups as follows:

| Duration of seizure at time of presentation to KGH	No. of cases
<lhr	11(24%)
1hr- 3hr	12 (26%)
3hr - 6hr	15(33%)
>6hr	8(17.5%)
Total	**46(100%)**
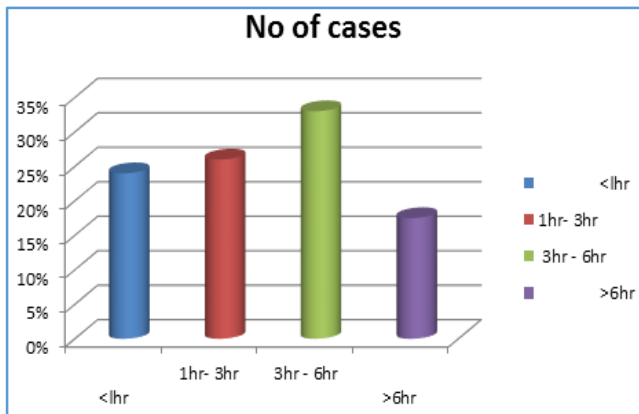
TYPE OF SEIZURES: The most common type of seizure was generalised tonic clonic type. Other varieties seen were complex partial seizures with or without automatisms, generalised tonic seizures and complex partial seizures with secondary generalisation. 2 cases of simple partial status were also seen.

Type of Seizure	No. of Cases Seen
Generalized tonic-clonic seizures (GTCS)	25(54.3%)
Generalized tonic seizure (GTS)	3(6.5%)
Complex partial seizures (CPS) with/without secondary	16(34.8%)
Simple partial seizures (SPS)	2(4.4%)
Total	46(100%)
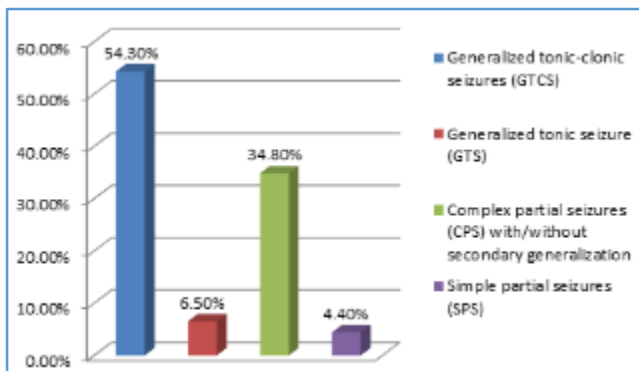
PRESENCE OF FEVER: Out of the 46 cases, 35 (76%) had fever and 11(24%) did not have fever at the time of presentation.
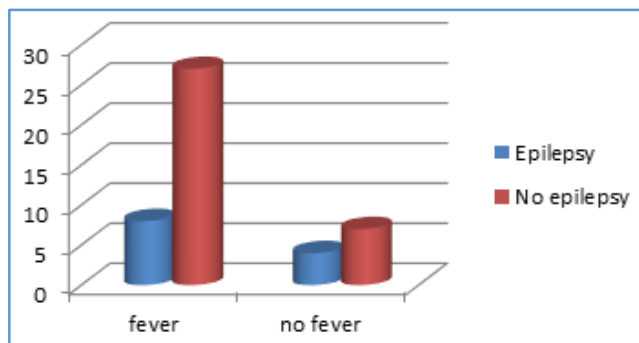

Previous History of Seizures: There were 12(26%) cases with a previous history of seizures, of these 4 had had a previous history of status epiiepticus. 3 cases were finally

diagnosed to have Idiopathic epilepsy and 9 cases were those with underlying neurological deficit.

The pattern of antiepileptic drug administration for epileptic patients was as follows:

Pattern of AED	No. of Cases
Withdrawal	2(17%)
Irregular	7 (58%)
Regular	3 (25%)
Total	**12(100%)**
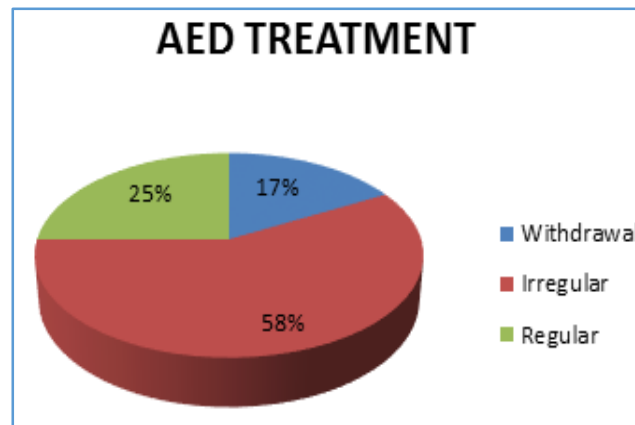
8 patients (67%) of the 12 had presented with fever secondary to upper respiratory tract infections, gastroenteritis and viral fevers. All three cases on regular treatment had intercurrent infections.

Birth Weight, Birth Asphyxia and Developemental Delay: Among patients with history of developmental delay, the birth weight and details of birth were carefully recorded. There were 12 patients with developmental delay, of which 5(42%) patients had history of birth asphyxia and 4 also had history of neonatal seizures. Of these 7 were adequate for birth weight and 5 had a low birth weight. On the whole 9(75%) cases out of the 12 had some incriminating factor in the neonatal period whereas 3(25%) had an apparently normal neonatal period.

Socioeconomic Status: The socioeconomic status of the patients was assessed using the modified Kuppuswamy scale. They were divided into Classes - I, II, III, IV, V based on the education, occupation and per capita income.

The Data was as Follows:

Socioeconomic status	No. of cases
Class I &II(Upper & upper middle)	0
Class III (Lower middle)	12(26%)
Class IV (Upper lower)	29 (63%)
Class V (Lower)	5(11%)

The time lag of presentation to the medical services was analysed with the socioeconomic status of the patient, using a Chi-square test, to look for an association between them.

Time lag of Presentation	Socioeconomic Status	
	Lower	Middle and Upper
<1 hr	9	7
>l-3hr	7	4
>3-6hr	11	1
>6hr	7	0

There was statistically significant association (p< 0.0001) between the socioeconomic status and the duration of seizure prior to presentation to the hospital. Patients from lower classes (Kuppuswamy class IV and V) presented later than those from higher classes.

NUTRITION: The nutritional status was categorised as per the IAP classification for malnutrition.

Nutritional Status	No. of Cases
Normal (> 80% of expected)	12(26%)
Grade I (> 70% to <80% of expected)	10(21.7%)
Grade II (> 60% to <70% of expected)	18(39%)
Grade III (> 50% to <60% of expected)	4 (8.7%)
Grade IV (<_50% of expected)	2 (4.6%)
Total	46(100%)

Only 12(26%) out of the 46 had the expected weight for age, all others were below the expected.

OTHER CLINICAL SIGNS (At the time of presentation)

• Glasgow Coma Scale	
<6	20
6-12	23
>12	2
• Posture	
Decorticate	4 (8.7%)
Decerebrate	8(17.4%)
Normal/Others	34(73.9%)
• Blood pressure	
Normal	30(65.2%)
Low	6(13%)
High	10(21.8%)
• Cranial nerve palsy	
Present	7(15.2%)
Absent	39 (84.8%)
• Tone	
Increased	18(39.1%)
Decreased	11 (23.9%)
Normal	17(37%)
• Motor deficit	
Diffuse signs	19(76.1%)
Hemiparesis	8 (17.4%)
Monoparesis	1 (2.1%)
Paraparesis	2 (4.3%)
• Meningeal signs	
Present	12 (26.1%)
Absent	34(73.9%)
• Raised Intracranial tension	
Present	14(30.4%)
Absent	32(69.6%)
• Splenomegaly ± hepatomegaly	
Present	9(19.6%)
Absent	37(80.4%)

- Most of the cases had a GCS of less than 12 on presentation to the hospital Only 2(4.3%)) had a GCS more than 12 and these were cases of simple partial seizure.
- The blood pressure of most of the patients, 65.2%, was within the normal range for age and sex. 6 (13%) had low values which was mostly seen in children less than 5 yrs of age and longer duration of seizures. Patients with high blood pressure were those with symptoms with raised intracranial pressure.
- 7(15.2%) had cranial nerve palsies and these were mostly cases of TB meningitis. One of the cases was that of Rasmussen's encephalitis with associated monoplegia.
- The most common motor deficit was seen in the form of diffuse signs like exaggerated or diminished tendon reflexes, plantar extensor and loss of superficial reflexes. It was seen in 19 cases (76.1%). The next most common was hemiparesis which was seen mostly in cases with TB meningitis. Seven cases had a prior motor deficit, 3 had spastic quadriparesis, 2 had spastic hemiparesis and 2 had spastic paraparesis.
- Signs of meningeal irritation were present in 12cases (26.1%), which were cases of TB meningitis, pyomeningitis or viral meningoencephalitis.
- Raised intracranial tension features were seen 14(30.4%), which were seen mainly in cases with TB meningitis, pyomeningitis, viral meningoencephalitis or cerebral malaria.
- Abdominal findings in the form of hepatomegaly and/or splenomegaly were present in 19.6% of cases, all of whom had malaria.

INVESTIGATIONS:
- **CSF ANALYSIS:** A lumbar puncture was done in 28 cases as per clinical suspicion. 7 cases showed a tuberculous picture, 4 showed a viral meningitis picture, 1 had a pyomeningitis picture and the remaining was normal study.

- **CT SCAN / MRI SCAN:** Imaging studies as indicated were done on 43 patients, 23 cases had features specific for their disease, 6 had features of diffuse cortical atrophy, 2 had features of diffuse cerebral edema, 2 had features of both diffuse cortical atrophy and specific features of the disease and the remaining (1 leases 25.6%) were normal study.

- **INTERICTAL EEG:** Since the facility of continuous EEG monitoring was not available and interictal EEG was done. This was done in 21 cases with suspicion of epilepsy. Only 5 demonstrated an epileptic foci, while most of them, 11 (52.3%), had features of diffuse cerebral dysfunction. The others had a normal EEG.

- **OTHERS:** 9 cases were QBC positive for malarial parasite and only 2 demonstrated a mantoux positivity.

Etiology: Based on etiology the cases were broadly divided into three categories: Acute symptomatic status, remote symptomatic status and Idiopathic status. Acute symptomatic status consists of status due to any CNS infection, electrolyte disorders, toxic exogenous, acute anoxic insult, trauma or

metabolic disorders etc. Remote symptomatic status consists of status due to any neonatal insult especially hypoxic-ischemic, non-progressive encephalopathy of obscure origin, CNS malformations and progressive encephalopathies. Idiopathic status consists of status not appearing to be associated with any cause of brain damage. It may be febrile, representing the extreme of the spectrum of febrile convulsions, or afebrile.

The following were the etiologies seen:
1. Acute symptomatic - 25 cases (54.3%)

|		
Pyomeningitis	-	1
Neurocysticercosis	-	2
Cortical vein thrombosis	-	1
Viral meningoencephalitis	-	4
Cerebral malaria	-	9 (19.6%)
CNS tuberculosis	-	8 (17.4%)

The most common acute symptomatic causes were CNS tuberculosis and cerebral malaria consisting about. 68% of the total acute symptomatic causes.

2. Remote symptomatic   16 cases (34.8%)

-Nonprogressive	
-cerebral palsy	7
-epilepsy	1
-cerebral venousmalformations	1
-bilateral occipital gliosis	1
-periventricular leucomalacia	1
-previous intracranial bleed	2
-Avm of left occipital lobe	1
Progressive	
-metachromatic leucodystrophy	1
-Rasmussen encephalitis	1

3. Idiopathic   5

|	
-Epilepsy	4
-Febrile status	1
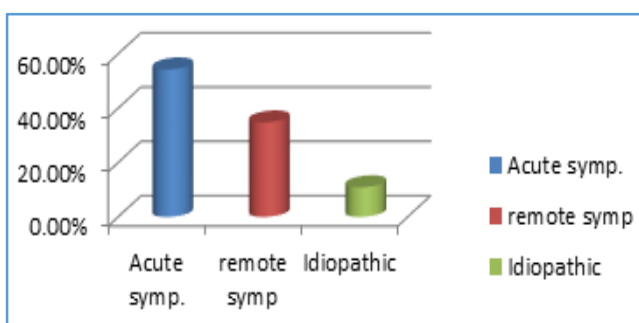
On the whole the most common cause for status was acute symptomatic causes followed by remote symptomatic causes and least common were idiopathic epilepsy and febrile status.

TREATMENT AND RESPONSE: Sixteen patients presented directly to the pediatric casualty, they were not given any treatment outside. Three cases developed status while on treatment for other causes in the PICU. Twenty-seven patients had received some type of treatment before arriving to the Pediatric casualty. The most common treatment given

was Inj. Diazepam (18 cases), 5 were given a second drug in the form of Phenytoin or Phenobarbitone and for 7 cases the details were not known.

The time lapse for treatment was categorised into drug administration within 45 minutes of onset of seizures and after 45 minutes of onset of seizure. Among the 27 cases referred from outside 21 fell in the former category, whereas only 6 were given within 45 minutes. The patients presenting directly to the casualty also had the majority (16 cases) receiving treatment beyond 45 minutes. 3 cases who were within the hospital when status developed received treatment in <45 minutes.
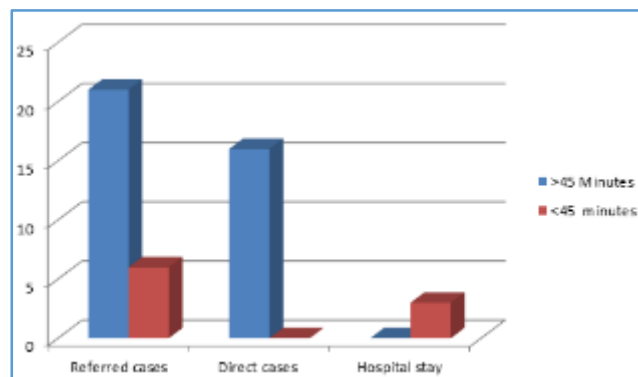
After admission the cases were management as per the status management protocol as mentioned earlier. When seizures were controlled within 1 hour of hospital admission and adequate treatment, it was considered to be good response. When the seizures were not controlled within 1 hour of hospital admission and adequate treatment with two drugs it was considered to be refractory status Thirty-eight (38) out of the 46 cases responded to the antiepileptic drug administration, 7 patients died and 1 case of Rasmussen's encephalitis did not respond to any antiepileptics.
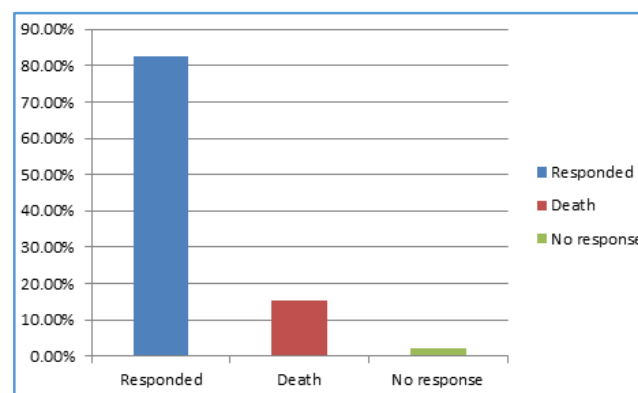
Among the patients who survived, 17 were good responders and 22 were Refractory. The majority hence were refractory.

Type of response	No. of cases (%)
Good response	17(43.6%)
Refractory	22 (56.4%)
Total	**39(100%)**

On trying to find an association between the duration of seizure before acquiring any form of treatment with response

to treatment, it was found that there was a significant association (p= 0.0112). The total duration of seizure activity from onset to response was calculated. The average duration of seizure activity was 10.72±12.03 hours. Only 3 cases had seizure duration of less than 1 hour, while the remaining had a duration of >1 hour.

Most of the cases (71.8%) were controlled by either 2 drugs or three drugs, consisting of short term antiepileptics, phenytoin and/or phenobarbitone. 28.2 % required 4 drugs consisting of short term antiepileptics, phenytoin, phenobarbitone and midazolam. One case of Rasmussen's encephalitis could not attain control even after multiple drug administration.

The number of drugs required for control was as follows:

No. of Drugs	No» of Cases (%)
2 drugs	17(37%)
3 drugs	16(34.8%)
4 drugs	12 (28.2%)
Total	**45(100%)**

Hospital Stay: The average duration of hospital stay was 8.152174± 5.56963 days.

Outcome: The outcome was divided into no sequelae, sequelae in the form of motor or mental handicap and death. Sequelae were defined as newly acquired motor deficit, aphasia, persistently vegetative state, loss of developmental milestones, and mental handicap.

Outcome	No* of cases (%)
No sequelae	17(37%)
Sequelae	22 (47.8%)
Death	7(15.2%)
Total	46(100%)
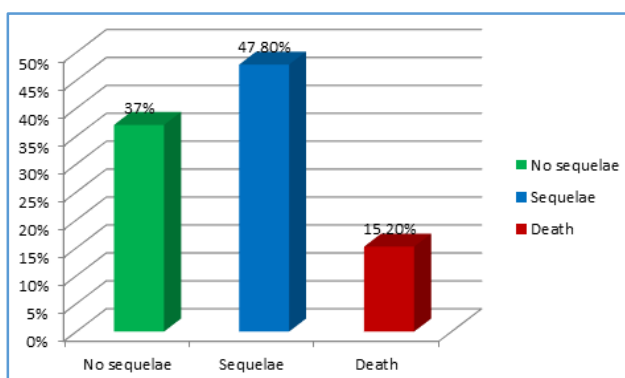
had a poor outcome, in the form of either sequelae (47.8%) or death (15.2%). The sequelae were in the form of motor deficit, speech impairment and cognitive disabilities.

Out of the 46 patients presented with status, there were 12 children with prior neurological deficit, in this worsening of the symptoms was assessed based on history and examination at discharge. Seven (58.3%) of these patients

developed sequelae, 3(25%) had no new deficit and 2(16.7%) died during the episode of status.

Out of the 34 patients with no prior deficit, 14(41.2%) were normal at discharge, 15(44.1%) developed sequelae and 5(14.7%) died. Among the patients who died 72% died within 24 hours, 14%(1) died within 48 hours and 14% died after 48 hrs.

DISCUSSION:
Age and Sex Distribution: The mean age of presentation in the present study was 44.9±36.6 months and 72% were below the age of 5 yrs. There was a statistically significant association between the occurrence of status in the age group of less than 5 years (p=<0.05). This was comparable with the study by Veena Kalra et al, 2005[6], wherein the mean age of presentation was 56.6+46.5 months and 56 % of the cases were below the age of 5 yrs. The present study however affected patients were of a slightly younger age than that seen in the Veena Kalra et al study.

Similar findings were seen in Delorenzo RJ et al, 1996.[7] Hesdorffer DC et al, 1998.[8] and Hauser WA et al, 1990.[9] The reason for this predominance of SE in younger children is not known. Probably, mechanisms for control of seizure activity are fragile in younger children and may get disrupted with minimal abnormalities in neurofunction. There was a male preponderance but no significant association between status and the gender of the patient, as was also in Veena Kalra et al., 2005.

Lag Time of Presentation and Duration of Seizure: The average duration of seizures before presenting to any kind of medical services was 3.09±2.74 hours which was comparable but slightly higher to that seen In a Malawi study by Ahmed S et al, 2006, wherein the average duration of seizures before hospital treatment was 2 hours. The average total duration of seizures seen was 10.72±12.03 hours. Similar findings were reported in a Kenyan study by Edwards T et al 2008.[10] where the status lasted for many hours.

This similarity is due to both the studies being from developing countries, where the resources are poor and ample facilities for transport and medical services are not widely available. There was statistically significant association (p<0.0001) between the socioeconomic status and the duration of seizure prior to presentation to the hospital. Patients from lower classes (Kuppuswamy class IV and V) presented later than those from higher classes. This association reflects the financial constraints, illiteracy and ignorance among the normal population.

Type of Seizure: The most common form of seizures was generalized tonic-clonic consisting 54.3%), which was similar to other studies like the study by Barzegar M et al, 2007 and the Kenyan study by Edwards T et al, 2008.[10] Congdon and Forsythe et al, 1980.[11] and Aicardi and Cheverie et al, 1970.[12] also report similar findings.

Previous History of Seizures: Thirty-four patients (74%) presented without prior history of seizures. Twelve cases presented with a prior history of seizures, of which 7 cases (58%) were poorly controlled. The percentage of patients

presenting as the first episode was higher in comparison to the study by Veena Kalra et al, 2005.[6] which had 53.3% cases presenting as the first episode. However, Shinnar et al, 1990.[13] recorded only 12% cases as presenting as status without any prior history.

This difference may be due to the differences in etiology, as is explained later. In cases which were eventually diagnosed as epilepsy, status epilepticus lead to the diagnosis in 25 % which was slightly lower than that seen by Hersdorffer et al, 1998 [8] (30%). Also in these cases 36%o had unprovoked status epilepticus, which was higher than that seen in Hersdoffer et al, 1998 (18%), the reason to which might be a poorer control or irregular treatment seen in patients with epilepsy in this study.

Etiology: The following table depicts the causes of status epilepticus in various studies:

ETIOLOGY	Name of the Study				
	Aicardi and Chevrie.[12] 1970 (N=239)	**Phillips and Shanahan.[2] 1989 (N=193)**	**Veena Kalra et.[6] Al.[5,7] 2005 (N=30)**	**Kwong KL et al.[14] 2008 (N=37)**	**Present Study 2008 (N=46)**
Acute	26%	44%	40%	60%	54%
Remote	21%	11%	47%	13%	35%
Idiopathic	28%	32%	3%	11%	9%
Febrile	25%	14%	10%	5%	2%

According to literature, acute symptomatic causes are becoming more common in recent series and febrile status is still the most common form. This is the case with studies by Erikksson KJ et al, 1997, Shinnar et al, 1992 etc. In our study, acute symptomatic was the most common form and febrile the least common. This trend was similarly seen in other newer studies shown in the table like Veena Kalra et al and Kwong KL atal.[14] This was probably due to the higher occurrence of acute symptomatic causes and better control of febrile seizures in recent times.

TREATMENT RESPONSE: As mentioned before treatment response was divided into good response and refractory. In the present study 43.6% of cases showed a good response and 56.4% cases were refractory. The refractory cases was higher than in most studies like Veena Kalra et al (40%), Mayer Stephan et al, 2002.[15](30%), and an Iranian study by Barzegar M et al, 2007 (40.7%). This may be explained by the average greater time lag before presentation to emergency services.

As shown by the study by Shinnar S et al, 2001, the longer the seizure lasts, the less likely it is to stop in the next few minutes. On trying to find an association between the duration of seizure before acquiring any form of treatment with response to treatment, it was found that there was a significant association (p= 0.0112) showing a progressive increase in the duration for control of seizure with thatof increase in the time lag of presentation to medical services.

Outcome: The mortality in the present study was 15% (approx.). This was comparable to some of the studies as shown. The mortality of some of the studies was as follows: Veena Kalra et al, 2005.[6] - 30% Knowng Kl et al, 1995.[14]- 11% Longroscino et al, 1997 - 1 % Hersdorffer et al, 1984.[16] - 21% Delorenzo RJ et al, 1996.[17] - 22%. The mortality in this study was lower than that found in the study by Veena Kalra et al. This could be explained by the higher percentage of sequelae seen in the present study. The percentage of sequelae in our study was 47.8%.

The sequelae in some of the other studies are:
15 % in Eriksson et al, 1997.[18]
36% in Aicardi J et al, 1970.[12]
17.5% in Maytal J et al., 1989.[19]
The higher sequelae in present study can be explained by the prolonged duration of seizure activity as explained later.

OUTCOME AND RISK FACTORS
Age and Outcome: The mortality was significantly higher (p= 0.0365) in the age group of < 36 months, in the present study. In the study by Veena Kalra et al there was a greater mortality in the same age group but it was not significant. (44.4% Vs 23.8%, p=0.487) Significant association was seen in Delorenzo et al, 1992 and Chevrie and Aicardi, 1977. Age had minimal association in the study by Dunn et al., 1988'.

There was no significant (p= 1.000) increase in the sequelae in children of younger age group. Significant association in age group <12 months was seen in the Kenyan study by Sadarangani M et ah, 2008.[20]

Gender and Outcome: No significant association was found with the sex of the patient and mortality (P=0.6823). This was the case with other studies like, Delorenzo et al, 1992[21], Sadarangani M et al, 2008[20] and AH Akbar et ah, 2005. No significant association was found between sequelae and the gender of the patient. However, a possibility of having more sequelae in the female sex was seen in the study by Chevrie and Aicardi, 1978.

Type of Onset of Seizure and Outcome: The association between any type of seizure and mortality was not significant. (12.5% Vs 21.7%, p=0.545). This was contrary to the study by Sadarangani M et al., 2008.[20] where there was a significant association between focal onset of seizures and mortality.

Time Lag for Presentation to Medical Ser Vices and Outcome: The time lag for presentation to medical services was divided into >45 minutes and <45 minutes. 6 patients (16%) with lag time for treatment of >45 minutes duration died when compared to 1 patient (11%) with lag time for treatment < 45 minutes. The association of patients with longer lag time, dying more, however was not significant (p=1.000). Similar findings were seen in the study by Veena Kalra et al. However in our study there was a significant association between shorter lag time to treatment and no sequelae, (p= 0.0125).

Total Seizure Duration and Outcome: All the 7 cases (19.4%) that died had seizure duration of more than 2 hour. None of the cases with a seizure duration of < 2hours died. A higher cut off was taken because of a longer duration of seizure before presentation to the hospital. There was however no statistical significance found (p=0.3159). Similar findings were seen in the study by Mayer Stephan A et al., 2002, which is explained later.

However, the study by Veena Kalra et al there was a significant association between a seizure duration of >45 minutes and mortality (p=0.0001). Similar associations were found in studies like, Delorenzo et al, 1992 Dunn et aL, 1988.[22] But there was significant association found between longer duration and seizure duration and higher incidence of sequelae (p=0.0001). This was as seen in the study by Mayer Stephan A et al., 2002.

Response to Treatment and Outcome: Both the mortality and sequelae were found to be significantly lesser in the patients who attained good seizure control within 1hour of presentation to the hospital. The corresponding p values were 0.0362 and <0.0001. All 7 who died had refractory status and 20 of the 22cases of refractory SE had sequelae. In the study by Mayer Stephan A et al 2002.[15] it was found that RSE was associated with prolonged hospital length of stay (P< .001) and more frequent functional deterioration at discharge (P=0.02).

There was however no significant increase in the mortality. The study by Veena Kalra et al., also showed similar findings as our study where 6 cases with response to treatment more than or equal to 1 hour died in comparison to 3 who responded < 1 hour. This was however statistically not significant (p=0.068).

Etiology and Outcome: Five out of the 25 cases of acute symptomatic cause died (Mortality = 20%), whereas 2 out of the remaining 19 died (Mortality =10.5%). The mortality was definitely higher in the acute symptomatic group however it was not statistically significant (p=0.4285). Significant association between etiology and outcome was seen in various studies like, Delorenzo et al, 1992.[21] Dunn et al, 1988.[22] and Ali Akbar et al, 2005 Prolonged febrile seizures had the best and symptomatic SE the worst, outcome, in most of the studies.

In our study cerebral malaria was significantly associated with a good outcome that is no sequelae (p=0.0016). Seven of the 9 cases of cerebral malaria had a good outcome, 7 out of the remaining 37 had a good outcome. This was similar to that found in a Kenyan study by Sadarangani M et al, 2008[20]; where positive malaria slide was associated with low mortality.

In our study, none of the malaria cases died, but the association of malaria with a low mortality was not found to be statistically significant.In our study, 40% of patients of Idiopathic/ febrile cause had sequelae whereas 58 % with other etiologies had sequelae. This was though not statistically significant (p=0.636). Idiopathic or febrile status was significantly associated with lesser sequelae in studies by Dunn et ah, and Ali Akbar et al. The relatively higher

percentage of sequelae may again be again due to the delay in treatment.

SUMMARY:
- The study consisted of 46 patients, 27male and 19 female. The mean age of presentation was 44.9+36.6 months and 34 cases (74%) were below the age of 5yrs, which was similar to other studies.
- The average duration of seizures before presenting to any kind of medical services was 3.09 ± 2.74 hours and there was statistically significant association (p=0.0375) between the socioeconomic status and the duration of seizure prior to presentation to the hospital. Both these results reflect the poor economic resources, education and awareness standards of the parents and the poor infrastructure of the developing countries.
- The most common form was generalized tonic-clonic seizures as seen in various studies.
- There were a higher number of cases presenting as status without a prior history of seizures. 36% had unprovoked status epilepticus, which was higher than seen in other studies, the reason to which might be a poorer control or irregular treatment seen in patients with epilepsy in this study.
- In our study, acute symptomatic was the most common form and febrile the least common. This was in contrary to the literature which describes febrile status as the most common form. However, there were many studies showing similar trends. The difference seen may be due to the higher prevalence of infective (Acute Symptomatic) illnesses in the current population and good control of febrile seizures.
- 43.6%o of cases showed a good response and 56.4% cases were refractory. The refractory cases were higher than in most studies. This can be explained by the average greater time lag before presentation to emergency services, and the significant association (p=0.0112) seen as, the longer the seizure lasts, the less likely it is to stop in the next few minutes.
- The mortality in the present study was 15%. The percentage of sequelae in our study was 47.8%. The relatively lower mortality when compared to higher average total duration may be due to the fact that longer duration of seizures were associated with higher incidence of sequelae (p=0.0001) than a higher mortality (p=0.3159) as was seen in this study.
- The mortality was significantly higher (p=0.0365) in the age group of <36 months, in the present study as in other studies.
- No significant association was found with the sex of the patient and mortality (p = 0.6823) and sequelae, as in other studies.
- There was no association found between a greater time lag for treatment and mortality however there was a significant association between greater lag time to treatment and sequelae, (p=0.0125).
- Both the mortality and sequelae were found to be significantly lesser in the patients who attained good seizure control within 1 hour of presentation to the hospital.

- Five out of the 25 cases of acute symptomatic cause died (Mortality=20%), whereas 2 out of the remaining 19 died (Mortality=10.5%). The mortality was definitely higher in the acute symptomatic group however it was not statistically significant (p=0.4285).
- In our study, 40% of patients of idiopathic/ febrile cause had sequelae whereas 58 % with other etiologies had sequelae. This was though not statistically significant (p=0.636). Idiopathic or febrile status was significantly associated with lesser sequelae in various studies.

CONCLUSIONS:
- Status epilepticus is the most common neuroemergency and still remains to be associated with a high mortality and morbidity.
- As mortality is higher in younger age groups and status with acute symptomatic etiology, there is a need to aggressively treat these groups.
- As the longer a seizure continues the harder it is to be controlled and as both the mortality and sequelae were found to be significantly lesser in the patients who attained good seizure control within 1 hour of presentation to the hospital, facilities for early transport and easily reachable medical services have to be improved and steps have to be taken to increase the awareness about the detrimental effects of prolonged seizures, and about the good outcome if treated early.

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