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Clinico-laboratory profile and immediate outcome of paediatric status epilepticus in a tertiary care hospital in South India

Purusothaman S* and Radha Kumar

Department of Paediatrics, Saveetha Medical College Hospital, Chennai – 602105 Tamil Nadu, India

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ABSTRACT

Convulsive status epilepticus is one of the common causes of children getting hospitalized to paediatric intensive care units and is associated with high morbidity and mortality. The objective of the study is to analyse the clinical presentation, laboratory parameters and immediate outcome of children admitted with status epilepticus to the PICU. A prospective study was performed at Saveetha Medical College Hospital, January 2016 to December 2016. Detailed history and examination of children followed by relevant investigations including biochemical parameters were done during hospitalization with the immediate outcome. During the study period, 54 children admitted with status epilepticus between the age group of 10 months to 15 years. Out of the 54 children, 22 children (40.7 %) were admitted with status epilepticus without any prior history of seizures, while 32 children (59.3%) had a previous history of seizures and 20 children (37%) presented with febrile status epilepticus. Seizure duration between 30-60 minutes was seen in 29 (53.7 %) patients whereas 7 children (12.2%) presented with refractory status epilepticus. Low haemoglobin (<10 gm/dl) was observed in 15 children (27.7 %), hypocalcemia in 6 children (11.1%) and hyponatremia (<135 mg/dl) was observed in 18 children (33.3%). 8 children (15.7%) had abnormal neuroimaging. The mortality was 5.5 % and all children who died had refractory status epilepticus. Younger children below 5 years had a higher incidence of status epilepticus. The commonest type of seizure was a generalized tonic-clonic seizure. Mortality was observed more in refractory status epilepticus.

* Corresponding Author

Name: Purusothaman S
Email: purushthedoc@gmail.com

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INTRODUCTION

Status epilepticus (SE) is a medical emergency in children associated with high morbidity and mortality (Nathan B, 2000). Status epilepticus is currently defined as "A continuous seizure activity or recurrent seizure activity without regaining consciousness lasting for more than 5 minutes" as part of an operational definition put forth within the past few years. In the past status epilepticus used to be defined as "A seizure lasting more than 30 minutes or recurrent seizures for more than 30 minutes during which the patient does not regain consciousness (Daniel H. Lowenstein *et al.,* 1999; JAMA 1993). Nowadays the cut off time has been reduced to emphasize the risks involved with longer seizures (Daniel H. Lowenstein *et al.,* 1999). Status epilepticus was earlier defined as refractory if the duration required to control the seizure activity was more than one hour. Currently, refractory status epilepticus is defined as status epilepticus that has failed to respond to therapy, usually with at least 2 medications such as benzodiazepines and another medication (Al-Grawi *et al.,* 2018; Al-Thahab *et al.,* 2018). Recognition and prompt intervention of children with status epilepticus is crucial to prevent adverse neurological and

systemic morbidity (R F M Chin, 2004). Status epilepticus aetiology is poorly understood and tends to be a multi-factorial condition, although the most common cause is due to infection (Manish Sadarangani, 2008). Longer the duration of seizure activity, more is the risk for permanent neurological damage.

Systematic studies on seizure duration in children have been few. Children in status epilepticus who are admitted to the PICU are likely to represent the severe end of the spectrum and its immediate outcomes were analysed only in a few studies. Mortality among patients with SE depends on the underlying aetiology, duration of seizure and appropriate early interventions. Understanding the aetiology and associated comorbid factors of refractory seizures in children is very poor. In this study, we investigate the potential risk factors and neuroimaging of all children presenting with convulsive status epilepticus.

METHODS

This study was a prospective hospital-based study approved by the institutional research and ethics committees of the Saveetha Medical College Hospital, Tamil Nadu. All children who either presented with status epilepticus at admission or developed status epilepticus during hospitalization over a period of 1 year (January 2016 to December 2016) were included in the study. The study included 54 children who presented with status epilepticus in the age group from 10 months to 15 years. Initial measures to stabilize the child and control the seizure activity with anti-epileptic drugs were followed based on our hospital protocols. A detailed history was collected and all the children were subjected to various investigations after stabilization which included complete blood counts, serum electrolytes, random blood sugar and serum calcium. Blood Culture, CRP and lumbar puncture for CSF analysis were performed on those children suspected of infection. The children were subjected to neuroimaging (either CT Brain or MRI) and EEG.

RESULTS

This was a hospital-based prospective study over a period of one year for 54 children who suffered from status epilepticus were included. 61 % of children were male compared to 39 % female children. Generalised tonic-clonic seizures were the most common presentation of seizure in 42 children (77.7%), whereas tonic seizures occurred in 10 (18.5%) and focal seizure in 2(3.7%). Out of 54 children, 12.9 % had refractory status epilepticus whereas 29 (53.7 %)had seizure activity lasting for 30-60 minutes. 59% of children had a prior history of seizure while 41 % of children presented for the first time with status epilepticus. Fever preceded the seizure in 37% of children. The children with refractory status epilepticus required three anti-epileptic drugs to control seizures. Leucocytosis was present in 55.5% of children, the rest being in the normal range. Low haemoglobin was present in 27%, low calcium level in 11.1% and low serum sodium levels were observed in 33.3% of patients. Majority children had abnormal EEG in 74.2%. Out of 10 children with abnormal neuroimaging, 7 children had refractory status epilepticus. Mortality in our study was 5.5% and all three deaths occurred in children with refractory seizures.

Immediate outcome: Mortality observed in our study was 5.5 % (3 children). All the three children

Table 1: Salient features of patients with status epilepticus (n=54)

S.No	Salient features	No. of Cases
1.	Age of presentation	10 months to 15 years
2.	Mean age	3.8 years
3.	Male: Female	33:21 (1.5 : 1)
4.	History	
	No previous history of seizures	22(40.7%)
	Previous history of seizures	32(59.3%)
	Fever associated with seizures	20(37%)
5.	Duration of seizure	
	5-30 minutes	18(33.3%)
	30-60 minutes	29(53.7%)
	60-90 minutes	7(12.2%)
6.	Seizure type	
	Generalised tonic-clonic	42(77.7%)
	Tonic	10(18.5%)
	Focal seizures	2(3.7%)
7.	Anti-epileptic drug	
	Two	32(59.3 %)
	Three	6(11.11%)

Table 2: Laboratory parameters of children with status epilepticus

S.No.	Laboratory Parameters	No. of cases
1.	**Total leucocyte count**	
	<4000	Nil
	4000-11000	24(44.4%)
	>11000	30(55.5%)
2.	Hb<10 gm/dl	15(27.7%)
3.	Serum calcium< 9 mg/dl	6(11.1%)
4.	Serum sodium	
	<135 mg/dl	18(33.3%)
5.	Abnormal CSF finding	3(5.5%)
6.	**EEG**	
	Abnormal epileptiform activity	40(74.2%)
7.	**Neuroimaging**	
	Normal	44(81.5%)
	Structural abnormality	10(18.5%)
8.	**Structural abnormality**	
	Cystic encephalomalacia	3
	Porencephaly	2
	Polymicrogyria cortex	2
	Space occupying lesion-DNET	2
	Arachnoid cyst in temporal region	1

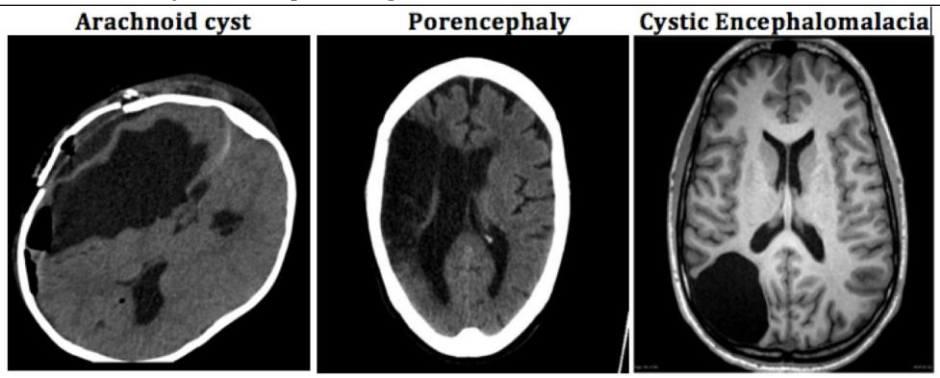

Figure 1:

had refractory seizures. No neurological deficit was observed in the study population after obtaining the seizure control.

DISCUSSION

Predominant involvement of children from younger age group with SE has been reported previously (Ahmed Khalid *et al.,* 2013; Miquel Raspall *et al.,* 2007; Mritunjay Kumar *et al.,* 2014; Shinnar S *et al.,* 1997). Sheffali Gulati *et al.,* 2005 and R F M Chin *et al.,* 2004 in their study found that 56% and 86% of patients were five years or younger. In the present study, we observed similarly that younger children were more affected with status epilepticus with a mean age of 3.8 years. 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 neuro-function.

In our study, the male to female ratio was 1.5:1. Male children were predominantly affected in our study which is similar to another Indian study by Sheffali Gulati *et al.,* 2005. The importance of gender in the risk assessment of SE is debated.

Table 3: Male to Female ratio in various studies

Author	M: F ratio
Mritunjay Kumar *et al.,* 2014	1.5:1
Chin RFM *et al.,* 2004	1;1
Ahmed Khalid *et al.,* 2013	1.4:1
Present study	1.5:1

Status epilepticus may be classified as convulsive (CSE)or non-convulsive (non-CSE). CSE is the most common form of status epilepticus. A generalised tonic-clonic seizure is the most common type 77.7% and it was consistent 86% Ahmed Khalid *et al.,* 2013. 40.7% children presented as SE without a prior history of seizures compared to 12 % in a study by Shinnar S *et al.,* 1997 and 53.3 % by Sheffali Gulati *et al.,* 2005. Almost 37% of children had febrile status epilepticus. Fever was the precipitating factors for seizures in the majority of cases.

The primary aim is to control and abort SE as the duration of seizure activity is directly proportional to immediate mortality and later morbidity. In our study, first line antiepileptic drugs were benzodiazepine (lorazepam or midazolam) followed by phenytoin and levetiracetam. The frequency of refractory seizures is low (12%) compared to other published reports (Besli GE *et al.,* 2010; Saz EU *et al.,* 2011; Sheffali Gulati *et al.,* 2005) were the frequency varies from 25-50%. Refractory seizures were observed more with structural abnormality. Over the last decade, the early intravenous use of levetiracetam, valproic acid and topiramate were effective in terminating seizures (Abend NS *et al.,* 2009). Mortality of status epilepticus varies from 11-53%. Several reports revealed that the prolonged SE is associated with higher neurological morbidity and mortality (Eriksson K *et al.,* 2005; Singh RK *et al.,* 2009; Morrison G *et al.,* 2006). In our study, the mortality rate was 5.5 %, which occurred in children with refractory seizures. Low haemoglobin and hyponatremia are an additional risk factor for refractory seizures.

CONCLUSION

In our study, we observed that younger children below 5 years had a higher incidence of status epilepticus of which febrile status epilepticus being common. The commonest type of seizure was a generalised tonic-clonic seizure. Mortality was seen in children with features of refractory status epilepticus.

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