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Original Research Article

Aetiology of new onset seizures in cases admitted to an intensive care unit of a tertiary care hospital: a two year study

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ABSTRACT

Background: Seizures are a common neurological disorder encountered globally in regular medical practice. Hospital onset seizures may occur in patients who never had a history of seizure before hospitalization and may be due to causes that lead to hospitalization or acquired during hospitalization like stroke, neuro infection etc. The objectives of this study were the purpose of the present study was to study the incidence and to describe demographic and clinical characteristics of patients developing new onset seizures in an intensive care unit of a tertiary care hospital.
Methods: A prospective study for two years was conducted on cases of seizures admitted in an intensive care unit of a tertiary care hospital. The etiology of all the cases was recorded based on the clinical history and necessary investigations like EEG and imaging studies of the brain in cases if required.
Results: About 238 cases with males 177 and females 61 cases were enrolled, and 31-50 years was most common age group. Diabetes was the most common co morbidity associated and generalized seizures were most common. CVA was most common etiology (26.89%) and idiopathic next common. Infarct was most common cause of CVA and meningitis in infections. Generalized tonic clonic seizures was most common in cases with CVA as the aetiology followed by infective cases.
Conclusions: It is mandatory to deal cautiously and carefully the cases of seizures developing in an ICU in addition to proper history and examination, each patient must undergo detailed EEG, imaging investigations and other ancillary investigations if necessary.

Keywords: EEG, Generalized tonic clonic seizures, Intensive care unit, Meningitis, Seizures

INTRODUCTION

Seizures are a common neurological disorder encountered globally in regular medical practice. Global surveys indicate that about 1 in 10 people will experience seizures during their life time. Seizure a latin derivative meaning "to take possession of" is defined as a paroxysmal event due to abnormal excessive hyper synchronous discharges from an aggregate of central nervous system neurons. These are a result of shift in the normal balance of excitation and inhibition within the central nervous system. A number of precipitating factors, internal and external like psychological physical stress, sleep deprivation, sedative drugs etc., and by repeated stimulation from sub convulsive electrical pulses known as "kindling phenomenon" may be linked to the seizures.[1]

Seizures are a frequent occurrence in hospitalized patients. A data survey globally in 2005 indicates seizures were identified in approximately 1.4 million of 39.2 million of total hospitalizations with various etiologies.[2] Seizures requires special clinical attention in

any period of life as the causes are multiple and important in management. The causes of seizures are variable based on the period of life and also the strategy of management. Hospital onset seizures may occur in patients who never had a history of seizure before hospitalization and may be due to causes that lead to hospitalization or acquired during hospitalization like stroke, neuro infection etc.[3] In general the patients in the hospital have unique characteristics, and the etiology and epidemiology of seizures developing in hospitals differs from non-hospitalized patients. Intensive care units are the common places in the hospitals where the patients develop new onset acute symptomatic seizures which require immediate attention and management. Identifying the etiology of the seizures helps in better management and in reducing the morbidity and mortality in the cases of seizures developed in ICU. The incidence of seizures developing in ICUs, the circumstances of these seizures and managements used and the impact of anti-epileptic drugs used are unknown and are quite variable from place to place based on the settings and circumstances.[4]

The purpose of the present study was to study the incidence and to describe demographic and clinical characteristics of patients developing new onset seizures in an intensive care unit of a tertiary care hospital.

METHODS

The present prospective study was conducted by Department of General Medicine of a tertiary care hospital in south India for a period of two years from January 2017 to December 2018. All the cases presenting with seizures for first time and admitted to intensive care unit were enrolled in the study. The study was presented before the institutional ethical committee and was approved by the committee. The study was conducted as per the guidelines of the committee. A written informed consent was obtained from all the cases enrolled in the study. A complete detailed history was obtained from the subjects, relatives and eyewitnesses regarding the seizures. A thorough clinical examination was conducted, and all the findings were recorded in a predefined questionnaire sheet prepared. Socio demographic data of the subjects in the study was noted and entered in the data sheet.

Inclusion criteria

- Age ≥18 years without past history of any seizures,
- Patients willing to consent for the study.

Exclusion criteria

- Patients with history of hyperventilation, TIA, Movement disorders, psychogenic seizures and with trauma (Head injuries) were excluded from the study.

Routine blood investigations which include complete blood picture, urine examination, blood sugar, blood urea was done as per protocol. Special investigations which include interictal EEG, plain CT of brain and magnetic resonance imaging were performed in cases if necessary. Serum electrolytes which include sodium, calcium, potassium and magnesium and toxic screening and CSF analysis (by Lumbar Puncture) in required cases were done if necessary.

Statistical analysis

All the collected data was entered in Microsoft excel spread sheet and analyzed for corrections. The corrected data was analyzed using SPSS version 19 for Windows ((IBM SPSS inc., Chicago, IL) and the results were generated as frequencies and percentages.

RESULTS

In the present study, a total of 1638 cases were admitted in medical intensive care unit with different aetiologies and fulfilling the inclusion criteria.238 cases (14.53%) developed new onset seizures accounting to 14.53%. Males were predominant in the study with 177 cases (74.37%) and females only 61 (25.63%). Most common age group in the study was 31-50 years with 54.62% followed in order by >50 years (26.89%) and 18-30 years (18.49%) (Table 1).

Table 1: Age and sex distribution of cases in study.

Sex	No	%
Male	177	74.4
Female	61	25.6
Age group		
18-30	44	18.5
31-50	130	54.6
≥50 years	64	26.9
Total	238	

The mean age of the study group was 42.1±1.85 years and males with a median age of 42.29±2.68 years and females with 41.52±2.54 years. Patient's age ranged from 18 years to 78 years in the study. Male to female ratio in the study was 2.9:1. Diabetes was the most common co-morbidities associated with cases in the study with 30.7% followed in order by others which include hypertension (24.4%), ischemic heart disease (18.9%), cerebro-vascular accidents (11.8%) and COPD in 4.6% of cases (Figure 1).

Type of seizures and duration

Majority of the cases (40.34%) presented with generalized seizures, followed in order by partial seizures (22.69%), partial seizures with secondary generalization (15.97%) and Myoclonic jerks in 11.76%. Status epilepticus was observed in 9.24% of cases in the study; 18 cases with generalized seizures and four with focal seizures with secondary generalization (Figure 2).

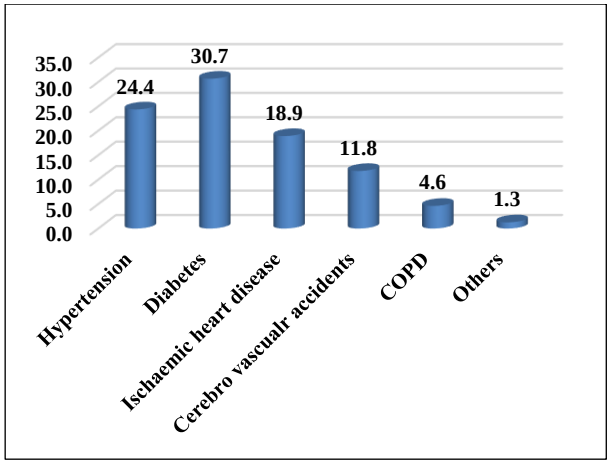

Figure 1: Comorbidities in the study cases in percentage.

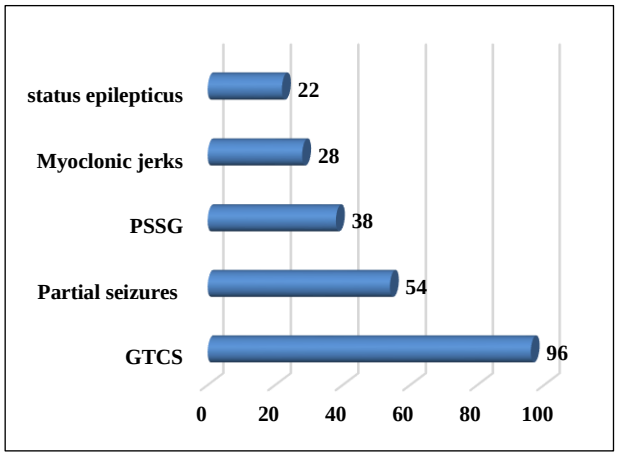

Figure 2: Type of seizures among cases in the study.

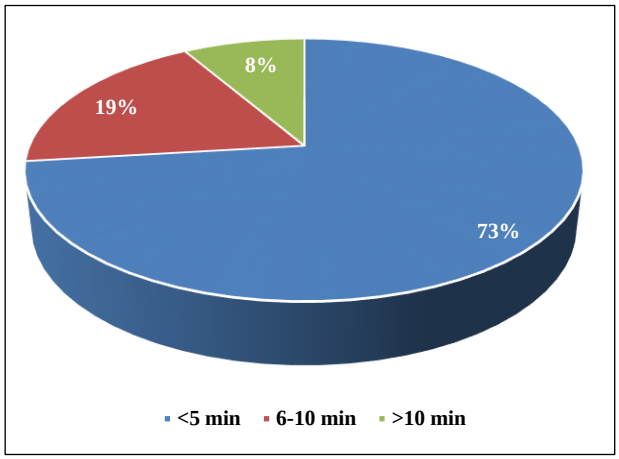

Figure 3: Duration of seizures among cases in the study.

Regarding the duration of seizure in the study, out of 238 cases 174 cases (73.11%) had <5 minutes, 44 cases (18.49%) with 6-10 min and 20 cases (8.4%) with >10 minutes. Mean duration of seizure was 5.23 min and standard deviation of 5.23±1.4 min (Figure 3).

Aetiology of seizures

CVA (stroke) was the most common cause of seizure in present study with 26.89% followed by other common causes which include infective etiology (20.59%), idiopathic with no specific cause (17.65%) and medication related cause in 11.76% of cases. Relatively rare causes of seizures include metabolic (8.40%), post-partum eclampsia (5.88%), brain tumours (5.04%) and other causes 3.78% (Table 2).

Table 2: Etiology of seizures of cases in the study.

Etiology	No	%
Infective	49	20.59
Medication related	28	11.76
CVA	64	26.89
Idiopathic	42	17.65
Metabolic	20	8.40
Post-partum eclampsia	14	5.88
Brain tumours	12	5.04
Others	9	3.78

In cases of cerebrovascular accidents, Infarct was the most common cause seen in 38 cases (59.4%) followed by cortical venous thrombosis in 16 (25%) and hemorrhage in 10 cases (15.6%). In subjects with infective aetiology, meningitis accounted for majority with 40.82%, followed in order by meningoencephalitis (22.45%), tuberculoma (18.37%), cerebral malaria (10.20%) and least neurocysticercosis (8.16%). In cases with related to medication, sub therapeutic drug levels was the most common cause (50%) followed by AED withdrawal in 42.86% and drug induced in 7.14% of cases. Hypoglycemia was the most common cause in cases with metabolic aetiology with 50% and less common were hyperglycaemia (20%), Hyponatremia (20%) and hypocalcemia in 10% of cases. Meningioma was the most common brain tumour with 50% followed by less common secondaries in 25%, glioma in 16.67% and glioblastoma in 8% of cases.

Among other miscellaneous causes, OP poisoning was seen in 5 cases, AV malformations in 2 and alcohol withdrawal in 2 cases in present study. Type of seizures in relation with the aetiology is summarized in (Table 3). GTCS was most common in cases with CVA as the aetiology followed by infective cases. Partial seizures were also common in cases with CVA as well as in idiopathic cases. The most common cause of GTCS was CVA (35.42%) followed by infection (23.96%) and idiopathic (16.67%) with no cause.30% of partial seizures were caused by CVA followed by 26% infections and 22% idiopathic cause. Majority of the cases of PSSG were caused by CVA, metabolic and brain tumours (18.42% each). Majority of Myoclonic jerks (25%) were caused by metabolic etiology. 50% of cases of status epilepticus was due to metabolic and idiopathic cause.

Investigations

Electroencephalography was done in 117 cases based on the necessity and abnormal EEG was observed in only 14 cases with 11 cases showing single temporal interictal epileptiform discharge (IED) and 3 cases showed focal abnormality. Imaging studies were done on 128 cases and abnormal findings were observed in 64 cases with ring enhancing lesions, infarcts, calcifications, diffuse cerebral atrophy, meningiomas and gliosis.

Table 3: Type of seizure in relation to etiology.

Etiology	Type of seizures (No) (%)					
	GTCS*	Partial seizures	PSSG*	Myoclonic jerks	Status epilepticus	Total
Infective	23	14	5	3	4	49
Medication related	10	5	5	3	5	28
CVA	34	16	7	5	2	64
Idiopathic	16	12	4	4	6	42
Metabolic	4	2	7	7		20
Post-partum eclampsia	6	2	2	2	2	14
Brain tumours	2	3	7			12
Others	1		1	4	3	9
Total	96	54	38	28	22	238

GTCS- Generalized tonic clonic seizures, PSSG- Partial seizures with secondary generalization.

DISCUSSION

Seizures in an ICU setting are difficult to diagnose, prevent, and manage effectively due to difference in complexity and causation of the underlying cause. These are manifestations of a neurological disease or dysfunction of a medical or post-surgical illness. Etiologies of seizures developing in ICU setting differ from place to place and region to region based on different types of common ailments prevalent in the region.

In the present study, incidence of new onset seizures was 14.53% which is similar to the findings in Bleck TP et al, who reported 13% in their study.[5] Male predominance was observed in the study with 74.77% which is quite high when compared with the findings of Varleas PN et al, who reported 55% in his study.[6] 55% of cases in the study were in between 31-50 years as similar to studies of Muralidhar V et al, and Venugopal K et al, who reported the same in their study.[7] The mean age of the study group in present study was less 42 years which is less when compared to the studies in the western countries which is more than 50 years. Findings in the study of Bladin CFA et al, reported more cases in >50 years age group which is contrary to the finding of present study.[8] Diabetes was the commonest co morbidity in present study, studies describing association of co morbidities with seizures are limited and finding in the study of Stam J et al, reported hypertension, diabetes as commonest associated co morbidities in his study.[9] In present study hypertension was almost equally associated with diabetes as co morbidity in development of seizures.

In present study, CVA (stroke) was the most common cause of seizures followed by infections (20.59%), idiopathic (17.65%) and medication related in 11.76%. Kanitkar SA et al, also reported CVA as the most common cause of seizures in his study followed by idiopathic, infections, metabolic causes.[10] However contrary to our findings Sendil G et al, reported idiopathic cause as the most etiology of seizures in his study, but his study was in relation to all the cases but authors confounded the study to cases specifically to cases admitted in ICU which clearly explains the cause of difference.[11] A Mexican study reported infections being the common cause of seizures in their study and mostly neurocysticercosis, this clearly explains that the etiology of seizures depend on the age of the cases in the study, population, sample size and endemicity of CNS infections.[12] Infarct was the most common cause in cases of CVA accounting to 59% in present study which is on par with findings of Maneesh KS et al, but contrary to few western studies who reported hemorrhage as the most cause and few reported cortical venous thrombosis as most common cause in their studies.[13] As mentioned the causes are variable from place to place based on multiple factors. In cases with infective etiology, meningitis was the most common cause in present study followed by meningo encephalitis, cerebral malaria, tuberculoma and last neurocysticercosis. These findings were similar to findings of Amaravathi KS et al, but contrary to findings of Rajashekhar V et al, who reported neurocysticercosis and cerebral malaria as most common causes in his study.[14,15] In the present study, hypoglycemia was the most common cause in metabolic causes of seizures as compared and was similar to many other studies, few studies reported association of hyponatremia with hypoglycemia as common cause in metabolic cases of

seizures. Meningioma was the most common malignancy associated with seizures in the present study, followed by secondaries which is similar to the findings of Pradeep PV et al, but reports of Singh G et al, stated that secondaries are more common than meningiomas in causation of seizures, but study group in their study was elderly and confined to oncology which explains the difference in the findings.[16,17]

In present study, GTCS was the most common type and CVA was the most common cause of GTCS. These seizures were observed more commonly among elderly more commonly than at younger age. Findings of present study coincide with reports of Chandy MJ et al.[18] Increased incidence of GTCS in elderly may be due to increased incidence of stroke in this population. Focal seizures were more commonly associated with infectious etiology than other causes and were on par with many studies conducted globally and with findings of Chalasani S et al, and Kumar MR et al.[19] Single temporal interictal epileptiform discharge (IED) was the most common EEG abnormal finding in present study and the incidence of abnormal EEG in present study was only 12%. By imaging studies, the incidence of abnormal findings was 50% and ring enhancing lesions was the most common abnormality which is on par with the findings of Pannag KN et al. [20]

CONCLUSION

GTCS were the more common seizures and CVA was the most common cause. GTCS are associated more commonly in elderly age group. Meningitis was most common infection. The choice of management and starting on anti-epileptic drugs should be cautious based on co morbidities associated and rate of chance of recurrence. Hence it is mandatory to deal cautiously and carefully the cases of seizures developing in an ICU in addition to proper history and examination, each patient must undergo detailed EEG, imaging investigations and other ancillary investigations if necessary.

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