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# Etiological profile of new onset seizures in adults

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**Abstract**
To evaluate the etiological profile of new onset focal seizures in adults with the help of laboratory and neuroimaging studies in a tertiary care hospital in Hyderabad.100 Cases of new onset seizures were included in the study. The etiology was determined by neuroimaging and appropriate investigations were done. In the age group of 18-90 yrs maximum cases were seen between 18-29 yrs and 50-59yrs.75 (75.0%) were GTCS, 21 (21%) were simple focal, 4 (4%) were focal with secondary generalized. Granulomatous lesions & Cerebro vascular accidents are the most common cause of Focal Seizure in younger age groups. Among granulomatous lesions of brain, Neurocysticercosis & tuberculomas are most common. Incidence in male is more than in female.

**Keywords:** GTCS (Generalised Tonic Clonic Seizures), NCC (Neurocysticercosis), CVST (Cortical Venous Sinus Thrombosis)

## Introduction

A seizure is a paroxysmal event due to abnormal, excessive or synchronous neuronal activity in the brain [1]

The etiology of seizures may be idiopathic or related to a particular disease. There are significant differences in the etiology of patients with new onset seizures and those with recurrent seizures and epilepsy [2]

Acute symptomatic seizures show clearly differentiated characteristics with regard to true epileptic seizures:

(i) A clearly identified causal association,

(ii) Generally tend not to recur,

(iii) Usually long-term antiepileptic drug (AED) treatment is not necessary [3]

The etiological spectrum of new-onset seizures and outcome may be different in developing countries when compared to developed countries. Studies in developing countries suggest that this figure is nearly at 100 per 100,000.

While several studies have been published in the developed countries regarding etiology of seizures, there is limited published data on etiology of seizures in Asia. Hence this study is being carried out to find reversible etiologies of acute symptomatic seizures before considering pharmacotherapy and to distinguish unprovoked and provoked seizures during diagnostic procedure.

## Objectives of the Study

1. To study the etiological spectrum of new onset seizures.
2. To evaluate new onset seizures by clinical and appropriate laboratory and radiological evaluation.

## Methodology/Patients and Methods

### Source of Data

Patients attending the outpatient department and emergency department with diagnosis of new onset seizures in Department of Medicine in Osmania General Hospital, during the study period (2013-2015).

### Method of collection of Data

Hundred patients presenting with new onset seizures were selected for the study. All patients in the study were informed about the procedures and consent will be taken. The study design is cross sectional descriptive study. Demographic data for the proposed study like age and gender, history and clinical examination, hematological, biochemical estimation, hormonal, radiological electrophysiological, extent of disease and duration of disease were be assessed.

### Inclusion Criteria

- All patients presenting with acute seizures.
- Age > 18years
- Both genders

### Exclusion Criteria

- Age <18 years
- Pseudo seizures/ NEAD (non epileptic ataxic disorder)
- Other causes for transient loss of consciousness like syncope/convulsive syncope.

### Following Investigations Were Done For the Patients

- Complete hemogram, Random blood sugar, Serum Electrolytes, Serum Calcium, Serum Magnesium, Liver Function Tests, Blood Urea, Serum Creatinine, Lumbar Puncture, CT/MRI head, EEG.

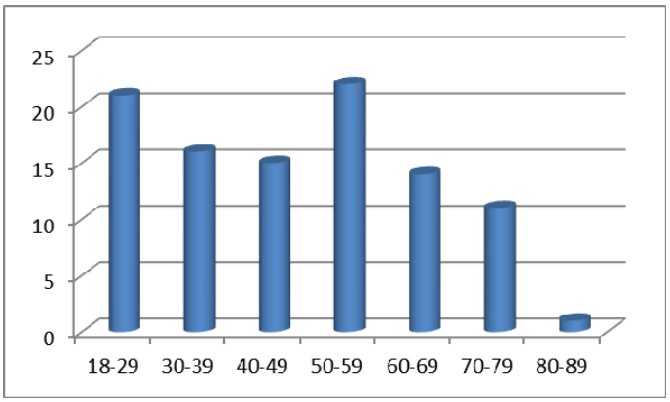
### Statistical methods applied

The analysis of the data has been carried out in various parts.

1. The first part of the result provides the distribution of age and gender of the subjects included in the study.
2. The second part includes distribution of the type of seizures and investigations carried out on study subjects.
3. The third stage includes the abnormalities found in CT, MRI, EEG and other biochemical and hematological tests. The percentage has been calculated for each of these abnormalities.
4. The next part of the tables presents the various etiologies of seizures.

## Results

The sample size for this study is 100 cases and the clinical hematological, biochemical and radiological profile for the study population has been studied.




**Graph 1:** Age distribution of patients

In this study the age – specific incidence of acute symptomatic seizures was found to be highest in the age groups of 50-59 yrs and 18–29 yrs and incidence reduced after 79 yrs.

**Table 1:** Gender distribution of study subjects

| Gender | Frequency | Percentage |
|---|---|---|
| Male | 60 | 60 |
| Female | 40 | 40 |
| Total | 100 | 100 |

New onset seizures was more in males in the age group between 50 -59 yrs and in females between 18 – 29 yrs.

**Table 2:** Seizure type in study subjects

| Seizure Type | No. of Patients |
|---|---|
| GTCS | 75 |
| Focal | 21 |
| Focal with secondary generalization | 4 |
| Total | 100 |

## Clinical Examination

All patients underwent CNS examination

CNS evaluation was normal for 62 % and abnormal for 38 % of the study population

**Table 3:** CNS abnormalities in study subjects

| CNS Abnormalities | No. of patients |
|---|---|
| Focal deficits | 17 |
| Altered Mental Status | 11 |
| Impaired Muscle Tone | 05 |
| Cerebellar Signs | 03 |
| Neck Stiffness | 02 |

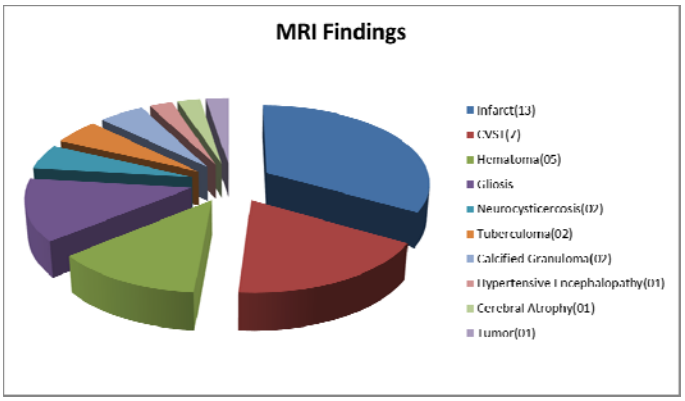
Out of the focal deficits noted, 9 patients had hemiparesis, 3 patients had extensor plantars, 3 patients had facial palsy and 2 patients had brisk DTR.

## Investigations

All the patients were subjected to hematological, biochemical and radiological investigations.

**Table 5:** CT and MRI findings in Study Subjects

| MRI Findings | No of patients |
|---|---|
| Infarct | 13 |
| Neurocysticercosis | 02 |
| Tuberculoma | 02 |
| Calcified granuloma | 02 |
| Gliosis | 05 |
| Hematoma | 05 |
| CVST | 07 |
| Contusion | 01 |
| Hypertensive Encephalopathy | 01 |
| Cerebral atrophy | 02 |
| Tumor | 01 |
| Total | 41 |




**Graph 3:** MRI Findings

MRI was done for all subjects. 13 subjects had infarct.2 patients had neurocysticercosis.2 patients had calcified granuloma.5 patients had gliosis.7 patients had cortical venous thrombosis. 2 patients had tuberculoma.1 patient had contusion

**Table 6:** EEG evaluation in study subjects

| EEG Findings | No. of patients |
|---|---|
| Normal | 70 |
| Abnormal | 30 |
| Total | 100 |

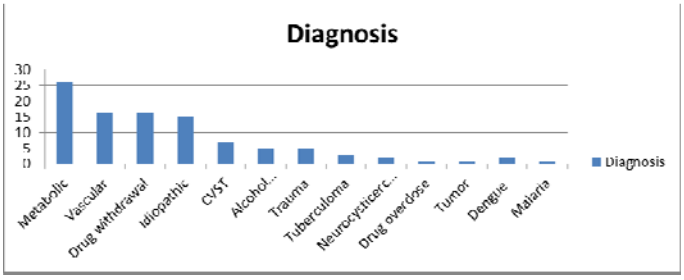
16 subjects presented with drug withdrawal seizures. 13 subjects had seizures due to phenytoin withdrawal and 3 subjects had seizures due to carbamazepine withdrawal.

**Table 7:** Other investigation findings in Study subjects

| Investigation Findings | No.of subjects |
|---|---|
| RFT abnormal | 7 |
| LFT abnormal | 5 |
| Hyperglycemia | 13 |
| Hypoglycemia | 5 |
| Anemia | 13 |
| Thrombocytopenia | 5 |
| Serum electrolytes abnormal | 6 |
| Total counts abnormal | 9 |
| Metabolic acidosis | 2 |
| Respiratory alkalosis | 1 |
| Polycythemia | 2 |

**Table 8:** Diagnosis of study subjects

| Diagnosis | No. of study subjects |
|---|---|
| Metabolic | 26 |
| Vascular | 16 |
| Drug withdrawal | 16 |
| Idiopathic | 15 |
| CVST | 7 |
| Alcohol Withdrawal | 5 |
| Trauma | 5 |
| Tuberculosis | 3 |
| Neurocysticercosis | 2 |
| Drug overdose poisoning | 1 |
| Tumor | 1 |
| Dengue fever | 2 |
| Malaria | 1 |
| Total | 100 |




**Graph 4:** Diagnosis

## Discussion

Data for the proposed study was collected in a pretested proforma which include various parameters like age, gender, seizure type etc.

One hundred cases of new onset seizures was selected after fulfilling the inclusion and exclusion criteria

**Table 9:** Comparison of Gender Distribution

| | |
|---|---|
| Present study | Males>Females |
| Rochester study | Males>Females |
| Bordeaux study | Males>Females |
| Yelandur study | Males>Females |

In our study new onset seizures was found in 60% of males and 40% of females. New onset seizures was more in males in the age group between 50 - 59 yrs and in females between 18 – 29 years and incidence reduced after 79 yrs.

Studies in developed countries showed a bi- modal distribution in the incidence of seizures, with first peak in the first few years of life while a second and more pronounced peak in those greater than 65 years [7]

In the Rochester, Minnesota study age-adjusted incidence of acute symptomatic seizures was considerably higher in men than women. The sex difference was greatest at the extremes of age, rates were higher in children younger than 15 years of age and in the elderly [6]

In a study done in Bordeaux, France, age adjusted incidence of acute symptomatic seizures were considerably higher in men than in women [5, 8]

It has been reported in some developing countries that the peak incidence of epilepsy occurred in early adulthood with no increase in the elderly [7]

In the Yelandur study in India, it was observed that the incidence was considerably higher in males than in females and was higher among children aged 0 – 14 years and sharply declined in the elderly aged greater than 60 years [9]

**Table 10:** Comparison of seizure types in study subjects

| Seizure type | Present study | JMK Murthy, NICU | NIMS study |
|---|---|---|---|
| GTCS | 75% | 55% | 22% |
| Focal | 21% | 45% | 78% |
| Focal with sec gen | 4% | NA | NA |

In this study, GTCS was seen in 75 subjects, 21 subjects presented with focal seizures and 4 subjects had focal seizures with secondary generalisation. Jaishree T Narayanan, JMK Murthy studied the clinical profile of new-onset acute symptomatic seizures as the first presenting event in patients with acute neurological illness in a neurological intensive care unit (NICU). Of the 3,151 admissions during the study period, 77 (2.4%) presented with new-onset seizures and 66 (2.1%) of them were related to acute, medical or neurological insult. GTCS was the seizure type in 36 (55%) patients and in the remaining 30 (45%) patients, the seizure type was partial with or without secondary generalization. Of the 30 patients seizure, 10 (15%) patients had seizure clusters and four (6%) patients presented with SE. Postictal Todd's palsy was noted in four (6%) patients. [4]

In another study done in NIMS[3] Hyderabad, GTCS was found in 22% of the study subjects and 78% of the patients had simple partial or complex partial seizures with or without secondary generalization.

In our study, clinical evaluation of CNS was normal for 62% and abnormal for 38 % of the study population. Of these abnormal 38% of the study population, focal deficits were found in 17%, altered mental status in 11%, impaired muscle tone in 5%, cerebellar signs in 3% and neck stiffness in 2% of the patients. Out of the focal deficits noted, 9 patients had hemiparesis, 3 patients had extensor plantars, 3 patients had facial palsy and 2 patients had brisk DTR.

**Table 11:** Comparison of CT Findings

| CT findings | Present study | NIMS study |
|---|---|---|
| Infarct | 13% | 6.08% |
| Hematoma | 05% | 5.13% |
| CVST | 05% | 2.85% |
| NCC | 02% | 9.5% |
| Tuberculoma | 02% | 9.5% |
| Gliosis | 05% | NA |
| Tumor | 01% | 7% |
| Calcified granuloma | 02% | NA |
| Contusion | 01% | NA |
| Cerebral Atrophy | 02% | NA |
| Hypertensive encephalopathy | 02% | NA |

**Table 12: Comparison of EEG findings**

| EEG Findings | Present study | NICU study |
|---|---|---|
| Normal | 70 | NA |
| Abnormal | 30 | 37% |

In this study, EEG was done for all subjects. 70 patients had normal study and 30 patients had abnormal findings. EEG showed diffuse symmetric occasional sharp wave discharges or spike waves in focal areas.

EEG was abnormal in 37 (56%) patients, mostly nonspecific, either diffuse symmetric or focal theta or delta activity in the NICU study [4]

In our study, among the routine hematological and biochemical investigations 68 patients had abnormal findings. Amongst them, 13 patients with acute seizures had hyperglycemia. Anemia was found in 13 patients. RFT was abnormal in 7 subjects, total counts were abnormal in 9 patients. 6 patients had abnormal serum electrolytes which manifested as hyponatremia, hyperkalemia, hypocalcaemia, hypomagnesaemia. LFT was abnormal in 5 subjects. 5 patients had thrombocytopenia.5 patients who presented with acute seizures had hypoglycemia. Metabolic acidosis was found in 2 subjects. Polycythemia was found in 2 subjects and 1 patient had respiratory alkalosis.

**Table 13:** Comparison of etiology of seizures

| Etiology | Present study | Rochester study | Bordeaux study |
|---|---|---|---|
| Metabolic | 26 | 10% | 15% |
| Vascular | 16 | 15% | NA |
| Drug withdrawal | 16 | NA | NA |
| Idiopathic | 15 | NA | NA |
| CVST | 7 | NA | NA |
| Alcohol withdrawal | 5 | 15% | NA |
| Trauma | 5 | 15% | 5% |
| Tuberculosis | 3 | NA | NA |
| NCC | 2 | NA | NA |
| Tumor | 1 | NA | NA |
| Drug overdose | 1 | 5% | Minimal |
| Dengue fever | 1 | NA | NA |
| Malaria | 1 | NA | NA |

Systemic metabolic illness accounted for about 10% of all acute symptomatic seizures in Rochester and about 15% of cases in Bordeaux. In Rochester, the incidence of acute symptomatic seizures attributed to metabolic insults was highest during the first year of life. This was largely caused by hypocalcaemia or hypoglycemia in newborns.[5]

Acute symptomatic seizures associated with cerebrovascular disease are generally limited to seizures occurring within 1 week of the acute event. Between 5% and 10% of individuals with a cerebrovascular insult experience a seizure at the time of stroke.

In this study, 16% subjects had acute seizures due to vascular insults both infarct and hemorrhage.

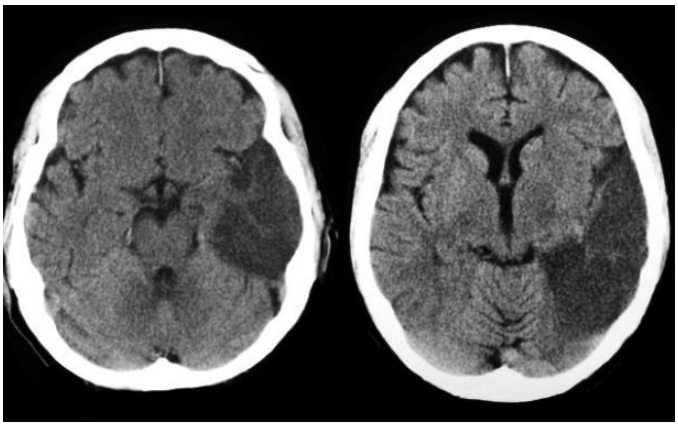


**Fig 3:** CT Brain image of MCA territory infarct

In Bordeaux, cerebrovascular disease accounted for about one third of all cases of acute symptomatic seizures, compared with only 15% of all cases in Rochester [5]

In this study, drug withdrawal seizures were seen in 16% patients.13% subjects had seizures due to phenytoin withdrawal and 3% subjects had seizures due to carbamazepine withdrawal.

Alcohol withdrawal seizures were found in 5% patients in our study. Most drug withdrawal seizures are associated with abuse of ethanol and, less frequently, barbiturates or other substances. This category of acute symptomatic seizures accounted for about 15% of cases in Rochester and about one third of cases in Bordeaux.

Seizures occurring within the first week of a traumatic brain injury are generally assumed to be acute symptomatic. 5% patients had seizures secondary to head trauma in this study.

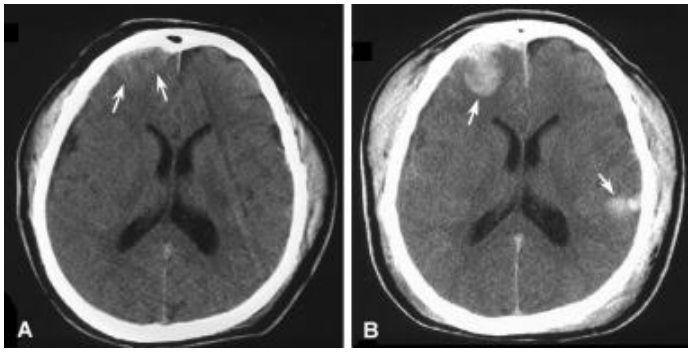



**Fig 4:** CT Brain showing head trauma with contusion

Acute symptomatic seizures associated with head trauma accounted for about 15% of all acute symptomatic seizures occurring in Rochester and only about 5% of all cases in Bordeaux. [5]

In another study Jaishree T Narayan, JMK Murthy observed that of the 66 patients with seizures, 3 patients had SE in the NICU of which 2 were due to CVT and one due to meningoencephalitis. Infections of the CNS accounted for about 15% of all acute symptomatic seizures in both Bordeaux, France, and Rochester, Minnesota.

In our study 7 patients had seizures due to CVST.

SCTEL(Single CT enhancing lesion) was the provoking factor in 50% of patients and infections of the CNS in 28% of

patients in study done in NIMS Hyderabad. SCTEL and neurocyticercosis together accounted for 66% of the etiological factors. [2]

Seizures may occur in association with a variety of toxic insults (e.g., carbon monoxide poisoning or acetylsalicylic acid overdose).In this study, 1 patient had acute seizures due to drug poisoning, which was due to organophosphorus poisoning.

Toxic insults accounted for about 5% of all acute symptomatic seizures in Rochester, but only a small proportion of cases in Bordeaux.

In this study, Acute Symptomatic Seizures secondary to tumors was found in 1% of the study subjects.

In Rochester, acute symptomatic seizures associated with primary or secondary brain tumors occurred at all ages but were rare in persons younger than 45 years of age. Unlike most other acute symptomatic seizures, seizures associated with neoplasm were equally common in men and women. [5]

Many viral or bacterial infections have been reported to cause acute symptomatic seizures due to secondary metabolic derangements. In this study 2% patients with dengue fever and 1% patients with malaria presented with acute seizures due to abnormal serum electrolytes and renal failure.

In another study done in New York, 68 patients who were HIV- seropositive had new onset seizures secondary to metabolic abnormalities such as hypomagnesaemia and renal failure[10]

**Conclusion**

New onset seizures account for a substantial proportion of all newly occurring seizures, even when febrile seizures are excluded both in developing countries like India and in developed countries.

In the present study, the age specific incidence of new onset seizures was more during early adult hood and middle aged persons compared to increased incidence during childhood and age greater than 65 years in developed countries.

The etiological spectrum also varied distinctly when compared to the data from developed countries. In our study, metabolic insults accounted for a large portion (26%), when compared to other studies. The next common cause of new onset seizures in our study was found to be due to vascular insults (16%) followed by drug withdrawal seizures (16%), idiopathic(15%),seizures secondary to CVST (7%), trauma (5%), alcohol withdrawal (5%), neurocysticercosis(2%), tuberculosis (3%), drug poisoning (1%), dengue fever (2%),malaria (1%) and tumor (1%).

New onset seizures continue to be a useful concept for classification and prognosis, and the suggestions by some that the term (and presumably the concept) be abolished seems inappropriate. In developing countries metabolic insults, cerebrovascular accidents and CNS infections like Japanese encephalitis, tuberculous meningitis, bacterial meningitis and NCC are endemic and are frequent risk factors for new-onset acute symptomatic seizures.

Further studies of this problem needs to be done systematically from other centers so that a better insight into this common problem can be obtained.

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