ORIGINAL ARTICLE

# Onset of First Seizure In Adults: A Prospective Study From A Tertiary Hospital

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**Abstract**

Seizure is the most common and serious neurological emergency seen in clinical practice. A detailed evaluation of every patient with first onset seizure is mandatory to determine seizure type, precipitating events, underlying etiology. There is no reliable diagnostic test and so its diagnosis and management requires clinical acumen and experience If the event is an epileptic seizure, the seizure type and associated clinical, electroencephalographic (EEG) and neuroimaging findings assist in determining the risk of seizure recurrence and the possible need to begin anticonvulsant therapy.

**Key Words**

Seizure, Central Nervous System, Epilepsy

## Introduction

Seizure is a paroxysmal event due to abnormal, excessive, hypersynchronous discharge from neurons leading to disturbance of consciousness, behaviour, emotion, motor function or sensation.(1) The risk of experiencing a seizure during one's life time is estimated to be 5-10% (2). It has been reported that 0.24 to 3% of adults who present to emergency department do so because of first seizure (3). The age-dependent incidence of a first unprovoked seizure has peak incidence at extremes of life i.e. in children and in adults above 60 years of age. In patient with first seizure, about 50% are of partial type while another 50% are generalized variety. Etiologically, 30% are remote seizures, rest 70% are idiopathic or cryptogenic in nature (4). About 20-30% of first seizures have an underlying cause. The etiologies range from genetic to environmental conditions or combination of both (5). Tuberculosis (65.9%), infection (15%) and neurocysticerosis (3.4%) are major causes of partial seizures in India. (6)

A detailed evaluation of every patient with first onset seizure is mandatory to determine seizure type, precipitating events, underlying etiology so as to plan for the treatment and prevention of its recurrence. In this prospective study clinical, laboratory, electroencephalography (EEG) and neuroimaging profile of adult patients presenting with first seizure were done to classify the type of first seizure so as to find out the etiological diagnosis of the same.

## Material and Methods

The present study was carried out over a period of one year after approval from the Ethical Committee. Patients were recruited from indoor wards of general medicine and neurology, outpatient clinic, neurology clinic and emergency department . The study group comprised of adult patients (age > 18 years) with first episode of seizure. Patients <18 years of age with pseudoseizures and non-epileptic attack seizures (syncope, panic attacks), anoxic encephalopathy, with seizures related to recent trauma or epilepsy, with first seizure already evaluated and patients with history of substance abuse were excluded from the study.

All the patients were subjected to detailed history and clinical examination. A detailed description of actual episode was obtained separately from the patient and caregiver or the one who had witnessed the event. Information regarding specific historic events like presence of aura, sensation of epigastric fullness, posturing, tongue bite, incontinence, postictal confusion, focal neurological signs, déjà vu, and premonition was obtained. A complete general physical examination was done in every patient presenting with first seizure to rule out non-neurological causes. Then a detailed neurological examination was performed. Specific attention was given to tongue bite, postictal confusion, trauma, focal neurological signs and meningeal signs. Patients were then categorized into types of seizures according to International League Against Epilepsy ( ILAE )

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Classification. ILAE published a modified version of the international classification of epileptic seizures. It is based on the clinical features and associated EEG findings. Epileptic seizures were classified as partial - simple with motor/sensory/autonomic or psychiatric signs, complex, partial with secondary generalization; primarily generalized seizures - absence (Petit-mal), tonic clonic (Grand-mal), tonic, atonic and myclonic; and unclassified - neonatal seizures and infantile spasms.(7) A complete laboratory investigation was done in all the patients presenting with first seizure. These included blood glucose - fasting and postprandial, serum electrolytes - Na+/K+/Cl-/Mg++/Ca++, liver function tests (LFT), renal function tests (RFT), resting electrocardiography (ECG). CSF examination, neurocysticercosis serology and quantiferon TB Gold Assay were done, wherever required. A 21-lead waking interictal electroencephalography EEG was performed in waking state over 30 minutes period using 16 channels with surface electrodes applied according to International 10-20 System. Computer Tomography (CT scan ) both plain and contrast enhanced was obtained with axial images of 5 mm thickness for posterior fossa and 10 mm thickness for supratentorial structures in all the cases. Magnetic Resonance Imaging (MRI) brain was done in those patients in whom CT scan findings were inconclusive or required further evaluation and in case of progressive neurological signs even if CT scan head was normal.

**Results**

A total of 96 patients were included in this study. There were 61 (63.54%) males and 35 (36.46%) females with male to female ratio of 1.74:1. Seizures were seen almost in all age groups. Majority of the patients, 26 (27.08%) each, were in the age groups of 21-30 and >60 years. Forty-four (45.84%) patients had partial seizures, while 52 (54.16%) patients had generalized seizures. More males 36 (59.02%) had generalized seizures, while partial seizures were observed more in females 19 (54.29%).

Among patients with partial seizures (n = 44), simple partial were seen in 28 (29.17%), complex in 12 (12.50%) and secondary generalized in 4 (4.17%) patients. While in patients with generalized seizures (n = 52), tonic clonic was seen in 38 (39.58%), absence in 8 (8.33%) and myoclonic in 6 (6.25%) patients. Eight clinical findings were analysed in patients with partial and generalized seizures. Overall, most common clinical findings observed were: postictal confusion in 70 (72.92%) patients, loss of consciousness in 59 (61.46%), frothing in 50 (52.08%), uprolling of eyes in 48 (50%) and tongue bite in 46 (47.92%). Less common clinical findings observed were vomiting in 19 (19.79%) patients, headache in 18 (18.75%) and incontinence in 13 (13.54%) patients. Metabolic profile was done in all 96 patients. Abnormalities were found in 8 patients. Hypoglycemia and uremia were reported in 3 (37.50%) patients each, while hyponatremia and hypocalcemia in 1 (12.50%) patients each. Hypomagnesemia was not reported in any patient. Cerebrospinal fluid (CSF) examination was done in 3 patients in which along with seizures, there were signs of meningeal irritation. CSF examination was suggestive of bacterial meningitis in 2 cases, viral meningitis in 1 case. Out of 96 studied patients, EEG was performed in 84 patients. EEG was not performed in 12 patients, 4 with partial seizures and 8 with generalized seizures, where diagnosis was obvious from initial investigation or where patient was sick enough and in patient who did not corporate. Seventeen (42.50%) patients with partial seizures and 27 (61.37%) patients with generalized seizures had abnormal EEG. Sharp waves and spikes were most common EEG findings in patients with partial and generalized seizures. Asymmetry was noticed in 2 (5%) patients with partial and 3 (6.82%) patients with generalized seizures. Neuroimaging (CT/MRI scan) was found to be abnormal in 24 (54.54%) patients with partial seizures (*Table 1*). Most common abnormality observed was Neurocysticerosis in 7 (15.91%) patients, followed by Stroke in 6 (13.64%), Tuberculoma and Tumors in 4 (9.09%) patients each. (*Fig 1&2*) Diagnosis of neurocysticerosis was supported by demonstration of sclolex on MRI or by positive cysticerosis serology. Diagnosis of tuberculoma was supported by high ESR, Mantoux test and positive Quantiferon TB Gold Assay.CT/MRI scan was found to be abnormal in 19 (36.54%) patients with generalized seizures (*Table 2*). The common findings observed were cerebral atrophy in 7 (13.46%) patients, followed by tuberculoma in 4 (7.69%) and stroke in 3 (5.77%).

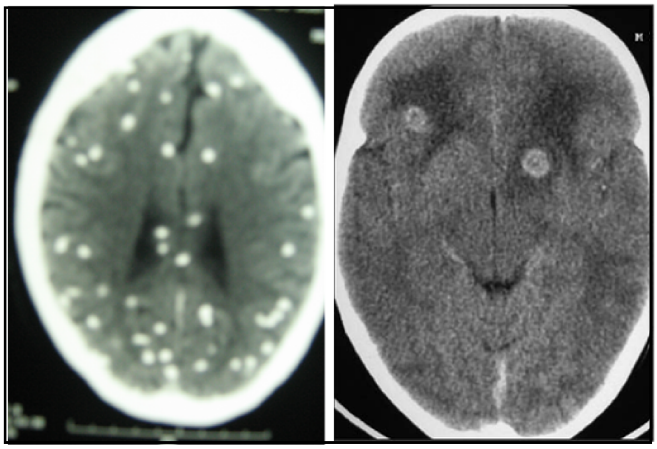

***Fig. 1& 2 CT Scan Showing Multiple Calcified NCC lesions & NCCT Showing Tuberculomas***

CT/MRI scan abnormalities in patients with normal and abnormal EEG were also observed. Out of 40 patients

*Table 1. Neuroimaging in Patients with Partial Seizures (n =44)*

| CT/MRI scan | | Partial seizures (n = 44) No. of patients | Percentage (%) |
|---|---|---|---|
| Normal CT/MRI scan | | 20 | 45.46 |
| Abnormal CT/MRI scan | Neurocysticerosis | 7 | 15.91 |
| | Tuberculoma | 4 | 9.09 |
| | Stroke (ischemic/hemorrhagic) | 6 | 13.64 |
| | Tumors | 4 | 9.09 |
| | Hydrocephalus | 2 | 4.54 |
| | Cerebral atrophy | 1 | 2.27 |
| | **Total** | **44** | **100.00** |

*Table 2 Neuroimaging in Patients with Generalized Seizures (n = 52)*

| CT/MRI scan | | Generalised seizures (n = 52) No. of patients | Percentage (%) |
|---|---|---|---|
| Normal CT/MRI scan | | 33 | 63.46 |
| Abnormal CT/MRI scan | Cerebral atrophy | 7 | 13.46 |
| | Tuberculoma | 4 | 7.69 |
| | Stroke (ischemic/hemorrhagic) | 3 | 5.77 |
| | Neurocysticerosis | 2 | 3.85 |
| | Hydrocephalus | 2 | 3.85 |
| | Tumors | 1 | 1.92 |
| | **Total** | **52** | **100.00** |

*Table 3. Etiological Diagnosis of the Patients*

| Etiological diagnosis | Total patients (n = 96) No. | Percentage (%) |
|---|---|---|
| Neurocysticerosis | 9 | 9.37 |
| Tuberculoma | 8 | 8.33 |
| Stroke (ischemic/hemorrhagic) | 9 | 9.37 |
| Tumors | 5 | 5.20 |
| Hydrocephalus | 4 | 4.16 |
| Cerebral atrophy | 8 | 8.33 |
| Hypoglycemia | 3 | 3.12 |
| Uremia | 3 | 3.12 |
| Hypocalcemia | 1 | 1.04 |
| Hyponatremia | 1 | 1.04 |
| Meningitis | 3 | 3.12 |
| Idiopathic | 42 | 43.75 |
| **Total** | **96** | **100.00** |

having normal EEG, 28 (70%) had normal neuroimaging and 12 (30%) had some type of abnormality on neuroimaging. Out of 44 patients with abnormal EEG, 21 (47.73%) had normal neuroimaging and 23 (42.27%) had some type of abnormality on neuroimaging.Result of the etiological diagnosis of the patients is given in Table 3.

## Discusion

The present study is one of the few studies to describe clinical, laboratory, EEG and neuroimaging (CT and MRI) data in patients who presented with first seizure. A total of 96 patients were included in the study group after following the exclusion criteria. A detailed description of the event was obtained at least twice, ensuring an accurate and precise classification of the seizures.

In the study, male patients comprised of 61 (63.54%) and female 35 (36.46%). Similar distribution was noticed by King *et al*. (8) and Kawakasani (9), where 61% were males and 39% females. Majority of the patients were

either <30 years or >60 years. Similar findings were observed by Hauser *et al.* (3). The patients were classified according to seizure type. Out of 96 patients included in the study, 44 (45.84%) had partial seizures, while 52 (54.16%) had generalized seizures. Among the partial seizure group, 28 (29.16%) had simple partial seizures, 12 (12.50%) had complex partial seizures and 4 (4.16%) had partial seizures with secondary generalisation. Among the generalized seizure group, tonic-clonic seizures were found in 38 (39.58%); absence in 8 (8.33%) and myclonic in 6 (6.25%) cases. Similar distribution was observed by King *et al*. (8). They observed 47% of their cases with partial seizures. Our study showed similar results with 45% patients having partial seizures.

We performed the metabolic evaluation of all the 96 patients included in the study. Metabolic abnormalities were found in 8 (8.33%) patients. Most common metabolic abnormalities found were hypoglycemia and uremia (3 cases each). Turnbull *et al*. (10) found metabolic abnormalities in 11 patients out of 136 patients with new onset seizure and Tardy *et al*. (11) found metabolic abnormalities in 12 patients out of 247 patients studied.

EEG was performed in 84 patients. EEG could not be performed in 12 patients (4 with partial seizures and 8 with generalized seizures) because of patient's non-compliance. Out of 84 patients, EEG was found abnormal in 44 patients (52.38%). Our observations are consistent with Hopkins (12), who found abnormal EEG in 48.8% patients. Overall 17 (42.5%) patients with partial seizures and 27 (61.37%) patients with generalized seizures had abnormal EEG findings. Similar findings were observed by King *et al*. (8), who reported abnormal EEG in 44% patients with partial seizures and 68% of patients with generalized seizures, whereas Yang *et al.* (13) observed abnormal EEG in 65% of the children. However, Kawakasani et al. (9) observed abnormal EEG in 77.4% of patients, out of which 33.9% showed epileptiform discharges. On analyzing individual abnormalities on EEG, sharp waves and spikes were seen in 17.5% of patients with partial seizures and 11.36% of patients with generalized seizures. Similar findings were observed by Baheti *et al.* (14), who observed sharp waves and spikes in 23% of patients with partial seizures and 16% of patients with generalized seizures. In the present study, sharp waves alone were observed in 10% of patients with partial seizures and 29.55% patients with generalized seizures, which is in concurrence with observations by Baheti *et al.* (14). In the present study, asymmetry with sharp waves and spikes were seen in 5% of patients with partial seizures and 2.27% patients with generalized seizures. Abnormal background with sharp waves and spikes on EEG were seen in 2.5% patients with partial seizures and 2.27% with generalized seizures. Baheti *et al.* (14) observed this type of abnormality in 3.8% of patients which is comparable to our study. However, Homes *et al*. (15) observed most common EEG abnormality to be focal slowing. Focal slowing alone was not seen in the present study. Neuroimaging (CT/MRI scan) is a useful tool to determine the etiological diagnosis of seizure. An abundance of such literature pertaining to adult patients exists. Neuroimaging has been reported abnormality ranging from 28 to 92% of patients with seizures disorder in various studies done by Washimkar *et al*. (6), Kawakasani *et al.* (9), Yang *et al.* (13).

Neuroimaging was performed in all patients in our study and was found abnormal in 54.54% patients with partial seizures and 36.54% patients with generalized seizures. Similar observations were found by Baheti *et al*. (14) who also found CT scan abnormalities in 50% of patients with partial seizures and 34.6% patients with generalized seizures. Murthy and Yangala (16) observed CT scan abnormalities in 52% patients with partial seizures. In contrast, Washimkar *et al.* (6) and Ishida *et al.* (17) respectively observed abnormal CT in 73% and 70% of patients with partial seizures.In our study, abnormal CT scan was observed in 54.54% patients with partial seizures which are much higher than 22-43% reported from developed countries. This difference could be due to high incidence of infectious diseases found in the present study. In the present study, among patients with partial seizures, most comon neuroimaging abnormality was neurocysticerosis (15.91%), followed by stroke (13.64%), tuberculoma (9.09%), tumors (9.09%), hydrocephalus (4.54%) and cerebral atrophy (2.27%).

Unlike the western studies which mostly found cerebral atrophy (diffuse or focal), porencephaly, hydrocephalus and tumors as underlying lesions in partial seizures, Indian studies done by Goulatia *et al.* (18), Kumar *et al.* (19), Bajaj *et al.* (20) and Aggarwal *et al*. (21) found unique CT finding characterized by focal ring enhancing lesions usually less than 10 mm in size and cortical and subcortical in location with the incidence of 24.8 to 56%. In our study 34.6% cases were having ring enhancing lesions, out of which 7 were neurocysticerosis and 4 were tuberculoma. Our study also revealed tumors in 9.09%. Vidwans and Shah (22) found tuberculoma in 19% of cases with partial seizures, whereas in the present study tuberculoma was found in 9% of the cases only which is quiet low. Baheti et al. (14) reported hydrocephalus in 7.6% respectively of the patients with partial seizures, while in the present study, 4.04% hydrocephalus was observed. Among the patients with generalized seizures, most comon neuroimaging abnormality found was cerebral atrophy (13.46%), followed by tuberculoma, stroke and neurocysticerosis - 7.69%, 5.77% and 3.85%, respectively. Hydrocephalus was found in 3.85% cases

and tumor in 1.92% cases. The generalized seizures in tuberculoma, neurocysticerosis and stroke could be because of rapid spread of focal neural discharge which was perceived as generalized discharge. Similar findings were observed by Baheti *et al.* (14) who observed cerebral atrophy in 15.3% cases. Kumar *et al.* (19) found ring/disc-like enhancing lesions in 19.7% patients, whereas in present study these lesions are seen in 12% of the patients only. Kramer *et al*. (23) observed hydrocephalus in 2.1% patients which is comparable to our study which revealed hydrocephalus in 3.85% cases.

In our study, it was observed that in patients with partial seizures, EEG was normal in 23 (57.5%), out of which neuroimaging was abnormal in 6 (26.09%) and normal in 17 (73.91%) cases. In patients with partial seizures having abnormal EEG (17; 42.5%), 11 (64.71%) had abnormal CT/MRI scan, whereas 6 (35.29%) had normal neuroimaging. Vidwans and Shah (22) observed similar findings in their study, i.e. when EEG was abnormal among patients with partial seizures, abnormal CT scan was seen in 57% cases, whereas normal CT scan was found in 43% cases. When EEG was normal among patients with partial seizures, CT scan was normal in 82% and abnormal in 18% cases. Baheti *et al.* (14) also observed similar study, i.e. when EEG was abnormal, CT scan was abnormal in 57.8% and normal in 42.2%; when EEG was normal in patients with partial seizures, normal CT scan was seen in 71.4% and abnormal CT scan was found in 28.6% cases. In our study, in patients with generalized seizures having abnormal EEG (n = 27), CT scan was abnormal in 12 (44.4%) cases and normal in 55.56% cases. Among the patients with generalized seizures having normal EEG (n = 40), neuroimaging was normal in 11 (64.72%) and abnormal in 35.28% cases. Baheti *et al.* (14) observed similar findings, i.e. when there was abnormal EEG among patients with generalized seizures, CT scan was abnormal in 33% cases and normal in 67% cases. In patients having normal EEG, CT scan was normal in 52% and abnormal in 48% of the cases.

## Conclusion

Every patient with first seizure must be evaluated by clinical examination, laboratory testing, EEG and neuroimaging. EEG is a useful tool for screening and categorizing the patients with seizure disorder. Neuroimaging is helpful in finding a structural lesion which may have therapeutic and prognostic significance. With the detection of an abnormal EEG, the probability of finding some abnormality on neuroimaging also increases.

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