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Clinical and etiological profile of new-onset seizures in adult patients: A cross-sectional study

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ABSTRACT

Background: In terms of the severity of the disease, the nature of the sickness, and its effects on the individual, the family, and the community, seizure disorder is a significant public health concern. **Aims and Objectives:** This study evaluated the clinical and etiological profile of new-onset focal or generalized seizures in adult patients. **Materials and Methods:** A cross-sectional study was conducted with 100 new-onset seizure patients admitted to the Government Ariyalur Medical College Hospital. A detailed history was taken from the relatives about the type of seizure and comorbid conditions. An examination of the central nervous system was done to find any underlying neurological deficits. Investigations done in all patients were blood sugar, urea, creatinine, serum electrolytes, and liver function tests. ECG, chest X-ray, electroencephalographic, and computerized tomography of the brain. Magnetic resonance imaging brain was done in the indicated cases. **Results:** Of the 100 patients, 76% were males and 24% were females. The majority of the patients belonged to the age group of 41–60 years (40%). The most common type of seizure observed was the generalized tonic-clonic type (49%), followed by the focal type of seizure (23%). Of the various comorbid illnesses observed, diabetes mellitus was seen in about 41% of the patients; hypertension was seen in 40% of the patients; chronic kidney disease was seen in 24%; and cerebrovascular diseases were seen in 15%. The commonest etiology of new-onset seizures observed in this study was metabolic causes, constituting 41% of the cases, cerebrovascular diseases (32%), and alcohol-related seizures (10%). **Conclusion:** Accurate identification of the cause of adult-onset seizures is crucial, and knowledge of clinical and etiological profiles will facilitate better treatment.

Key words: Adult-onset; Focal seizures; Generalised seizures

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INTRODUCTION

A seizure is a paroxysmal event due to abnormal, excessive, hyper-synchronous discharges from an aggregate of central nervous system (CNS) neurons. Clinical manifestations are sudden, transient, aberrant phenomena that can affect consciousness or be interpreted by the patient or observer as motor, sensory, autonomic, or psychic events. A person with epilepsy experiences recurring seizures due to a long-term underlying disease.[1,2] Epilepsy that develops beyond age 20 is typically a complication of an underlying brain disorder or may result from a metabolic or toxic source. Sometimes, months or years pass after the initial CNS injury, such as trauma, stroke, infection, and first seizure.[2,3]

A seizure occurs in about 2% of adults at some point. For two-thirds of these patients, there will never be another. Assuming that two or more unexplained seizures qualify as epilepsy, the incidence of epilepsy in various populations around the world ranges from 0.3% to 0.5%, and the prevalence of epilepsy has been estimated at 5–10 people per 1000.[3,4] The type of seizure that occurred must be identified to focus the diagnostic process on specific etiologies, choose the best therapy, and provide potentially

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crucial information about the prognosis. It has become easier to identify and treat due to the development of more advanced imaging techniques and newer medications.[4]

The easiest way to conceptualize the interaction between genetically determined seizure thresholds, underlying predisposing diseases or metabolic derangements, and acute precipitating stimuli is to think of the etiology of seizures as multifactorial in any one individual. Seizures can be brought on by almost any kind of brain illness. While prenatal insults appear to be the most frequent cause in children, cerebral vascular disease is the most frequently recognized cause in older people.[5,6] One of the most frequent neurologic emergencies in children, adolescents, and young adults is status epilepticus. Status epilepticus can result from severe febrile seizures, persistent epilepsy, degenerative illnesses, intoxication, acute neurologic problems including meningitis, encephalitis, or stroke, complicated febrile episodes, degenerative diseases, or it might be the initial sign of epilepsy. Very little research examines the origins of newly developing seizures in South India. Therefore, research into the numerous disorders causing seizures in our patients and the utilization of investigations to identify the root cause are important.[7-9]

We can determine the underlying cause of the seizures through a thorough physical examination, particularly of the nervous system, a detailed medical history, analysis of blood and other body fluids, electroencephalographic (EEG) recordings, magnetic resonance imaging (MRI), or computerized tomography (CT) scans. Since treating the underlying problem can prevent seizures, a precise diagnosis of the etiology of the seizure is essential for effective treatment and a positive prognosis. We studied the clinical profile of new-onset focal or generalized seizures on this ground.

Aims and objectives

To study the clinical and etiological profile of new-onset focal or generalized seizures in adult patients.

To identify the relative contribution of various causes to new onset seizures by gender. To discuss the profile of new onset seizure population in our study with other similar studies from India.

MATERIALS AND METHODS

The cross-sectional descriptive study was conducted from November 2021 to October 2022 on 100 patients admitted to the medical wards and IMCU of Government Ariyalur Medical College Hospital with new-onset focal or generalised seizures.

Inclusion criteria

Inclusion criteria were as follows: all patients with the first episode of focal or generalized seizures and age of onset of seizures >12 years were included.

Exclusion criteria

Exclusion criteria were as follows: History of seizures and seizure-like episodes: pseudo seizures, movement disorders, and TIA were excluded.

Family members were asked for a thorough history of the type of seizure, its duration, and any accompanying symptoms such as fever, headache, vomiting, weakness, or loss of consciousness. A past medical or neurological ailment history was elicited. A thorough examination focused on the neurological system to identify any etiological factors, localized neurological impairments, or consequences. A fundus examination was performed to check for retinopathy or papilledema.

Baseline investigations were conducted to determine metabolic abnormalities, kidney and liver functions, and electrolyte imbalances. An ECG was performed for all patients to find out if there was any cardiovascular abnormality. A cerebrospinal fluid examination was carried out for the indicated patients. Neuroimaging was conducted for all patients with seizures as an emergency, mainly CT brain. MRI brain was done if the CT was inconclusive. EEG was done routinely for all patients in the interictal period.

Statistical analysis

Data were entered in the Excel spreadsheet, and variables were coded accordingly. The statistical analyses were performed using Graphpad Prism version 5. Data were presented as mean with standard deviation for normal distribution or scale data (age). The data were presented as the categorical frequency with proportion n (%).

RESULTS

In this study, the majority of patients belong to the age group 41–60 years (40%), followed by the age group >60 years (31%). Out of 100 patients, 76 were male, and 24 were female.

The mean age of the patients in the study population was 50.2±17.3 years. The mean age among male patients was 48.32±17.2 years, and for female patients it was 53.1±16.5 years.

The most common seizure type was a generalized tonic-clonic type (49%), followed by focal seizures (23%). 15% of the study population presented with status epilepticus, and 7% presented with epilepsia partialis continua. Alcoholism was seen as a triggering factor in 14% of patients, all males.

Hanging was a triggering factor for 2% of the patients. There were no associated symptoms in the majority of the patients. Headache was the most commonly associated symptom in 10% of the patients. Fever and vomiting were the other symptoms noticed; many patients had a combination of these symptoms (Table 1).

Diabetes mellitus and hypertension were the most commonly observed comorbid illnesses, followed by chronic kidney disease, stroke, and coronary artery disease.

Sixty-two patients had a history of alcoholism, and 37 patients had a history of smoking; all were male. 59% of patients were conscious during their presentation to the hospital, and about 14% were unconscious. Most patients had no focal neurological deficit (63%) (Table 2).

34 out of 100 patients had elevated blood sugar values. Among them, 26 patients had seizures attributed to hyperglycemia. The average sugar value of patients with hyperglycemic seizures was 441 mg/dL.

Out of 100 patients, 29 had elevated renal parameters. Among them, 11 patients had seizures attributable to uremia. The average serum urea and creatinine values observed in patients with uremic seizures were 141.5 mg/dL and 9.6 mg/dL, respectively.

Low levels of serum sodium were found in eight patients. Among them, three patients had seizures due to hyponatremia. The average serum sodium level in those who had seizures because of hyponatremia was 113.6 mEq/L.

EEG findings

Among 100 patients, 45 had normal findings. Among 55 abnormal EEG findings, 23 showed diffuse slowing, and 32 showed focal spikes and sharp waves.

Imaging studies

Among 100 patients, 41 patients had abnormal imaging. 25 out of 32 patients with cerebrovascular disease had abnormal CT brain imaging. Out of 41 patients with metabolic causes for seizures, 10 had abnormalities in CT brain imaging. All patients with alcohol-related seizures had normal imaging of the CT brain. Of the six patients with CNS infections, two had abnormal CT brain imaging. MRI brain was done for 16 patients, among which 15 showed abnormal findings. MRI of the brain was useful in diagnosing CVT, CNS infections, demyelinating disease, and brain tumors.

Among the various metabolic causes, hyperglycemia was the most commonly associated metabolic derangement (26%), followed by uremia (11%), hyponatremia (3%), and hypoglycemia (1%).

Among the various cerebrovascular diseases, ischemic stroke constituted 18%, followed by intracranial hemorrhage (9%) and cerebral venous thrombosis (5%). Out of six patients diagnosed with CNS infections, four were found to have acute meningoencephalitis, and tuberculous (TB)

Table 1: Frequency distribution of seizure types overall and between genders in the study population

Patient's characteristics	Frequency (Percentage)		
	Overall (n=100)	Male (n=76)	Female (n=24)
Age category			
13–20 years	4 (4)	4 (5.2)	0 (0)
21–40 years	25 (25)	20 (26.3)	5 (20.9)
41–60 years	40 (40)	32 (42.1)	8 (33.3)
>60 years	31 (31)	20 (26.4)	11 (45.8)
Type of Seizure			
Generalised tonic-clonic seizure	49 (49)	38 (50)	11 (45.8)
Focal generalized	6 (6)	5 (6.6)	1 (4.2)
Focal seizures	23 (23)	14 (18.4)	9 (37.5)
Epilepsia partialis continua	7 (7)	5 (6.6)	2 (8.3)
Status epilepticus	15 (15)	14 (18.4)	1 (4.2)
Triggering factors			
Hanging	2 (2)	1 (1.3)	1 (4.2)
Alcohol	14 (14)	14 (18.4)	0 (0)
Nil	84 (84)	61 (80.3)	23 (95.8)
Associated symptoms			
No associated symptoms	78 (78)	62 (81.6)	16 (66.7)
Fever	2 (2)	1 (1.3)	1 (4.2)
Headache	10 (10)	8 (10.5)	2 (8.3)
Vomiting	1 (1)	1 (1.3)	0
Headache and vomiting	5 (5)	0	5 (20.8)
Fever, headache, and vomiting	3 (3)	3 (3.9)	0
Trauma	1 (1)	1 (1.3)	0

Table 2: History of alcohol consumption, smoking, sensorium, and focal neurological deficit

Patient's characteristics	Frequency (percentage)		
	Overall (n=100)	Male (n=76)	Female (n=24)
Number of past illnesses			
No past illness	28 (28)	24 (31.6)	4 (16.7)
One past illness	26 (26)	18 (23.7)	8 (33.3)
Two past illness	28 (28)	18 (23.7)	10 (41.6)
Three past illness	15 (15)	14 (18.4)	1 (4.2)
>3 past illness	3 (3)	2 (2.6)	1 (4.2)
Type of past illnesses			
Diabetes mellitus	41	29	12
Hypertension	40	30	10
Chronic kidney disease	24	19	5
Coronary artery disease	7	7	0
Old stroke	15	10	5
Others	13	8	5
No illness	28	24	4
History of alcohol consumption	62 (62)	62 (81.6)	0
History of smoking	37 (37)	37 (48.7)	0
Sensorium at presentation			
Conscious	59 (59)	46 (60.5)	13 (54.2)
Drowsy	27 (27)	18 (23.7)	9 (37.5)
Unconscious	14 (14)	12 (8.3)	2 (8.3)
Focal Neurological deficit			
Cranial nerve palsy	1 (1)	1 (1.3)	0
Left hemiplegia	15 (15)	12 (15.8)	3 (12.5)
Left monoplegia	1 (1)	1 (1.3)	0
Right hemiplegia	19 (19)	10 (13.2)	9 (37.5)
Right monoplegia	1 (1)	1 (1.3)	0

meningitis and cerebral abscesses were diagnosed in one patient each (Table 3).

The most common seizures seen in cerebrovascular diseases and metabolic derangements were focal seizures with secondary generalization, followed closely by focal seizures. Status epilepticus was the most common type of seizure seen in patients with CNS infections and alcohol-related seizures.

Among patients <20 years of age, CNS infections and idiopathic causes are the most common etiologies for new-onset seizures (50%). Among patients aged 21–40 years with cerebrovascular diseases (32%), cerebral venous thrombosis was the main cause of CVD, followed by alcohol-related seizures (20%).

In the age group 41–60, metabolic causes were the leading cause of new-onset seizures (47.5%), followed by cerebrovascular diseases (32.5%).

Among the patients aged >60, the common causes of new-onset seizures were metabolic abnormalities (54.8%) and cerebrovascular diseases (35.5%).

DISCUSSION

Seizures are common disorders found worldwide and are encountered frequently during medical practice. The etiological spectrum of seizures in developing countries differs from that in developed countries. These etiologies also vary from region to region.[4,6] In our study, 100 new-onset focal or generalized seizures were included. Out of 100 patients, 76 were male, and 24 were female. The literature stated a mild to moderate preponderance of males, as observed in studies performed by Muralidhar and Venugopal,[10] Hirani and Shrivastva,[11] and Sendil et al.[12]

In this study, the majority of the patients (40%) belonged to the age group 41–60 years, followed by the age group >60 years (31%). Studies by Chalasani and Kumar revealed similar results, showing that 46.9% of participants were between the ages of 21 and 40.[13] The majority of patients were under 40 years old in investigations by Muralidhar and Venugopal[10] (64%), Hirani and Shrivastva[11] (54%), and Saha et al.,[14] (40%).

In our study, the most common type of seizure was generalized tonic-clonic seizures (49%), followed by focal seizures (23%). Status epilepticus was the third-most common type of presentation, constituting 15%. Epilepsia partialis continua was the presentation in 7% of the patients, and focal seizures with secondary generalization included about 6% of the total patients. Sendil et al.,[12] and Hirani and Shrivastva[11] also saw an increased prevalence of generalized tonic-clonic seizures in adults (64% and 60%, respectively).

Table 3: EEG, CT brain findings, etiology, metabolic abnormality, cerebrovascular disease, and CNS infection

Findings	Frequency (Percentage)		
	Overall (n=100)	Male (n=76)	Female (n=24)
EEG findings			
Normal	45 (45)	39 (51.3)	6 (25)
Diffuse slowing	23 (23)	16 (21.1)	7 (29.2)
Focal Spikes and sharp waves	32 (32)	21 (27.6)	11 (45.8)
CT brain observations			
Normal	59 (59)	48 (63.2)	11 (45.8)
Abnormal	41 (41)	28 (36.8)	13 (54.2)
Etiology			
ADEM	1 (1)	1 (1.3)	0
Alcohol-related	10 (10)	10 (13.2)	0
Anoxia	2 (2)	1 (1.3)	1 (4.2)
CNS infection	6 (6)	4 (5.3)	2 (8.3)
CVD	32 (32)	22 (28.9)	10 (41.7)
ICSOL	3 (3)	2 (2.6)	1 (4.2)
Idiopathic	5 (5)	5 (6.6)	0
Metabolic	41 (41)	31 (40.8)	10 (41.7)
Metabolic abnormality			
No metabolic abnormality	59 (59)	45 (59.2)	14 (58.3)
Hyperglycemia	26 (26)	19 (25)	7 (29.2)
Hypoglycemia	1 (1)	1 (1.3)	0
Hyponatremia	3 (3)	1 (1.3)	2 (8.3)
Uremia	11 (11)	10 (13.1)	1 (4.2)
Cerebrovascular disease			
Nil	68 (68)	54 (71.1)	14 (58.4)
Cerebral venous thrombosis	5 (5)	3 (3.9)	2 (8.3)
Intra cranial hemorrhage	9 (9)	7 (9.2)	2 (8.3)
Ischemic stroke	18 (18)	12 (15.8)	6 (25)
CNS infection			
Nil	94 (94)	72 (94.8)	22 (91.6)
Cerebral abscess	1 (1)	0	1 (4.2)
Meningoencephalitis	4 (4)	3 (3.9)	1 (4.2)
TB meningitis	1 (1)	1 (1.3)	0

ADEM: Acute demyelinating encephalomyelitis, CVD: Cerebrovascular disease, ICSOL: Intra cranial space occupying lesion, CNS: Central nervous system

In our study, the majority of cases (41%) were due to metabolic abnormalities; hyperglycemia (26%), followed by uremia (11%), were the most commonly observed metabolic abnormalities. However, alcohol withdrawal was found to be the most frequent metabolic cause of adult-onset seizures (31%), according to a study by Kanitkar et al.,[15] A study by Sander et al.,[16] and Hauser et al.,[17] observed that 9% and 11% of all patients experienced alcohol-related seizures, respectively. In the present study, alcohol-related seizures were found in 10% of the patients, and all the patients were male.

In our study, ischemic stroke was commonly observed among cerebrovascular diseases, followed by intracranial hemorrhage and cerebral venous thrombosis. Among the various CNS infections, meningoencephalitis was the most commonly observed infection. Stroke was the most frequent cause of seizures, according to Kanitkar et al.,[15] followed by metabolic (26%), idiopathic (16%), tumors (8%), granulomas (6%), and neurocysticercosis (4%). Similar results were reported by Saha et al.,[14] According to Pradeep et al.,[18] cerebral vascular disorders (20%), neurocysticercosis (12%), tuberculoma (6%), posttraumatic stress disorder (6%), and tumors (4%) were the most common etiologies of seizures that started at the age of 20 or more. Idiopathic causes accounted for 44% of these cases.

A significant prevalence of idiopathic seizures in adults was also noted by Hirani and Shrivastva.[11] According to Quraishi et al.,[19] the most frequent causes of adult-onset seizures were CNS infections (38%), stroke (30%), and idiopathic (20%). In a Mexican study,[20] neurocysticercosis was cited as the root cause in 50% of cases. CVA, CNS infections, and idiopathic causes cause a significant portion of adult-onset seizures. The relative contributions of these causes depend on the age distribution of the study population, the sample size, and the prevalence of CNS infections.

In our study, 5% of the patients had idiopathic seizures despite thorough testing. This group of idiopathic seizures

may be further divided into various groups using more accurate screening methods. Anti-epileptic medications were started for all of the patients. Most individuals could control their seizures with just one anti-epileptic medicine effectively. Patients with metabolic etiologies had their metabolic variables adjusted. Neurosurgery received patients with brain tumors as referrals.

In conclusion, male predominance and the age range of 41–60 years were observed as the main regions for new-onset seizures. The most frequent seizure type was tonic-clonic generalized. The range of etiologies varies and includes idiopathic tumors, alcoholism, demyelinating disorders, CNS infections, metabolic reasons, and cerebrovascular diseases. Metabolic factors were the most frequent cause of newly developing seizures, followed by cerebrovascular disorders. CNS infections are one of the treatable causes of seizures. Once the underlying illness is treated in individuals with metabolic abnormalities, the seizures will be under control, and long-term AED therapy can be avoided. Therefore, a thorough assessment is crucial in every case of newly developing seizures to determine the cause and begin the appropriate therapy, lowering morbidity and mortality in the community.

Limitations of the study

The study's limitations must be considered while analyzing the findings. The results may not be generalizable because this is a highly selected sample. CNS infections such as NCC, TB meningitis, bacterial meningitis, Japanese encephalitis, and TB meningitis are common risk factors for new-onset seizures in underdeveloped nations. AED prevention and potential therapeutic implications make it necessary to research a sizable group of patients with these illnesses for the risk of recurrent seizures.

CONCLUSION

Male predominance and the age range of 41–60 years were observed as the main risk factors for new-onset seizures. The most frequent seizure type was tonic-clonic generalized. The range of etiologies varies and includes idiopathic tumors, alcoholism, demyelinating disorders, CNS infections, metabolic reasons, and cerebrovascular diseases. Metabolic factors were found to be the most frequent cause of newly developing seizures, followed by cerebrovascular disorders. CNS infections are considered one of the treatable causes of seizures. Once the underlying illness is treated in individuals with metabolic abnormalities, the seizures will be brought under control, and long-term AED therapy can be avoided. Therefore, a thorough assessment is crucial in every case of newly developing seizures to determine the cause and initiate the appropriate therapy, thereby lowering morbidity and mortality in the community.

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