

Original Research Article

A STUDY OF CLINICAL, ETIOLOGICAL AND RADIOLOGICAL PROFILE IN LATE ONSET SEIZURES

P Madhavi¹, Karnakar Palvai², Sushanth Vemuganti³, Priyadarshini Jannu⁴

¹Associate Professor, Department of General Medicine, Government Medical College Narsampet, Telangana, India.
 ²Associate Professor, Department of General Medicine, Kakatiya Medical College, Warangal, Telangana, India.
 ³Assistant Professor, Department of General Medicine, Kakatiya Medical College, Warangal, Telangana, India.
 ⁴Post Graduate, Kakatiya Medical College, Warangal, Telangana, India.

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Corresponding Author:

Dr. Priyadarshini Jannu, Post graduate, Kakatiya Medical College, Warangal, Telangana, India. Email: Jannupriya5@gmail.com

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ABSTRACT

Background: Late-onset seizures—those beginning after 40 years of age—are often symptomatic of underlying structural, metabolic, or infectious etiologies, making prompt evaluation essential for appropriate management and prevention of recurrence. The study objective is to analyze the clinical presentation, radiological and electroencephalographic findings, and etiological spectrum of new-onset seizures in adults aged over 40 years.

Materials and Methods: This observational study was conducted at Mahatma Gandhi Memorial Hospital from January 2022 to December 2023. One hundred patients aged >40 years with new-onset seizures were evaluated. Clinical history, neurological examination, CT brain, EEG, and relevant laboratory investigations were performed. MRI and CSF studies were done when indicated. Data were analyzed using SPSS version 25.

Results: The most common seizure type was generalized tonic-clonic seizure (52%), predominantly in the 40–50-year age group. Focal seizures with generalization (26%) were more common in those above 60 years. Cerebrovascular accidents were the leading etiology (38%), followed by alcohol withdrawal (12%) and metabolic causes (8%). Imaging abnormalities were present in 56% of patients, while EEG was abnormal in 26%. Concordance between clinical deficits, imaging, and EEG was highest in cases with infarcts and hemorrhage. Unknown etiology accounted for 14% of cases despite extensive evaluation.

Conclusion: Cerebrovascular disease is the predominant cause of new-onset seizures in adults over 40 years. Neuroimaging plays a pivotal role in identifying underlying pathology, often more so than EEG. A comprehensive clinical and radiological approach is essential for accurate diagnosis and tailored management.

Keywords: Late-onset seizures, neuroimaging, cerebrovascular accidents.

INTRODUCTION

Seizures are among the most common neurological conditions encountered in clinical practice, and their onset in adulthood, particularly after the age of 40, warrants detailed evaluation.^[1] Unlike seizures in younger populations, which are frequently idiopathic or genetic, late-onset seizures are more likely to be symptomatic of underlying structural, metabolic, infectious, or vascular abnormalities.^[2] This distinction makes it essential to identify the exact cause to guide appropriate management and prevent recurrence.

The incidence of late-onset seizures has been rising, driven by increased life expectancy and improved access to diagnostic technologies.^[3] In older adults, the most frequently implicated causes include cerebrovascular accidents, head trauma, brain tumors, central nervous system infections, and degenerative brain diseases.^[4] These individuals often present with atypical or subtle symptoms, leading to delays in diagnosis. Moreover, comorbidities and age-related physiological changes may complicate the clinical picture and influence treatment choices.^[5]

Neuroimaging and electroencephalography (EEG) are indispensable tools in evaluating adult-onset seizures.^[6] Imaging studies such as CT and MRI help detect structural lesions, including infarcts, hemorrhages, neoplasms, and signs of cortical atrophy, while EEG assists in identifying epileptiform activity and classifying seizure types.^[7] When combined with a detailed clinical history and examination, these investigations provide valuable insights into the etiology and help tailor individualized treatment plans.

Despite the clinical significance of new-onset seizures in adults, especially those above 40 years of age, there is limited region-specific data detailing their clinical, radiological, and etiological spectrum.^[8] This information is vital not only for effective diagnosis and management but also for understanding the burden of neurological disease in the aging population.^[9] Addressing this gap can improve outcomes and reduce the likelihood of recurrent seizures and their associated complications. The present study was undertaken to evaluate the clinical profile of patients presenting with new-onset seizures after the age of 40 years and to determine the underlying etiology using clinical examination, imaging modalities, and electroencephalography.

MATERIALS AND METHODS

This hospital-based observational study was conducted in the Department of General Medicine at Mahatma Gandhi Memorial Hospital between January 2020 and December 2021. A total of 100 patients above 40 years of age, admitted with newonset seizures, were included. Patients with a past history of seizures or conditions mimicking seizures—such as syncope, transient ischemic attacks (TIAs), or pseudo seizures—were excluded from the study to ensure diagnostic accuracy.

Each patient underwent a comprehensive clinical evaluation. A detailed history was obtained, focusing on seizure characteristics including onset, frequency, duration, type, precipitating factors, aura, and postictal symptoms. Relevant past medical history such as hypertension, diabetes, stroke, and head injury was noted, along with personal habits like alcohol intake and smoking. A thorough physical and neurological examination was performed in all patients, including fundus evaluation and assessment for focal deficits.

All participants underwent standard laboratory investigations and imaging. This included blood tests, chest X-ray, ECG, and neuroimaging with CT brain. EEG was performed in all patients to evaluate for epileptiform activity. When indicated, MRI and cerebrospinal fluid (CSF) analysis were carried out. Additional investigations such as CSF ADA, culture, and viral markers were done based on clinical suspicion. Cardiac evaluation was performed in patients with suspected cardiovascular causes or abnormal ECG findings.

The collected data were compiled and analyzed using appropriate statistical methods. Descriptive statistics were used to summarize clinical, etiological, and radiological variables. Categorical data were expressed as frequencies and percentages, while continuous data were presented as mean \pm standard deviation. Associations between clinical variables and seizure etiology were assessed using the Chisquare test. A p-value of less than 0.05 was considered statistically significant. Data analysis was performed using SPSS version 25.

RESULTS

In the present study, the distribution of seizure types among different age groups was analyzed. It was observed that the majority of patients belonged to the 50-60-year age group (40%), followed by the 40-50year group (34%), and those above 60 years (26%). Generalized tonic-clonic seizures (GTCS) were the most prevalent type across all age groups, particularly prominent in the 40-50-year group. Focal seizures with generalization (FSG) were more common in patients aged over 60 years, whereas complex focal seizures (CFS) were distributed relatively evenly across age brackets. This pattern highlights a trend of more generalized seizures in the vounger subset of the late-onset group and a shift toward focal presentations in the elderly population (Table 1).

Table 1: Association Between Age and Type of Seizure					
Age Group	GTCS	FSG	CFS	SFS	Total (%)
40-50 years	24	2	6	2	34 (34%)
50-60 years	20	10	8	2	40 (40%)
>60 years	8	14	4	0	26 (26%)
Total	52	26	18	4	100 (100%)

etiological assessment revealed An that cerebrovascular accidents, including cerebral infarcts (24%) and intracerebral hemorrhage or subdural hemorrhage (14%), were the most frequent causes of seizures. Focal late-onset seizures were predominantly associated with structural lesions such as infarcts and hemorrhage. On the other hand, alcohol withdrawal accounted for 12% of GTCS

presentations, while metabolic causes like hypoglycemia, hepatic encephalopathy, and hyponatremia contributed to 8% of cases. Granulomatous lesions such as tuberculomas or neurocysticercosis were responsible for 8% of seizures, mainly of the focal variety. A minority of cases (14%) had no identifiable cause despite comprehensive evaluation (Table 2).

Table 2: Association Between EEG and Imaging Findings				
CT Scan Finding	EEG Normal	EEG Abnormal	Total	
Normal	36	8	44	
Abnormal	38	18	56	
Total	74	26	100	

Neuroimaging and EEG findings showed a moderate degree of correlation. Among the study population, 56% had abnormal imaging results, while 26% demonstrated abnormal EEG patterns. Interestingly, 18% of patients had both abnormal imaging and EEG findings, whereas 8% had normal imaging but

abnormal EEGs, suggesting a need for multimodal evaluation. Conversely, 38% had abnormal imaging despite normal EEGs, reinforcing the greater sensitivity of imaging in detecting structural etiologies in late-onset seizures (Table 3).

Fable 3: Association Between Type of Seizure and Etiology					
Etiology	GTCS	CFS	FSG	SFS	Total
Cerebral infarct	4	6	14	0	24
Hemorrhage/SDH	2	4	8	0	14
Granuloma / Tuberculoma /	0	6	2	0	8
NCS					
Brain tumor / Secondaries	0	2	2	2	6
etc.					
Alcohol withdrawal	12	0	0	0	12
Hypoglycemia	4	0	0	0	4
Hepatic encephalopathy	2	0	0	0	2
Hyponatremia	2	0	0	0	2
Dementia / Cerebral atrophy	4	0	0	0	4
Cerebral malaria	4	0	0	0	4
Viral encephalitis	2	0	0	0	2
TB Meningitis	2	0	0	0	2
Hypertensive encephalopathy	2	0	0	0	2
Unknown	12	1	0	1	14
Total	52	18	26	4	100

Clinical and radiological correlations further reinforced the predominance of cerebrovascular pathology as a leading cause of late-onset seizures. Nearly all patients with cerebral infarction (n=24) and hemorrhage (n=14) had corresponding imaging abnormalities and focal neurological deficits. Tumors and granulomas also showed concordant radiological and focal clinical signs. Among metabolic and infective causes, laboratory investigations were crucial in establishing the diagnosis, with abnormalities like hypoglycemia, hyponatremia, elevated liver enzymes, positive CSF ADA, HSV IgM, and malarial parasites aiding in the diagnosis. Only 16% of cases had abnormal laboratory investigations contributing to diagnosis, underscoring the primacy of imaging and clinical correlation (Table 4).

Fable 4: Association Between Imaging and Clinical Findings				
Etiology	Focal Neurological Deficit	Abnormal Imaging	Abnormal EEG	Other Abnormal Investigations
Cerebral infarct	24	24	8	-
Cerebral hemorrhage/SDH	10	14	6	-
Granulomas	2	8	2	-
Brain tumor	2	6	4	-
Alcohol withdrawal	-	-	2	-
Hypoglycemia	-	-	-	4 (Low blood sugar)
Hepatic encephalopathy	-	-	-	2 (Abnormal LFT)
Hyponatremia	-	-	-	2 (Low serum Na)
Diffuse cerebral atrophy	4 (Dementia)	4	2	-
Cerebral malaria	-	-	-	4 (QBC-MP +)
Viral encephalitis	-	-	2	2 (CSF HSV IgM +)
TB Meningitis	2 (Neck stiffness)	-	-	2 (CSF ADA +)
Hypertensive	-	-	-	-
encephalopathy				
Unknown	-	-	-	-
Total	48 (48%)	56 (56%)	26 (26%)	16 (16%)

Radiological profiling showed that 44% of patients had no detectable abnormalities on brain imaging. Among those with radiologically evident pathology, cerebral infarctions (24%) were the most frequent, followed by intracerebral hemorrhage (10%) and granulomatous lesions (8%). Tumors accounted for 6%, and subdural hemorrhage and cerebral atrophy were each seen in 4% of patients. These findings affirm the critical role of imaging, especially in

identifying structural brain lesions associated with new-onset seizures in adults (Table 5).

Table 5: Distribution of Precipitating Factors	
Precipitating Factor	Number of Cases
No identifiable factor	32
Emotional upset	18
Sleeplessness	14
Alcohol withdrawal	14
New moon day	10
Fever	8
Menstruation	4
Total	100

DISCUSSION

In the present study, generalized tonic-clonic seizures (GTCS) were the predominant type across all age groups, especially among patients aged 40-50 years. This observation aligns with findings by Madella M et al. and Modi et al., who also reported GTCS as the most frequent seizure type in late-onset epilepsy.^[10,11] Our data further showed that focal seizures with generalization (FSG) were more prevalent in patients over 60 years, consistent with the trend noted by other researchers such as Madella M et al., indicating age-related shift toward focal an seizure presentations due to an increased incidence of structural brain pathologies in the elderly.^[10] Complex focal seizures (CFS) were distributed relatively evenly, highlighting the heterogeneity in seizure types among older adults. These trends underscore the importance of considering age and clinical context when evaluating new-onset seizures. Our etiological analysis revealed cerebrovascular accidents, including infarctions (24%)and hemorrhage (14%), as the most common causes of seizures in older adults, which is in concordance with the studies by Modi et al., and Adhikari et al.^[11,12] They reported stroke-related causes ranging from 32% to over 45% in similar populations. The predominance of focal seizures in patients with infarcts and hemorrhage supports the hypothesis that structural brain insults are a major precipitant of seizures in this age group. Alcohol withdrawal (12%) and metabolic causes (8%) also played significant roles, primarily leading to GTCS, a finding also reported by Murthy JMK et al. and Kaur et al., suggesting that reversible causes should always be considered, especially in male patients with substance use history.^[13,14]

EEG and imaging findings in our study demonstrated moderate correlation, with 56% of patients showing imaging abnormalities and 26% displaying abnormal EEGs. This is comparable to Delil S et al.'s findings, where 59.3% had abnormal imaging and 35% had EEG abnormalities.^[15] Notably, 18% of our patients had both abnormal EEG and imaging, while 38% had imaging abnormalities despite normal EEGs. These results highlight the higher sensitivity of imaging, particularly CT or MRI, in detecting structural lesions such as infarcts, hemorrhage, tumors, and granulomas. The data reinforce the necessity of comprehensive neuroimaging in all cases of lateonset seizures to identify potentially treatable causes, even when EEG is normal.

Radiological profiling showed cerebral infarctions as the leading abnormality, followed by hemorrhage, granulomas, tumors, and atrophy. Nearly half of the patients had corresponding focal neurological deficits, affirming the clinical relevance of imaging findings. In contrast, metabolic and infectious causes were diagnosed primarily through laboratory tests. These findings are consistent with prior literature that stresses the combined use of clinical evaluation, imaging, EEG, and laboratory investigations for accurate etiological classification. The presence of unidentifiable causes in 14% of cases further reflects the complexity of late-onset epilepsy and suggests a possible role of occult neurodegenerative or autoimmune processes, which might require advanced investigations in future studies.

CONCLUSION

This study highlights the multifactorial etiology of late-onset seizures in adults over 40 years of age, with cerebrovascular events emerging as the most common cause, followed by alcohol withdrawal, metabolic disturbances, and space-occupying lesions. Generalized tonic-clonic seizures were the predominant clinical presentation, particularly in the younger subset of the late-onset group, whereas focal seizures were more common in older patients. Neuroimaging proved superior to EEG in detecting underlying structural abnormalities, reinforcing its central role in diagnostic evaluation. The integration of clinical assessment, imaging, and EEG findings provided a comprehensive approach to identifying seizure etiology, underlining the importance of a thorough and multidisciplinary evaluation in this age group to guide appropriate management and reduce recurrence risk.

REFERENCES

- Stafstrom CE, Carmant L. Seizures and epilepsy: an overview for neuroscientists. Cold Spring Harb Perspect Med. 2015 Jun 1;5(6):a022426.
- Liu S, Yu W, Lü Y. The causes of new-onset epilepsy and seizures in the elderly. Neuropsychiatr Dis Treat. 2016; 12:1425-34.

- Trinka E, Rainer LJ, Granbichler CA, et al. Mortality, and life expectancy in Epilepsy and Status epilepticus-current trends and future aspects. Front Epidemiol. 2023; 3:1081757.
- Thompson HJ, McCormick WC, Kagan SH. Traumatic brain injury in older adults: epidemiology, outcomes, and future implications. J Am Geriatr Soc. 2006;54(10):1590-5.
- Rayman G, Akpan A, Cowie M, et al. Managing patients with comorbidities: future models of care. Future Healthc J. 2022 Jul;9(2):101-105.
- Rayi A, Murr NI. Electroencephalogram. [Updated 2022 Oct 3]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK563295/
- Cendes F, Theodore WH, Brinkmann BH, et al. Neuroimaging of epilepsy. Handb Clin Neurol. 2016; 136:985-1014.
- Kaur S, Garg R, Aggarwal S, et al. Adult onset seizures: Clinical, etiological, and radiological profile. J Family Med Prim Care. 2018;7(1):191-197.
- Feigin VL, Vos T, Nichols E, et al. The global burden of neurological disorders: translating evidence into policy. Lancet Neurol. 2020 Mar;19(3):255-265.

- Maddela M, Rajyalaxmi N, Swapna M, Anusha R. A Study of Clinical, Etiological and Radiological Profile in Late Onset Seizures at Government Tertiary Care Hospital, Telangana. IJCPR. 2025;17(3):100-107.
- Modi M, Prabhakar S, Majumdar S, et al. Hyperhomocysteinemia as a risk factor for ischemic stroke: an Indian scenario. Neurol India. 2005;53(3):297-302. doi:10.4103/0028-3886.16927
- Adhikari G, Baral D. Clinical profile of patients presenting with acute myocardial infarction. Int J Adv Med 2018; 5:228-33.
- Murthy JMK, Yangala R. Acute symptomatic seizures incidence and etiological spectrum: a hospital-based study from South India. Seizure. 1999; 8:162-5.
- 14. Kaur S, Garg R, Aggarwal S, et al. Adult onset Seizures: Clinical etiological and radiological profile. Journal of family medicine and primary. 7(1),191,2018.
- Delil S, Senel GB, Demiray DY, Yeni N. The role of sleep electroencephalography in patients with new onset epilepsy. Seizure. 2015; 31:80–3.