



OPEN ACCESS

Key Words

First onset seizures, elderly, vascular etiology, neuroimaging, EEG, CT scan

Corresponding Author

Dr. Chetna Patil,
Department of Bharati Hospital,
Pune, India

Author Designation

¹Consultant Neurophysician and
Assistant Professor

²Consultant Neurophysician

³DNB GI Surgery

Received: 15 November 2024

Accepted: 28 December 2024

Published: 30 December 2024

Citation: Dr. Chetna Patil, Dr. K. Krishna Reddy and Dr. Ujwal Zambare, 2024. Clinical, Etiological and Diagnostic Features of New-Onset Seizures in the Elderly: A Comprehensive Study. Res. J. Med. Sci., 18: 655-659, doi: 10.36478/makrjms.2024.12.655.659

Copy Right: MAK HILL Publications

Clinical, Etiological and Diagnostic Features of New-Onset Seizures in the Elderly: A Comprehensive Study

¹Dr. Chetna Patil, ²Dr. K. Krishna Reddy and ³Dr. Ujwal Zambare

¹Department of Bharati Hospital, Pune, India

²Department of Yashoda Hospital, Hyderabad, India

³Department of Medic Over Hospital, Pune, India

ABSTRACT

To assess the clinical profile, etiology and diagnostic approach to first onset seizures in elderly patients admitted to a tertiary care hospital. It included 63 patients aged 60 years and more who presented for the first time with seizures. Data on the demographics, type of seizure, etiology and diagnostic utility of neuroimaging (CT, MRI), EEG and laboratory investigations were taken. The interrelation between age, gender, type of seizure and causative factors were analyzed. A majority of patients were males 68.3%. The majority had their age ranging from 66-70 years (33.3%). The predominant seizure type was GTCS, comprising 82.2%. Most patients had an etiology due to vascular causes at 30.2%, then metabolic causes (20.6%), followed by infections at 14.3% and tumors 9.5%. CT scans were done in all cases and abnormalities were found in 47.6% of patients, whereas MRI was used only in unclear cases, showing abnormal findings in 51% of patients. EEG abnormalities were found in 31.7% of cases, with higher sensitivity observed in infectious and metabolic causes. Adult onset seizures in the elderly are mostly of vascular and metabolic origin, with a valuable contribution from CT in emergencies for an initial diagnosis. Though MRI yields more, in many places, it is CT that will have to suffice. This article points out that a history, examination and targeted neuroimaging can go a long way in seizure management in elderly patients.

INTRODUCTION

Epilepsy is a neurologic disorder of recurrent unprovoked seizures, documented and recognized from ancient civilizations, including China, Egypt and India. The cause of epileptic seizures for many years was attributed to supernatural causes, for example, lunar influence or divine powers. The term "epilepsy" itself stems from the Greek meaning "to be seized by forces from without," reflecting the early cultural and mystical interpretations of the condition. A significant shift in understanding occurred, however, nearly 2,500 years ago with Hippocrates, a pioneer of medical science who challenged these divine explanations. In his book, Hippocrates postulated that epilepsy was not caused by any divine intervention but by a physical disorder, particularly the existence of an excess amount of phlegm that changed the consistency of the brain^[1,2]. Scientific inquiry into epilepsy really picked up at the turn of the 19th century with the work of Fritsch, Hitzig, Ferrier and Caton, who could induce and record epileptic seizures in the cerebral cortex of animals. This was followed by a discovery in 1929 by Hans Berger, who introduced the technique of recording electrical brain signals using scalp electrodes. Berger's work laid the foundation for electroencephalography (EEG), a diagnostic tool that has since become indispensable in the study and classification of epileptic seizures. Later breakthroughs by Gibbs, Lennox, Penfield and Jasper led to further refining the classification systems and expanding the scope of understanding the varied manifestations of epilepsy^[3-5]. Epidemiological studies in the last decades have shown a disturbing trend: incidence and prevalence of seizure disorders increased significantly after the age of 60. Aging has been considered a definite risk factor for the development of epilepsy, especially new-onset seizures in elderly patients. This demographic shift underscores the need for targeted research focusing on the clinical, etiological and diagnostic aspects of new-onset seizures in older adults^[6-8]. The study aims to evaluate the clinical profile, etiological factors and laboratory and imaging characteristics of new-onset seizures in elderly patients. This has been done by analyzing these factors and thus furthering understanding about this increasingly prevalent condition and enabling better diagnosis and management of the aging population.

MATERIALS AND METHODS

Research Setting: This study was carried out at the Department of Neurology, Yashoda Super Speciality Hospital, Malakpet, Hyderabad. The hospital caters to a diverse population., it caters to both urban and rural communities in southern India. This comprehensive setting ensured access to a wide spectrum of elderly patients presenting with neurological conditions, making it an ideal location for studying new-onset seizures in this demographic.

Study Population: The study population consisted of the elderly outpatients and inpatients attending the hospital's Neurology Department. Inclusion was done in any patient above 60 years who was newly diagnosed with a seizure. To make the study more focused, patients with a known history of seizure disorders, those who were <60 years of age, and patients diagnosed with movement disorders, hyperventilation syndrome, or transient ischemic attacks were excluded. The exclusion was strenuous in nature so that the data could represent only true cases of new-onset seizures in the elderly population.

Study Design and Sample Size: The prospective study design was followed, wherein the data were to be collected in a systematic and observational manner about the outcomes. In earlier studies, the prevalence of seizures among the elderly Indian patients was estimated to be 1.5%. According to the Cochrane formula, the minimum required sample size to obtain a confidence interval of 95% with a margin of error of 5% was calculated to be 23. The relative prevalence of the condition further ensured that a total of 63 patients were enrolled in this study to make it more reliable and generalizable.

Duration of the Study: This study lasted for 18 months between July 2017 and December 2018. It has generated enough data to be able to establish the clinical, etiological and diagnostic patterns regarding the newly developing seizures among elderly populations.

Data Collection and Analysis: Systematic data collection from the patients involved gathering demographics, clinical presentation, laboratory findings and imaging findings. The statistical analysis was performed using SPSS version 20.0 software. Continuous variables are reported in mean±SD. Statistics for the summation of data are frequency, percent, range and mean. The chi-square test was employed to determine relationships between categorical variables. ANOVA was employed to compare means across more than two groups. A p-value of <0.05 was statistically significant, whereas a p-value of <0.01 was considered highly significant. These statistical tools ensured that a strong evaluation of the data could be made in order to generate meaningful interpretations and conclusions about new-onset seizures in the elderly population.

RESULTS AND DISCUSSIONS

Age and Gender Distribution: The mean age of the population under study was 72.48±7.82 years. Among the patients, the highest number (33.3%) comprised the 66-70 years age group followed by 20.6% in the

range of 76-80 years and 19% in the 61-65 years category. The distribution of gender-wise patients was mainly male, as 68.3% of them were male patients, while female patients accounted for 31.7%, yielding a Male: Female ratio of 2.15:1.

Presenting Symptoms: Headache was the most common presenting symptom in 47.6% of cases. Fever and vomiting also manifested, reported in 17.5% and 15.9% of patients respectively.

Types of Seizures: GTCS was the most common seizure type at 82.5%. Others included focal seizures 6.3%, focal seizures with secondary generalization at 4.8%, status epilepticus at 3.2%, myoclonic jerks at 1.6% and epilepsy partialis continua at 1.6%.

EEG Findings: Electroencephalograph findings revealed that 68.3% of patients had normal EEG results, while 31.7% exhibited abnormalities. Abnormal EEG findings were significantly associated with infections, metabolic disturbances and toxic etiologies ($p < 0.05$).

Neuroimaging Findings: On CT scan, the findings were reported normal for 52.4% of patients. The common abnormalities included gliosis at 15.9%, tumors or space-occupying lesions at 9.5%, hemorrhage at 7.9% and infarcts at 4.8%. MRI findings showed that 38.1% of the scans were normal. Common abnormalities identified on MRI included hemorrhage at 4.8%, small vessel ischemia at 4.8%, meningeal enhancement at 4.8%, cerebral venous sinus thrombosis at 3.2% and glioma at 3.2%.

Etiology of Seizures: The most common etiological category was vascular causes (30.2%), followed by metabolic disturbances (20.6%), infections (14.3%), tumors (9.5%) and alcohol-related seizures (6.3%). Ischemic events were the most common cause within vascular causes at 30%, followed by intra cerebral hemorrhages at 25% and CSVT at 20%. Metabolic etiologies included hyponatremia at 46.15% and hyperglycemia at 15.38%. Infections were mostly meningoencephalitis at 33.3% and tuberculoma at 22.2%. Tumors included brain metastasises at 33.3% and high-grade gliomas at 33.3%.

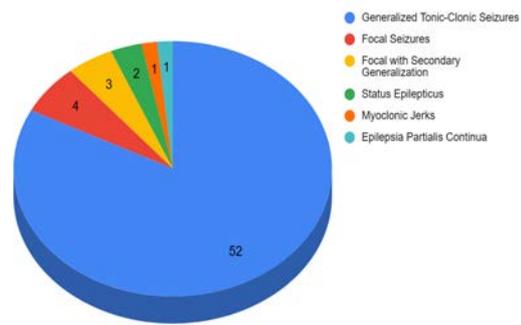
Statistical Associations: There was no important relationship observed between the etiology of seizures and the types of seizures ($p > 0.05$). However, there was association found between the etiology of seizures and findings on CT brain imaging ($p < 0.05$). Abnormal EEG findings were significantly more common in cases associated with infections, metabolic and toxic causes ($p < 0.05$).

Table 1: Age and Gender Distribution of the Study Population

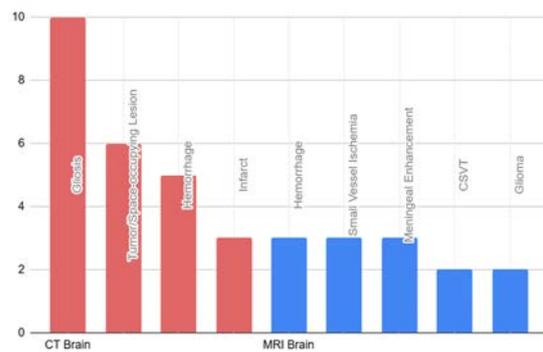
Parameter	Number of Patients (%)
Mean Age (years)	72.48±7.82
Age Groups	
61-65	19.0
66-70	33.3
76-80	20.6
Gender Distribution	
Male	68.3
Female	31.7
Male: Female Ratio	2.15:1

Table 2: Common Presenting Symptoms and Seizure Types

Parameter	Number of Patients (%)
Presenting Symptoms	
Headache	47.6
Fever	17.5
Vomiting	15.9
Seizure Types	
Generalized Tonic-Clonic Seizures	82.5
Focal Seizures	6.3
Focal with Secondary Generalization	4.8
Status Epilepticus	3.2
Myoclonic Jerks	1.6
Epilepsia Partialis Continua	1.6



Graph 1: Proportional Representation of Seizure Types



Graph 2: Comparison of CT and MRI Abnormalities in Seizure Etiology

First Onsets of Seizure in the Aged Population: Study of clinical as well as etiology. The inclusion is 63 total patients aged greater than or equal to 60 years, including all admitted under the tertiary hospital located at X Roads, Malakpet in Hyderabad. Because of the strategic location of the hospital and its closeness

to surrounding districts, a wide range of cases are routinely referred to this facility, giving a valuable opportunity to analyze various aspects of seizure management and diagnosis.

Study Findings: Most affected age group was 66-70 years (33.3%), followed by 76-80 years (20.6%). This age distribution is in accordance with other similar studies, like Ravi P. *et al.* (38.1%) and Binod S. *et al.* (34.9%) (Kasper *et al.*, 2015). The majority of the patients in our study were male, accounting for 68.3%, which is in accordance with other research, where male predominance in seizure incidence among elderly populations has been highlighted ((Fisher^[9,10]). In terms of seizure type, generalized tonic-clonic seizures (GTCS) were the most common, occurring in 82.2% of cases, which is consistent with findings from Ravi P. *et al.* (51%) and Alan B. *et al.* (50%) (Lowenstein, 2012). A slight increase in focal seizures was noted in older patients, particularly after the age of 70, but there was no statistically significant correlation between age and seizure type in our study. This outcome is consistent with the previous literature indicating that GTCS is still the most common seizure type in the elderly (Walker^[11,12]. The leading cause of seizures was vascular causes, accounting for 30.2% of cases, followed by metabolic causes at 20.6%, infections at 14.3%, tumors at 9.5% and alcohol-related seizures at 6.3%. These results are comparable to those from Binod S. *et al.* (44%) and Ravi P. *et al.* (56.8%), who reported vascular causes as the most common in elderly patients (Kasper *et al.*, 2015). Vascular causes included both venous and arterial issues with a high prevalence of arterial vascular lesions. Interestingly, there was no distinct age-related difference in the etiology of seizure, which is in agreement with studies by Mousali YM *et al.* and Ravi P. *et al.* (Fisher^[10]). Among infectious causes, tuberculoma (22.4%) and neurocysticercosis (11.1%) were noted, which may be attributed to regional differences in the types of infections since the study population resides in a region with diverse consumption of meat products (Kasper *et al.*, 2015). Metabolic causes, mainly hyponatremia (38.46%), were also common, which is consistent with other studies where electrolyte imbalances significantly contribute to seizures in geriatric patients (Walker)^[9,12]. Regarding the diagnostic procedure, all the patients underwent a CT scan with an abnormality present in 47.6%, mostly as gliosis in 15.9% and hemorrhage in 7.9%. These are comparable studies wherein CT is initially used in emergency management with a new-onset seizure and later followed up by MRI for diagnostic purposes, used in 51 cases with inconclusive findings in the CT examination. The most common MRI findings included hemorrhage, small vessel ischemia and meningeal

enhancement. The yield of MRI in our study (41.7% abnormal findings) is consistent with the findings of Binod S. *et al.*, who reported abnormal MRI results in 59.7% of cases (Fisher^[10,13]). EEG was performed interictally in all patients, with 31.7% having significant abnormalities on EEG. The most common abnormalities were observed in cases with etiologies of infectious and metabolic causes, implying that EEG is useful in outlining certain seizure causes, especially in cases in which clinical examination results may be inconclusive and imaging results have not yielded clear findings (Lowenstein^[11,14]). Overall, this study emphasizes that a comprehensive approach to diagnosis of first-onset seizures in the elderly should take into account both clinical history, EEG, CT scans and MRI. The findings suggest that though CT scans are essential in the initial management of seizures in an emergency, MRI may offer additional diagnostic clarity in cases where CT results are not conclusive or where more detailed imaging is required for treatment planning. This approach is in line with the goals of optimizing seizure management and treatment while taking into account the economic constraints that patients face (Kasper^[10], Fisher^[15]).

CONCLUSION

Adult onset seizures, especially among the elderly, are most often seen in the age group of 66-70 years and are mainly male. The etiology leading to these seizures is vascular causes followed by metabolic and infectious causes. With advancements in neuroimaging, electro physiology and laboratory techniques, the number of etiologically unclear cases has become very few. Thus, history and examination hold the key for diagnosing seizure. The causes of neonatal seizures that are emerging with advanced diagnostic modalities include CSVT, AV malformations, toxins and encephalitis. While EEG abnormalities occur in less than half of patients, MRI continues to be the most sensitive neuroimaging study, with high yield. Nevertheless, CT scan continues to have utility in the emergency department, mainly due to its accessibility and low cost. The understanding of the clinical, imaging and risk profiles of seizures in elderly patients enhances the management and treatment given by the physician.

REFERENCES

1. Hanby, M.F., S. Al-Bachari, F. Makin, R. Vidyasagar, L.M. Parkes and H.C.A. Emsley, 2015. Structural and physiological MRI correlates of occult cerebrovascular disease in late-onset epilepsy. *NeuroImage: Clin.*, 9: 128-133.
2. Stephen, L.J. and M.J. Brodie, 2000. Epilepsy in elderly people. *Lancet*, 355: 1441-1446.

3. DeToledo, J.C., 1999. Changing Presentation of Seizures with Aging: Clinical and Etiological Factors. *Gerontology*, 45: 329-335.
4. Hauser, W.A., 1992. Seizure Disorders: The Changes With Age. *Epilepsia*, 33: 6-14.
5. Ropper, A., M. Samuels and J. Klein, 2014. Chapter 16: Epilepsy and Other Seizure Disorders. In: *In Adams and Victor's Principles of Neurology*, McGraw-Hill Education., pp: 318-356.
6. Krumholz, A., S. Wiebe, G. Gronseth, S. Shinnar and P. Levisohn *et al.*, 2007. Practice Parameter: Evaluating an apparent unprovoked first seizure in adults (an evidence-based review): [RETIRED]. *Neurology*, 69: 1996-2007.
7. Gavvala, J.R. and S.U. Schuele, 2016. New-Onset Seizure in Adults and Adolescents. *JAMA*, 316: 2657-2668.
8. Berkovic, S.F., J.C. Mulley, I.E. Scheffer and S. Petrou, 2006. Human epilepsies: Interaction of genetic and acquired factors. *Trends Neurosci.*, 29: 391-397.
9. Kasper, D., A. Fauci and S. Hauser, 2015. Seizures and Epilepsy. In: *In Harrison's Manual of Medicine*, McGraw-Hill Education., pp: 2542-2559.
10. Fisher, R.S., J.H. Cross, C. D'Souza, J.A. French and S.R. Haut *et al.*, 2017. Instruction manual for the ILAE 2017 operational classification of seizure types. *Epilepsia*, 58: 531-542.
11. Lowenstein D.H., 2012. Seizures and Epilepsy. In: *Harrison's Principles of Internal Medicine*, In Longo D.L., A.S. Fauci and D.L. Kasper, (Eds.), McGraw-Hill Education., pp: 3251-3270.
12. Walker M.C., 2015. Hippocampal Sclerosis: Causes and Prevention. *Semin. Neurology.*, 35: 193-200.
13. Aroniadou-Anderjaska, V., B. Fritsch, F. Qashu and M.F.M. Braga, 2008. Pathology and pathophysiology of the amygdala in epileptogenesis and epilepsy. *Epilepsy Res.*, 78: 102-116.
14. Touret, M., S. Parrot, L. Denoroy, M.F. Belin and M. Didier-Bazes, 2007. Glutamatergic alterations in the cortex of genetic absence epilepsy rats. *BMC Neurosci.*, Vol. 8 .10.1186/1471-2202-8-69.
15. Chapman, A.G., 2000. Glutamate and Epilepsy. *J. Nutr.*, 130: 1043-1045.