ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 12, 2024

Exploring the Etiology and Clinical Spectrum of New-Onset Seizures in Adults: Insights from SVIMS

Dr. P. Phani Kumar, Dr. C. Subba Rambabu, Dr. B. Surendra, Dr. Rakesh Koppolu, Dr. Chennakesavulu Dara

Assistant Professor of Neurology, ACSR Government Medical College, Nellore, Andhra Pradesh.

Assistant Professor of General Medicine, ACSR Government Medical College, Nellore, Andhra Pradesh.

Assistant Professor of General Medicine, ACSR Government Medical College, Nellore, Andhra Pradesh.

Corresponding Author: Assistant Professor of General Medicine, ACSR Government Medical College, Nellore, Andhra Pradesh.

Professor of General Medicine, ESIC Medical College, Hyderabad.

Abstract: Seizures, marked by abnormal brain activity, are prevalent, affecting 1% of individuals globally. These events arise from various neurological conditions such as epilepsy, stroke, brain tumors, or metabolic disturbances. The causes of adult-onset seizures differ from those in children, making accurate diagnosis essential for effective treatment. Despite the prevalence of seizures, limited data exists on their etiology and clinical characteristics in southern Andhra Pradesh. This study explored the causes, seizure types, and outcomes in adults with new-onset seizures at a tertiary care center. A cohort of 60 patients aged 18 and above underwent clinical assessments, EEG, CT/MRI scans, and metabolic tests. Findings revealed cortical sinus venous thrombosis (CSVT) as the leading cause, followed by unknown etiologies and infarcts. Focal seizures with impaired awareness were predominant. This study highlights significant regional variations in seizure causes and diagnostics, emphasizing the need for further research to improve management strategies.

(Keywords: seizures, semiology, MRI, EEG, epilepsy, encephalopathy, hyponatremia)

Introduction: Seizures are transient events characterized by abnormal, excessive hypersynchronous brain activity, presenting as signs and/or symptoms [1]. Seizure disorders, affecting approximately 1% of individuals over their lifetime, represent one of the most prevalent and treatable neurological conditions, particularly in developing countries like India. Seizures may occur in epilepsy and other neurological conditions, such as stroke, brain tumors, and metabolic encephalopathy. In adults, the causes of symptomatic or provoked seizures differ from the genetic epileptic syndromes seen in children. Accurate identification of the underlying cause is crucial for prevention and treatment. However, there is a significant gap in published reports on the etiology of adult-onset seizures in southern Andhra Pradesh.

Globally, the incidence of single unprovoked seizures ranges from 23 to 61 cases per 100,000 person-years, while acute symptomatic seizures occur at a rate of 29 to 39 cases per 100,000 person-years. Rates

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 12, 2024

are nearly double in low-income countries [2]. Seizures exhibit a bimodal age distribution, being more common in pediatric populations and individuals over 60 years of age [3-4]. People with epilepsy experience higher morbidity and mortality due to factors such as accidents, status epilepticus, suicide, and sudden unexpected death in epilepsy (SUDEP) [5-7].

Electroencephalography (EEG) is vital for diagnosing and managing seizures, particularly when performed within the first 24 hours of an event. Neuroimaging—including computed tomography (CT) and magnetic resonance imaging (MRI)—aids in diagnosing adult-onset seizures [8]. While MRI is more effective in detecting structural lesions, CT is valuable for identifying calcifications, acute hemorrhage, and cases involving patients with pacemakers or metallic implants. Despite the importance of understanding adult-onset seizures, comprehensive data from southern Andhra Pradesh remains limited. This study addresses this gap by exploring diverse etiologies, clinical profiles, semiology, and outcomes, with a particular focus on seizure recurrence [9].

Methodology: This prospective observational study aimed to assess the clinical characteristics, diagnostic workup, and outcomes of patients with new onset seizures. It included 60 patients, aged above 18 years, who presented with new onset seizures at the neurology OPD and Emergency Department of Sri Venkateswara Institute of Medical Sciences, Tirupati, between May 2020 and December 2021. A total of 159 patients were initially enrolled, but 99 were excluded due to recurrent seizures, childhood seizures, psychogenic seizures, transient ischemic attacks, hypoglycemia, or paroxysmal dyskinesias. The included patients underwent detailed clinical history-taking, neurological examinations, and various investigations, including EEG, neuroimaging (CT/MRI), metabolic profiles, and infectious and autoimmune panels. The study aimed to follow these patients to monitor seizure recurrence, assess functional status using the modified Rankin scale (mRS), and evaluate compliance with antiepileptic drugs. The inclusion criteria were new onset seizures, both provoked and unprovoked, while psychogenic seizures, transient ischemic attacks, and other conditions like agitation or paroxysmal dyskinesias were excluded. Data collection included demographic details, clinical history, past medical history, seizure characteristics, medication history, family history of seizures, and relevant diagnostic test results. The sample size was calculated to be 60 based on the expected incidence rate and a margin of error. Data analysis was conducted using SPSS, with categorical variables presented as percentages and numbers, while continuous variables were described using mean ± standard deviation for normally distributed data or median with interquartile range for nonparametric data. The Fischer exact test was used for comparing proportions.

Results: During the study period from May 2020 to December 2021, 159 seizure cases were screened, of which 60 patients with new-onset seizures were included. The patients' ages ranged from 18 to 70 years, with a mean age of 43.5 ± 14 years. The majority of patients were in the 41-50 age group (n=24), followed by 51-60 years (n=12). Of the 60 patients, 42 were male and 18 female, with a male-to-female ratio of 2.3:1.

The most common etiology (Table 1) for seizures was Cortical Sinus Venous Thrombosis (CSVT), which accounted for nearly a quarter of the cases, followed by unknown causes, infarcts, hemorrhages, neurocysticercosis, hyperglycemia, and hyponatremia. All CSVT patients had acute symptomatic seizures (within one week), while among infarct patients, 57% experienced acute seizures, often with concomitant hyponatremia. Seizures in hyponatremic patients occurred within 24 hours, while those with both infarct and hyponatremia had seizures within a week. A single patient with meningoencephalitis had a remote

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 12, 2024

symptomatic seizure. Stroke was the primary etiology, followed by metabolic causes, unknown etiology, and neuroinfections. Among stroke cases, CSVT was observed in 14 patients (9 men, 5 women). Metabolic disorders, including hyperglycemia and hyponatremia, were present in 4 patients each. Neuroinfections, particularly neurocysticercosis, were more common in men. Twelve patients had an unknown etiology. No statistically significant differences were found between men and women across etiologies. Focal seizures with impaired awareness were the most frequent seizure type (n=29), followed by generalized tonic-clonic seizures (GTCS) and focal seizures with bilateral tonic-clonic seizures. Among stroke cases, GTCS was the most common seizure type (46.15%), followed by focal seizures with impaired awareness (42.3%). In cases of metabolic disorders, focal seizures with impaired awareness were most common. In neuroinfectious cases, GTCS was frequently observed, with focal seizures occurring in HIV patients with opportunistic infections.

Table 1: Etiological spectrum of new-onset seizures in the study cohort (n=60)

SI. No.	Etiology	Number (n=60)	Percentage (%)
1.	**Acute Symptomatic Seizure**		
	Stroke		
	Infarct	4	6.7
	CSVT	14	23.3
	Metabolic		
	Hypoglycemia	1	1.7
	Hyperglycemia	3	5.0
	Hyponatremia	2	3.3
2.	**Remote Symptomatic Seizure**		
	Stroke		
	Infarct	3	5.0
	Hemorrhage	5	8.3
	Neuro infections		
	Tuberculoma		
	Neurocysticercosis	4	6.7
	Meningoencephalitis	1	1.7
	Autoimmune Encephalitis[#]	1	1.7
	HIV with Opportunistic Infections	3	5.0
	Primary CNS Tumor	3	5.0
	Trauma	2	3.3
	Metastasis	1	1.7
3.	**Cryptogenic (Unknown)**	12	20.0

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 12, 2024

No seizure trigger was identified in 44 cases (73.3%), while alcohol intoxication and fever triggered seizures in 9 (18%) and 5 (8.3%) patients, respectively. Thirty-five patients (58.3%) had no comorbidities, while hypertension (30%) and diabetes (28.3%) were the most common comorbidities. There were no significant differences in comorbidities between genders (P=0.10). Neurological abnormalities were noted in 36 patients, with headache, vomiting, and focal neurological deficits being the most common symptoms. CT scans were performed on 46 patients, with abnormal findings in 34. These included infarcts (11.3%), hemorrhages (8.3%), CSVT (23.3%), ring lesions/granulomas (15%), gliosis (6.6%), gliomas (6.6%), and brain metastases (1.6%).

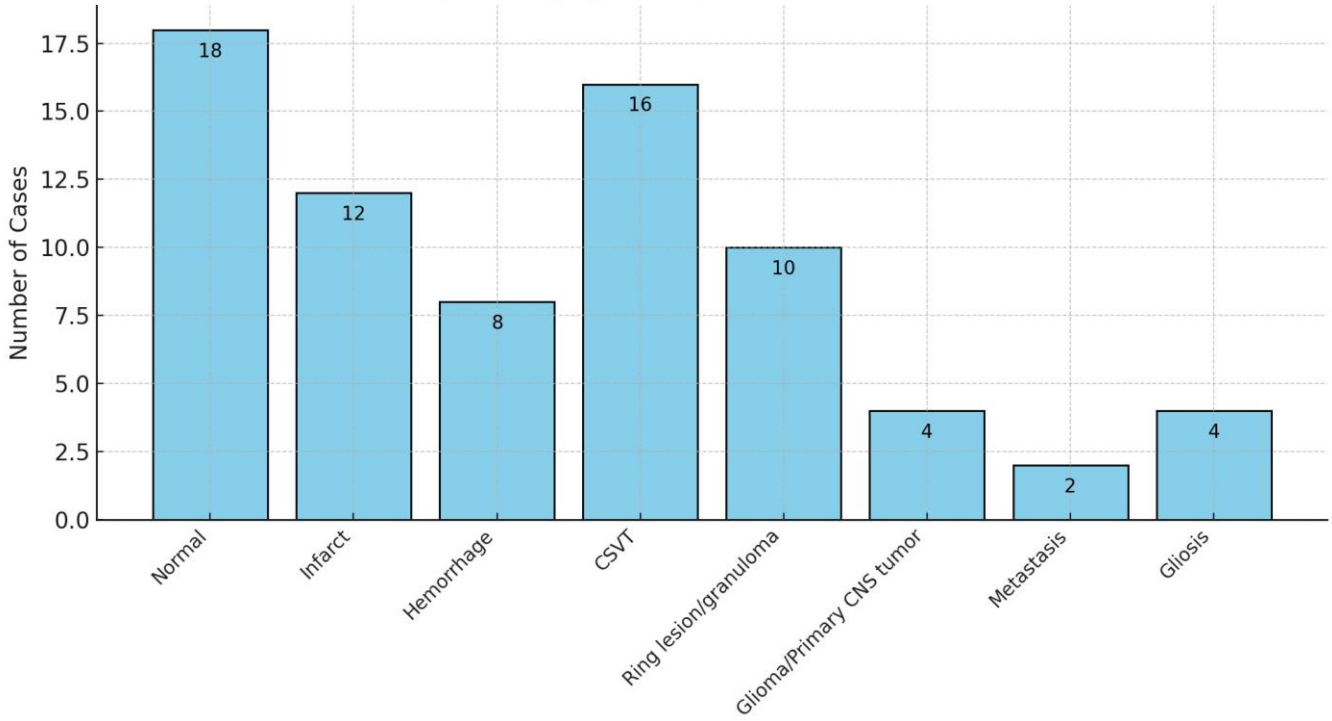

Figure1: Frequency of imaging findings in the study cohort with new-onset adult seizures

MRI (Figure1) was done for 20 patients, revealing abnormalities in 13, including ring lesions/granulomas, metastases, infarcts, and CSVT. EEG was conducted in all patients, showing normal results in 58.3% and focal or generalized slowing in the remainder. Follow-up was conducted with 38 patients (63%), with a median followup duration of 2 months to 1.5 years. Of these, 32 (53%) had no seizures and were functionally independent, 2 (3%) defaulted on medication and experienced seizure recurrence, and 4 patients died within 12 months. The remaining 22 patients (37%) were lost to follow-up.

Discussion: In comparison to other studies, the present study presents notable differences in demographic parameters, etiology, seizure types, triggers, imaging, and EEG findings. The male-to-female ratio in this study (2.3:1) is higher than that observed in Gupta et al. [10] at 1.8:1, Hui et al. [11] at 1:1, Breem et al [12] at 1.12:1, and Hakami et al. [13] at 1.5:1. This suggests a more pronounced male predominance in the present cohort compared to other studies. The mean age in this study (43.5 years) is higher than Gupta et al. (18 years), Hui et al. (33 years), and Breem et al. (37 years), but aligns closely with Narayanan et al [14]. (42.2 ± 18.8 years). The smaller sample size (60 patients) in the present study contrasts with larger

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 12, 2024

studies like Hakami et al. (764 patients), which may limit the generalizability of findings.

Vascular etiology was the most common cause of seizures in the present study (43%), differing from Gupta et al. and Hakami et al., where vascular causes were not specified, and from Narayanan et al., where metabolic disorders and neuroinfections predominated. This aligns with Hauser et al [15].'s findings, which also identified vascular causes as the leading factor. In terms of seizure types, focal seizures with impaired awareness (48.35%) were the most common in the present study, contrasting with Gupta et al. and Narayanan et al., where generalized tonic clonic seizures (GTCS) accounted for 80-90% of cases. This difference in seizure types could be attributed to improved access to video EEG, better clinical histories, and advancements in imaging, leading to more accurate classification in the present study.

Triggers for seizures in the present study were largely unspecified (73%), with alcohol intoxication (26%) being a common trigger, similar to Gupta et al. where alcohol intoxication was the primary trigger. In comparison, Breem et al. also reported alcohol as the main trigger. Hypertension was the most common comorbidity in the present study, followed by diabetes, which aligns with findings from Joshi et al [16], where these conditions were also prevalent among patients with seizures.

Regarding diagnostic imaging, 74% of patients in the present study showed abnormal results, which is higher than the 35% seen in Breem et al. and 37% in Narayanan et al. The higher rate of abnormalities in the present study may reflect a more comprehensive diagnostic approach or the specific population studied. Of the 60 patients, 27% had normal imaging findings, with abnormalities including infarcts, hemorrhages, granulomas, gliomas, and gliosis. The study noted that CT scans were more commonly used (46 patients), and MRI was performed in fewer patients [20], primarily due to financial constraints, reflecting the cost limitations in certain healthcare settings.

EEG was performed on all patients, and most showed normal results, while others had focal or generalized slowing. This finding is consistent with studies like Narayanan et al. and King et al [17], which also reported a high frequency of normal EEG results in smaller sample sizes. The lack of interictal or ictal findings in many patients may be attributed to their use of anti-seizure medications, which can influence EEG patterns. However, studies like Hui et al. (2001) and Schreiner et al [18] with larger sample sizes found a higher frequency of abnormal EEG findings, which may indicate that larger studies or those with less medication interference tend to show more abnormal results.

Limitations of the study: This hospital-based prospective observational study may be subject to referral bias. In developing countries, CNS infections such as Japanese encephalitis, tuberculous meningitis, and neurocysticercosis are common risk factors for new-onset acute symptomatic seizures, yet this study had a lower representation of neuroinfection cases, possibly due to ascertainment bias, as patients with infections are typically managed by the Internal Medicine team. Further research involving a larger population of patients with these conditions is needed to assess the risk of seizure recurrence and the potential role of antiepileptic drug prophylaxis. Additionally, the study was conducted during the COVID-19 pandemic, which likely contributed to a lower enrollment of patients, and two-thirds of the cohort was followed up due to the pandemic's impact.

Conclusion: In this study of 60 adults with new-onset seizures, the majority were males, with the age group of 41 to 50 years being the most affected. Cortical sinus venous thrombosis (CSVT) was identified

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 12, 2024

as the leading cause of seizures, followed by cases with unknown etiology and infarcts. The most common type of seizure was focal seizures with impaired awareness, followed by generalized tonic-clonic seizures and focal-to-bilateral tonic-clonic seizures. A significant portion of patients (73%) did not have a clear trigger for their seizures. Imaging results revealed normal findings in 26.7% of cases, with CSVT and ring lesions/granulomas also being notable causes. Additionally, 58.3% of patients had normal EEG findings.

References:

1. Fisher, R. S., van Emde Boas, W., Blume, W., Elger, C., Genton, P., Lee, P., & Engel, J. Jr. (2005). Epileptic seizures and epilepsy: definitions proposed by the International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE). *Epilepsia*, *46*(4), 470–472.
2. Sridharan, R., & Murthy, B. N. (1999). Prevalence and pattern of epilepsy in India. *Epilepsia, 40*, 631–636.
3. Hauser, W. A., & Beghi, E. (2008). First seizure definitions and worldwide incidence and mortality. *Epilepsia, 49*(Suppl 1), 8–12.
4. Tallis, R., Hall, G., Craig, I., & Dean, A. (1991). How common are epileptic seizures in old age? *Age and Ageing*, *20*, 442–448.
5. Baker, G. A., Jacoby, A., Buck, D., Stalgis, C., & Monnet, D. (1997). Quality of life of people with epilepsy: a European study. *Epilepsia, 38*, 353–362.
6. Sillanpää, M., Jalava, M., Kaleva, O., & Shinnar, S. (1998). Long-term prognosis of seizures with onset in childhood. *The New England Journal of Medicine, 338*, 1715–1722.
7. Tomson, T., Nashef, L., & Ryvlin, P. (2008). Sudden unexpected death in epilepsy: Current knowledge and future directions. *The Lancet Neurology, 7*, 1021–1031.
8. Schreiner, A., & Pohlmann-Eden, B. (2003). Value of the early electroencephalogram after a first unprovoked seizure. *Clinical Electroencephalography*, *34*(3), 140–144.
9. Bharucha, N. E. (2012). Epidemiology and treatment gap of epilepsy in India. *Annals of Indian Academy of Neurology, 15*(4), 352–353.
10. Krumholz, A., Wiebe, S., Gronseth, G., Shinnar, S., Levisohn, P., Ting, T., et al. (2007). Practice parameter: Evaluating an apparent unprovoked first seizure in adults (an evidence-based review): Report of the Quality Standards Subcommittee of the American Academy of Neurology and the American Epilepsy Society. *Neurology, 69*(21), 1996–2007.
11. Gupta, S. K., Satishchandra, P., Venkatesh, A., & Subbakrishna, D. K. (1993). Prognosis of single unprovoked seizure. *Journal of the Association of Physicians of India, 41*, 709–710.
12. Hui, A. C., Tang, A., Wong, K. S., Mok, V., & Kay, R. (2001). Recurrence after a first untreated seizure in the Hong Kong Chinese population. *Epilepsia, 42*(1), 94–97.
13. Breen, D. P., Dunn, M. J., Davenport, R. J., & Gray, A. J. (2005). Epidemiology, clinical

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 12, 2024

characteristics, and management of adults referred to a teaching hospital first seizure clinic. *Postgraduate Medical Journal, 81*, 715–718.

14. Hakami, T., McIntosh, A., Todaro, M., Lui, E., Yerra, R., Tan, K. M., et al. (2013). MRI-identified pathology in adults with new-onset seizures. *Neurology, 81*, 920–927.

15. Narayanan, J. T., & Murthy, J. M. K. (2007). New-onset acute symptomatic seizure in a neurological intensive care unit. *Neurology India, 55*, 136–140.

16. Hauser, W. A., & Beghi, E. (2008). First seizure definitions and worldwide incidence and mortality. *Epilepsia, 49*(Suppl 1), 8–12.

17. Joshi, M. A., et al. (2017). *Scholars Journal of Applied Medical Sciences, 5*(2E), 620–625.

18. King, M. A., Newton, M. R., Jackson, G. D., Fitt, G. J., Mitchell, L. A., Silvapulle, M. J., et al. (1998). Epileptology of the first-seizure presentation: A clinical, electroencephalographic, and magnetic resonance imaging study of 300 consecutive patients. *The Lancet, 352*(9133), 1007–1011.