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Original Research Article

Clinico-Radiological Associations in Patients with Focal Seizures: A Study from a Tertiary Care Center in Central India

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Abstract:

Background: Focal seizures, arising from a specific cortical region, exhibit diverse clinical presentations depending on the lobe involved. Accurate classification and neuroimaging correlation are essential for diagnosis, localization, and management. This study aimed to evaluate the clinico-radiological profile of patients presenting with focal seizures in a tertiary care setting in Central India.

Aims and Objectives: This study was to evaluate the clinical profile and neuroimaging characteristics of patients presenting with focal seizures in a tertiary care centre. The specific objectives were to describe the demographic and clinical features of these patients, classify seizure types according to the ILAE 2017 criteria, identify and categorize CT/MRI abnormalities, and assess the correlation between seizure semiology and radiological findings.

Methods: This cross-sectional observational study included 100 patients with clinically diagnosed focal seizures. A detailed clinical evaluation and classification according to the ILAE 2017 guidelines were performed. All patients underwent brain CT and/or MRI. Seizure semiology was correlated with radiological findings, and statistical analysis was conducted using Fisher's exact test.

Results: The majority of patients were in the 19–30 years age group (30%), with a female predominance (56%). Focal impaired awareness seizures were the most common (41%), followed by focal motor (27%) and focal to bilateral tonic-clonic seizures (25%). Temporal and frontal lobes were the most frequently involved regions. Neuroimaging revealed abnormalities in 95% of patients, with infarcts (25%), tuberculomas (14%), and gliosis/encephalomalacia (12%) being the most common. A statistically significant association was found between seizure semiology and radiological findings ($p = 0.0045$).

Conclusion: This study underscores the importance of integrating seizure semiology with neuroimaging findings to localize epileptogenic foci accurately. The high prevalence of structural lesions, such as infarcts and infections, in this population underscores the need for tailored diagnostic approaches, especially in resource-limited, high-burden regions. Early and accurate diagnosis can guide targeted therapy and improve patient outcomes.

Keywords: Focal seizures, Seizure semiology, Neuroimaging, CT, MRI, Temporal lobe epilepsy, Epileptogenic focus, India.

Introduction

Seizures are defined as sudden, transient episodes of abnormal, excessive, and synchronous neuronal activity in the brain, leading to varied clinical manifestations depending on the site of origin. They are broadly categorized into focal and generalized types. Focal seizures arise from a specific cortical region within one cerebral hemisphere. They may remain localized or evolve into bilateral tonic-clonic seizures, while generalized seizures involve both hemispheres from the onset and typically result in immediate loss of consciousness. [1,2] The International League Against Epilepsy (ILAE) revised its classification in 2017, categorizing focal seizures into focal aware seizures, focal impaired awareness seizures, and focal to bilateral tonic-clonic seizures. [3] Precise classification is critical for clinical diagnosis, selection of antiepileptic therapy, and prognostication.

Focal seizures exhibit heterogeneous clinical presentations, ranging from motor and sensory symptoms to cognitive and autonomic disturbances, depending on the cortical region involved. Focal aware seizures, previously termed simple partial seizures, occur without loss of consciousness and may present as focal motor jerks, sensory auras, or autonomic signs. In contrast, focal impaired awareness seizures, formerly complex partial seizures, are associated with impaired consciousness and often feature automatisms and postictal confusion. In some patients, focal seizures progress to bilateral tonic-clonic seizures, complicating the clinical picture. [4,5] Accurate recognition and differentiation from clinical mimics such as transient ischemic attacks (TIAs), migraine aura, psychogenic non-epileptic seizures (PNES), and paroxysmal movement disorders is crucial but often challenging, especially in resource-limited settings. [10,11]

Epilepsy, defined by recurrent unprovoked seizures, remains a major global public health concern, affecting over 50 million people worldwide. Focal seizures are the most prevalent seizure type in both developed and developing countries. In India, the estimated epilepsy prevalence ranges between 3 and 11 per 1,000 individuals, with focal seizures constituting a significant proportion. [6,7] The burden is further exacerbated by preventable causes such as perinatal insults, traumatic brain injury, neuroinfections, and cerebrovascular disease. Neurocysticercosis and tuberculous meningitis remain endemic and major contributors to focal epilepsy in the Indian subcontinent. [8,9] Unfortunately, limited access to specialized neurology services and advanced neuroimaging in many regions contributes to underdiagnosis and misclassification, often delaying appropriate therapy and increasing morbidity.

Neuroimaging plays a pivotal role in identifying structural causes of focal seizures. Computed Tomography (CT) is often the first-line imaging modality in emergency settings due to its availability and utility for detecting acute lesions, such as hemorrhage or calcifications. However, Magnetic Resonance Imaging (MRI) is the gold standard for identifying subtle epileptogenic foci, including mesial temporal sclerosis, cortical dysplasias, tumors, and vascular malformations. Advanced MRI sequences such as FLAIR, DWI, and SWI significantly enhance lesion detection and characterization. [9,12] Common radiological findings in focal seizures include neurocysticercosis (ring-enhancing or calcified lesions), tuberculomas, post-traumatic gliosis, congenital malformations, and low-grade tumors such as gangliogliomas and dysembryoplastic neuroepithelial tumors (DNETs). [13,14].

Despite the known utility of neuroimaging, many existing studies have examined either clinical features or radiological abnormalities in isolation, limiting the ability to draw integrated conclusions. A systematic clinico-radiological correlation is essential for improving diagnostic accuracy, guiding individualized treatment, and predicting outcomes—particularly in resource-constrained settings where infectious etiologies predominate. To address this gap, the present study evaluated and correlated the clinical and neuroimaging profiles of patients presenting with focal seizures at a tertiary care center in Central India. Specifically, the study aimed to classify patients by focal seizure type, detect abnormalities on CT and MRI, and establish a correlation between seizure type and radiological findings, with the ultimate goal of improving epilepsy care and informing diagnostic and therapeutic strategies in similar regional settings.

Material And Methods

This hospital-based, cross-sectional observational study was conducted in the Department of Medicine at a tertiary care center in Central India over 12 months. Ethical clearance was obtained from the Institutional Ethics Committee before the commencement of the study, and written informed consent was obtained from all participants or their legal guardians.

Patients of all ages presenting with focal seizures, either as a new onset or with a prior diagnosis of focal epilepsy, were considered for inclusion in the study. Focal seizures were defined according to the 2017 International League Against Epilepsy (ILAE) classification. Patients were included based on clinical history and neurological examination suggestive of focal seizure semiology. Exclusion criteria included patients with generalized seizures without any focal features, non-epileptic events (e.g., psychogenic seizures), and those unwilling to undergo neuroimaging or participate in the study.

A detailed clinical evaluation was performed for each participant, including history of seizure onset, frequency, duration, semiology, aura, postictal state, past medical and family history, and possible etiological factors. Seizures were classified into focal aware seizures, focal impaired awareness seizures, and focal to bilateral tonic-clonic seizures. A thorough neurological examination was conducted to assess focal deficits and other relevant signs. Seizure frequency and number of episodes were recorded as reported by patients or caregivers, irrespective of whether the patient was on antiepileptic treatment or off treatment at the time of evaluation, as treatment status was not considered a modifying factor for episode count.

All participants underwent neuroimaging as part of the evaluation. Depending on clinical indication, availability, and patient suitability, either Computed Tomography (CT), Magnetic Resonance Imaging

(MRI), or both were performed. CT scans were primarily used in emergency settings or where an MRI was contraindicated. MRI studies were performed using standard epilepsy protocols, including T1-, T2-, FLAIR-, DWI-, and SWI-weighted sequences. The imaging findings were reviewed independently by a radiologist blinded to clinical details. Radiological abnormalities were categorized by etiology: infections (e.g., neurocysticercosis, tuberculomas), vascular lesions, neoplasms, post-traumatic lesions, and congenital malformations.

The data were compiled and analyzed to identify the distribution of seizure types and the frequency of various imaging abnormalities. The correlation between clinical seizure type and radiological findings was statistically evaluated using appropriate tests such as the Chi-square or Fisher's exact test. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 100 patients with focal seizures were included in the study. The majority of patients (30%) belonged to the 19–30 years age group, followed by 19% in the 31–40 years group. Patients aged ≤18 years accounted for 13%, while 14% were aged 41–50 years, 17% were aged 51–60 years, and 7% were aged> 60 years. Females constituted a slight majority (56%) compared to males (44%). Regarding the duration of seizure history, 61% of patients reported having seizures for 1–5 years, 27% for 6–10 years, and 10% for less than 1 year; only 2% had a history exceeding 10 years. Most seizure episodes lasted 2–3 minutes (34%) or 4–5 minutes (25%), while 15% lasted ≤1 minute, 18% lasted 6–9 minutes, and 8% lasted 10 minutes or more. The frequency of seizure episodes varied: 49% experienced 3–5 episodes, 27% had 1–2 episodes, and 21% had 6–10 episodes. Only 1% had more than 10 episodes, and the episode count was unknown in 2% of cases. The number of seizure episodes recorded in this study was independent of whether the patient was on antiepileptic treatment or off treatment at the time of evaluation.

Table 1: Demographic Characteristics and Clinical Profile of Patients with Focal Seizures

AGE Category	Counts	% of Total
≤18	13	13%
19-30	30	30%
31-40	19	19%
41-50	14	14%
51-60	17	17%
>60	7	7%
Gender		
Female	56	56%
Male	44	44%
Duration of Seizure History		
<1 year	10	10%
1-5 years	61	61%
6-10 years	27	27%
>10 years	2	2%
Duration of Seizure Episode		
≤1 Min	15	15%
2-3 Min	34	34%
4-5 Min	25	25%
6 to 9 Min	18	18%
≥10 Min	8	8%
Episodes of Seizure		
1 to 2 Episodes	27	27%
3 to 5 Episodes	49	49%
6 to 10 Episodes	21	21%
>10 Episodes	1	1%
Unknown	2	2%

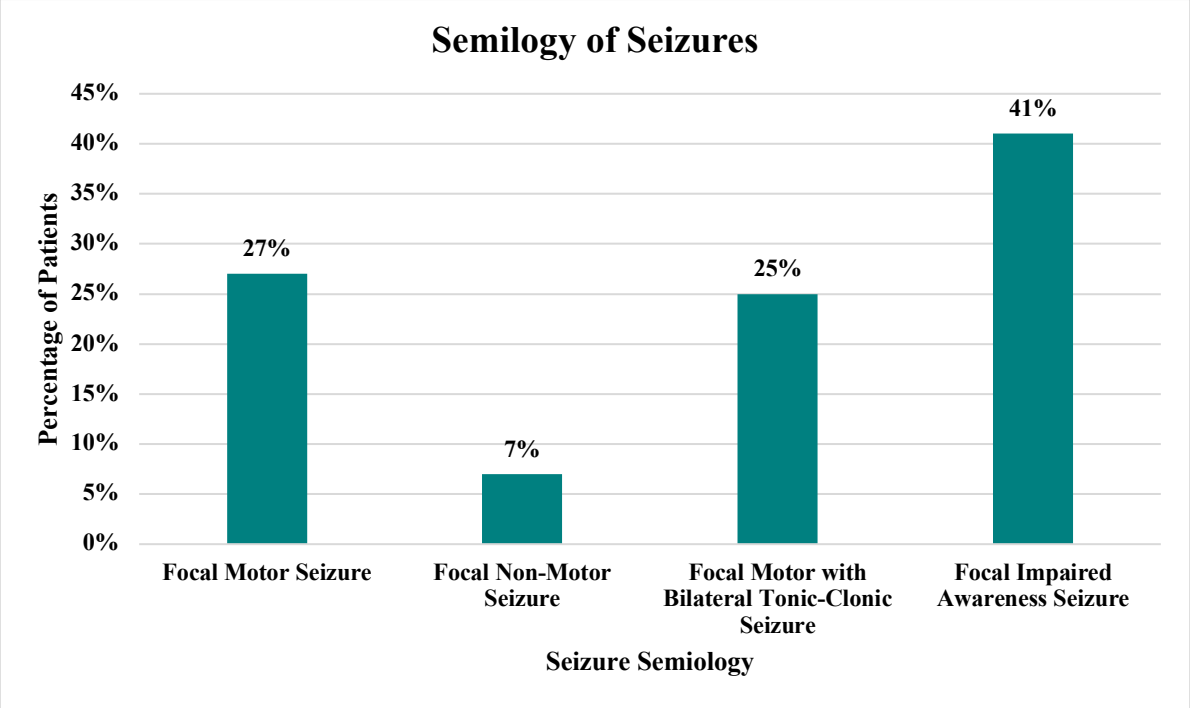

Figure 1: Distribution of Semiology of Seizure

Figure 1 presents the distribution of patients based on seizure semiology. The most common type was focal impaired awareness seizure, observed in 41% of patients. Focal motor seizures followed this in 27%, focal with bilateral tonic-clonic seizures in 25%, and focal non-motor seizures in 7% of the study population.

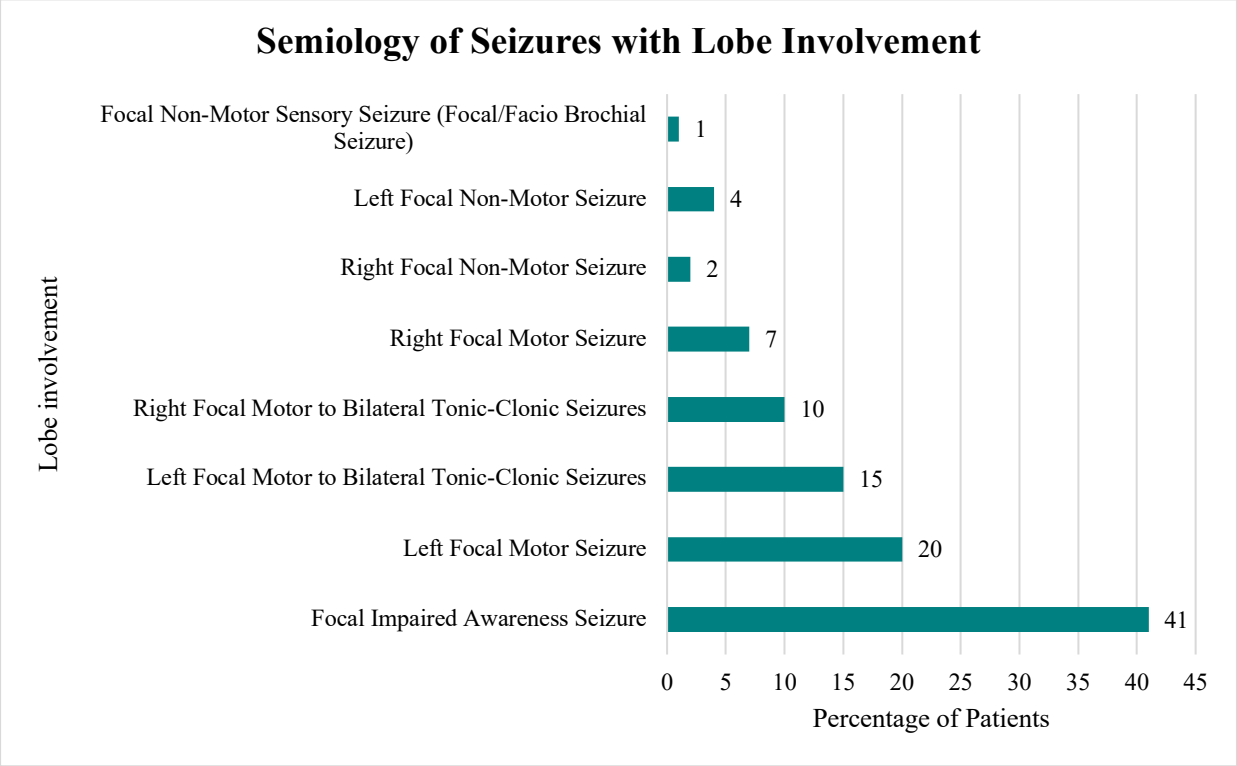

Figure 2: Distribution based on seizure semiology with lobe involvement

The table presents a detailed distribution of patients based on seizure semiology and lateralization. Focal impaired awareness seizures were the most common, reported in 41% of patients. Left focal motor seizures accounted for 20%, while 15% experienced left focal motor to bilateral tonic-clonic

seizures, and 10% had right focal motor to bilateral tonic-clonic seizures. Right focal motor seizures were seen in 7% of patients. Focal non-motor seizures were less common, with left-sided in 4%, right-sided in 2%, and focal non-motor sensory seizures (such as facio-brachial seizures) reported in 1% of the patients.

Table 2: Distribution of Seizure Semiology Based on Lobe Involvement Among Patients with Focal Seizures

Seizure Semiology	Lobe Involved	No. of Patients(n)	Percentage (%)
Focal Motor Seizure	Frontal Lobe	10	10
	Temporal Lobe	6	6
	Parietal Lobe	3	3
	Subcortical Lobe	2	2
	Multiple Lobes	5	5
	Not Significant	1	1
Focal Motor with Bilateral Tonic-Clonic Seizure	Frontal Lobe	10	10
	Temporal Lobe	7	7
	Multiple Lobes	5	5
	Not Significant	3	3
Focal Impaired Awareness Seizure	Frontal Lobe	5	5
	Temporal Lobe	20	20
	Multiple Lobes	4	4
	Not Significant	12	12
Focal Non-Motor Seizure	Temporal Lobe	1	1
	Parietal Lobe	5	5
	Multiple Lobes	1	1

Table 2 shows the distribution of seizure semiology based on lobe involvement among patients with focal seizures. Focal motor seizures were most commonly associated with the frontal lobe (10%), followed by the temporal lobe (6%), the parietal lobe (3%), the subcortical region (2%), and multiple lobes (5%); 1% showed no significant findings. In cases of focal motor seizures progressing to bilateral tonic-clonic seizures, the frontal lobe remained the most frequently involved (10%), followed by the temporal lobe (7%), multiple lobes (5%), and 3% with no significant localization. Focal impaired awareness seizures were predominantly linked to the temporal lobe (20%), while the frontal lobe (5%) and multiple lobes (4%) were less commonly involved, and 12% of cases showed no significant findings. Focal non-motor seizures were relatively rare, with parietal lobe involvement in 5% of cases, and temporal and multiple lobe involvement in 1% each. Overall, the temporal and frontal lobes emerged as the most commonly affected regions across different focal seizure types.

Table 3: Association between CT/MRI Findings and Seizure Semiology

CT / MRI Findings	Focal Motor Seizure	Focal Non-Motor Seizure	Focal with Bilateral Tonic-Clonic Seizure	Focal Impaired Awareness Seizure	Total (Row %)	Fisher's Exact Test, p-value
I/P Bleed	4 (14.8%)	0 (0.0%)	1 (4.0%)	2 (4.9%)	7 (7.0%)	χ^2= 77.64 p = 0.0045
Infarct	9 (33.3%)	4 (57.1%)	12 (48.0%)	0 (0.0%)	25(25.0%)	
CVT	3 (11.1%)	0 (0.0%)	1 (4.0%)	3 (7.3%)	7 (7.0%)	
Encephalomalasia/Gliosis	0 (0.0%)	0 (0.0%)	2 (8.0%)	10 (24.4%)	12(12.0%)	
NAD	2 (7.4%)	0 (0.0%)	1 (4.0%)	2 (4.9%)	5 (5.0%)	
Neoplasms (Oligo/Astro/ Meningioma/ DNET/Mets	4 (14.8%)	0 (0.0%)	0 (0.0%)	3 (7.3%)	7 (7.0%)	
Non-NCC Cyst	1 (3.7%)	1 (14.3%)	0 (0.0%)	1 (2.4%)	3 (3.0%)	
NCC	1 (3.7%)	1 (14.3%)	0 (0.0%)	1 (2.4%)	3 (3.0%)	
Tuberculoma	3 (11.1%)	1 (14.3%)	6 (24.0%)	4 (9.8%)	14 (14.0%)	
MTS	0 (0.0%)	0 (0.0%)	2 (8.0%)	1 (2.4%)	3(3.0%)	
EDH	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (4.9%)	2(2%)	
ADEM	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (4.9%)	2(2%)	
PRES	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (4.9%)	2(2%)	

Post surgery	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (4.9%)	2(2%)	
RASSMUSSEN Encephalitis	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (4.9%)	1(1%)	
PML	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (4.9%)	1(1%)	
Subdural Effusion	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (2.4%)	1(1%)	
Cerebral Malformation	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (2.4%)	1(1%)	
Total	27 (100.0%)	7 (100.0%)	25 (100.0%)	41 (100.0%)	100 (100.0%)	

Table 3 presents the association between CT/MRI findings and seizure semiology. Infarcts were the most common abnormality, observed in 25% of cases, predominantly among those with focal motor (33.3%), focal non-motor (57.1%), and focal with bilateral tonic-clonic seizures (48%). Encephalomalacia/Gliosis was found in 12% of patients, with the majority (24.4%) associated with focal impaired awareness seizures. Tuberculoma was detected in 14% of cases, most notably among those with focal bilateral tonic-clonic seizures (24%). Intracerebral hemorrhage (I/P bleed) was present in 7% of cases, primarily among focal motor seizure patients (14.8%). Other findings, such as neoplasms, neurocysticercosis (NCC), CVT, and NAD, were observed in smaller proportions across all seizure types. Rare abnormalities, including MTS, EDH, ADEM, PRES, post-surgical changes, Rasmussen encephalitis, PML, subdural effusion, and cerebral malformation, accounted for less than 5% each. A statistically significant association was found between seizure type and CT/MRI findings (Fisher's Exact Test, $p = 0.0045$), indicating that specific radiological patterns were significantly correlated with seizure semiology.

Discussion

This study provides a comprehensive overview of the demographic characteristics, seizure semiology, and neuroimaging correlations among patients presenting with focal seizures at a tertiary care centre. The findings contribute essential insights into the clinical presentation of focal seizures in this regional population.

Focal seizures were most prevalent among young adults, with the highest proportion seen in the 19–30-year age group. Similar age-related patterns have been reported by Amudhan et al. and Mahur et al., who highlighted the strong influence of neuroinfections and post-traumatic sequelae in younger individuals [6,15]. In contrast, studies by Kaur et al. and Rania et al. observed a greater frequency of focal seizures in older adults due to higher rates of cerebrovascular disease [16,17]. The distribution seen in the present study reflects a mixed burden of infectious, traumatic, and vascular etiologies.

A slight female predominance was noted, unlike earlier studies by Asadi-Pooya et al. and Karlander et al., in which males were more commonly affected [18,19]. This variation may reflect differences in healthcare utilization patterns or rising awareness and diagnosis among women. Kaur et al. also reported a nearly balanced gender distribution, supporting the possibility of shifting demographic trends [16].

Focal impaired-awareness seizures (FIAS) emerged as the most common seizure type in this study, followed by focal motor seizures and focal to bilateral tonic–clonic seizures. A similar pattern was reported by Kaur et al. and Orozco-Hernandez et al., emphasizing the central role of temporal lobe involvement in focal epilepsy [16,20]. The identification of subtle features such as aura and automatisms remains essential for accurate diagnosis, particularly in cases where early symptoms may be misinterpreted.

Left-sided lateralization was more frequently seen in focal motor seizures, and frontal lobe abnormalities constituted the most common lesion type among these patients. Temporal lobe pathology was strongly associated with FIAS, reinforcing well-established neuroanatomical correlations described in earlier literature.

Nearly half of the patients experienced 3–5 seizure episodes, a pattern consistent with findings by King-Stephens et al. and Balamurugan et al. [21,22]. Most seizures lasted 2-5 minutes, similar to previous descriptions by Fisher et al. and Huff et al. [3,2]. Only a small proportion experienced prolonged seizures, indicating a relatively low burden of status epilepticus.

Neuroimaging findings demonstrated a strong correlation with seizure semiology. Infarcts were the most common abnormality and were frequently associated with focal motor and focal to bilateral tonic–clonic seizures, aligning with the role of post-stroke epilepsy described by Doria et al. and Myint et al. [23,24]. Tuberculomas and encephalomalacia/gliosis were also commonly detected, reflecting the persistent prevalence of CNS infections in this region, as supported by studies from Gupta et al. and Navarro-Flores et al. [25,26]. Only 5% of patients had normal neuroimaging, a proportion considerably lower than that reported by Kumar et al. [27], suggesting a high prevalence of structural etiologies in this population.

Overall, the findings underscore the importance of integrating detailed clinical assessment with targeted neuroimaging to localize epileptogenic foci and guide effective management accurately. The predominance of structural lesions highlights the need for robust prevention and early treatment of infections, trauma, and vascular risk factors in this region.

This study has certain limitations. Being hospital-based and conducted at a single tertiary centre, the findings may not fully represent the general population. Advanced diagnostic tools such as functional MRI and long-term video-EEG monitoring were not routinely available, possibly limiting the detection of subtle abnormalities. Additionally, long-term follow-up data were not accessible to assess treatment outcomes and prognosis.

Conclusion

This study highlights the critical role of clinico-radiological correlation in the evaluation of patients with focal seizures. Focal impaired awareness seizures emerged as the most common semiology, with the temporal and frontal lobes being the most frequently involved regions. A significant association was observed between seizure types and neuroimaging findings, particularly with infarcts, gliosis, and tuberculomas, reflecting the structural basis of epilepsy in a substantial proportion of patients.

The predominance of post-infectious and vascular etiologies underscores the need for region-specific diagnostic protocols in Central India, where neurocysticercosis, tuberculosis, and stroke are major contributors. Neuroimaging, especially MRI, is indispensable for identifying subtle lesions and should be integrated routinely into the diagnostic workup of focal seizures.

Overall, this study emphasizes that a detailed clinical assessment, supported by targeted imaging, enhances diagnostic accuracy and facilitates individualized patient management. These findings have important implications for optimizing epilepsy care in resource-limited settings and reinforce the value of early recognition and localization of epileptogenic foci in improving outcomes.

References

1. Ighodaro ET, Maini K, Arya K, Sharma S. Focal onset seizure. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan– [cited 2025 May 7].
2. Huff JS, Murr N. Seizure. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan– [cited 2025 May 7].
3. Fisher RS. The new classification of seizures by the International League Against Epilepsy 2017. Curr Neurol Neurosci Rep. 2017;17(6):48. doi:10.1007/s11910-017-0758-6.
4. National Institute of Neurological Disorders and Stroke. Epilepsy and seizures [Internet]. Bethesda (MD): NINDS; 2024 [cited 2025 May 7].
5. Buck BH, Akhtar N, Alrohimi A, Khan K, Shuaib A. Stroke mimics: incidence, aetiology, clinical features and treatment. Ann Med. 2021;53(1):420–436. doi:10.1080/07853890.2021.1890205.
6. Amudhan S, Gururaj G, Satishchandra P. Epilepsy in India I: epidemiology and public health. Ann Indian Acad Neurol. 2015;18(3):263–277. doi:10.4103/0972-2327.160093.
7. Santhosh NS, Sinha S, Satishchandra P. Epilepsy: Indian perspective. Ann Indian Acad Neurol. 2014;17(Suppl 1):S3–S11. doi:10.4103/0972-2327.128643.
8. Carpio A, Romo ML, Parkhouse RME, Short B, Dua T. Parasitic diseases of the central nervous system: lessons for clinicians and policy makers. Expert Rev Neurother. 2016;16(4):401–414. doi:10.1586/14737175.2016.1155454.
9. Goodman AM, Szaflarski JP. Recent advances in neuroimaging of epilepsy. Neurotherapeutics. 2021;18(2):811–826. doi:10.1007/s13311-020-00944-0.
10. Nadarajan V, Perry RJ, Johnson J, Werring DJ. Transient ischaemic attacks: mimics and chameleons. Pract Neurol. 2014;14(1):23–31. doi:10.1136/practneurol-2013-000782.
11. Shankar Kikkeri N, Nagalli S. Migraine with aura. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan– [cited 2025 May 7].
12. Xie M, Wang X, Duan Z, Luan G. Low-grade epilepsy-associated neuroepithelial tumors: tumor spectrum and diagnosis based on genetic alterations. Front Neurosci. 2022;16:1071314. doi:10.3389/fnins.2022.1071314.
13. Verellen RM, Cavazos JE. Post-traumatic epilepsy: an overview. Therapy. 2010;7(5):527–531. doi:10.2217/thy.10.57.
14. Urbach H, Kellner E, Kremers N, Blümcke I, Demerath T. MRI of focal cortical dysplasia. Neuroradiology. 2022;64(3):443–452. doi:10.1007/s00234-021-02771-y.
15. Mahur H, Jain A, Singh D, Verma H, Singh Ahada R, et al. A study on the aetiology and clinical profile of epilepsy in Southern Rajasthan [Internet]. J Indian Acad Clin Med. 2019;20(1–2):6–9 [cited 2025 May 1].
16. Kaur S, Garg R, Aggarwal S, Chawla SPS, Pal R. Adult onset seizures: clinical, etiological, and radiological profile. J Family Med Prim

Care. 2018;7(1):191–197. doi:10.4103/jfmpc.jfmpc_322_16.
17. Rania S. Nageeb, Adaham Mahmoud Mohamad Ismail, Sawsan Abd El Aziz Youssef, Eman Atef Mohamed (2024) Profile of adult -onset epilepsy in Zagazig university hospitals. The Egyptian Journal of Neurology, Psychiatry and Neurosurgery, 60(1), 10.1186/s41983-024-00835-7
18. Asadi-Pooya AA, Alkhaldi M, Damabi NM, Dehkordi KF. Sex differences in epilepsies: a narrative review. Arch Epilepsy. 2024;30(4):100–103. doi:10.4274/ArchEpilepsy.2024.24124.
19. Karlander M, Ljungqvist J, Zelano J. Post-traumatic epilepsy in adults: a nationwide register-based study. J Neurol Neurosurg Psychiatry. 2021;92(6):617–621. doi:10.1136/jnnp-2020-325382.
20. Orozco-Hernández JP, Quintero-Moreno JF, Marín-Medina DS, Castaño-Montoya JP, Hernández-Coral P, Pineda M, et al. Clinical and sociodemographic profile of epilepsy in adults from a reference centre in Colombia. Neurología (Engl Ed). 2019;34(7):437–444. doi:10.1016/j.nrleng.2018.02.006.
21. King-Stephens D, Wheless J, Krogh C, Bettles M, Niemira J, Stolper R, et al. Burden of disease in patients with a history of status epilepticus and their caregivers. Epilepsy Behav. 2020;112:107374.doi:10.1016/j.yebeh.2020.107374.
22. Balamurugan E, Aggarwal M, Lamba A, Dang N, Tripathi M. Perceived trigger factors of seizures in persons with epilepsy. Seizure. 2013;22(9):743–747. doi:10.1016/j.seizure.2013.05.018.
23. Doria JW, Forgacs PB. Incidence, implications, and management of seizures following ischemic and hemorrhagic stroke. Curr Neurol Neurosci Rep. 2019;19(7):37. doi:10.1007/s11910-019-0957-4.
24. Myint PK, Staufenberg EFA, Sabanathan K. Post-stroke seizure and post-stroke epilepsy: a review of incidence, risk factors and prognosis. Postgrad Med J. 2006;82(971):568–572. doi:10.1136/pgmj.2005.040675.
25. Gupta M, Tobin EH, Munakomi S. CNS tuberculosis. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan– [updated 2024 May 6; cited 2025 May].
26. Navarro-Flores A, Fernandez-Chinguel JE, Pacheco-Barrios N, et al. Global morbidity and mortality of central nervous system tuberculosis: a systematic review and meta-analysis. J Neurol. 2022;269(7):3482–3494. doi:10.1007/s00415-022-11052-8.
27. Kumar A, Ighodaro ET, Sharma S. Focal impaired awareness seizure. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan– [updated 2024 Mar 19; cited 2025 May].