

ORIGINAL RESEARCH

“Co-relation of MRI findings in new onset seizure patients presenting to tertiary care centre” A prospective study from central India¹Dasari Ramu, ²R.S. Maniram, ³P.Dhurvey, ⁴R.S. Jagat, ⁵R.S. Yadav, ⁶Simmi Dubey¹Post graduate Resident, Department of Medicine, Gandhi Medical College Bhopal, Madhya Pradesh, India²⁻⁵Associate Professor, Department of Medicine, Gandhi Medical College, Bhopal, Madhya Pradesh, India⁶Professor and Head, Department of Medicine, Gandhi medical College Bhopal, Madhya Pradesh, India**Correspondence:**

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Email: ramdasari920@gmail.com**Abstract**

Background: The term seizure is used to describe abnormal, uncontrolled paroxysmal electrical activity of brain, literature suggests that about 8 -10% of population may experience at least one episode of seizure. In adult patients with new onset seizures, neuroimaging studies like MRI brain are advised to find out the underlying cause, structural abnormality, and the likelihood of recurrence. For neuroimaging, CT scan and MRI both can be done but for detection of cerebral lesions, imaging with MRI is considered superior to CT scan. MRI becomes essential, because of its superior depiction of brain anatomy and tissue composition. Aims and Objectives: To Evaluate the MRI brain study in new onset seizure and to identify a lesion in MRI brain that can explain the seizure.

Materials and methods: sixty-nine patients (age 18 and above with new onset seizures) were studied in the out-patient and in-patient department of medicine of a tertiary care centre of central India from 1st July 2019 to 30th June 2021. All patients fulfilling inclusion criteria were subjected to detailed clinical history, examination including neurological examination, and etiology and characteristics of seizure were co related with MRI brain findings.

Results: The majority of patients were presented with focal seizures 38(55%) and with generalized seizure 31(45%). Seizures are more prevalent in age 18 to 40 years. The prevalence of seizures was higher in males (60%) than in females (40%). MRI brain revealed abnormal findings on 68.1% cases with new onset seizures. MRI revealed CVA in 17.3% cases (infarct in 13% and bleed in 4.3%), tuberculoma in 7.2% and neurocysticercosis in 5.8% cases, viral and tubercular meningitis in 4.3% cases each, Cortical Venous Thrombosis was noted in 8.7% cases, AV Malformations, Mesial temporal lobe sclerosis, Posterior reversible encephalopathy syndrome (PRES) and Dyke Davidoff Masson Syndrome were noted in 2.9% cases each.

Key words: seizure, MRI brain, Neuroimaging studies, CVA infarct, CVA I p bleed, Tuberculoma, Neurocysticercosis, Cortical venous thrombosis, AV malformation, PRES.

Introduction

The term seizure is used to describe abnormal, uncontrolled paroxysmal electrical activity of brain, it may be associated with altered behaviour, memory and also level of consciousness⁽¹⁾. though the seizures are commonly observed in children, literature suggests that about 8-10% of population may experience at least an episode of seizure during their life time and among them, approximately 2-3% of patients may have epilepsy⁽²⁾. With the rise in life expectancy and burden of non-communicable disease, the frequency of seizure is expected to rise. The rate of occurrence of symptomatic seizures have been linked to age and most common etiology in older people with a first seizure is stroke; however, its exact relevance to epileptogenicity is yet to be defined.^[3] New onset seizures in adulthood represents underlying etiology such as CNS infections, trauma, intracranial space occupying lesions, metabolic disorders, cerebrovascular accident, drugs, alcohol withdrawal, high fever, electrolyte disturbances, primary and metastatic brain tumors.^[4,5] Neuroimaging studies like MRI brain is recommended in adult patients with new onset seizures to determine the underlying cause, structural abnormality, and the possibility of recurrence. For the detection of brain lesions associated with epilepsy, MRI has been found to be superior to CT, because of its superior depiction of brain anatomy and tissue composition. MRI has the higher diagnostic yield for epileptogenic lesions.^[6,7] The latest MRI methods like as 3-Tesla scanner multichannel head coils, 3D structural imaging at sub millimetre resolution, and new pulse sequences including fluid-attenuated inversion recovery (FLAIR), all this have increased the sensitivity for cortical abnormality detection, which also includes hippocampal atrophy due to mesial temporal sclerosis, and also abnormal cortical neuronal migration. Literature assessing the role and use of neuroimaging in new onset seizure is lacking, especially in Indian Scenario. The present study therefore was conducted to correlate MRI brain findings to new onset seizures and to find any lesion that can explain seizure.

Materials and methods

The present prospective cross-sectional observational study was performed on sixty-nine patients were studied in the out-patient and in-patient department of medicine of a tertiary care centre of central India from 1st July 2019 to 30th June 2021. Detailed history regarding onset of seizure, provoking factor, clinical features, past medical history, history of trauma, drug use and All the patients were subjected to detailed physical examination and systemic examination including neurological examination and findings were noted. Neuroimaging was done in all the cases either with the help of Magnetic resonance imaging-MRI (contrast and non-contrast). Patients belonging to age range of more than 18 years and Patients with first onset seizure were included. patients with history of already known seizures and age <18 years were excluded. Age, gender, complete blood picture, serum sodium and potassium, serum calcium and cerebrospinal fluid analysis were recorded. Data was compiled using MS Excel and analysed using IBM SPSS software version 20. Continuous data was expressed as mean and standard deviation whereas Categorical data was represented as frequency and percentage. Chi square test was applied to assess the association between two proportions. P value less than 0.05 was considered statistically significant.

Results

Mean age of patients in our study with new onset seizures was 37.95±16.2 years and majority i.e. 44% of the patients belonged to less than 30 years of age (p=0.28) no significant association between MRI abnormalities and age. There was little male predominance observed for new onset seizures with male: female ratio of 1.5:1. Males made up over 60% of the patients while females made up only 40%. In our study 17 percent of patients with new-onset seizures, there was a history of hypertension and in our present study out of 69

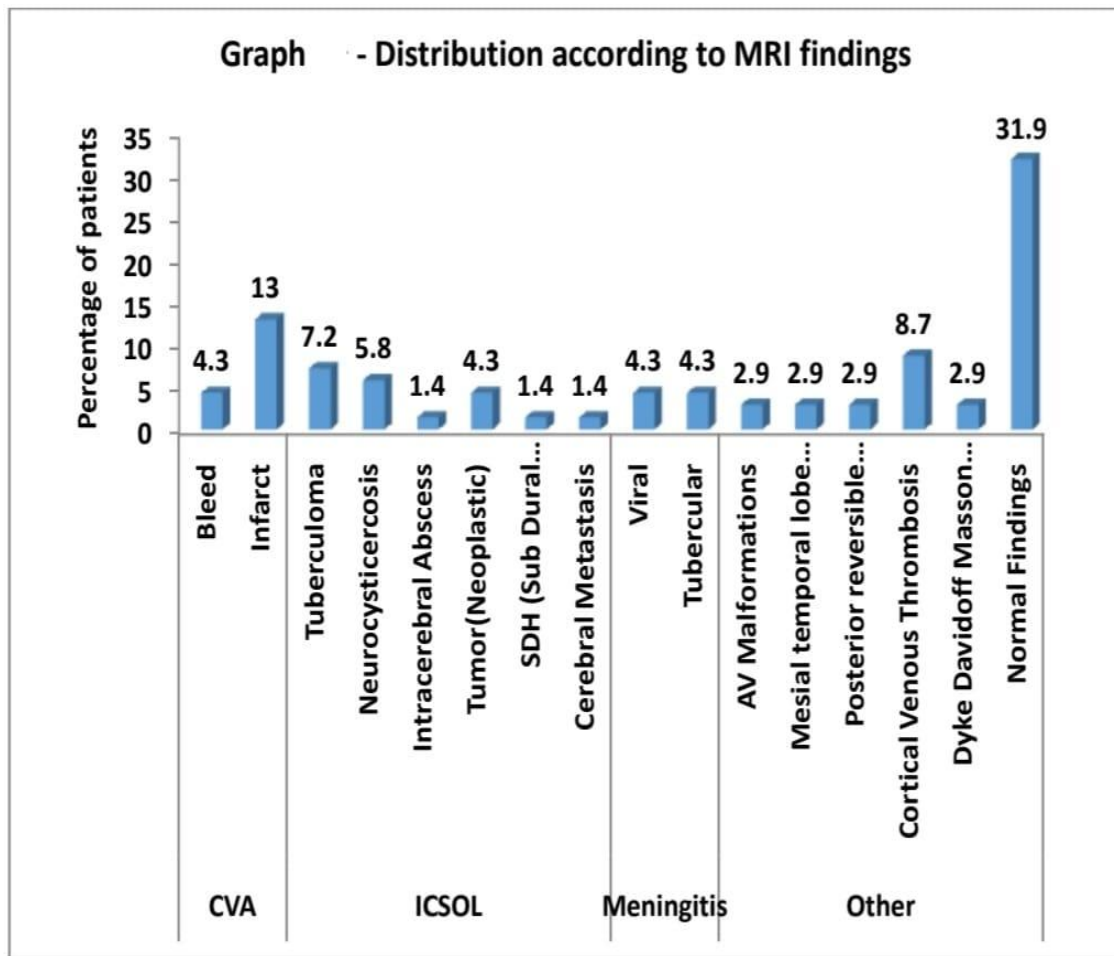
new onset seizure patients, we observed seizures were focal in 55% cases and generalized in 45% cases.

Type of seizures	Frequency (n=85)	Percentage
Focal	38	55.0
Generalised	31	45.0

In our study MRI brain was done in 69 cases. Out of them 68.1% cases had abnormal MRI findings, MRI revealed CVA in 17.3% cases (infarct in 13% and bleed in 4.3%), tuberculoma in 7.2% of cases, neurocysticercosis in 5.8% of cases, whereas viral and tubercular meningitis in 4.3% cases each. Cortical Venous Thrombosis was noted in 8.7% cases whereas AV Malformations, Mesial temporal lobe sclerosis, Posterior reversible encephalopathy syndrome (PRES) and Dyke Davidoff Masson Syndrome were noted in 2.9% cases each.

Table - Distribution according to MRI findings

MRI Brain		Frequency (n=69)	Percentage
CVA	Bleed	3	4.3
	Infarct	9	13.0
ICSOL	Tuberculoma	5	7.2
	Neurocysticercosis	4	5.8
	Intracerebral Abscess	1	1.4
	Tumor(Neoplastic)	3	4.3
	SDH (Sub Dural Haemorrhage)	1	1.4
	Cerebral Metastasis	1	1.4
Meningitis	Viral	3	4.3
	Tubercular	3	4.3
Other	AV Malformations	2	2.9
	Mesial temporal lobe sclerosis	2	2.9
	Posterior reversible Encephalopathy syndrome(PRES)	2	2.9
	Cortical Venous Thrombosis	6	8.7
	Dyke Davidoff Masson Syndrome	2	2.9
Normal Findings		22	31.9



Discussion

New onset seizures are paroxysmal, abnormal, uncontrolled electrical activity of the brain, that represents the abnormal excessive or synchronous neuronal activity in brain beginning in the adulthood.^[8,9] Adult new onset seizures are usually secondary to underlying pathological process including cerebrovascular accident, CNS infections, intracranial space occupying lesions, high fever, trauma, metabolic disorders, drugs, alcohol withdrawal, electrolyte disturbances, primary and metastatic brain tumors etc.^[4,5] Thus, complete history taking, neurological examination, and systematic evaluation should be done as soon as possible to identify the underlying cause.^[10,11] MRI is preferred for detecting cerebral abnormalities as compared to CT,

The present study entitled “ CO- RELATION OF MRI FINDINGS IN NEW ONSET SEIZURE PATIENTS PRESENTING TO TERTIARY CARE CENTRE” was conducted on 69 patients presenting to tertiary care centre.

Our study revealed 68.1 % of cases had abnormal MRI Brain findings, our study findings were concordant to the findings of Mahmoud MH et al (2021) in which neuroimaging was found to be abnormal in 75% patients.^[12] Olszewska DA et al (2014) reported MRI abnormality in 44% cases with adult onset seizures revealing epileptogenic lesion.^[13] Hakami Tet al (2013) revealed MRI abnormality in 28% cases with first onset seizures in adults.^[14]

New onset seizures in adults were secondary to cerebrovascular accident (both infarct and bleed) in 17.3%. CVA infarct were predominant cause of new onset seizures as compared to CVA bleed and tuberculomas followed by neurocysticercosis were predominant causes among ICSOL, Similarly, Mahmoud MH et al (2021) documented ischemic infarct in 41.76% cases, intracranial hemorrhage in 2.5% and ICSOL in 10% cases. Ho K et al (2013) reported

stroke, post-traumatic, or neoplastic lesions as most common neuroimaging findings in patients with new onset seizures whereas lesions most likely evident on MRI were cortical development malformations, mesial temporal sclerosis, and cavernomas.^[15]

Our study findings were also supported by findings of Shariff EM et al (2017) in which occult cerebrovascular disease (oCVD) are the major cause of adult onset seizures identified on neuroimaging.^[15]

The Mean age of the patients was 37.95 ± 16.2 years and majority belonged to less than 30 years of age. New onset seizures were observed in higher proportions of males (60%) in our study with male: female ratio of 1.5:1. We observed no significant association of neuroimaging abnormality with age and sex ($p > 0.05$). Dam AM et al (1985) in their study observed that 25% of the patients may have their first onset of seizure after 25 years of age.^[16] Similarly, mean age of patients with first onset seizure in a study of Hakami T et al (2013) was 42.2 years with 61% males.^[17] Bharuccho NE et al (2003) also documented there was no significant statistical difference in rate of adult onset seizures between women and men.^[18] Majority of seizures were focal (55%) whereas remaining 45% were Generalised seizures. Kaur S et al (2018) observed increased risk of focal seizures were associated with stroke.⁽¹⁹⁾

Mean systolic and diastolic bloodpressure in patients with seizures was 122.1 ± 16.17 and 79.32 ± 10.48 mmHg respectively. In our study Hypertension was documented in 17% of the patients as per JNC 8th Classification. We have considered $SBP \geq 140$ as Hypertension and correlated with neuroimaging studies. However hypertension, on the other hand, was found in a much larger proportion of patients who had a normal neuroimaging scan. The link of hypertension with new onset seizures have been associated to stroke, as hypertension is a risk factor for CVA which is associated with seizure, severe uncontrolled hypertension may increase the risk of seizures in adults.^[20] Gasparini S et al (2019) reported the role of Renin-angiotensin system as a direct link between hypertension and epilepsy, however, other mechanisms have also been documented. Hypertension related brain lesions reported in the reference study are small vessel disease, large-artery stroke, and PRES which may produce seizures and epilepsy by indirect mechanisms⁽²⁾

Conclusion

There are substantial amount of patients who present with new onset seizure to our study centre, In most cases of new-onset seizures, the seizures are secondary to underlying etiological reasons. The most common causes of new onset seizures in adults in central India. are cerebrovascular accident and intracranial space occupying lesions, predominantly infarct and tuberculoma respectively. MRI is the neuroimaging of choice in new onset seizure. All new onset seizures should have a specific epilepsy protocol for MRI to be done. MRI findings provide an early identification of etiology of the seizures and imply the necessity for long-term anticonvulsant therapy or surgical resection

Bibliography

1. Huff JS, Murr N. Seizure. [Updated 2021 Jul 25]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-Available from: <https://www.ncbi.nlm.nih.gov/books/NBK430765/>
2. Hauser WA, Beghi E. First seizure definitions and worldwide incidence and Epidemiology. 2008 Jan;49:8-12
3. Gavvala JR, Schuele SU. New-onset seizure in adults and adolescents: a review. Jama. 2016 Dec 27;316(24):2657-68
4. Daniel HL. In: Harrison's Principles of Internal Medicine. 19th ed. Kasper DL, Fauci AS, Hauser SL, Longo DL, Jameson JL, Loscalzo J, editors. Vol. 2. USA: McGraw Hill

- Education; 2015. pp. 2542–59
5. Guidelines for epidemiologic studies on epilepsy. Commission on Epidemiology and Prognosis, International League Against Epilepsy. *Epilepsia*. 1993;34:592–6.
 6. Olszewska DA, Costello DJ. Assessment of the usefulness of magnetic resonance brain imaging in patients presenting with acute seizures. *Irish Journal of Medical Science* (1971-). 2014 Dec;183(4):621-4.
 7. King MA, Newton MR, Jackson GD, Fitt GJ, Mitchell LA, SilvapulleMJ, Berkovic SF. Epileptology of the first-seizure presentation: a clinical,electroencephalographic, and magnetic resonance imaging study of 300 consecutive patients. *The Lancet*. 1998 Sep 26;352(9133):1007-11.
 8. TALLIS R, HALL G, CRAIG I, DEAN A. How common are epileptic seizures in old age?. *Age and ageing*. 1991 Nov 1;20(6):442-8.
 9. Scheffer IE, Berkovic S, Capovilla G, Connolly MB, French J, Guilhoto L, Hirsch E, Jain S, Mathern GW, Moshé SL, Nordli DR. ILAE classification of the epilepsies: position paper of the ILAE Commission for Classification and Terminology. *Epilepsia*. 2017 Apr;58(4):512-21.
 10. Cornes SB, Shih T. Evaluation of the patient with spells. *Continuum (Minneap Minn)*. 2011;17(5 neurologic consultation in the hospital):984- 10
 11. Pohlmann-Eden B, Legg KT. Treatment of first seizure in adults. *Epileptology*. 2013;1(1):61-7.
 12. Mahmoud MH, Awad EM, Mohamed AK, Shafik MA. Etiological profile of new-onset seizures among adult Egyptians. *The Egyptian Journal of Neurology, Psychiatry and Neurosurgery*. 2021 Dec;57(1):1-8.
 13. Olszewska DA, Costello DJ. Assessment of the usefulness of magnetic resonance brain imaging in patients presenting with acute seizures. *Irish Journal of Medical Science* (1971-). 2014 Dec;183(4):621-4.
 14. Hakami T, McIntosh A, Todaro M, Lui E, Yerra R, Tan KM, French C, Li S, Desmond P, Matkovic Z, O'Brien TJ. MRI-identified pathology in adults with new-onset seizures. *Neurology*. 2013 Sep 3;81(10):920-7.
 15. Shariff EM, AlKhamis FA. New onset epilepsy in the elderly: clinical, radiological and electroencephalographic features and treatment responses. *Neurosciences Journal*. 2017 Apr 1;22(2):102-6.
 16. Adams SM, Knowles PD. Evaluation of a first seizure. *American family physician*. 2007 May 1;75(9):1342-7.
 17. Hakami T, McIntosh A, Todaro M, Lui E, Yerra R, Tan KM, French C, Li S, Desmond P, Matkovic Z, O'Brien TJ. MRI-identified pathology in adults with new-onset seizures. *Neurology*. 2013 Sep 3;81(10):920-7.
 18. Bharucho NE. Epidemiology of epilepsy in India. *Epilepsia* 2003;44(1):9-11
 19. Kaur S, Garg R, Aggarwal S, Chawla SP, Pal R. Adult onset seizures: Clinical, etiological, and radiological profile. *Journal of family medicine and primary care*. 2018 Jan;7(1):191.
 20. Liu S, Yu W, Lü Y. The causes of new-onset epilepsy and seizures in the elderly. *Neuropsychiatr Dis Treat*. 2016 Jun 17;12:1425-34
 21. Gasparini S, Ferlazzo E, Sueri C, Cianci V, Ascoli M, Cavalli SM, Beghi E, Belcastro V, Bianchi A, Benna P, Cantello R. Hypertension, seizures, And epilepsy: a review on pathophysiology and management.*Neurological Sciences*. 2019 Sep;40(9):