Original Article

A Study on Prevalence of Different Causes of New Onset Seizures in Adults Presenting in a Tertiary Care Hospital with their Neuroimaging and EEG Findings

Basundhara Saha[1], Nirendra Mohan Biswas[2], Pijush Kanti Biswas[3]

Introduction : Seizure patients are challenging to physicians in terms of prompt management need and for determining further follow up plan in accordance with relevant etiology. Early etiological work up of first Seizure presentation in adult age, is backbone for best outcome in these group of patients.

Materials and Methods : This study is an Observational, Descriptive, Cross-sectional, Non-randomized, Single Center Study for a span of one year, over sixty-five adults above eighteen years of age, with first onset of Seizure in adult age, admitted in Medicine and Neurology emergency, at a tertiary care hospital in Kolkata. Cases are evaluated by detailed history, clinical examinations and relevant investigations. The etiological diagnosis is ascertained. Seizure was classified according to International League Against Epilepsy (ILAE), 2017 criteria.

Observation and Results : Middle aged adult male patients between 30-60 years are the most vulnerable Category of people for first onset Seizure at adult age with Generalized Tonic Clonic Seizure (GTCS) is the most common type of Seizure. The most common Seizure etiologies are metabolic derangements, Central Nervous System (CNS) Infection and inflammation and intracerebral SOL. Epileptogenic foci detected by Computerized Tomography (CT) scan of Brain is more frequent presentations in older adults compared to younger counterpart. Correlation between abnormal Neuroimaging and abnormal EEG is strong to reach to an etiological diagnosis.

Conclusion : The usual etiology of new onset Seizures in middle age are Dyselectrolytemia, CNS infection/ inflammation and intracerebral structural lesion. CT Scan brain is a useful investigation in elderly as structural lesion is most common etiology. Abnormal EEG and Neuroimaging has strong correlation to detect the etiology.

[*J Indian Med Assoc* 2023; **121(5):** 19-22]

Key words **: Seizure, Neuroimaging, EEG.**

Seizure patients attending medical departments are challenging to physicians. A variety of factors influence the incidence of seizure. About 5-10% of the population have recorded to have at least one Seizure in lifetime with highest incidence in early childhood and late adulthood amongst which 2 to 3% go on to develop Epilepsy[1]. A first Seizure episode can be terrifying and it immediately raises questions about the underlying cause and immediate prognosis as well as the chances of recurrence. Neuroimaging by Computerized Tomography (CT) scan and MRI as well as EEG along with routine investigations can well dictate diagnosis and prognosis. Although some studies on adult-onset Seizure have been done in India no such study has been recorded in the north-eastern part of the country invoking us a study of this kind.

Department of General Medicine, NRS Medical College and Hospital, Kolkata 700014

[1]MD (General Medicine), Senior Resident

[2]MD (General Medicine), Professor

[3]MD (General Medicine), DM (Cardiology), Associate Professor and Corresponding Author

Received on : 13/05/2022

Accepted on : 22/07/2022

Editor's Comment :

- First onset seizure in adult affects middle age group belonging to 30 to 60 years usually due to Dyselectrolytemia, CNS infection or inflammation, whereas structural brain lesion is the predominant cause in the elderly.

Materials and Methods

It is a single center, Institution based Non randomized, Cross sectional Observational Descriptive Study over 65 patients attending general medicine and Neuromedicine emergency ward at NRS Medical College, Kolkata, India for a duration of one year (April, 2019 to March, 2020). All patients above eighteen years of age with new onset seizure attended to the aforementioned venue included in the study. Patients with first seizure onset earlier before 18 years age and established cases of movement disorder has been excluded from the study. The objectives of our study are to detect etiological causes of first onset seizure above 18 years of age, along with their Neuroimaging, EEG findings and to detect a correlation between Neuroimaging and EEG of these patient population. After proper explanation about the study, informed

consent was taken from the guardians of the patients. Detailed history, clinical examination and relevant investigation done. Classification of Seizure made using International League Against Epilepsy (ILAE), 2017 Guidelines. Lab investigations included Complete Blood Count (CBC), Liver Function Test (LFT), Renal Function Test (RFT), Random Blood Sugar, Serum Electrolytes along with CT scan/MRI brain, EEG, Cerebro Spinal Fluid (CSF) study, Chest X-ray (CXR), ECG, sputum for Acid Fast Bacilli (AFB)/Cartridge Based Nucleic Acid Amplification Test (CBNAAT) etc. Patients were followed up in the indoor till they are stable clinically. Data analyzed with SPSS 18 statistical software. Ethical clearance taken from Institutional Ethics committee of NRS Medical College, Kolkata vides memo no: No/NMC/10024 dated 08/01/2019.

Observations and Results

In our study, out of 65 patients 20(31%) were Female and 45 (69%) were Male. The minimum recorded age of the patients are 18 years and maximum are 93 years. The mean age was 46 years among female and 47.5 years in male and 47 years overall. The most affected age group belongs to the range of 18-30 years comprising 27.69% (n=18, of which 11 are Males and 7 Females) of study population, next affected category is 30-40 age group comprising 20% (n=13, comprising 10 males & 3 females). The other age categories of 40-50, 50-60 and $\geq$ 80 years comprises 10.77% each. As per level of consciousness, GCS score >13 observed in 32.31%, GCS score (8-12) found in 46.15% and GCS $\leq$ 8 detected in 21.54% of cases. Among 14 patients presenting with poor GCS score $\leq$8, six patients (ie, 42.86%) belonged to elderly age group (>60 years) and 5 (ie, 35.71%) patients falls in younger age category (18-30 years). Risk factor for Seizure in the form of old Cerebral Vascular Accident (CVA)/Stroke, recent/remote head injury, Alcohol/substance abuse, past CNS TB/Infection, history of developmental delay in childhood and family history of epilepsy present in 24 (36.92%) and not found in 41(63.08%). In our study majority (63.08%, 41out of 65) of the patient population presented with Generalized Tonic Clonic Seizure (GTCS), followed by Focal Seizure with impaired consciousness in 23.38% cases. Only one patient had generalized Myoclonic Seizure (1.54%). So, 64.62% of the study population presented with generalized and 35.38% cases with Focal Seizure type. Of the total 65 patients, metabolic abnormalities are present in 23.08% (n=15) cases, not found in 79.62% (n=50). Among the metabolically abnormal patient's population 20% (n=3) had Hypoglycemia, 40%(n=6) presented with Dyselectrolytemia, 26.67% (n=4) had Uremia, 13.33% (n=2) presented with Hepatic encephalopathy. Overall, 31 patients underwent Lumber puncture, of which CSF report shows abnormality in 11 (35.48%) cases and normal in 20 patients (64.51%). Abnormal CSF report suggesting viral meningoencephalitis found in 46% (n=5), bacterial meningitis in18% (n=2), Tuberculous Meningitis in 27% (n=3), Aseptic meningitis in 9% (n= 1). All 65 subjects underwent CT scan brain among which MRI Brain also done in 55 cases. CT findings is normal in 44.62% (n=29), abnormal in 55.38% (n=36). The most common CNS lesion on CT scan was infarction in 10.77% followed by ring lesion in 9.23% and intracerebral Hemorrhage in 7.96%. We observed cerebral infarction is causative factor of Seizure in female (15%) but intracerebral hemorrhage and ring lesion are most common findings in male, comprising 11.11% patients at each category. The CT scan in new onset Seizure of elderly patient population revealed Infarction in 28.57%, Gliosis in 19.04% and cerebral atrophy in 14.28%. The breakup of findings in MRI Scan of 55 patients shows Hyperintensities on T2, indicating Demyelination / Inflammation/edema in12.31% followed by infarction in 10.77% and ring lesion in 9.23%. In the female population, hyperintensities on T2 MRI found in 15% and Infarction in 15% whereas among the males intracerebral Hemorrhage, Ring lesion and hyperintensities on T2 found at similar occurrence rate @11% in each of these three types of lesions. EEG was done on 80% patients (n=52) of whom 22 patients has abnormal discharge in EEG but 30 patients have normal presentation. Among 65 patients one female expired due to Acute Demyelinated Encephalomyelitis (ADEM) and two males expired one due to Hemorrhage, another one with CNS infection when undergoing treatment indoor.

We found a strong positive correlation between abnormal EEG and abnormal Neuroimaging with Correlation coefficient of 0.902, (P- Value 0.0138) but almost no correlation found between normal EEG with normal Neuroimaging (Figs 1-4).

Discussion

After analysis we found that Seizure incidence is more common in Male compared to Female in a ratio of 2.25: 1. The majority of patients (41.53%) presented at middle age range (30-60 years) with mean age of the study population being 47 years. These findings corroborate with study by V muralidhar[2]. In our study,

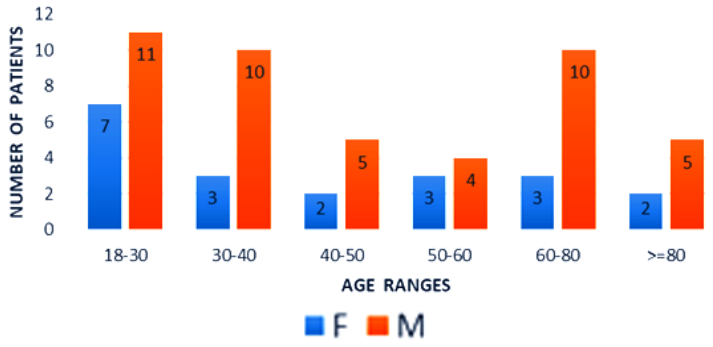

Fig 1 — Age and Sex Distribution of Patients

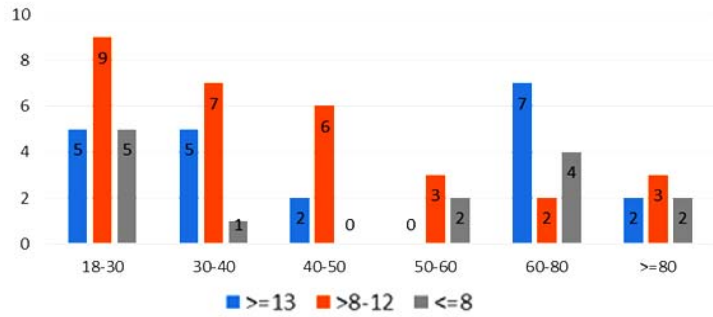

Fig 2 — Age Rangewise Distribution of Gas Scores of the Patients

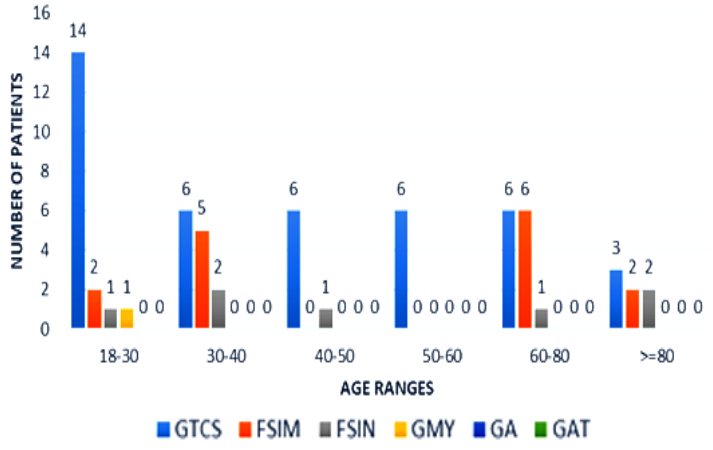

Fig 3 — Age Distribution of Types of Seizure

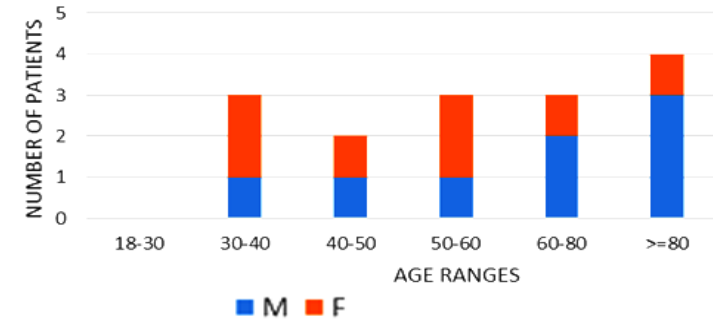

Fig 4 — Age and Sex Distribution of Metabolic Abnormality

majority (46%) of Seizure patients presented with GCS score (8-12). We also observed that most patients with poor GCS score (<8) belonged to elderly age group (≥60 years). Among the multiple risk factor predisposing to seizure most common was Alcohol and substance use, comprising about 12.31% of study population and old CVA is present in 9.23% of patients. We found most common Seizure type to be GTCS (63.08%) followed by Focal Seizure (Motor in type) with impaired consciousness (23.08%) which corroborates with another few studies[3]. In our study status epilepticus occurred in 7.69% patients.

About 23% of patients with adult onset first seizure has metabolic derangement and the most common etiology was Dyselectrolytemia. The most common Central Nervous System (CNS) Infection as detected by CSF study was viral meningoencephalitis followed by Tuberculous Meningitis. The most common CNS lesion detected by CT studies as well as by MRI Brain was infarction and ring lesion, the two Neuroimaging studies corroborated in 75.38% of Seizure patients. Abnormal discharge in EEG found in34% cases. In majority patients EEG report was normal. EEG abnormality was more common in patients with Focal Seizure rather than GTCS patients. Thus, the most common etiology of first Seizure onset at adult age over 18 years were metabolic derangements (16.92%), CNS Infection or Inflammation (15.38%) and intracerebral Space occupying lesion (15.38%), usually ring lesion, tumors and Metastasis. Idiopathic Seizure found in 7.69% patients. The Correlation between abnormal Neuroimaging and abnormal EEG is strongly positive and statistically significant (P -Value = 0.013) but the same is not true in cases of normal Neuroimaging and normal EEG findings.

Limitations of the study : Our study has few constrains in extrapolating our observation to general population as our study population is a small size of convenient patient population attending in a Tertiary Care Centre in Kolkata, West Bengal, India over one year. Reliance has been given on history delivered by lay people and relatives of patients who may not be efficient enough to detect exact episode, prior episode of Seizure, nor able to detect

any manifestation of sensory Seizure. Inability to perform EEG in all patients happened due to huge work pressure of Neuro electrophysiology department.

Conclusion

New onset Seizure in adult is more common in male belonging to middle age group of 30-60 years. Most usual causes are Dyselectrolytemia, Viral meningoencephalitis, CNS infection or Inflammation, Cerebral Infarction and Ring Lesion. CT Scan Brain is the most useful tool of investigation in elderly population to detect an epileptogenic focus as compared to young. CT Scan brain and MRI is nearly had equal value to detect structural lesion in Seizure patients. Abnormal EEG and abnormal Neuroimaging has strong positive correlation to reach to a diagnosis.

Acknowledgement

We acknowledge the participation of students and faculties of postgraduate Medicine and Neurology as well as related laboratory personnel in conducting the study. We hugely acknowledge the immense contribution from the Scholars whose article are cited and included in reference of this manuscript. We are also grateful to Authors, Editors, Publishers of those journal and books from where the article is reviewed and discussed.

Conflict of Interest : Nil

Source of Funding : Nil

Ethical Clearance : Taken from Institutional Ethics Committee vide memo No/NMC/10024 dated 08/01/2019.

References

1 Harrison Principles of Internal Medicine, 20th Edition, Vol 2, 2018.
2 Muralidhar V, Venugopal K — New onset seizures: Etiology and co-relation of clinical features with computerised tomography and electroencephalography. *Journal of the Scientific Society* 2015; **42(2):** 82-7.
3 Kaur S, Garg R, Aggarwal S, Singh SPC, Pal R — Adult-onset seizures: Clinical, etiological, and radiological and radiological profile; *Journal of Family Medicine and Primary Care* 2018; **7(1):** 191-7.
4 Sinha S, Satishchandra P, Kalband BR, Bharath RD, Thennarasu K, — Neuroimaging observation in a cohort of elderly manifesting with new onset seizures: Experience from a university hospital. *Ann Indian Acad Neurol* 2012; **15(4):** 273-80.
5 Amudhan S, Gururaj G, Satishchandra P — Epilepsy in India I: Epidemiology and public health. *Annals of Indian Academy of Neurology* 2015; **18(3):** 263-77.
6 Gavvala JR, Schuele SU — New-Onset Seizure in Adults and Adolescents, A Review. *JAMA* 2016; **316(24):** 2657-68
7 Debicki DB — Electroencephalography after a single unprovoked seizure. *Seizure (European Journal of Epilepsy)* 2017; **49(7):** 69-73.
8 Newton CR, Garcia HH — Epilepsy in poor regions of the world. *The Lancet* 2012; **380(9848):** September 29, 1193-201.
9 Santhosh NS, Sinha S, Satishchandra P — Epilepsy: Indian perspective. *Annals of Indian Academy of Neurology* 2014; **17 (Suppl 1):** S3-S11
10 van Donselaar CA, Schimsheimer RJ, Geerts AT, Declerck AC — Value of the Electroencephalogram in Adult Patients with Untreated Idiopathic First seizures. *Arch Neurology*1992; **49(3):** 231-7.