

Seizure in geriatric population – An unheeded integer

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ABSTRACT

Background: Epilepsy is one of the most prevalent neurological conditions among the elderly. Age-related epileptogenic disorders as well as the ageing itself pose a risk for seizures in the elderly. The lack of witnesses, non-specific symptoms, and transient symptoms make the diagnosis challenging in the elderly. **Aim:** This study aimed to assess the various presentation and aetiology for the seizure disorder in the elderly population. **Materials and Methods:** A total of 125 elderly patients ≥ 60 years with new onset seizure were included in the study. Demographic data, co-morbidities, and clinical presentation of seizure were elicited. Hemogram, liver and renal function tests, random blood sugar, electrolytes, and serum calcium were analysed. Computed tomography (CT), magnetic resonance imaging (MRI) brain, and electroencephalogram (EEG) were performed. **Results:** Seizure was seen predominantly in the males with age group of 60–70 years. Generalized tonic-clonic seizure was the commonest presentation, followed by focal seizures. The leading causes of seizures were cerebral vascular accidents, metabolic conditions, and alcohol. CT brain was abnormal in 49%, and 73% of the patients showed abnormality in MRI brain. EEG was abnormal in 17.3% of patients. Temporal lobe infarction was the commonest, trailed by parieto-temporal and frontal lobe involvement. **Conclusion:** Seizures in the elderly have varied clinical signs and aetiology. An awareness about these atypical presentation and aetiology is essential for the early diagnosis and management to prevent morbidity.

Keywords: CVA, elderly, GTCS, metabolic, seizure

Introduction

After stroke and dementia, epilepsy is one of the most prevalent neurological conditions among the elderly. Geriatric epilepsy comprises new-onset epilepsy in the elderly as well as pre-elderly (60 years old) epilepsy that continues into old life.

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Epilepsy, particularly late-onset epilepsy, has a major negative influence on elderly people's standard of living and places a greater load on societal health resources.^[1] According to a recent survey study, epilepsy affects up to 240 out of every 100,000 senior people aged 65 and older on a yearly average.^[2] Elderly people account for around 25% of cases of newly developing epilepsy.^[3] Age-related epileptogenic disorders as well as the ageing itself pose a risk for seizures in the elderly. Genetic, metabolic, structural, and unknown causes are the main aetiology of the seizure in all age groups. While genetic causes play major role in the young population, structural and metabolic causes play the major role in elderly.^[4]

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It is critical to correctly differentiate between epilepsy and other diseases that affect elderly people often. Elderly people may experience different seizure symptoms from younger ones. The lack of witnesses, non-specific symptoms, and transient symptoms make the diagnosis challenging in the elderly.^[5] Elderly people are prone for several co-morbidities like cardiovascular, renal, and hepatic dysfunction. These co-morbidities complicate the seizure in the elderly in addition to make them prone for adverse effects of the anti-epileptic drugs.^[6] In senior individuals with decreased bone mineral density, seizure condition may result in trauma that results in fracture. Elderly people with seizure disorders may often experience depression, which places a heavy load on family caregivers.^[7] The awareness of these atypical symptoms, secondary aetiology, co-existing co-morbidities, and the burden on the caregivers is essential for the primary care physicians. This knowledge will be useful to make an early diagnosis and management to prevent the morbidity and mortality. This study aimed to assess the various presentation and aetiology for the seizure disorder in the elderly population.

Materials and Methods

This cross-sectional observation study was done at the tertiary care centre in northern Tamil Nadu after obtaining institute ethical approval dated 17 February 2018. A total of 125 elderly patients ≥ 60 years with new onset seizure were included in the study after obtaining written informed consent. Patients with pseudo seizure, < 60 years and not willing for study were excluded for the study. Detailed history regarding demographic data, co-morbidities, and clinical presentation of seizure were elicited. Complete hemogram, renal and liver function test, blood sugar, electrolytes, and serum calcium were measured. Computed tomography (CT) and magnetic resonance imaging (MRI) brain was done. Electroencephalogram (EEG) was obtained in co-operative patients. Lumbar puncture and cerebrospinal fluid analysis was done in patients with suspected central nervous system (CNS) infection. Early post-stroke and late post-stroke seizure are defined as patients with one or more seizures within the first week after the stroke and patients with one unprovoked epileptic seizure at least one week after the stroke, respectively.^[8]

Statistical analysis

The collected data was entered in the Microsoft excel sheet. Statistical analysis was done by using SPSS software version 25 (IBM, USA). Data was represented in frequency and percentage. Descriptive analysis was done.

Results

The new onset seizure disorders in elderly are seen maximum in the age group of 60–70 years and most of them were males. Most of them had either generalized tonic-clonic seizure (GTCS) or focal type of seizure. Eleven of them had status epilepticus and three had myoclonic jerks [Table 1].

In the older age group cerebrovascular accidents (CVAs) are the main cause of seizure and later the seizure continues in the post-stroke period in most of them. In a quarter of individuals metabolic derangements such as hyperglycaemia, hypoglycaemia, and hyponatremia are the cause for seizure occurrence. Hypoxia and central nervous system (CNS) infection are some rare causes of seizure and sometimes the cause is not known. A few of patients develop seizure due to metastasis or consequently to trauma [Table 2].

Only 49% had abnormal CT brain findings and 73% of the study population showed abnormality by MRI brain. ECG was normal in 82.7% of individuals and abnormal only in 17.3% of patients [Table 3]. Of the 44 patients who had CVA-infarction as the cause of seizure, 13 of them had temporal lobe involvement and 9 of them had parieto-temporal involvement. Others had frontal, fronto-temporal, occipital, and parieto-occipital lobe involvement. Two of them had multi-infarct involvement [Table 4].

Discussion

In the present study, the new onset seizure disorders in elderly are seen maximum in the age group of 60–70 years. Parallel

Table 1: Characteristic of the study population

Parameter	Frequency (percentage) n=104
Age in years	
60-70	76 (731.1)
71-80	25 (24)
>81	3 (2.9)
Gender	
Male	71 (68.3)
Female	33 (31.7)
Type of seizures	
Focal	48 (46.2)
GTCS	53 (51)
Myoclonic jerks	3 (2.9)
Status epilepticus	11 (10.6)

Table 2: Aetiology of seizures in the study population

Parameter	Frequency (percentage) n=104
Alcohol	10 (9.6)
Cerebrovascular accident	49 (47.1)
CVA- infarct	44 (42.3)
CVA-Haemorrhage	5 (4.8)
Early post-stroke	13 (26.5)
Late post-stroke	36 (73.4)
Hypoxia	3 (2.9)
Idiopathic	7 (6.7)
CNS infection	3 (2.9)
Metabolic	24 (23.1)
Hyperglycaemia	9 (37.5)
Hypoglycaemia	8 (33.3)
Hyponatremia	7 (29.1)
Metastasis	5 (4.8)
Post-traumatic	3 (2.9)

CVA=Cerebrovascular accident

Table 3: Imaging and EEG findings in the study population

	Normal	Abnormal
CT Brain	53 (51)	51 (49)
MRI Brain	31 (29.8)	73 (70.2)
EEG (n=81)	67 (82.7)	14 (17.3)

CT=computed tomography, MRI=Magnetic resonance imaging, EEG=Electroencephalogram

Table 4: Lobe involvement in patient with CVA-infarction

Lobe involved	Frequency (percentage) n=44
Temporal	13 (29.5)
Parieto-temporal	9 (20.4)
Frontal	6 (13.6)
Fronto-temporal	6 (13.6)
Occipital	4 (9)
Parieto-occipital	4 (9)
Multi-infarct	2 (4.5)

CVA=Cerebrovascular accident

to our study, another group of researchers found that patients over 60 years old are more likely to experience their first seizure.^[9] According to a notable earlier report from USA, the incidence of new-onset epilepsy rises with age from 28 per 100,000 at age 50 to 40 per 100,000 at age 60 and 139 per 100,000 at age 70.^[10] Another study from Finland showed that the incidence of new-onset epilepsy in adults over 60 years of age increases over time.^[11] A study from Rotterdam that covered persons over the age of 55, documented the incidence of epilepsy rose from 7 per 1,000 for those in their 55s to 64s to 12 per 1,000 for those in their 85s to 94s.^[12] On the contrary, a few other studies noted that the incidence of new onset seizures are common in patients around less than 40 years of age.^[13,14] In the present study, most of the participants with the new-onset seizure disorders are the males (68.3%). Previous studies have also reported that new-onset epileptic episodes in the elderly have a slight preponderance to the male.^[13,15]

In the present study, most of the elderly patients presented with GTCS (51%) followed by focal type of seizure (46.2%). Malge *et al.*,^[16] documented that GTCS was the most common type of seizure in both the genders, followed by focal seizure with secondary generalization. Similar other studies have also reported GTCS to be predominant seizure type in the elderly.^[13,17]

The most common cause of epilepsy in our study is CVAs (47.1%) followed by metabolic causes (23.1%), followed by idiopathic, metastasis, trauma, and CNS infections. In patients with CVAs, it was mainly a cerebral infarct followed by haemorrhage. Kaur *et al.*,^[13] in his study reported that stroke was the most common cause (23%) of seizures, followed by idiopathic (22%), CNS infections (21%), metabolic (12%), brain tumours (8%), encephalomalacia with gliosis (7%), and cortical venous thrombosis (4%). Similar other studies have also pointed out the stroke as the most common aetiology for the seizures in elderly.^[18,19] Another study reported the most common cause to be CVA-infarct (34.5%), followed by hypoglycaemia (10.3%) and

hyponatremia (10.3%).^[16] In general, epilepsy can happen at the same time as a stroke, just after one, or it might be a first sign of a cerebrovascular disease and the chance of having epilepsy rises 20 times in the first year following a stroke.^[20] The likelihood of developing epilepsy is highly correlated with the quantity of lesions and the size of the stroke location. The primary causes of epilepsy include mechanical stimulation of a stroke lesion, nerve cell senescence, gliosis around the lesion, and the development of glial scar tissue.^[21]

Seizures are frequently accompanied by changes in metabolic homeostasis, which may also be the solitary sign of electrolyte abnormalities. Because of their numerous comorbid conditions and polypharmacy, older people frequently have acute metabolic problems. In the present study, in a quarter of individuals metabolic derangements, hyperglycaemia (37.5%), hypoglycaemia (33.3%), and hyponatremia (29.1%) are the causes for seizure occurrence. The likelihood of seizures increases when the metabolic disturbance grows more quickly.^[3] Malge *et al.*,^[16] reported hypoglycaemia and hyponatremia as the second common causes of seizure following stroke. A similar other study reported hypocalcaemia followed by hypoglycaemia and hyponatremia to be the metabolic causes of seizures in elderly.^[9] Neuronal excitability and synchronisation are affected both directly and indirectly by changes in electrolyte gradients across cellular membranes, and the resulting aberrant neuronal discharge may support epileptiform activity.^[22]

One-third to one-half of geriatric epilepsies still have unidentified causes, even though certain new-onset epilepsies in the elderly have recognised aetiology. In the present study, 6.7% of the seizures are of idiopathic origin. In individuals with unidentified reasons, immune factors may be possible culprits. The immunological origin of the novo new-onset refractory SE is highlighted by a recent study done in USA on elderly patients in different critical care unit.^[23] In the present study, metastasis contributed to about 4.85% of the epileptic aetiology. Both primary tumours and brain metastases have a role in epilepsy in the elderly. Lungs, bladder, pancreas, oesophagus, liver, breast, uterus, and colon are common sites of primary brain metastases. Compared with patients with well-differentiated tumours, individuals with poorly differentiated tumours are more likely to experience seizures.^[24]

In the present study, trauma and infections contributed to around 2.9% of the new-onset seizures in the elderly. People over 65 are at an increased risk for developing post-traumatic epilepsy because they are more prone to fall and suffer major injuries, such as head trauma. Penetrating wounds, severity of the wound, biparietal or multiple contusions, cerebral bleeding, temporal or frontal location of the lesion, and skull fracture are risk factors for post-traumatic epilepsy.^[21,25] A study has reported Apo E allele to the risk of post-traumatic epilepsy.^[26] Previous studies have documented that CNS TB (42.8%) was the most prevalent CNS illness that led to seizures, followed by neurocysticercosis (28.5%) and viral meningoencephalitis (14.3%). Pyogenic meningitis,

brain abscesses, and cerebral malaria were less frequent CNS illnesses.^[19] A Mexican study reported CNS neurocysticercosis infection to be the most common cause for seizure in elderly.^[27]

In the present study, only 49% had abnormal CT brain findings and 73% of the patients showed abnormality in MRI brain. In a study done by Sinha *et al.*,^[28] CT head was normal in 40.7% of the cases. Kaur *et al.*,^[13] reported CT findings to be normal in 30% of the patients. The abnormal CT findings reported by these authors are mostly infarct (16%), followed by ring enhancing lesions, tuberculoma, brain tumour, intracranial haemorrhage, and brain abscess. Sinha *et al.*,^[28] documented the abnormal CT findings were infarct (22%), diffuse oedema (10%), intracranial hemorrhage (9%), tumours (7%), calcified granuloma (5%), neurocysticercosis (3%), and brain atrophy (3%). In the study done by Kaur *et al.*,^[13] reported normal MRI in 30% of the patients; the abnormal findings in the rest were mostly infarct followed by tumour. Sinha *et al.*,^[28] reported MRI brain to be normal in 44.2% of the patients; the abnormality observed in the remaining patients were mostly infarcts followed by haemorrhage. In the present study, EEG was normal in 82.7% of individuals and abnormal only in 17.3% of patients. In an Egyptian study, EEG detected abnormality among 37.5% of the cohort; 19.1% of the patients had epileptiform EEG activity (spikes and sharp waves), whereas 18.3% had non-epileptiform activity (cerebral slowing).^[9] Another study reported abnormal EEG in 37% of their cohort.^[29]

In the present study, of the 44 patients who had CVA infarct as the cause of seizure, 13 of them had temporal lobe involvement and 9 of them had parieto-temporal involvement. Others had frontal, fronto-temporal, occipital and parieto-occipital lobe involvement. Two of them had multi-infarct involvement. Studies have shown that temporal lobe is the most epileptogenic regions of the brain, in particular, large events involving the middle and superior temporal gyri are linked to the onset of late seizures; this is followed by the involvement of frontal lobe.^[30] Another study has shown that following a CVA, the area supplied by the middle cerebral artery, that includes the frontal and parietal lobes, is the commonly involved region in the post-stroke epilepsy.^[31] A similar study revealed that comparing to other structures, the parietal lobe showed a significantly greater risk of infarction in post-stroke epileptic episodes.^[32] Global hypoperfusion as well as localised ischemia can trigger seizure activity. The hippocampus, which is a particularly epileptogenic region, is highly susceptible to ischemia injury.^[33] Studies have also shown that on brain MRI of status epilepticus, the thalami and insular cortex frequently show high intensity lesions; as a result, these regions have been theorised to be crucial in the spread of epileptic seizures.^[34,35] Individuals with larger lesions affecting several brain lobes were more likely to experience post-stroke seizures than patients with single lobe involvement. In a study done in a group of 123 individuals, it was found that seizure incidence was highest with bleeding into lobar cortical regions (54%), lowest in a group with basal ganglionic haemorrhage (19%), and non-existent in a group with thalamic haemorrhage.^[36]

Conclusion

Elderly-onset seizures are significant because they are frequently accompanied by secondary causes. Compared to individuals who are younger, the clinical symptoms and causes are different. The presenting seizures can be treated appropriately if the cause is correctly determined by history gathering, clinical examinations, and appropriate investigations, thereby minimising the morbidity and death.

Key points

1. Seizure was seen predominantly in the age group of 60-70 years.
2. Males were commonly affected.
3. GTCS was the commonest presentation.
4. Cerebral vascular accident (CVA) was the major cause of seizure in elderly.
5. Temporal lobe infarction was the commonly seen infarct among patients with seizure.

Take home message

Seizure is common elderly with atypical presentation and varied aetiology different from the adults.

Author contributions

NN: Conceptualization, Investigation, Resources, Methodology; SS: Conceptualization, Investigation, Resources, Methodology; AM: Conceptualization, Investigation, Resources, Methodology; AG: Conceptualization, Investigation, Resources, Writing- Original draft preparation; AK: Conceptualization, Methodology, Data Curation, Writing - Original Draft. JG: Conceptualization, Methodology, Investigation, Resources, Data Curation; KSR: Methodology, Investigation, Resources, Data Curation; VS: Data Curation, Writing- Original draft preparation, Review & Editing, Supervision

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Conflicts of interest

There are no conflicts of interest.

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