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Aetiology and Clinical Profile of Patients Aged ≥30 Years with Seizures

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Abstract

Background: Seizures are the common neurological disorders found throughout the world and are routinely encountered in the clinical practice. The aim of this study was to evaluate the aetiology of seizures in patients aged ≥30 years of age and also to evaluate the clinical profile of seizures.

Methods: The present observational study was conducted in the Postgraduate Department of Medicine at SMHS Hospital, an associated hospital of Govt. Medical College Srinagar over a period of two years. Patients who aged ≥30 years presenting as first time seizures were enrolled for the study. Informed consent was taken from all patients. Data was analysed for aetiology and clinical profile of seizures.

Results: Two hundred two patients were included in this study, 55.9% were males. The mean age of patients was 52.0±15.51 years and 32.2% of patients belonged to age group of 60-74 years. In this study common causes of seizures were vascular (36.1%), infectious (20.8%), idiopathic (17.8%) and metastatic (14.4%). The commonest seizure type was GTCS (55%) followed by focal with secondary generalization (26.7%). EEG was normal in 55.4% patients and abnormal in 44.6% patients. CT was abnormal in 58.9%) patients whereas MRI was abnormal in 72.3% patients.

Conclusion: This study shows that vascular causes, infections, idiopathic and metastatic causes are leading causes of seizures. The commonest type of seizure is primary generalized seizures followed by focal with secondary generalization. MRI is the investigation of choice for determining the cause of seizures.

Keywords: Seizures, vascular, metastatic, generalized, focal.

Introduction

Seizures are the common neurological disorder found throughout the world and are routinely encountered in the clinical practice. Epilepsy is the fourth most common non-traumatic neurologic disorder in the United States, following only by migraine, cerebrovascular disease, and Alzheimer disease in prevalence.[1] A *seizure* (from the Latin *sacire*, "to take possession of") is a paroxysmal event due to abnormal excessive or synchronous neuronal activity in the brain.[2] An epileptic seizure is a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain[3] or an episode of neurologic dysfunction in which abnormal neuronal firing is manifest clinically by changes in motor control, sensory perception, behavior, or autonomic

function.[4] A seizure may be convulsive when associated with motor manifestations or may manifest as neurological dysfunction such as sensory, cognitive or emotional disturbance.

Epilepsy by definition is recurrent spontaneous seizures. Epilepsy must begin with first seizures but not all first seizures mean the beginning of epilepsy. Three-fourths of persons with an isolated seizure never have another[5]. The life time chance of epilepsy is 3%[6]. International League Against Epilepsy (ILAE) has modified the definition of epilepsy in 2014 as at least two unprovoked seizures occurring more than 24 hours apart; One unprovoked seizure and a probability of further seizures similar to the general recurrence risk after two unprovoked seizures, occurring in the next 10 years or diagnosis of an epilepsy syndrome.[7] There are 50 million people living with epilepsy worldwide, and most of them reside in developing countries.[8] According to the world health organization (WHO), of the 50 million people with epilepsy worldwide, 80% reside in the developing countries.[9] The annual incidence of epilepsy in the U.S. ranges between 15 and 71 per 100,000 person-years[10]. Annually approximately 150,000 adults will present with a first seizure in the United State.[11] However in the developing countries, given the high incidence of epilepsy, the prevalence is relatively low, which may be due to poor prognosis and high mortality for people with epilepsy.[9,12] Poor prognosis is because of the treatment gap due to lack of knowledge of antiepileptic drugs, poverty, cultural beliefs, stigma, poor health infrastructure and shortage of trained professionals.[3]Seizures are classified according to the international league against epilepsy (ILAE) commission on classification and terminology, 2005-2009 updated approach to classification of seizures.[13]

1. Focal seizures

Motor

Sensory

Autonomic

Cognitive

2. Generalized seizures

a. Absence

Typical

Atypical

b. Tonic-clonic

c. Clonic

d. Tonic

e. Atonic

f. Myoclonic

3. Unclear

Brain imaging is the important tool in the investigations of seizures. It provides the vital information about the structural abnormalities of the brain that can be the cause of the seizure activity.

Computed tomography (CT) can generate excellent hard tissue imaging contrast with moderately good soft tissue resolution. CT scan has advantages of cost effectiveness, speedy scan, ready accessibility, which makes it a reliable imaging modality in most of the patients. However disadvantages of CT scan include exposure to the ionizing radiations and lesser sensitivity than Magnetic resonance imaging (MRI). The sensitivity of CT scan is no more than 30 % in unselected population[14].

Magnetic resonance imaging (MRI) is the imaging procedure of choice in the investigation of patients with epilepsy. It is more sensitive than CT scan particularly in detection of early disease. MRI has many advantages over CT scan notably use of non-ionizing radiations, superior soft tissue definition, better resolution and lesion characterization even without the use of contrast, images

can be taken in any plain, use of different sequences to allow detailed analysis of any pathology. However, MRI is expensive, lesser availability, time consuming, image degradation by motion and cannot be done in patients having metallic foreign bodies that can get magnetized like pacemakers, prosthesis, bullet and in claustrophobia.

Aims and Objectives

The aim of the study was to:

- Evaluate the etiology of seizures in patients aged ≥ 30 years of age.
- Evaluate the clinical profile of seizures in patients aged ≥ 30 years of age.

Materials and Methods

An observational study was conducted in the Postgraduate Department of Medicine at S.M.H.S Hospital, an associated hospital of Government Medical College Srinagar over a period of two years. 202 consecutive patients of new onset seizures meeting the inclusion and exclusion criteria were taken for the study.

Inclusion criteria

1. Patients presented with first time seizures.
2. Age equal or more than 30 years.

Exclusion criteria

1. Seizures in patients of age less than 30 years.
2. Patients who have previous history of seizures or are on treatment.
3. Patients not having seizures.

Informed consent was taken from all patients / attendants who participated in the study, with a consent form signed by all patients / attendants which was written in the language understood by the patients and/or by their attendants.

Patients aged ≥30 years were recruited in the study. Detailed history and examination of all patients was conducted after obtaining an informed consent in the local understandable language.

Routine investigations like complete blood count, kidney function test, liver function test, AST, ALT, serum sodium, serum potassium, serum calcium, serum phosphorous, serum magnesium, blood glucose were done. Electrocardiography, HBsAg, X-ray chest (posterioanterior view), CT scan brain and/or MRI scan brain (plain or contrast enhanced), electroencephalography were done in all patients. Specific investigations were done wherever indicated which included toxicological screening, CSF analysis, Mantoux test, anti-cysticercal antibodies, serum ammonia, herpes simplex virus PCR or any other relevant investigations as deemed necessary by the clinical situation. Seizures were classified according to the International League Against Epilepsy (ILAE) commission as classification and terminology (2005-2009) on updated approach to classification of seizures.[52] Data analysis was done using SPSS 20.0 statistics software (Statistical package for the social sciences) continuous data were summarised as mean and standard deviation. Categorical data were summarised as frequency and percentage.

Observations and Results

We studied 202 patients at GMC and Associated hospitals with adult onset seizures between the ages of 30 years and 88 years, out of which 113 (55.9%) were males and 89 (44.1%) were females.

Table 1:Distribution of the studied population on the basis of gender

	Number of patients	Percentage
Males	113	55.9
Females	89	44.1

Total	**202**	**100.0**

We found 36.6% patients were in the age group of 30-44 years, 24.8% were in the age group of 45-89 years, 32.2% were in the age group of 60-74 years, 6.4% were in the age group of 75-89.

In our study, common causes of seizures were, vascular (36.1%), infections (20.8%), idiopathic (17.8%) and metabolic (14.4%). Other causes include drugs (4.5%), trauma (2%) and tumours (3%).

Table 2: Distribution of the studied population in different age groups

Age (years)	Number of patients	Percent
30- 44	74	36.6
45 – 59	50	24.8
60 – 74	65	32.2
75 – 89	13	6.4
Total	**202**	**100.0**

Table 3:Distribution of etiology of seizures

Etiology	Number of patients	Percentage
Vascular	73	36.1
Metabolic	29	14.4
Trauma	4	2.0
Infections	42	20.8
Drugs	9	4.5
Inflammation	2	1.0
Tumors	6	3.0
Idiopathic	36	17.8
Miscellaneous	1	0.5
Total	**202**	**100.0**

In the age group of 30-44 years, most common cause of seizure was infections in 26 patient and idiopathic in 22 patients, in the age group of 45-59 years infections (12), vascular (12) and idiopathic (10) seizures are common. In the age group of 60-74 years, vascular (42), metabolic (12) seizures are common, and in the age group of 75-80 years, vascular (8) seizures are common.

Table 4:Etiology of seizures in different age groups

Etiology		Age in years				
		30-44	45-59	60-74	75-80	Total
Vascular	N	11	12	42	8	73
	%	15.1	16.5	57.5	10.9	100
Metabolic	N	5	8	12	4	29
	%	17.2	27.6	41.4	13.8	100
Trauma	N	1	2	1	0	4
	%	25	50	25	0	100
Infection	N	26	12	3	1	42
	%	61.9	28.6	7.1	2.4	100
Drugs	N	6	2	1	0	9
	%	66.7	22.2	11.1	0	100
Inflammation	N	2	0	0	0	2
	%	100	0	0	0	100
Tumours	N	0	4	2	0	6
	%	0	66.7	33.3	0	100
Idiopathic	N	22	10	4	0	36
	%	61.1	27.8	11.1	0	100
Miscellaneous	N	1	0	0	0	1
	%	100	0	0	0	100

Infectious seizures include encephalitis (33.3%), tuberculosis (38.1%), bacterial meningitis (19%), neurocystiocercosis (4.8%) and brain abscess (4.8%).

Table 5:Distribution of infectious seizures		
Infections	**Percentage**	**No. of patients**
Encephalitis (n=14)	14	33.30%
Tuberculosis (n=16)	16	38.10%
Bacterial meningitis (n=8)	8	19%
Neurocysticercosis (n=2)	2	4.80%
Brain abscess (n=2)	2	4.80%
Total	**42**	**100**

We found metabolic seizures were due to hypoglycemia (51.7%), hyponatremia (24.1%), hypocalcemia (10.4%), hyperglycemia (6.9%) and uremia (6.9%).

Table 6:Distribution of metabolic seizures		
Metabolic causes	**No. of patients**	**Percentage**
Hypoglycaemia	15	51.7
Hyperglycemia	2	6.9
Hypocalcemia	3	10.4
Hyponatremia	7	24.1
Uremia	2	6.9
Total	29	100

Major seizure type was GTCS (55%), followed by focal with secondary generalized seizure (26.7%). Other types were focal without dyscognitive features (6.4%), focal with dyscognitive features (3%), myoclonic seizures (1.5%), absence seizures (0.5%), epilepsia partialis continua (0.5%), 6.4% of patients had status epilepticus.

Table 7:Distribution of types of seizures		
Type of seizure	**Number of patients**	**Percentage**
Generalized tonic-clonic seizures	111	55
Focal with secondary generalized seizures	54	26.7
Epilepsia partialis continua	1	0.5
Focal with dyscognitive	6	3.0
Absence	1	0.5
Focal without dyscognitive	13	6.4
Myoclonic	3	1.5
Status epilepticus	13	6.4
Total	**202**	**100**

In our study, EEG was normal in 55.4% patients and abnormal in 44.6% patients. EEG abnormalities were spike and wave pattern (13.4%), sharp waves (12.9%), slow waves (2.5%), periodic lateralized epileptiform disorders (2.9%), and diffuse slowing (12.9%).

Table 8: EEG in study population		
EEG	**Frequency**	**Percentage**
Normal	112	55.4
Abnormal	90	44.6
Total	**202**	**100.0**

In our study, CT scan was normal in 41.1% of patients and abnormal in 58.9% patients.

Table 9: CT in study patients		
CT Scan	**Frequency**	**Percentage**
Normal	83	41.1%
Abnormal	119	58.9%

Total	202	100%

In our study, CT scan abnormalities were infarct (15.13%), gliosis (18.49%), intracranial hemorrhage (15.13%), posterior reversible encephalopathy syndrome (PRES) (4.2%), cerebral venous sinus thrombosis (CVST) (5.04%), subdural hematoma (2.52%), extradural haematoma (0.84%), brain abscess (1.68%), neurocysticercosis (1.68%), vasogenic edema (1.68%), tuberculoma (5.88%), basal exudates (0.84%), intracranial space occupying lesion (5.04%) and microvascular ischemic changes (21.85%).

Table 10: CT Scan Findings

CT scan findings	No. of patients	Percentage
Microvascular ischemic changes	26	21.85
Infarct	18	15.13
Gliosis	22	18.49
Intracranial hemorrhage	18	15.13
Posterior reversible encephalopathy syndrome	5	4.2
cerebral venous sinus thrombosis	6	5.04
Subdural hematoma	3	2.52
Extradural hematoma	1	0.84
Abscess	2	1.68
Neurocysticercosis	2	1.68
Vasogenic edema	2	1.68
Tuberculoma	7	5.88
Basal exudates	1	0.84
ICSOL	6	5.04

Abnormal MRI brain findings revealed gliosis, encephalitis (9.3%), tuberculoma (6%), neurocysticerosis (1.3%), abscess (1.3%), meningeal enhancement (8%), basal exudates (4.7%), hydrocephalus (2%), cerebral venous sinus thrombosis (4%), tumour (4%), infarct (12%), posterior reversible encephalopathy syndrome (4.7%), extradural hematoma (0.7%), subdural hematoma (2%) and microvascular ischemic changes (33.3%).

Table 11:MRI findings in study patients

MRI findings	No. of patients	Percentage
Microvascular ischemic changes	50	33.3
Gliosis	23	15.3
Encephalitis	14	9.3
Tuberculoma	9	6
Neurocysticercosis	2	1.3
Abscess	2	1.3
Meningeal enhancement	12	8
Basal exudates	7	4.7
Hydrochephalus	3	2
Cerebral venous sinus thrombosis	6	4
Tumor	6	4
Infarct	18	12
Posterior reversible encephalopathy syndrome	7	4.7
Extradural hematoma	1	0.7
Subdural hematoma	3	2

Table 12:Distribution of etiology and cause of seizures

	Generalized tonic-clonic (n=111)	Focal with secondary generalization (n=54)	Epilepsia partialis continua (n=1)	Focal with dyscognition (n=6)	absence (n=1)	focal without dyscognition (n=13)	myoclonic (n=3)	SE (n=13)
Cerebrovascular (n=73)	31	27	**0**	0	0	12	0	3
Metabolic (n=29)	22	0	1	0	0	1	2	3
Idiopathic (n=36)	24	10	0	0	1	0	0	1
Tumor (n=6)	0	6	0	0	0	0	0	0
Inflammatory (n=2)	2	0	0	0	0	0	0	0
Trauma (n=4)	2	2	0	0	0	0	0	0
Infection (n=42)	22	8	0	6	0	0	0	6s
Drugs (n=9)	8	1	0	0	0	0	0	0
Miscellaneous (n=1)	0	0	0	0	0	0	1	0
Total	**111**	**54**	**1**	**6**	**1**	**13**	**3**	**13**

Figure 1: Saggital sinus thrombosis

Figure 2: Meningioma

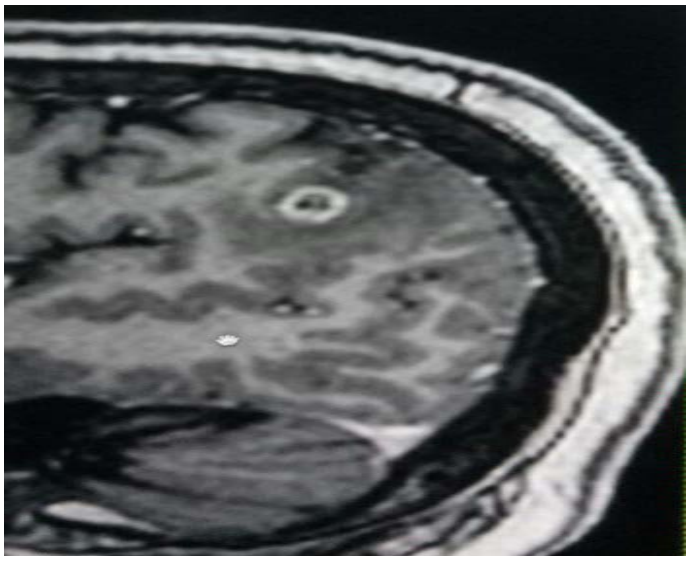

Figure 3 : Neurocysticercosis

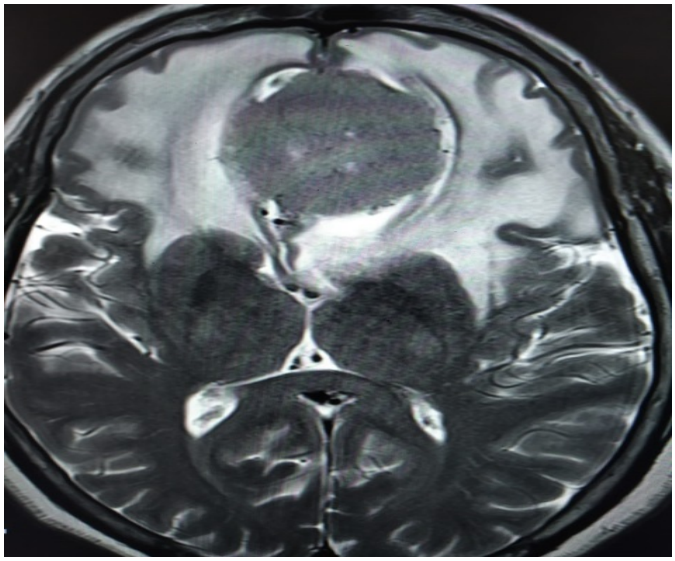

Figure 4: Intracranial space occupying

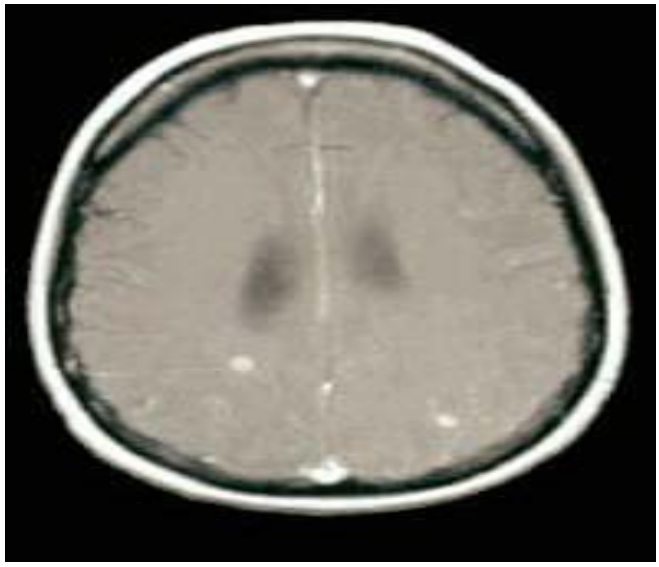

Figure 5 Tuberculoma lesion (GBM

Discussion

We conducted the study in the Department of Medicine of GMC Srinagar and Associated Hospitals to evaluate the etiology and clinical profile of adult onset seizures. We studied total of 202 patients who presented with new onset seizure, patients belonged to the age of above 30 years. Out of 202 patients 113 were males which constituted 55.9% of the study population and 89 were females which constituted 44.1% patients with mean age of 52±15.51. 74 (36.6%) patients belonged to age group of 30-44 years out

of which 34 (30.09%) were males and 40 (44.94%) females. 50 (24.8%) of patients were in the age group of 45-59 years, of which 27 were males and 23 were females which constituted 23.89% of males and 25.84 % of females respectively. Among the study population 65 (32.2%) of patients belonged to age group of 60-74 years out of which 41 (36.28%) were males and 24 (26.97%) were females. 13 (6.4%) patients were in the age group of > 75 years out of which 11 (9.74%) patients were males and 2 (2.25%) patients were females. Our findings were consistent with other studies including study conducted by **Sheikh NA et al**[15] who conducted a hospital based prospective study in Kashmir, India to evaluate the etiological profile of adult onset seizures. They found that out of 144 patients 83 (57.6%) were males and 61 (42.4%) were females with mean age of 48.4±1.33 years in the study population. 55 (38.2%) of patients were ≤ 45 years of age of which 30 (36.1%) were males and 25 (40.9%) were females.

In our study cerebral venous sinus thrombosis (CVST) was found in 6 patients which comprised of 2.97% of study population out of which 4 (1.98%) patients developed CVST in post-partum period and 2 (0.99%) patients had history of exposure to oral contraceptives. 5 patients has seizures due to posterior reversible encephalopathy syndrome (PRES) comprising of 2.47% of total study population and 5 patients were having hypertensive enchephalopathy which constituted 2.47% 0f total study population.

Murthy JMK et al[16] in their study found that 15 out of 526 patients had seizures due to cerebrovascular sinus thrombosis (CVST) which formed 2.85% of study population these results were similar with our study in which 2.97% of patients had seizures due to CVST. **Kaur S et al**[17] found in their study that 4% of seizures were due to cerebral venous thrombosis and 1% seizures are due to posterior reversible enchephalopathy syndrome (PRES).

Quraishi SMS et al[18] evaluated the etiological profile of new onset seizures and found that 2% of the adult onset seizures are due to hypertensive enchephalopathy

Sridhar D et al[19] who studied 100 patients with adult onset seizures found that 1% of patients had seizure due to hypertensive enchephalopathy.

In our study out of 202 patients 42 patients were due to infectious disease of brain which comprised of 20.8% of patients, out of which encephalitis was present in 14 patients which constituted 6.93% of patients, tuberculosis in 16 patients which form 7.92% of patients, bacterial meningitis occurred in 8 patients which make up 3.96% of patients. 2 patients were each due brain abscess and neurocysticercosis comprising 0.99% each.

Our results were consistent with the other studies **Sheikh NA et al**[15] in which out of 144 patients 27 patients were due to infectious disease of brain which constituted 18.7% of patients. They found that in 6.9% of patients seizures were due to encephalitis and 5.6% of patients were due to neurotuberculosis these results were similar to our results.

In our study metabolic seizures occurred in 29 patients which comprised of 14.4% of patients similar results were obtained by **Ashwin T et al**[20] where they found 15% of seizures are due to metabolic abnormalities.

Nine patients in our study had drug induced seizures which make up 4.5% of the study population, most common cause was cocaine use which was present in 3 patients accounting for 1.5%, 1% of patients had seizures due to quinolones, other drug induced seizures were alcohol withdrawal, amphetamines, theophylline and tramadol each accounting for 0.5%. in the study conducted by **Kaur S et al**[17] they found 3% of seizures were due to alcohol withdrawal and **Ashwin T et al**[20]

observed 5% of seizures are due to alcohol withdrawal, studies have shown alcohol related seizures are more common in developed countries **Jallon P, Geneva**[21] 28.9% and EPIMART – **French island**[22] 31.1%.

In our study we found 111 patients had generalized tonic-clonic seizures (GTCS) making up 55% of patients, similar results were observed by other studies **Jaishree T et al**[23] found in their study GTCS occurs in 55% of patients. We found focal with secondary generalized seizures in 26.7% of patients, **Hirani MM et al**[24] observed 18% of patients and **Prakash B et al**[25] found 17% of patients developed focal with secondary generalized seizures. **Hirani MM et al**[24] and **Prakash B et al**[25] observed 8% of patients have seizures without cognitive impairment.

Conclusion

It is mandatory to deal carefully with each case of adult onset seizure with a tailor-made approach. Identification and awareness about the etiological factors and seizure type help in better management of these patients. Comprehensive medical care, education and involvement of patients and care takers about the basic disease and management can help in better outcomes and prevention of some seizures. Primary care physicians play a pivotal role in identifying patients with adult onset seizures and should encourage these patients to undergo neuroimaging so as to arrive at an appropriate etiological diagnosis.

References

1. Hirtz D, Thurman DJ, Gwinn-Hardy K, Mohamed M, Chaudhuri AR, Zalutsky R. How common are the "common" neurologic disorders Neurology 2007; 68: 326–337.

2. Lowenstein DH. Seizures and epilepsy. In: Kasper LD, Braunwald E, Fauci SA, Hauser LS, Longo LD, Jameson LJ. Harrison's Principles of Internal Medicine.18ed, McGraw Hill; 2005: p.2357-62.

3. Fisher RS, Acevedo C, Arzimanoglou A, et al. A practical clinical definition of epilepsy. ILAE official report Epilepsia, 2014; 55(4): 475–482.

4. Toshniwal SP, Jagtap SB, Mohabe VM, Kabara MV. Study of etiology and clinical profile of patients presented with first episode of seizure. MedPulse International Journal of Medicine. February 2017; 1(2): 45-49

5. Chalasani S, Kumar MR. Clinical Profile and Etiological Evaluation of New Onset Seizures after Age 20 years. IOSR Journal of Dental and Medical Sciences, 2015 Feb; Volume 14, Issue 2: PP 97-101.

6. Hauser WA, Annegers JE, Kurland CT et al. Incidence of epilepsy and unprovoked seizures in Rochester, Minnesota. Epilepsia 1993 May-June; 34(3):453-6

7. International league against epilepsy. Definition of epilepsy 2014. (Internet). Available from http:// www.ilae.org/ visitors/ centre/ Definition-2014.cfm

8. Santosh NS, Sinha S and Satishchandra P. Epilepsy Indian perspective. Ann Indian Acad Naurol. 2014 Mar; 17 (suppl 1): S3-S11.

9. Geneva: world health organization; 2006. WHO. Neurological Disorders: Public Health Challenges.

10.Bakaki PM, Koroukian SM, Jackson LW, et al. Defining incident cases of epilepsy in administrative data. Epilepsy Res. 2013; 106: 273-279.

11.Krumholz A, Wiebe S, Gronseth G, Shinnar S, Levisohn P, Ting T, et al. 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 2007; 69(21): 1996–2007.

12.Bharucha NE. Epidemiology of epilepsy in India. Epilepsia 2003; 44 (Suppl 1): 9-11

13.Berg AT, Berkovic SF, Brodie MJ, Buchhalter J, Cross JH, Walter van Emde Boas et al. Revised terminology and concepts for organization of seizures and epilepsies: Report of the ILAE commission on classification and terminology, 2005-2009. Epilepsia 2010; 51 (4): 676-685.

14.Gastaut H, Gastaut JL. Computerized transverse axial tomography in epilepsy. Epilepsia 1976; 17: 325–336.

15.Sheikh NA, Shabnum N, Bhat GA, Kawoosa A, Mushtaq M, Wani MA. Etiological profile of adult onset seizures: a hospital based prospective study from Kashmir, India. Int J Adv Med 2017; 4: 793-8.

16.Murthy JMK, Yangala R. Acute symptomatic seizures-incidence and etiological spectrum: a hospital-based study from South India. Seizure 1999; 8: 162-165.

17.Kaur S, Garg R, Aggarwal S, Chawla SP, Pal R. Adult onset seizures: Clinical, etiological, and radiological profile. J Family Med Prim Care 2018; 7: 191-7.

18.Quraishi SMS, Rani PSU, Prasanthi P, Sudhakar P. Etiological profile of new onset seizures. Journal of Evidence Based Medicine and Healthcare 2015 Oct; Volume 2, Issue 41: Page 7032-7044, DOI: 10.18410/jebmh/2015/960.

19.Sridhar D, Muralidhar L, Raghavender S. Etiological profile of new onset seizures in adults. International Journal of Multidisciplinary Research and Development 2016 Feb; Volume 3; Issue 2: 392-397.

20.Ashwin T, Tumbanatham A, Siva Ranganathan Green, Jaya SK. Clinico-etiological profile of seizures in adults attending a tertiary care hospital. Int J Adv Med. 2017 Apr; 4(2): 490-496.

21.Pierre Jallon, Incidence of First Epileptic Seizures in the Canton of Geneva, Switzerland, Epilepsia, 1997; 38(5): p541-552.

22.Jallon P, Smadja D, Cabre P, Le-Mab G, Bazin M, and EPIMART Group. EPIMART: Prospective incidence study of epileptic seizures in newly referred patients in a French Carribean Island (Martinique). Epilepsia, 1999; 40(8): p1103 – 1109.

23.Narayanan JT, Murthy JMK. New-onset acute symptomatic seizure in a neurological intensive care unit. Neurology India; April-June 2007; Vol. 55; Issue 2.

24.Hirani MM, Shradda. Clinical profile of new onset seizures in adults. Medical Science 2015 May; Volume 5, Issue 5: ISSN - 2249-555X).

25.Prakash B, Arun BJ, Ashok VB, Nagaraj N. New onset seizures an etiological study. Int J Adv Med. 2017 Dec; 4(6): 1532-1536.