

A STUDY OF AETIOLOGY OF SEIZURES

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ABSTRACT

Patients with seizures are commonly encountered by the physicians in the emergency and even in outpatient departments. Our study aimed to know the most common age of onset and most common etiology and the most common types of seizures in adults with newly diagnosed seizures. **Methodology:** Our study was a cross sectional study. Patients aged more than 18 years, presenting with newly diagnosed seizures i.e. who have never had seizures in the past, fulfilling inclusion and exclusion criteria and those who were willing for the study were included. Analysis was done with detailed history, general physical and neurological examination. Further analysis with relevant laboratory investigations, Brain imaging and Electroencephalogram (EEG) was done. Etiology was determined based on data obtained from clinical, laboratory, Brain imaging and EEG. **Results:** Total number of patients studied was 93 with 44 female patients and 49 male patients. Maximum patients were found in the 41-50 years age group followed by 21-30 years. Most common age of onset was 41-50 years in males and 51-60 years in females. Most common etiology was Cerebrovascular accident (CVA) accounting for 47.31% of patients followed by Neuro infection in 23.65%. The most common CVA was Ischemic Stroke followed by cerebral venous sinus thrombosis (CVT), and the most common Neuro infection was Tubercular meningitis followed by viral meningoencephalitis. Other etiologies were Neurodegenerative diseases, space occupying lesions and hyperglycemia. No obvious etiology was found in 7 out of 93 patients. **Conclusion:** Majority of patients were males. Age of onset of new onset seizures was lower in males as compared females. Ischemic stroke was the common etiology in both males and females. Most common seizure type studied was Generalised Tonic Clonic type. Neuroinfections were second common cause of seizure next to cerebrovascular accidents. Neuroinfections were less frequent in patients above 50 years of age.

KEYWORDS: Seizure, Seizure types.

INTRODUCTION

A single seizure can be the first manifestation of epilepsy caused by an underlying brain tumor, a systemic or infectious disease or can be a syndrome that deserves special attention and treatment.^[1,4] Epilepsy is a chronic neurological disease affecting people of all ages.^[2] As per prevalence studies of seizures, an approximate of 5-10% of the total population will have at least one seizure and the highest incidence seen in early childhood and late adulthood.^[5] Since even one seizure is a frightening, traumatic event with serious potential consequences, such as loss of driving privileges, limitations for employment and bodily injury, information about optimal evidence based approaches for evaluating and treating adults presenting with a seizure is important.^[1]

Approximately 50 million people worldwide are living with epilepsy, which makes it one of the world's most common neurological disease.^[6]

Infectious diseases play an important role in seizures and long-term burden causing both new-onset epilepsy and status epilepticus.^[7] Loss of driving privilege is one of the most disruptive social consequences of epilepsy.^[6]

No clinical finding or symptom or a laboratory test is reliable in discriminating between an initial seizure and nonepileptic events and even Serum prolactin level and creatine kinase level cannot be used to diagnose a seizure reliably.^[1]

The lack of knowledge of antiepileptic drugs, poverty, cultural beliefs, stigma, poor health infrastructure and shortage of trained professionals contribute for the treatment gap.^[8]

AIMS AND OBJECTIVES

- To know the most common age of onset and etiology of newly diagnosed seizures in adults.

- To study the types of newly diagnosed seizures in adults.

MATERIALS AND METHODOLOGY

Source of data

This was a cross sectional study carried out with cases admitted in medical emergency wards, intensive care units of Anil Neerukonda Hospital, NRI Institute of medical sciences, Visakhapatnam.

Methods of collection of data

Study design: This study was a cross sectional study

Study period: January 2019 to January 2021

Place of study: Patients admitted in medical emergency wards, intensive care units of Anil Neerukonda Hospital, NRI Institute of medical sciences, Visakhapatnam.

Study population: All the consecutive cases that fulfilled the inclusion and exclusion criteria during the study period were taken (minimum of 50 cases).

Inclusion criteria

- Patients presenting with new onset seizures.
- Age more than 18 years.
- Patients willing for the study.

Exclusion criteria

- Patients with past history of seizures.
- Patients with insufficient clinical data for seizure diagnosis

Methodology

After obtaining ethical clearance and approval from the Institutional Ethics Committee written informed consent was taken from the patients. Aim was to include minimum of 50 patients and during the study period all patients those who fulfilled the inclusion criteria were included in the study. Analysis of patients aged more than 18 years with newly diagnosed seizures was performed. Detailed history and clinical examination was done in all patients.

Patients with insufficient history, those with past history of seizures and those in alcohol withdrawal state were excluded. Routine investigations like Complete blood counts, ESR, Random blood sugar, Renal function tests, Liver function tests, complete urine examination, Electrocardiograph were done in all patients.

Specific investigations like Serum calcium, serum magnesium, chest X-Ray, serum homocysteine levels, serum protein C and protein S levels, CSF analysis, CT Brain and MRI Brain scans plain and contrast were done wherever indicated. Electroencephalography was done only in those patients who were hemodynamically stable and co operative for the study. The diagnostic probability was based on the clinical data obtained from the patient charts and the results of the EEG and/or CT/MRI scans. The etiology of seizures was determined on the basis of medical history, neurologic examination, lab

investigations, the EEG recordings and CT/MRI scans.

Sample Size Estimation

Formula used is

$$4pq \div d^2$$

- p- is prevalence i.e 37 (taken from latest Indian prevalence study)
- q- is (100-p)=63.
- d- absolute precision.-10.
- $4 \times 37 \times 63 \div 10 \times 10 = 93$.
- Sample size derived is 93

RESULTS

This was a cross sectional study aimed to know the most common age of onset, the most common etiology and also to know the various types of seizures in patients presenting with new onset seizures. Total numbers of patients studied were 93 with 44 female patients and 49 male patients. After analysis majority of study subjects were males constituting 53% of total, and females were 47%. Most common age of onset was 41-50 years in males and 51-60 years in females. Most common etiology was Cerebrovascular accident in both genders and Generalised tonic clonic seizure being the most common seizure type in the study subjects.

Table 1: Illustrating gender distribution in study subjects.

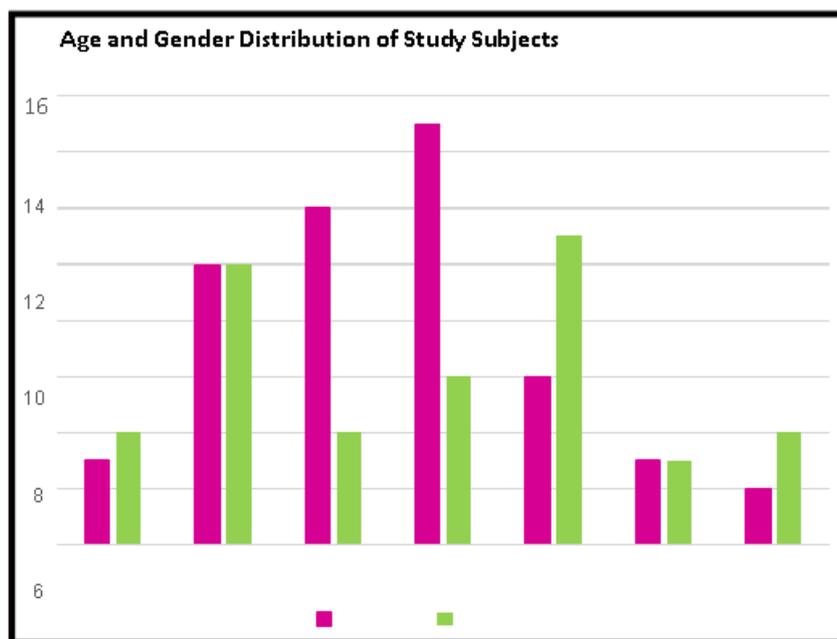
Gender	Number	Percentage
Males	49	53%
Females	44	47%

In our study of total 93 cases, 49 were males who constituted 53% and 44 were females who constituted 47%

Table 2: Table showing the number of patients with Co morbidities.

	Patients with Co morbidities	Patients without Co morbidities
Males	20	29
Females	24	20
Total	44	49

Out of 93 patients 44 were females and 49 were males. 20 males and 24 females had previous co morbidities. Among the co morbid illnesses of the study subjects, Hypertension, Type 2 Diabetes mellitus, Ischemic heart disease and chronic kidney disease were among the most common illnesses followed by Pulmonary Tuberculosis, hypothyroidism, anemia and others.



Graph 1: Graph showing age and gender distribution in study subjects.

In our study the most common age of onset was 41-50 years age group in males the mean age of onset being 42 years and in females the most common age of onset was

51-60 years age group and the mean age of onset was 44.52 years.

Table 2: Table showing patients with underlying etiology of seizures and those with cryptogenic seizures.

Males	Females	Total	Percentage	
Acute symptomatic seizures(with an immediate underlying cause)	43	43	86	92.47%
Cryptogenic seizures	6	1	7	7.53%
Total	49	44	93	100%

Among total number of patients 92.47% had acute symptomatic seizures and 7.53% had cryptogenic seizures.

Table 3: Illustrating various Etiologies of seizures in the study group.

Etiology	Number of cases	Percentage
1.Cerebro Vascular Accidents	44	47.31%
Infarct(Ischemic stroke)	21	47.72%
Intra cranial Hemorrhage (ICH)(Hemorrhagic stroke)	5	11.36%
Cerebral venous sinus thrombosis(CVT)	17	38.63%
Hypertensive Encephalopathy	1	2.27%
2.Neuro Infections	22	23.65%
Viral meningoencephalitis	6	27.27%
TB meningitis/Tuberculoma	7	31.81%
Cryptococcal meningitis	3	13.63%
Neurocysticercosis	5	22.72%
CNS Toxoplasmosis	1	4.54%
3.Space Occupying Lesions	9	10.75%
Gliososis	3	40%
Meningiomas	1	10%
Calcified Granulomas	5	50%
4.Metabolic	2	2.15%
Hypoglycemia	0	0%
Hyperglycemia (hyperosmolar non-ketotic coma)	2	100%
5.Degenerative	7	7.53%

Diffuse Cerebral Atrophy	7	100%
6.Hypoxic Ischemic Encephalopathy	1	1.07%
7. Poisonings	1	1.07%
8. Cryptogenic	7	7.53% %
TOTAL	93	

In our study of 93 patients the most common cause of seizure was cerebrovascular accident which comprised about 47.31%, followed by neuroinfections 23.65%, and space occupying lesions in 10.75%.

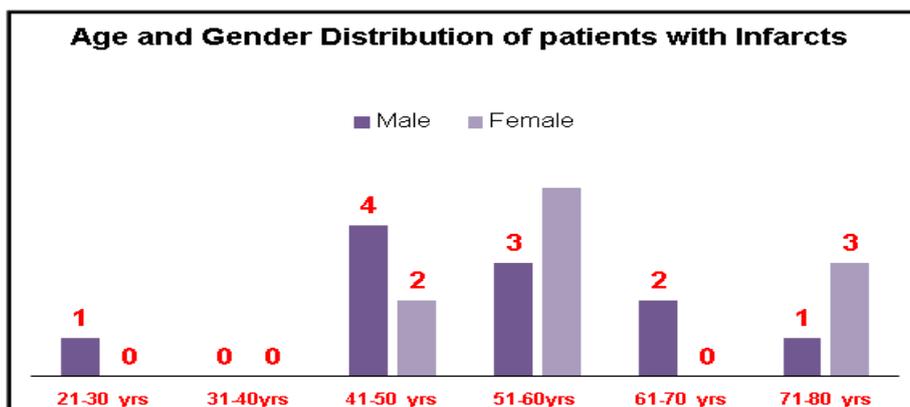
No obvious cause of seizure was found in 7.53% of cases hence called as cryptogenic.

Table 4: Showing different seizure distribution among study subjects.

Type of seizure	Percentage
1. Generalized tonic clonic type	67%
2. Focal seizure	20%
3. Focal with secondary generalization	11%
4. Status epilepticus	2%

In our study of 93 patients, major type of seizure observed was generalized tonic clonic type in about 67% of study subjects followed by focal seizures in 20%, and

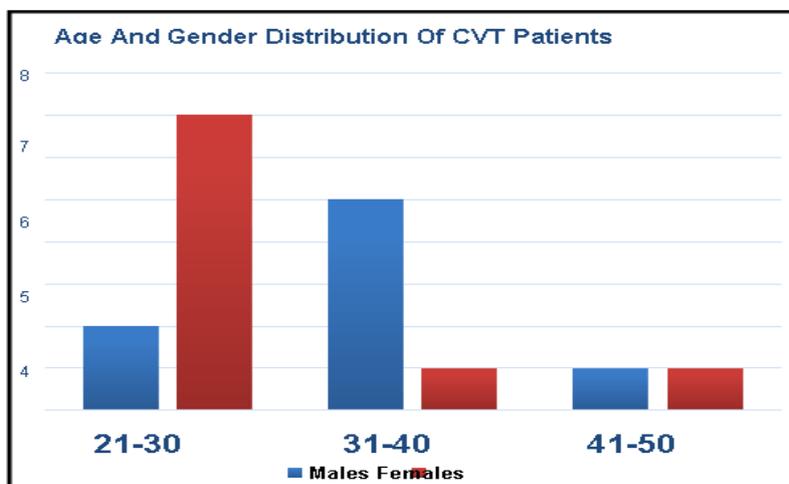
focal with secondary generalization in 11% and status epilepticus in 2%.



Graph 2: Graph illustrating age and gender distribution among patients with various Cerebrovascular accidents.

Age and gender analysis of patients with seizures due to cerebral infarct showed the most common age of onset to be 41-50 years in males and 51-60 years in females.

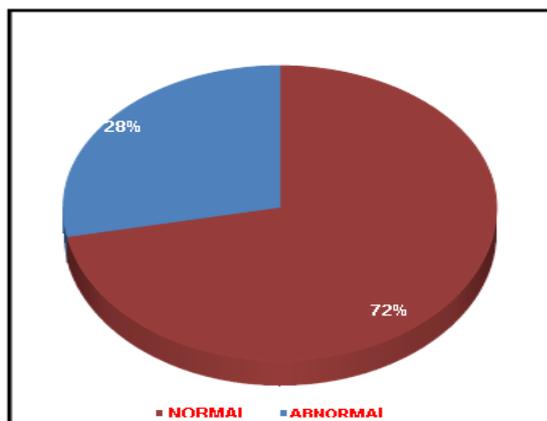
Mean age of onset was 48.5 yrs in males and 61 yrs in females.



Graph 3: Graph showing age and gender distribution among patients with Cerebral Venous sinus thrombosis.

In our study all patients with CVT were below 50 years. The most common age of onset of CVT was 31-40yrs in males and 21-30yrs in females with female predominance below 30 years and male predominance above 30 years.

Analysis of EEG studies of 56 patients showed abnormality in 15 patients. Rest of the EEGs showed normal study.



Graph 4: Graph showing results of EEG Analysis.

Table 5: Table illustrating frequency of CT/MRI Brain findings in patients with different Seizure types.

CT/MRI FINDINGS	GTCS	Focal	Focal with sec Generalization	Status epilepticus
Infarcts	10	6	4	1
Intra cerebral Hemorrhage	2	2	1	0
Cerebral venous sinus thrombosis	7	7	3	0
Hypertensive Encephalopathy	1	0	0	0
Meningiomas	1	0	0	0
Gliosis	2	2	0	0
TB Meningitis/Tuberculoma	6	1	0	0
Cryptococcoma	3	0	0	0
Neurocysticercosis	3	1	1	0
Degenerative	7	0	0	0
Hypoxic ischemic encephalopathy(HIE)	1	0	0	0
CNS Toxoplasmosis	1	0	0	0
Total	48	19	10	1
No imaging abnormality was detected in 15 patients				

Imaging was done in all 93 patients. Imaging Abnormalities were seen in 78 study subjects and no imaging abnormalities were seen in 15 patients.

Table 6: Table shows comparison of demographic and clinical variables with types of seizures.

Variables	GTCS N=62	Focal N=19	Focal with sec generalisation N=10	Status epilepticus N=2	p-value
Age	40(18-80)	45(23-80)	45(26-55)	57.5(50-65)	0.3428
Gender M/F	32/30	13/6	3/7	1/1	0.263
Comorbidity Y/N	24/38	9/10	4/6	2/0	0.3505
CT/MRI- NORMAL/NO T NORMAL	6/56	0/19	0/10	0/2	0.3608
HB	11.74±1.95	13.02±3.05	11.7±2.61	13.2±0.78	0.16
WBC	9720(1400-29000)	8600(1640-18700)	11500(5200-18400)	13300(10700-15900)	0.3375
PLATELETS	219000(14000-680000)	244000(84000-244000)	238500(112000-361000)	367500(291000-444000)	0.1374
S. SODIUM	134.74±4.35	135.42±4.46	136.3±4.2	135.5±0.70	0.728

SERUM POTASSIUM	3.6(2.4-5.6)	3.8(3.3-4.6)	3.5(3.2-4.9)	3.6(2.4-4.7)	0.8316
RBS	112(46-740)	132(15-500)	180(90-300)	138.5(94-183)	0.4956
LFT- normal/abnorm al	56/5	17/2	8/2	1/1	0.2147
ECG- normal/abnorm al	50/11	15/4	8/2	2/0	0.9055
CXR- normal/abnorm al	56/5	18/1	10/0	2/0	0.7609
**EEG - normal/abnorm al	25/8	10/3	6/2	0/2	0.1283

* Data with normal distribution are represented as mean±sd, without normal distribution as median (range) and categorical data as counts.

** EEG- not done N=37 and done N=56. Analysis has been performed for 56 patients.

Results: Data with normal distribution are represented as mean±sd, without normal distribution as median (range) and categorical data as counts. Comparison of demographic and clinical variables showed none of the variables were significantly different among the seizure types.

DISCUSSION

Age of onset and etiology of Seizures.

Our study was a cross sectional study done on 93 subjects. Out of total 93 patients, 49 were males who comprised about 53% of total and 44 were females who comprised about 47%. Maximum number of patients i.e. 21 out of 93 were found in the age group of 41-50 years, followed by 20 patients in 21-30 years age group. Mean age of onset for first seizure was 44 years. In males the most common age of onset was 41-50 years and the mean age of onset being 42 years. In females the most common age of onset was 51-60 years age group and the the mean age of onset was 44.52 years.

Shridhara et al⁹ in their study group of 100 patients found that the mean age of onset was 50 - 59 years in males and 18- 29 years in females. Mukul et al¹⁰ in their study concluded that the mean age of onset of first seizure was 45.56 years. Among total number of patients 92.47% had acute symptomatic seizures and 7.53% had cryptogenic seizures.

In our study of 93 patients the most common cause of seizure was Cerebrovascular Accidents which comprised about (44) 47.31%, followed by Neuroinfections in (22) 23.65%, and space occupying lesions in (9)10.75%, and Degenerative diseases seen in (7) 7.53%, Metabolic

causes i.e Hyperglycemia in (2)2.15% ,poisonings in (1) 1.07% and hypoxic ischemic encephalopathy in (1) 1.07%. No obvious cause of seizure were found in (7) 6.45% of cases hence labelled as cryptogenic. All categories of seizure etiology were seen in both males and females but poisoning and Hypoxic ischemic encephalopathy were seen in females only. Males out numbered females in Cerebrovascular accidents, Neuroinfections, Neuro degenerative diseases and cryptogenic seizures. Females out numbered males in seizures due to hyperglycemia and space occupying lesions.

Toshniwale S P et al,^[11] had studied 100 patients and concluded that Infections were the most common cause of seizures. Shridhara et al,^[9] in study of 100 subjects showed metabolic insults accounted for a large portion of new onset seizures.

Cerebrovascular accidents

In Our study, the major type of CVA were infarcts which accounted for (21) 47.7%, followed by CVT in (17) 38.63%, and intracranial bleeds in (5)11.36%, followed by hypertensive encephalopathy in 2.27%. Among the cerebrovascular accidents the most common CVA in males was cerebral infarct followed by cortical venous sinus thrombosis followed by intracranial bleeds. In females also the most common CVA being cerebral infarct followed by CVT followed by hypertensive encephalopathy followed by intracranial bleed. Age and gender analysis of patients with seizures due to cerebral infarct showed the most common age of onset to be 41-50 years in males and 51-60 years in females. Mean age of onset was 48.5 yrs in males and 61 yrs in females.

Table 7: Comparison of age distribution with other studies.

	Our study	Mukul et al, ^[10]	Chalasani et al, ^[12]
Age group		Number of cases	
21-40 yrs	36	44	46
41-60 yrs	38	30	37
>60 yrs	12	18	15
Total	86	92	98

Neuroinfections

Among Neuroinfections, Tubercular meningitis /tuberculoma was seen in(7) 31.81%, followed by Viral Meningoencephalitis (5) in 27.27%, and Neurocysticercosis in (5)22.72%, cryptococcal meningitis in (3)13.63%, toxoplasmosis seen in (1) 4.54%.

Neuroinfections were one of the common causes and all types of Neuro infections seen below 50 yrs age groups. Neuroinfections were less frequent above 50 yrs. Major type of seizures among all types of Neuroinfections was GTCS type. Focal seizures were seen in

Neurocysticercosis and Tubercular Meningitis patients. One Tubercular meningitis /Tuberculomas were more common in females compared to males. All others were common in males compared to females.

Space occupying lesions

Among space occupying lesions as cause of seizures 5

patients had Calcified granuloma, 3 patients had gliotic changes, 1 patient had meningioma. 6 out of 9 were females. Major type of seizure in meningioma and calcified granuloma were GTCS type and focal seizures were common in gliotic changes. Only patients with gliotic changes had residual neurological deficits

Table 8: Comparison of etiologies with other studies.

Etiology	Our study	Chalasanani et al ¹²	Mukul et al ¹⁰
CVA(Cerebro vascular Accidents)	44	37	17
Neuro infections	22	28	10
SOL	9	14	5
Degenerative	7	0	2
Cryptogenic	7	12	11
Metabolic	2	15	3

Types of Seizures

After analysis of type of seizures, the major type of seizure observed was generalized tonic clonic type in about (62/93) 67% of study subjects followed by focal seizures(19/62) 20% , and focal with secondary generalization in (10/93)11%, and status epilepticus in (2/93)2%. Chalasanani S et al¹² concluded partial seizure to be the predominant seizure type in their study accounting for 46% and GTCS accounting for 44%. Mukul et al¹⁰ concluded that Generalized seizure is most common type seen in 74% of patients.

Among CVA patients GTCS was the most common type of seizure in patients with infarcts. Both GTCS and Focal type of seizures were seen in equal number of cases in ICH and CVT. One patient with multi infarct state presented with Status Epilepticus. Among all types of Neuroinfections GTCS was the most common type of seizure. Focal seizures were seen in Neurocysticercosis and Tubercular Meningitis patients. One elderly female patient with Viral meningoencephalitis presented with status Epilepticus.

Table-9: Comparison of types of Seizures with other studies.

Type of seizure	Our study	Chalasanani et al ¹²	Mukul et al ¹⁰	Beghi .E ⁴
Focal	20%	19.38%	32%	36%
GTCS	67%	43.87%	54%	-
Focal with sec generalisation	11%	36.73%	7%	-
Status epilepticus	2%	0	0	6%
Total	93	98	50	

Brain imaging findings

All 93 patients underwent Brain imaging in the form of CT/MRI, Imaging findings were seen in 78 patients, no imaging abnormalities were seen in 15 patients.

compared to females. First seizures in adults most commonly occurred in age group of 21- 40 years. Most common seizure type of adult onset seizure was partial seizure,

Electroencephalogram

EEG Was done in 56 Patients and was not done in 37 patients. Out of 56 patients 15 patients had abnormal EEG studies. In a study by mukul et al EEG was done in 62% of patients and not done in 38% and EEG was normal in 22% and abnormal in 40 % of patients. Study by Shridhara et al,^[9] showed EEG study normal in 70 patients and abnormal in 30 patients. 2 out of 7 patients with cryptogenic seizures had abnormal EEG study.

Most common cause was CNS infection. Among CNS infections most common cause was Neurocysticercosis. Among cerebrovascular diseases there was no difference between thrombotic or hemorrhagic events.

Breen D P et al,^[13] showed that the Median age of onset was 32 years. Lower socio economic groups were more likely to present with a suspected first seizure, of which majority were provoked by excess alcohol, recreational drugs, or sleep deprivation.

Chalasanani S et al,^[12] in their study concluded that new onset seizures are more common in males when

Toshniwale S P et al,^[12] had studied 100 patients and concluded that GTCS was the most common type of seizure accounted for 63% and focal seizures in 37% cases. Infections (35%) were the most common cause (Neurocysticercosis 14%, Tuberculoma 9%, Others 12%) followed by Vascular causes in 29% of cases. Idiopathic seizures seen in (17%), Metabolic causes in 7%, Alcohol related seizures (11%). Males presented 2.8 times more often than females to the tertiary care hospital as first onset seizure. Peak incidence was seen in 26-45years age group. Major type of seizure was generalized tonic clonic type in about

47.6% followed by focal seizures in about 28.57% and focal with sec generalized in about 19.04%, and status epilepticus in about 4.76%.

CONCLUSION

- Among newly diagnosed seizures in adults, the most common age of onset was 41-50 years age group in males and 51-60 years age group in females.
- In our study of 93 patients with newly diagnosed seizures, majority of patients were Males.
- Mean age of onset was higher in females as compared to males.
- Ischemic stroke was the most common etiology in both males and females.
- Most common neuroinfection observed was Tubercular meningitis followed by viral meningoencephalitis.
- Generalised tonic clonic seizure (GTCS) was the most common type of seizure studied.
- Only 16% of patients showed abnormal EEG study.
- About 92.47% of patients had an underlying identifiable etiology.

SUMMARY

- Patients with seizures are commonly encountered by the physicians in the emergency and even in outpatient departments.
- It is essential to differentiate true seizures from various seizure mimics.
- Along with management of new onset seizures in the emergency it is important to evaluate for the etiology of seizures.
- Our study results showed that New onset seizures in adults were seen in all the age groups between 18-80 years.
- Majority were males.
- About 92.47% of patients had an underlying etiology of seizures.
- Most common type of seizure was generalised tonic clonic type.
- Most common etiologies were cerebrovascular accidents and neuroinfections.

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