

A Study on Clinical and Etiological Factors of New-Onset Seizures in Adults

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Abstract

Introduction: Seizure has been recognized since antiquity and probably as old as man himself. Seizures are common disorders found all over the world and are encountered frequently during medical practice in variety of settings.

Materials and Methods: Patients presenting with a history of seizures were included in the study. Patient and eyewitness were interviewed regarding history, and clinical examination was done as mentioned in pro forma.

Conclusion: Seizure being a medical emergency, its etiological determination is quite important in expediting the management and helping in the prevention of seizures. Etiological spectrums of seizures vary from region to region which includes neuroinfection, CVA, tumor, metabolic, poisoning, and alcohol withdrawal.

Key words: Focal, Hypoglycemia, Seizures

INTRODUCTION

Seizure has been recognized since antiquity and probably as old as man himself. Seizures are common disorders found all over the world and are encountered frequently during medical practice in variety of settings. Although a variety of factors influence the incidence and prevalence of seizures, 5–10% of the population will have at least one seizure, with the highest incidence occurring in early childhood and late adulthood.^[1]

Etiological spectrum of acute symptomatic seizures in developing countries is different from developed countries. At present, central nervous system (CNS) infections such as malaria, meningitis, tuberculosis, HIV, and neurocysticercosis account for significant number of cases in developing countries.^[2] Since these infections vary from region to region, etiology of seizure may also vary from region to region.

Single small enhancing computed tomography lesions (SSECTLs) (ring enhancing/disc lesions, 20 mm in size) are an important cause of seizures in India. Initially, it was thought that SSECTLs were due to tuberculosis, focal encephalitis, microabscesses, and cysticercosis, but now, histopathological studies suggest that in most of the cases, SSECTL is due to dying cysticercus larva.^[3] Hence, etiology itself changes over time.

In Indian subcontinent, cerebral venous thrombosis is common in post-*puerperal* women presents with severe headache, low-grade fever, and seizures.^[4] Focal seizures are more common, but they can generalize to a life-threatening status epilepticus.^[5]

Etiology of seizures can be easily made out in most of the older patients. The causes include subdural hematoma, stroke, CNS infections, and degenerative disorders such as Alzheimer's disease and malignancy which includes malignant gliomas and brain metastases.^[6] In stroke, seizures occur more commonly with hemorrhagic stroke than with ischemic stroke. They also can occur with systemic metabolic conditions such as uremia, hyperglycemia, hypoglycemia, hyponatremia, and alcohol withdrawal.^[6]

Seizures can be presenting feature in tubercular meningitis, which is the most common type of chronic meningitis in

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www.ijss-sn.com

Month of Submission : 11-2018
Month of Peer Review : 12-2018
Month of Acceptance : 12-2018
Month of Publishing : 01-2019

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India. >60% of patients with intracranial tuberculoma may have seizures.^[2]

Hence, this study is done to know the various etiologies of new-onset seizures in adults in this region.

With the advent of modern technologies such as CT scan, magnetic resonance imaging, and cerebrospinal fluid serology for infection such as viral, tubercular, and neurocysticercosis, the diagnosis of seizure has become more accurate and has completely changed the course of management.

Aims of Study

The aims of this study were as follows:

1. To study the clinical and etiological factors of new-onset seizures in patients of Mahatma Gandhi Memorial Hospital, Warangal, located in Northern Telangana which is a tertiary hospital for four districts, that is, Warangal, Karimnagar, Khammam, and Nalgonda constituting urban, rural, and tribal areas.
2. Number of patients considered: 100.

Objective of Study

The objective of this study was to evaluate the cause for new-onset seizures in 100 number of adult inpatients admitted at Mahatma Gandhi Memorial Hospital, Warangal.

MATERIALS AND METHODS

Type of Study

This is a prospective and observational study.

Source of Data

A total of 100 patients admitted with new-onset seizures from the Mahatma Gandhi Memorial hospital attached to Kakatiya Medical College, Warangal, who fulfilled the inclusion and exclusion criteria as mentioned below.

Duration of Study

The study began on January 2016 and ended on October 2017.

Methods of the Collection of Data

Patients presenting with a history of seizures were included in the study. Patient and eyewitness were interviewed regarding history, and clinical examination was done as mentioned in pro forma.

Inclusion Criteria

The following criteria were included in the study:

1. Age of patients more than or equal to 15 years.
2. Patients presenting with new-onset seizures.

New-onset seizure is defined as the first seizure (or the first cluster of seizures within 24 h period) ever experienced by the patient.

Exclusion Criteria

The following criteria were excluded from the study:

- Patient with seizure-like episodes,
- Patients who are known epileptics,
- Patients with a history of drug non-compliance of automated external defibrillators, hyperventilation, TIA, narcolepsy, and movement disorder such as choreoathetosis, tic disorder, and psychogenic seizures,
- Patients not willing to participate in this study.

RESULTS AND OBSERVATIONS

The results of the study are shown in Tables 1-4. Number of cases of the new-onset seizures studied - 100.

In the present study, patient's age ranged from 15 years to 74 years, with mean of 40.51 years. Majority of patients were in the age group of 21–30 years ($n = 29$, 29%) followed by 41–50 years ($n = 19$, 19%). 75% of the patients were in the 2nd–5th decades. 6% of the patients were in the age group of >60 years. Least number of patients are seen in age group >70. Of 100 patients, 56 were male and 44

Table 1: Age and sex distribution

Age in years	Male	Female	Combined
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
≤20	6 (10.7)	3 (6)	9 (9)
21–30	15 (26.8)	14 (31.8)	29 (29)
31–40	11 (19.6)	7 (15.9)	18 (18)
41–50	10 (17.8)	9 (20.45)	19 (19)
51–60	9 (16.1)	8 (18.18)	17 (17)
61–70	4 (7.1)	2 (4.5)	6 (6)
>70	1 (1.7)	1 (2.2)	2 (2)
Total	56 (56)	44 (44)	100 (100)
Mean±SD	44.84±16.15	35.22±15.33	40.51±16.42

Table 2: Etiologies according to sex distribution

Etiology	Male	Female	Combined
	(<i>n</i> =56)	(<i>n</i> =44)	(<i>n</i> =100)
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
Neuroinfection	20 (57)	15 (43)	35 (35)
Cerebrovascular accidents	16 (55)	13 (45)	29 (29)
Metabolic	4 (40)	6 (60)	10 (10)
Idiopathic	4 (57)	3 (43)	7 (7)
Alcohol related	6 (100)	0 (0)	6 (6)
Poisoning	3 (60)	2 (40)	5 (5)
Tumor	3 (75)	1 (25)	4 (4)
Eclampsia	0 (0)	3 (100)	3 (3)
Miscellaneous	1(100)	0 (0)	1 (1)

Table 3: Correlation of etiologies with age group

Etiology	Age in years							Total
	15–20	21–30	31–40	41–50	51–60	61–70	>70	
Neuroinfection	4	14	10	5	2	0	0	35
Cerebrovascular accidents	0	4	3	7	9	5	1	29
Metabolic	1	1	1	5	2	0	0	10
Idiopathic	2	4	1	0	0	0	0	7
Alcohol related	0	0	2	1	2	1	0	6
Poisoning	2	3	0	0	0	0	0	5
Tumor	0	1	0	1	1	0	1	4
Eclampsia	0	2	1	0	0	0	0	3
Miscellaneous	0	0	0	0	1	0	0	1
Total	9	29	18	19	17	6	2	100

Table 4: Etiological spectrum of seizures

Parameters	Sander et al. ^[14] (1990) (%)	Present study (%)
Acute symptomatic seizures	15	89
Idiopathic seizures	62	7
Remote symptomatic seizures	21	4 (post-infarct)

were female, with male-to-female ratio of 1.26:1.0. Majority of males and females were in the 3rd decade.

Neuroinfection is a leading cause of seizure, which accounted for 35% followed by cerebrovascular accidents (29%) and metabolic (10%). In 7% of patients cause is idiopathic (cryptogenic). Alcohol related is 6%, poisoning 5%, tumor 4%, eclampsia related 3%, and post-dialysis 1%.

Among neuroinfection ($n = 35$), majority of seizures were due to neurocysticercosis accounted for 34% followed by meningitis 31% and cerebral malaria 21%. 12% of seizures were due to neurocysticercosis, of which SPECTL was seen in 42%^[5] of NCC patients, multiple healed calcified granulomas in 42%^[5] of patients, and multiple ring-enhancing lesions in 16%^[2] of patients. 15% of seizures were due to CNS tuberculosis. Meningitis accounted for 46.6% followed by tuberculoma 26.6%^[4] and meningoencephalitis 26.6%^[4]

Meningitis accounted for 15% ($n = 15$) of seizures. Tubercular meningitis is the most common meningitis ($n = 9$, 60%) followed by viral 26.6%^[4] and bacterial 13.3%^[2]

Among cerebrovascular accidents ($n = 29$), stroke accounted for 82% (infarct - 14 and hemorrhage - 10) followed by cerebral venous thrombosis 13%^[4] and subarachnoid hemorrhage 1%.

In metabolic seizures ($n = 10$), 50% were due to hypoglycemia.^[5] 5% of cases are poison related, 4% of cases are tumor related, and 7% of cases are idiopathic.

7% of seizures were pregnancy related. (CVT-4 + Eclampsia-3). 6% of cases are alcohol related.

In males ($n = 56$), 35.7% of males had seizures due to neuroinfection. 28.5% of males had seizures due to CVA. 10.7% of males had seizures due to alcohol-related products. 7.1% of males had seizures due to idiopathic cause 7.1% of males had seizures due to metabolic causes. 5.3% of males had seizures due to tumors. 5.3% of males had seizures due to poisoning. Among neuroinfection in males ($n = 20$), majority of seizures due to neurocysticercosis 35% followed by meningitis^[6] and cerebral malaria.^[5] Among CVA in males ($n = 16$), majority of seizures were due to infarct 50% followed by hemorrhage 37.5%.^[6] Among metabolic ($n = 4$), majority are due to hypoglycemia.^[3] In females ($n = 44$), majority of seizures were due to neuroinfection 34%, followed by CVA 29.5%, metabolic 13.6%,^[6] eclampsia 6.8%,^[3] idiopathic 6.8%,^[3] poisoning 4.5%,^[2] and tumors 2.2%.^[1]

Among neuroinfection in females ($n = 15$), majority of seizures due to neurocysticercosis 34%^[5] followed by meningitis^[4] and cerebral malaria.^[3] Among CVA ($n = 13$), majority of seizures were due to infarct 46.1%^[6] followed by hemorrhage 30.7%^[4] and CVT 23%.^[3] All the seizures due to CVT occurred in females, and all were postpartum.

Three cases of pregnancy-related complications like eclampsia causing seizures are seen.

No cases of alcohol-related seizures are seen in females in this study.

GTCS: Generalized tonic-clonic seizures. FWA: Focal seizures with awareness. FWIA: Focal seizures with impaired awareness. SE: Status epilepticus. GA: Generalized absence.

GTCS ($n = 59$) is the most common seizure. The M.C cause for GTCS is neuroinfection (38.9%) followed by CVA (28.8%) and metabolic (6.7%). 35% of FWA is caused by neuroinfection followed by CVA 25%. 55.5% of FWIA

seizures due to CVA followed by neuroinfection (28.5%). 28.5% of SE seizures due to neuroinfection. One patient had FWA due to hypocalcemia. Most of neuroinfection patients presented with GTCS (65.7%). 58.6% of CVA patients presented with GTCS followed by FWA (17.2%). 40% of metabolic seizures were GTCS. 40% of patients of poisoning presented with GTCS. 42.8% of idiopathic seizures were GTCS.

DISCUSSION

Seizures are common disorders found all over the world and are encountered frequently during medical practice in variety of settings. At present, CNS infections such as malaria, meningitis, tuberculosis, HIV, and neurocysticercosis account for significant number of cases in developing countries. Since these infections vary from region to region, etiology of seizure may also vary from region to region. In Indian subcontinent, cerebral venous thrombosis is common in post-puerperal women presents with severe headache, low-grade fever, and seizures. SSECTLs are frequently reported from India. Etiological spectrum of seizures in developing countries is different from developed countries.

Hence, this study on “seizures” was done to know the various etiologies of new-onset seizures in adults in this region. The present study “The clinical and etiological study of new-onset seizures in adults” was carried out in the Mahatma Gandhi Memorial Hospital, Warangal, attached to Kakatiya Medical College, Warangal. 100 cases of new-onset seizures were selected as per the criteria mentioned in the materials and methods. The observations are compared with the studies done by others on the same subject.

Age and Sex Distribution

Etiological spectrum depends on age, sex, geography, and medical setting. Of 100 patients, 56 were male and 44 were female, with male-to-female ratio of 1.26:1.0.

Majority of males and females were in the 3rd decade.

The present study included 100 patients with new-onset seizures as per the criteria mentioned in the materials and methods.

Etiological spectrum depends on age, sex, geography, and medical setting.

In the present study, of 100 patients, 9% of patients were in the age group of 15–19 years, 47% of patients were in the age group of 20–39 years, 36% of patients were in the age group of 40–59 years, and 8% were in the age group of 60 years and above.

The major etiology for seizures seen in the 2nd and 3rd decades was neuroinfections up to 68% and metabolic seizures 50% in the 5th decade. CVA 55% in the 5th and 6th decades, poisonings 60% common in the 2nd decade, and 75% of cerebral sinovenous thrombosis occurred in the 2nd decade.

In a study from the United Kingdom by Sande *et al.* (1990), 25% were below the age of 15 years, 51% in the 3rd–4th decades, and 24% >60 years. Another study from South India (Hyderabad) by Narayanan and Murthy (2007), 36% were >60 years, with mean age of 49 years.

In the present study [Table 4], patient's age ranged from 15 years to 74 years, with mean of 40.51 years. Patients more than or equal to 15 years were included in the study. Majority of patients were in the age group of 21–30 years ($n = 29$, 29%) followed by 41–50 years ($n = 19$, 19%). 78% of the patients were in the age group of 21–60 years. 8% of the patients were in the age group of >60 years. In our study, majority of patients were younger unlike western studies are in older age group.

Mean age was lower (41 years) when compared with the study by Narayanan and Murthy, probably etiological spectrum varies from region to region. All studies were slightly male predominate.

Etiological Spectrum of Seizures

In 15% of cases, acute symptomatic seizures are seen in Sander *et al.* study. In the present study, it is 89%. Idiopathic seizures are 89% in Sander *et al.* study. In the present study, it is 7%. Remote symptomatic seizures are 21% in Sander *et al.* study. In the present study, it is 4%. Other etiologies in the present study are neuroinfection 35%, CVA 29%, metabolic 10%, idiopathic 7%, alcohol related 6%, poisoning 5%, tumor 4%, eclampsia related 4%, and post-dialysis 1%. Idiopathic seizures were the most common seizures in western population unlike acute symptomatic, in the present study, of which neuroinfections are more common.

Etiologies Observed in Various Studies

In the present study [Tables 5-9], neuroinfection is a leading cause of seizure which accounted for 35% followed by cerebrovascular accidents 29% and metabolic 10%. In 7% of patients cause is idiopathic (cryptogenic). Majority of seizures were due to neurocysticercosis accounted for 34% followed by meningitis 31% and cerebral malaria 21%.

Stroke accounted for 82% (infarct - 14 and hemorrhage - 10) followed by cerebral venous thrombosis 13%.^[4] 7% of seizures were pregnancy related. (CVT-4 + Eclampsia-3). In metabolic seizures ($n = 10$), 50% were due to hypoglycemia.^[5]

Neuroinfection occurred in 2% of the patients in Sander *et al.*^[14] study, 15% in Hauser *et al.*, 77% in the study by Murthy and Yangala,^[2] and 32% in a study by Narayanan and Murthy. In our study, etiology is comparable to Indian studies.

SSECTLs (ring enhancing/disc lesions, 20 mm in size) are an important cause of seizures in India. SSECTL accounted for 50% of seizures in a study by Murthy and Yangala.^[2] In our study, it occurred only in 5% of cases [Table 6]. This may be due to regional variation in incidence of neurocysticercosis.

CVA occurred in 15% of the patients in Sander *et al.* study, 18% in Hauser *et al.*, 14% in the study by Murthy and Yangala,^[2] and 21% in a study by Narayanan and Murthy. In our study, CVA occurred in 29%. This is because ischemic was seen in 14% of cases.

Alcohol-related seizures occurred in 9% of the patients in Sander *et al.* study, 11% in Hauser *et al.*, and 6% in our study. Alcohol-related seizures were less common when compared with western studies. Seizures due to alcohol withdrawal were more common than poisoning in the present study. In our study [Table 10],

Table 5: Sander *et al.* (1990) (UK)

Paramters	Percentage (%)
Vascular	15
Tumor	6
Infection	2
Alcohol related	9

Table 6: Murthy and Yangala (1999) (Hyderabad)^[2]

Paramters	Percentage (%)
Neuroinfection	77
Neurocysticercosis	20
CNS tuberculosis	16
Vascular	14
Stroke	11
CVT	3
Metabolic	3
Tumors	7

Table 7: Narayanan and Murthy (2007)

Paramters	Percentage (%)
Neuroinfection	32
Neurocysticercosis	13
Tuberculoma	4.5
Vascular	21
Stroke	18
CVT	3
Metabolic	32
Others	15
Alcohol	9

- 68% of neuroinfection were seen in the 3rd and 4th decades
- 31.1% occurred in the 6th decade, 24.1% of CVA occurred in the 5th decade.
- 51.7% of stroke occurred after 50 years.
- 50% of metabolic seizures occurred in the 5th decade.

Etiological spectrum of seizures in different age group was significantly different in our study when compared to Hauser *et al.* study. Seizures due to neuroinfection were leading cause in the age group of 15–35 years and 35–64 years in our study, whereas alcohol-related seizure in Hauser *et al.* study.

- 40% of metabolic seizures were GTCS.
- 40% of patients of poisoning presented with GTCS.
- 42.8% of idiopathic seizures were GTCS.

One case of FWA due to hypocalcemia occurred in our study.

Table 8: Etiological spectrum of seizures in different age group

Paramters	Hauser <i>et al.</i> ^[13] study (1995) (U.S.A)	Our study
15–35 years	Alcohol related (11%) Head trauma (8%)	Neuroinfection (28%) CVA (7%)
35–64 years	Alcohol related Tumor (13%) Head trauma (5%) Stroke (20%)	Neuroinfection (7%) Stroke (20%) Idiopathic (7%) Alcohol related (6%) Poisoning (5%)
>65 years	Stroke (50%)	CVA (5%)

Table 9: Different types of seizures in various studies

Paramters	Generalized tonic-clonic (%)	Focal with awareness (%)
Sander <i>et al.</i> ^[14]	39	52
Murthy and Yangala ^[2]	22	78
Narayanan and Murthy	55	45
Our study	59	20

Table 10: Present study

Paramters	Percentage (%)
Neuroinfection	35
Cerebrovascular accidents	29
Metabolic	10
Idiopathic	7
Alcohol related	6
Poisoning	5
Tumor	4
Eclampsia	3
Miscellaneous	1

SE occurred in 3% of patient in a study by Murthy and Yangala^[2] and 10% in a study by Narayanan and Murthy. In our study, etiology 7% had SE.

- 35% of patients had neuroinfection-related seizures
- 29% of patients had cerebrovascular accidents related
- 10% of patients had metabolic
- 7% of patients had idiopathic
- 6% of patients had alcohol related
- 5% of patients had poisoning
- 4% of patients had tumor
- 3% of patients had eclampsia-related seizures
- 1% of patients had due to post-dialysis.

In the present study, metabolic abnormality 40% presented as generalized tonic-clonic, 30% as FWA, and 20% as SE. In a study by Murthy and Yangala,^[2] all were (100%) focal to bilateral tonic-clonic.

CONCLUSION

Seizure being a medical emergency, its etiological determination is quite important in expediting the management and helping in the prevention of seizures. Etiological spectrums of seizures vary from region to region which includes neuroinfection, CVA, tumor, metabolic, poisoning, and alcohol withdrawal. Neuroinfection and cerebrovascular accidents accounted for significant number of seizures in all the age groups. Neurocysticercosis is the most common etiology among neuroinfections in new-onset seizures.

Management of seizure is always multimodal which constitutes the treatment of underlying etiology, avoidance of precipitating factors, suppression of recurrent seizures by prophylactic therapy, and addressing a variety of psychological and social issues.

From the present study, on clinical and etiological features of new-onset seizures, the following conclusions were made.

- 93% of seizures were acute symptomatic seizures in which underlying etiologies can be made.
- Majority of seizures occurred in patients <50 years.
- Etiological spectrum of seizures was varied and included neuroinfection, CVA, tumor, metabolic, poisoning, and alcohol withdrawal.
- Neuroinfection and cerebrovascular accidents accounted for significant number of seizures in all the age groups.
- Neurocysticercosis is the most common cause in neuroinfection.

- Cerebral venous thrombosis is an important cause of acute symptomatic seizures among young patients with cerebrovascular diseases.

Summary

This prospective study was done in the MGM Hospital attached to Kakatiya Medical College, Warangal, to know the various etiologies. 100 cases of new-onset seizures who fulfilled the criteria as mentioned in materials and methods were included in the study. Of 100 patients, 56% were male and 44% were female with male-to-female ratio of 1.26:1.0. Majority of males and females were in the 3rd decade. Patient's age ranged from 15 years to 74 years, with mean of 40.51 years, with 75% of the patients were in the <50 years.

Neuroinfection was the leading cause of seizure which accounted for 35% followed by cerebrovascular accidents (29%) and metabolic (10%). In 7% of seizures were idiopathic (cryptogenic). Neurocysticercosis (35%) was the most common cause among neuroinfection followed by meningitis (37.9%) and cerebral malaria (22.8%). 82% of the CVA were due to stroke and 13.7% due to CVT. 50% of metabolic seizures were due to hypoglycemia. 7% of seizures were pregnancy related. In males, majority of seizures were due to neuroinfection (35.7%) followed by CVA (28.5%). Most of idiopathic seizures (57.1%) and all alcohol-related seizures occurred in males. In females, majority of seizures were due to neuroinfection (34%) followed by neuroinfection 28.9%. 6% of seizures were pregnancy related.

Up to the 5th decade, neuroinfection was the most common cause for seizures (33%) followed by CVA (14%). Above 50 years, CVA was the most common cause (15%) followed by metabolic seizures (2%). All CVAs occurring in the 2nd and 3rd decades in females were CVT^[4] and eclampsia.^[3] GTCS was the most common seizure. The most common causes for GTCS were neuroinfection (23%) followed by CVA (17%) and metabolic (4%). 35% of FWA is caused by CVA. 28.5% of SE is caused by metabolic. One patient had FWA due to hypocalcemia. 5% of seizures were GA.

The results of the present study were comparable with studies by Murthy and Yangala^[2] and Narayanan and Murthy.

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Murthy and Palvai: Clinical and Etiological Factors of New-Onset Seizures

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How to cite this article: Murthy PSVR, Palvai K. A Study on Clinical and Etiological Factors of New-Onset Seizures in Adults. *Int J Sci Stud* 2018;6(9):99-105.

Source of Support: Nil, **Conflict of Interest:** None declared.