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Research Article

PROSPECTIVE OBSERVATIONAL STUDY ON INTEGRATING SEIZURE TYPES AND ETIOLOGY FOR EPILEPSY, TREATMENT OUTCOMES

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ABSTRACT

Epilepsy is a chronic neurological disorder characterized by recurrent seizures, and its management often relies on the accurate identification of seizure type and underlying etiology. Understanding how these factors influence treatment outcomes can improve individualized therapeutic strategies. To evaluate the impact of integrating seizure types and etiological classifications on treatment outcomes in patients with epilepsy through a prospective observational study. This study was conducted in the Department of General Medicine at Government General Hospital, Kurnool. A total of 92 patients (57 males and 35 females; mean age 37.5 years) were enrolled and classified according to International League Against Epilepsy (ILAE) guidelines. Clinical profiles, etiologies, treatment regimens, and seizure control were documented and analyzed. Statistical associations between seizure type, etiology, age, and treatment outcome were evaluated. Generalized tonic-clonic seizures were the most frequent type. Major etiologies included idiopathic epilepsy, alcohol-related causes, and cerebrovascular accidents. Favourable outcomes were seen in 73.9% of patients, moderate recovery in 21.7%, and no recovery in 4.3%. A significant association was found between etiology and treatment outcome ($\chi^2 = 27.05$, $p = 0.0076$) and between age and recovery ($t = 4.15$, $p = 0.0078$), whereas seizure type showed no significant correlation with outcome ($p = 0.813$). Etiology and patient age are major determinants of therapeutic success in epilepsy, while seizure type alone does not predict outcomes. Incorporating etiological assessment into clinical decision-making can enhance personalized management and improve treatment effectiveness.

Keywords: Epilepsy, Computed tomography (CT), Etiology, Seizure, Patient age.

INTRODUCTION

Epilepsy is a chronic neurological disorder characterized by recurrent, unprovoked seizures resulting from abnormal electrical activity in the brain. It affects nearly 50 million people worldwide and represents a major health burden due to its medical and social impact. Seizures may cause temporary disturbances in movement, sensation, behavior, or consciousness depending on the brain region involved. Although epilepsy can occur at any age, it is more frequently observed in children and the elderly (Beghi E, 2020). The development of epilepsy is mainly associated with an imbalance between excitatory and inhibitory neuronal activity. Normally, excitatory neurotransmitters such as glutamate are balanced by inhibitory neurotransmitters like gamma-aminobutyric acid (GABA). Disturbance of this balance leads to neuronal hyperexcitability and synchronized firing, which results in seizures (Goel D, 2020). Epilepsy may arise from various causes. Idiopathic epilepsy is often related to genetic factors without identifiable structural abnormalities, whereas symptomatic epilepsy occurs due to conditions such as traumatic brain injury, brain tumors, congenital abnormalities, infections, stroke, or metabolic disorders (Citaristi I, 2022).

According to the International League Against Epilepsy (ILAE), seizures are classified as focal, generalized, or unclassified based on their origin and clinical features. Diagnosis primarily relies on clinical history, electroencephalography (EEG), and neuroimaging techniques such as computed tomography (CT) and magnetic resonance imaging (MRI) (Balestrini S, 2021). Antiepileptic drugs are the main treatment for epilepsy; however, about one-third of patients continue to experience seizures despite therapy. In such cases, alternative

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approaches such as epilepsy surgery, vagus nerve stimulation, and ketogenic diet therapy may be considered. Therefore, this study aims to evaluate the relationship between seizure types, etiological factors, and treatment outcomes in patients with epilepsy (Fisher, 2017).

MATERIALS AND METHODS

This study is prospective observational study and subjects involved are the inpatients and outpatients in government general hospital, Kurnool. The duration of this study takes 6 months; sample size includes 90 to 100.The subjects are based on inclusion and exclusion criteria. The materials used for the study patient data collection forms, ADR reporting forms.

Data selection

In- patients and out- patients of both genders above 14 years of age who are attending the general medicine department and collected data on patients who are diagnosed with epilepsy were selected in this study.

Data collection

All the data of the subjects are collected by using the case proforma after signing the consent forms. The data collection includes the demographic details, chief complaints, past medical history, past medication history, personal habits, allergies, diagnosis, drug chart, drug interactions and adverse drug reactions (DiPiro J. T, 2008).

Statistical analysis

Student T test and Chi – square test

RESULTS AND DISCUSSION

A total of 92 patients were collected in general medicine department includes, 26(28.3%) CVA, 23(25.0%) idiopathic, 18(19.6%) alcoholic, 6(6.5%) trauma, 5(5.4%) genetics, 3 metabolic disorder, 3 infections, 3 thrombosis (15.2%) and others 5 others. A total of 92 patients, 76 males and 16 females. A total of 92 patients, 63 patients are having GTCS type of seizures, 18 patients are having tonic – clonic type of seizures, 6 patients are having tonic type of seizures, & 1 patient are having clonic type of seizures (Rathi H, 2021). A total of 92 patients, the age range of 15 – 20 years 16 patients, 20 – 25 years 10 patients, 25 – 30 years 17 patients, 30 – 35 years 6 patients, 35 – 40 years 13 patients, 40 – 45 years 9 patients, 45 – 50 years 0 patients, 50 – 55 years 12 patients, 55 – 60 years 7 patients, 60 – 65 years 5 patient. The data show clear age differences among various causes of epilepsy. Genetic epilepsy occurs in the youngest patients, with a median age of around 15 years, indicating early onset. In contrast, epilepsy related to cerebrovascular accident (CVA) is seen mainly in older individuals, with a median age of about 52 years. (Babunovska M, 2021).

Alcohol-related epilepsy shows a wider age range with a median age near 37 years. Idiopathic epilepsy also affects a broad age group but centers around a median age of about 25 years. Trauma-related epilepsy typically appears in adults with a median age in the early 40s, while the “other” category has patients around 30 years. Overall, the findings highlight a strong relationship between epilepsy etiology and the age of onset (Peltola J, 2024).

Figure 1. Representation of etiological distribution.

Table 1. Shows etiological distribution of the total study population.

Etiology	Percentage (%)
CVA	28.3
Idiopathic	25.0
Alcohol	19.6
Other	15.2
Trauma	6.5
Genetics	5.4

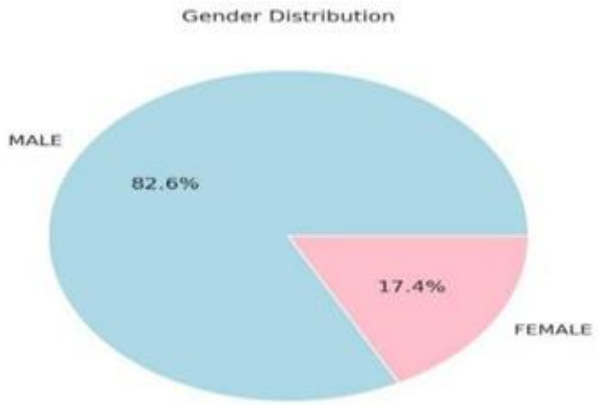

Figure 2. Representation of gender distribution.

Table 2. Shows Gender Distribution.

Gender	Percentage (%)
Male	82.6
Female	17.4

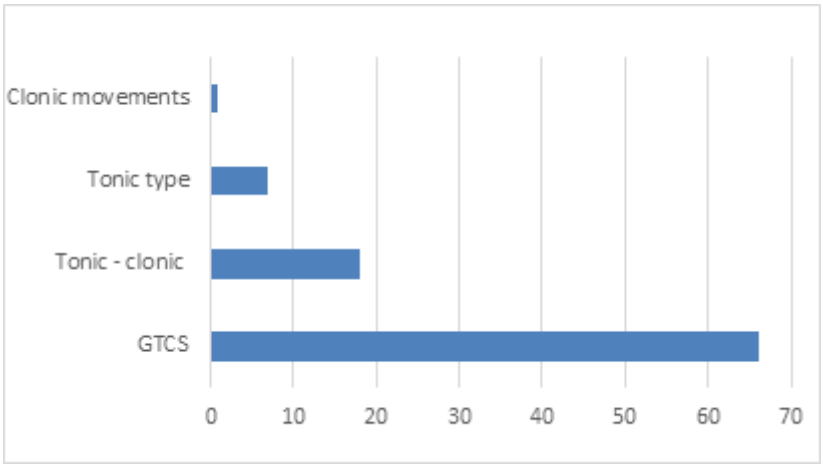

Figure 3. Representation of the seizure type.

Table 3. Shows type of seizures.

Type of seizure	No. of patients
GTCS	63
Tonic - clonic	18
Tonic type	6
Clonic movements	1

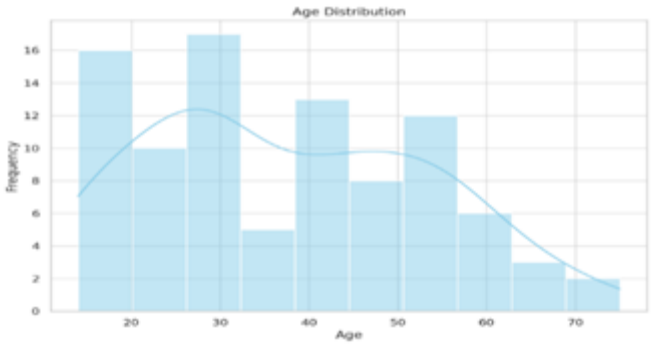

Figure 4. Shows the age distribution.

Table 4. Shows the age distribution.

Age range	Frequency
15 – 20	16
20 – 25	10
25 – 30	17
30 – 35	6
35 – 40	13
40 – 45	9
45 – 50	0
50 – 55	12
55 – 60	7
60 – 65	5

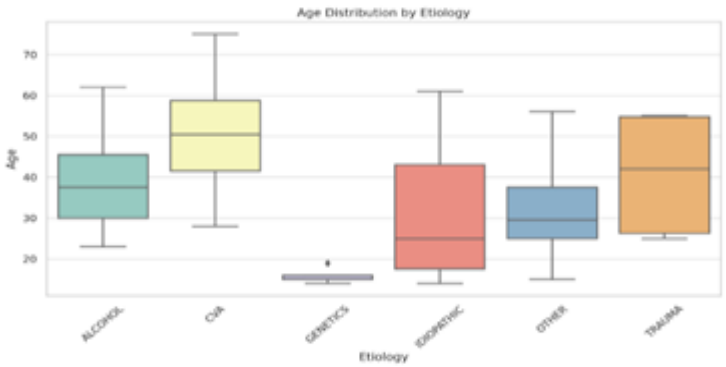

Figure 5. Shows age distribution by etiology.

Table 5. Shows age distribution by etiology.

Etiology	Median age	Age range (approx)
Alcohol	37	23 – 62
CVA	51	28 – 76
Genetics	15	14 – 19
Idiopathic	25	14 – 61
Trauma	32	15 – 56
Others	42	25 – 55

GTCS is the most common seizure type overall. It is observed in 57 males and 13 females, showing a significant male predominance. Tonic-Clonic seizures are the second most frequent, with 15 cases in males and 5 in females. Tonic seizures occur in 5 males and 3 females. Clonic seizures are the least common, seen in only 2 males (Rodríguez C. A, 2022). There is a significant difference in mean age between patients with Idiopathic and CVA etiologies (Mula M, 2021). The negative t-statistic indicates that the Idiopathic group has a lower average age compared to the CVA group. 3 (Joshi R, 2020). The p-value is 0.0076, which is less than 0.05. Therefore, there is a statistically significant association between Etiology and Outcome (Recovered/Moderately Recovered vs Not recovered) (Oteri A, 2010).

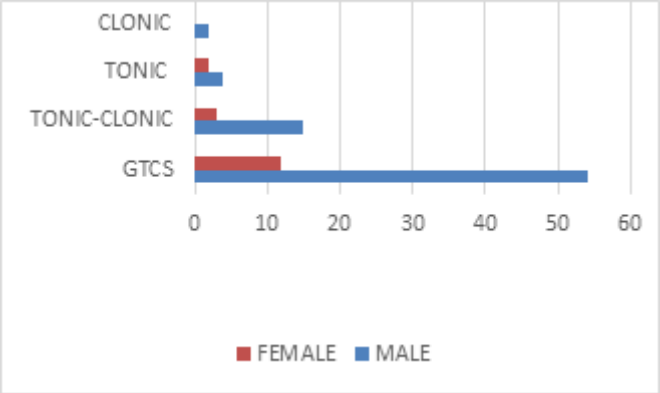

Figure 6. Shows gender vs seizure type.

Table 6. Shows type vs gender.

Type	Male	Female
GTCS	54	12
Tonic – Clonic	15	3
Tonic	4	2
Clonic	2	0

Table 7. Age comparison between idiopathic & CVA.

Statistic	Value	Interpretation
Group 1	Idiopathic	Comparision group with lower average age
Group 2	CVA	Comparision group with higher average age
T – statistics	-4.85	Indicates the direction & magnitude of the difference
P - value	0.0000156	Statistically significant ($p<0.05$)
Significance level	0.05	Common alpha threshold

Table 8. Comparision between outcomes and etiology

Etiology	Not recovered	Recovered/moderately
Alcohol	01	19
CVA	0	27
CVA, thrombus	0	1
Metabolic disorder	0	3
Injury	1	0
Infections	0	3
Genetics	1	4
Idiopathic	1	22
Thrombosis	0	3
Trauma	0	6

This prospective observational study involved 92 patients with epilepsy and aimed to examine the association between seizure types, underlying causes, and treatment outcomes. Most participants were male, with an average age of 37.5 years. (Dwivedi R, 2022) Generalized tonic–clonic seizures (GTCS) were the most frequently observed seizure type. The main etiological factors identified were idiopathic epilepsy, alcohol-related seizures, and cerebrovascular accidents (CVA). (Bhui U, 2022). Treatment outcomes were generally positive, with 73.9% of patients achieving full recovery, 21.7% showing partial improvement, and 4.3% showing no recovery (Kobayashi K, 2020). Statistical analysis revealed no significant relationship between seizure type and treatment outcome ($\chi^2 = 6.03$, $p = 0.813$), suggesting that seizure classification alone is not a reliable predictor of recovery. However, a significant association was found between etiology and treatment outcome ($\chi^2 = 27.05$, $p = 0.0076$), indicating that the underlying cause of epilepsy plays a crucial role in determining prognosis (Mula, 2021). Patients with idiopathic epilepsy or alcohol-related seizures showed better recovery rates, whereas those with epilepsy due to structural brain damage or CVA tended to have less favorable outcomes. Age also appeared to influence recovery. Patients who recovered were significantly younger (mean age 21.8 years) compared with those who did not recover (38.4 years). Younger individuals may experience better outcomes due to greater brain adaptability, fewer coexisting illnesses, and improved response to treatment (Joshi R, 2020). Overall, the results suggest that etiology and patient-related factors have a stronger impact on treatment outcomes than seizure type alone. In the encouraging recovery rates, the study has limitations, including a small sample size, a single-center setting, and a relatively short follow-up period. Future studies with larger populations, multiple centers, and longer follow-up durations are needed to better understand long-term epilepsy outcomes (Oteri A, 2010).

CONCLUSION

This prospective observational study indicates that both patient age and underlying etiology play a critical role in determining epilepsy treatment outcomes. The results confirm the initial hypothesis that the cause of epilepsy is a major predictor of therapeutic success. A significant association was found between etiology and recovery status ($\chi^2 = 27.05$, $p = 0.0076$), while seizure type showed no meaningful correlation with outcome ($p = 0.813$). Moreover, older patients demonstrated a significantly greater chance of recovery compared to younger individuals ($t = 4.15$, $p = 0.0078$). Overall, these findings underscore the necessity of incorporating both age and etiological factors into clinical evaluation and treatment planning to enhance epilepsy management and patient outcomes.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest

ETHICS APPROVAL

Not applicable

FUNDING

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AI TOOL DECLARATION

The authors declares that no AI and related tools are used to write the scientific content of this manuscript.

DATA AVAILABILITY

Data will be available on request

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