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Original Research Article

Management and Prognostic Factors in Late-Onset Seizures

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Abstract:

Background: Seizures occurring in adulthood often require a different diagnostic and management approach compared to childhood epilepsy. The prognosis and treatment response in late-onset seizures depend on the underlying etiology, with metabolic, infectious, and structural causes playing a major role. Management strategies, including the choice of AEDs (Anti-Epileptic Drugs) and the need for long-term therapy, are influenced by these factors. Understanding prognostic indicators can help optimize treatment and improve seizure control in affected patients.

Methods: A prospective observational study was conducted on patients aged 20 years and above presenting with late-onset seizures. Clinical history, seizure classification, and risk factor assessment were performed. Investigations included EEG, CT/MRI, and metabolic screening. Patients were managed with AEDs and outcomes were assessed based on seizure control, recurrence, and treatment response.

Results: Antiepileptic treatment was initiated based on seizure type and etiology. Sodium valproate and carbamazepine were the most commonly prescribed drugs. Patients with structural brain lesions, cerebrovascular disease, and metabolic abnormalities showed a higher risk of seizure recurrence. Good seizure control was observed in patients with metabolic seizures after correction of the underlying disorder. However, those with neurodegenerative conditions and chronic structural brain lesions had a poorer prognosis.

Conclusion: Effective management of late-onset seizures requires a tailored approach, addressing underlying causes. While metabolic and infectious etiologies have a better prognosis with targeted treatment, structural and neurodegenerative causes often pose challenges. Comprehensive diagnostic evaluation and individualized therapy can significantly improve patient outcomes.

Keywords: Late-Onset Seizures, Antiepileptic Drugs, Cerebrovascular Disease, Prognosis, Seizure Recurrence, Metabolic Seizures.

Introduction

Epileptic seizures represent one of medicine's most complex and challenging conditions. The impact of seizures extends beyond their clinical manifestations to encompass significant psychological, social, and economic consequences, particularly when they occur in adults who have not previously experienced such episodes.[1,2]

Late-onset seizures-those occurring beyond early adulthood—warrant particular attention from clinicians. These seizures often signal underlying pathology that may be progressive and potentially life-threatening if left unaddressed. The management of such seizures requires a nuanced approach that considers both the acute presentation and the long-term implications of the underlying etiology.[3,4]

The prognostic factors for late-onset seizures differ significantly from those in pediatric populations. While childhood epilepsy often has genetic or developmental underpinnings, seizures in adults frequently result from acquired conditions such as cerebrovascular disease, tumors, trauma, or metabolic derangements.[5] Understanding these etiological differences is crucial for both effective management and accurate prognostication.

Studies have shown considerable variability in outcomes for patients with late-onset seizures. This variability correlates with the underlying cause, with cerebrovascular disease accounting for 40-80% of cases and tumors representing between 0-37% in different patient populations.[6] The wide range in these figures highlights the need for further investigation into prognostic factors. In developing countries, the management challenges are compounded by the prevalence of infectious etiologies including malaria, meningitis, tuberculosis, HIV, and neurocysticercosis.[7] The Indian subcontinent presents

additional considerations, with cerebral venous thrombosis being common in post-puerperal women who present with severe headache, low-grade fever, and seizures.[8] These patients have a seizure incidence of approximately 40%, higher than in arterial stroke, with focal seizures predominating but potentially generalizing to life-threatening status epilepticus.[9]

For elderly patients, the management approach must account for common etiologies including subdural hematoma, stroke, CNS infections, degenerative disorders like Alzheimer's disease, and malignancies such as gliomas and brain metastases.[10] The higher incidence of seizures in hemorrhagic stroke compared to ischemic stroke necessitates special consideration in treatment planning.[11] Systemic metabolic conditions-including uremia, hyperglycemia, hypoglycemia, hyponatremia, and alcohol withdrawal-also require specific management approaches.[7] Modern diagnostic technologies have revolutionized both the accuracy of diagnosis and the trajectory of management. CT scans, MRI, and CSF serology for various infections have enabled more precise identification of underlying causes, allowing for targeted treatment approaches.[12] This technological advancement has particularly benefited patients with late-onset seizures, whose conditions often stem from structural or metabolic abnormalities that can be visualized or detected through these methods.

The definition of epilepsy itself has evolved over time, from Galen's 2nd century description of "a general convulsion of all parts of the body, not continuous but occurring at intervals, with defect of understanding and the senses" to the modern understanding of epilepsy as "a condition in which a person has recurrent seizures due to a chronic, underlying process."[13] This definition distinguishes epilepsy from isolated seizures or those occurring due to correctable circumstances. A seizure represents a paroxysmal event resulting from abnormal, excessive, hypersynchronous discharges from an aggregate of central nervous system neurons.[13]

This study aims to investigate the management approaches and prognostic factors associated with late-onset seizures in adults, with particular attention to the correlation between etiology, treatment response, and long-term outcomes. By identifying reliable prognostic indicators, we seek to improve the clinical management and quality of life for patients experiencing seizures in adulthood.

Aims and Objectives: This study aims to assess the management strategies for late-onset seizures, focusing on treatment approaches based on underlying etiologies. It also seeks to identify prognostic factors influencing seizure recurrence and long-term outcomes. The study evaluates the effectiveness of diagnostic tools such as EEG and neuroimaging in guiding treatment decisions and predicting prognosis, ultimately aiming to optimize individualized patient care.

Materials and Methods

This hospital-based observational study was conducted over a period of one year in the OPD, ICU, Casualty, and Medicine wards of Government Medical College, Thrissur, Kerala.

Inclusion and Exclusion Criteria: The study includes adult patients aged above 20 years presenting with their first episode of seizure. Patients with a history of seizures before the age of 20, those with seizures secondary to definite head trauma, or those experiencing seizure-like episodes due to conditions such as hyperventilation, TIA (Transient Ischemic Attack), narcolepsy, movement disorders (e.g., choreoathetosis, tic disorder), or psychogenic seizures were excluded.

Data Collection Tools: For studying the management and prognostic factors of late-onset seizures, standardized treatment protocols and follow-up charts were used to record therapeutic interventions and patient responses. Seizure severity scales and functional assessment tools were utilized to evaluate the impact on daily activities. Imaging tools such as EEG, CT, and MRI were essential in monitoring disease progression and response to treatment. Laboratory tests, including blood parameters and metabolic screenings, were performed to assess underlying causes and treatment-related changes.

Data Collection Methods: After establishing a diagnosis, each patient underwent detailed assessment and management planning. Treatment regimens, including AEDs, lifestyle modifications, and any necessary surgical interventions, were recorded. The choice of medication, dosage, and adjustments was documented, along with any adverse drug reactions.

Patients were followed up at regular intervals to assess seizure control, medication adherence, and quality of life. Factors influencing prognosis, such as seizure frequency, underlying etiology, treatment response, and presence of comorbidities, were systematically analyzed. Additional investigations, including repeated EEG or neuroimaging, were conducted in cases with persistent or worsening symptoms.

Outcome measures such as seizure remission, recurrence rates, and long-term neurological function were evaluated to identify prognostic indicators. The collected data were analyzed to establish patterns in treatment efficacy and factors influencing prognosis in late-onset seizures.

Statistical Analysis: The collected data was analyzed using the computer program statistical package for social sciences (SPSS 11.0) and STAT 8.0.

Descriptive analysis was used to compute percentages to calculate the mean and standard deviation.

Results

Table 1 highlights the different anti-seizure medications used in the study, along with the number of patients prescribed each drug. Phenytoin (Dilantin) was the most commonly used drug, followed by carbamazepine and sodium valproate. Most patients (80%) received phenytoin as monotherapy, with a few requiring combination therapy.

Table 1: Anti-Seizure Medications Used in Management

Medication	Number of Patients	Percentage (%)
Phenytoin (Dilantin)	80	80%
Carbamazepine	8	8%
Sodium Valproate	6	6%
Phenobarbitone	2	2%
Combination Therapy (Phenytoin + Carbamazepine)	2	2%
Combination Therapy (Phenytoin + Phenobarbitone)	2	2%
Total	**100**	**100%**

Table 2 shows the recurrence rate of seizures in patients based on different prognostic factors. Factors such as neurological deficits and abnormal EEG findings increased the risk of recurrence. Patients with abnormal neurological exams and EEG findings had a significantly higher seizure recurrence rate.

Table 2: Prognostic Factors and Seizure Recurrence

Prognostic Factor	Seizure Recurrence (Yes)	Seizure-Free (No)	Total (%)
Normal Neurological Exam	12	56	68 (68%)
Neurological Deficit Present	20	12	32 (32%)
Normal EEG	10	61	71 (71%)
Abnormal EEG	22	7	29 (29%)
Normal CT Scan	15	34	49 (49%)
Abnormal CT Scan	17	34	51 (51%)

Table 3 evaluates the prognosis of different seizure types. Generalized seizures had a lower recurrence rate compared to focal seizures. Patients with generalized seizures had a better prognosis, while those with simple partial seizures had the worst outcomes.

Table 3: Correlation between Seizure Type and Prognosis

Seizure Type	Poor Prognosis (%)	Good Prognosis (%)	Total (%)
Simple Partial	75	25	8 (8%)
Complex Partial	50	50	2 (2%)
Simple Partial → Generalized	53	47	34 (34%)
Complex Partial → Generalized	0	100	2 (2%)
Generalized Seizures	12	88	52 (52%)
Unclassified	100	0	2 (2%)

Table 4 shows how age affects the prognosis of seizures. Older patients had a higher likelihood of poor seizure control. Prognosis worsened with increasing age, particularly in those above 60 years.

Table 4: Influence of Age on Prognosis

Age Group	Poor Prognosis (%)	Good Prognosis (%)	Total (%)
30-40	11	89	18 (18%)
41-50	25	75	30 (30%)
51-60	35	65	26 (26%)
61 & above	50	50	26 (26%)

Table 5 categorizes treatment outcomes based on CT scan abnormalities. Patients with normal CT scans had better seizure control compared to those with infarcts or tumors. Structural brain abnormalities, especially infarcts and tumors, were associated with poor seizure control.

Table 5: Treatment Outcome Based on CT Findings

CT Scan Findings	Seizure-Free (%)	Recurrent Seizures (%)	Total (%)
Normal	69	31	49 (49%)
Infarct	40	60	20 (20%)
Tumor	30	70	20 (20%)
Hemorrhage	20	80	6 (6%)
Atrophy	10	90	2 (2%)
Arachnoid Cyst	50	50	1 (1%)

Table 6 examines the relationship between EEG findings and response to anti-seizure treatment. Patients with normal EEGs had the best response to treatment, while those with bilateral spikes had the worst response.

Table 6: EEG Findings and Treatment Response

EEG Findings	Good Response (%)	Poor Response (%)	Total (%)
Normal EEG	86	14	71 (71%)
Focal Slowing	40	60	15 (15%)
Focal Spikes/Waves	30	70	8 (8%)
Bilateral Spikes/Waves	20	80	4 (4%)
Unclassified Abnormality	10	90	2 (2%)

Table 7 lists various risk factors that negatively impact seizure control and prognosis. Structural abnormalities, abnormal EEG findings, and older age were the most significant risk factors for poor seizure control.

Table 7: Risk Factors for Poor Prognosis

Risk Factor	Number of Patients	Percentage (%)
Age > 60 years	26	26%
Structural Brain Lesion (CT)	51	51%
Abnormal EEG	29	29%
Presence of Neurological Deficit	32	32%
Alcohol Use	10	10%
Multiple Seizure Episodes	45	45%

Discussion

Management and Prognostic Factors in Late-Onset Seizures: The management of late-onset seizures requires careful consideration of the underlying etiology, seizure type, patient comorbidities, and prognostic factors. Our study, along with previous research, provides important insights into the appropriate management strategies for these patients.

Anti-Epileptic Drug Treatment: In our study, 96% of patients received AED therapy, with phenytoin being the most commonly prescribed medication (80% of patients). This is consistent with the traditional first-line treatment approach for adult-onset seizures described by Stephen and Brodie.[1] However, newer studies have shown comparable efficacy with newer AEDs that have more favorable side effect profiles, particularly in the elderly population, where pharmacokinetic and pharmacodynamic considerations are important.[1]

Carbamazepine was used in 8% of our patients as monotherapy, while sodium valproate was prescribed in 6% of cases. Only 4% of patients required combination therapy. This relatively low rate of polytherapy suggests good seizure control with monotherapy in most cases, similar to findings by Loiseau et al.[14] who reported 68% seizure freedom with monotherapy in elderly patients. The AED dosages in our study were generally lower than those typically used in younger adults, reflecting the altered pharmacokinetics in older patients. This approach aligns with recommendations by Ramsay et al.[15] who advocated "start low, go slow" dosing regimens in elderly patients to minimize adverse effects while maintaining efficacy.

Etiology-Specific Management: Patients with cerebrovascular disease (28% of our cohort) received both anticonvulsants and appropriate treatment for the underlying vascular pathology. This dual approach is supported by Silverman et al.[16] who demonstrated better outcomes with combined therapy than with AEDs alone. Similarly, patients with metabolic causes (10% of our patients) received correction of the underlying abnormality along with anticonvulsant therapy.

For tumor-related seizures (20% of our patients), management involved a multidisciplinary approach

combining anticonvulsants with specific treatment for the neoplasm. This approach is consistent with recommendations by Glantz et al.[17] who emphasized the importance of tumor-directed therapy for optimal seizure control.

Prognostic Factors

Several prognostic factors for seizure control and outcome were identified in our study:

1. **Etiology**: Patients with idiopathic seizures (41% of our cohort) generally had better prognosis than those with structural pathologies, consistent with findings by Sander et al. [50]. Cerebrovascular disease, especially hemorrhagic stroke, was associated with poorer outcomes, similar to observations by Lamy et al.[18]
2. **Age**: Our study showed that patients in the age group 61 and above had a higher proportion of symptomatic seizures (80.8%) compared to the younger age groups. This age-related increase in structural pathology as a cause for seizures correlates with poorer prognosis, as noted by Annegers et al.[19]
3. **Clinical Examination Findings**: In our study, 32% of patients had abnormal neurological examinations, which correlated with structural abnormalities on CT scans. This is similar to findings by Lopez et al.[20] and indicates a poorer prognosis compared to those with normal examination.
4. **Seizure Type**: In our cohort, generalized seizures were most common (52%), followed by partial seizures becoming generalized (36%). Simple partial seizures were associated with a higher likelihood of structural abnormalities (75% had focal neurological deficits), consistent with observations by Ahuja et al.[21] and indicating potentially poorer prognosis.

Our approach to management and identification of prognostic factors showed both similarities and differences with previous studies. Luhdrof et al.[6] reported higher rates of polytherapy (38%) compared to our study (4%), possibly reflecting differences in seizure severity or treatment protocols. Conversely, our findings regarding etiology-specific prognostic factors closely matched those reported by Lopez et al.[20] and Sander et al.[22]

They emphasized the prognostic value of early CT scanning in late-onset seizures. Similarly, our observation regarding the prognostic significance of EEG abnormalities aligned with findings by Krumholz and Wiebe.[23]

While our study did not include extensive long-term follow-up data, previous studies have shown variable recurrence rates based on etiology. Stephen and Brodie[24] reported recurrence rates of 40-50% in patients with cerebrovascular etiology, compared to 15-30% in idiopathic cases after two years. Similarly, Annegers et al.,[19] observed that seizure remission was significantly more likely in idiopathic cases than in those with structural pathologies.

Management of late-onset seizures should be tailored according to underlying etiology, seizure type, and patient characteristics. Careful consideration of prognostic factors such as age, neurological examination findings, EEG abnormalities, and imaging results is essential for optimizing treatment strategies and counseling patients about expected outcomes. Early identification and treatment of underlying etiologies, particularly in symptomatic cases, may significantly improve both seizure control and overall prognosis.

Limitations

This study has some limitations, including a small sample size, which may limit the generalizability of findings. Many patients were reluctant to undergo advanced neuroimaging (CT contrast and MRI), potentially leading to an underestimation of structural causes. Additionally, a significant number of patients in psychiatry wards were excluded, despite the potential impact of psychiatric disorders and medications on seizure occurrence. Future studies with larger samples, comprehensive imaging, and inclusion of psychiatric comorbidities are needed for a more thorough understanding of late-onset seizures.

Conclusion

In this study, idiopathic epilepsy was identified as the most common cause (41%), followed by cerebrovascular disease (28%) and tumors (20%). The majority of cases occurred between 30 and 50 years, a group not extensively studied before, with a clear male predominance (5:1 ratio). Generalized tonic-clonic seizures were the most frequent type, while complex partial seizures were rare. Neuroimaging (CT scan) played a crucial role in detecting underlying abnormalities, particularly when seizures had a short duration or EEG showed focal slowing. Patients with diabetes, hypertension, or coronary artery disease had a higher likelihood of cerebrovascular disease as the underlying cause. CSF analysis contributed little to the etiologic diagnosis, and EEG abnormalities were seen in only 29% of cases. Given the significant proportion of structural causes, CT scan evaluation is mandatory for all patients with late-onset seizures, even when clinical and EEG findings are normal.

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