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EVALUATION OF COGNITIVE FUNCTION AND QUALITY OF LIFE IN EPILEPTIC PATIENTS: A PROSPECTIVE CROSS SECTIONAL STUDY

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ABSTRACT

Background: Epilepsy is a chronic neurological disorder often impairing cognitive capacity and QoL. AEDs play a key role in seizure management, but the long-term implications for cognitive health and QoL vary with the type of AED used. To assess and compare cognitive function and QoL in patient populations treated for epilepsy with Phenytoin, Levetiracetam, Lacosamide, or Carbamazepine and to see whether a correlation exists between these two parameters

Methods: This study was an 80-patient-based prospective cross-sectional one, in which participants were equally divided into four groups, each in course of AED monotherapy. The Montreal Cognitive Assessment (MoCA) scale was used to assess cognitive function, whereas QoL was assessed via the QOLIE-31 questionnaire. Data analysis was carried out by means of ANOVA, and Pearson correlation.

Results: The mean MoCA score in the Phenytoin group was 23.5 ± 3.77, and in the Lacosamide group, 24.95 ± 3.51, whereas the mean QOLIE-31 score was observed to vary from 64.52 ± 13.84 to 68.40 ± 12.84. There were no statistically significant differences among the groups ($p > 0.05$). Strong positive correlations between MoCA and QOLIE-31 scores were observed within every group (from 0.9872 to 0.9935, $p < 0.05$).

Conclusion: Regardless of whichever of the four AED groups was compared, cognitive and QoL scores did not differ from one another. Preserving cognition in Epilepsy is integral for improving overall well-being.

Keywords: Epilepsy, Antiepileptic Drugs, MoCA, QOLIE-31, Cognitive Function, Quality of Life

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INTRODUCTION

Epilepsy is a chronic neurological disorder characterized by recurrent seizures unprovoked by anything since abnormal electrical discharges in the brain are generating the seizures. It affects over 50 million individuals worldwide, making it one of the very common neurological disorders in the world. With the clinical implications also extending to social changes and restrictions, the disease often compromises cognitive skills, emotions, and social functioning. Epilepsy in India remains a major public health issue, with a tremendous number of patients in both urban and rural areas due to poor awareness about the disease and lack of access to care.[1,2].

Antiepileptic drugs (AEDs) constitute the treatment of seizure disorders with seizure control and improvement of quality of life (QoL) as its goals. Commonly, distressing side effects from prolonged use of an AED disease include impairing cognition, producing fatigue, changing mood, or interacting pharmacologically. The extent to which any AED influences cognition and QoL greatly changes with the kind of drug itself, the dosage, duration of therapy, and peculiarities of each patient. Although standards like Phenytoin and Carbamazepine are largely being used traditionally, they are most often linked to greater neuropsychological side effects when compared with newer agents.[3,4]

Cognitive function and quality of life are interrelated in patients with epilepsy. On the other hand, cognitive deterioration may become very important in affecting the patient's functional capacity and daily life satisfaction, as seizure activity may serve as one cause leading to it, while medication might be another. The MoCA and the QOLIE-31 questionnaire are good tools to measure the cognitive status and overall QoL of this population. Understanding how each AED affects these parameters then helps guide tailored interventions.[5,6]

The present work intends to study and compare the neuropsychological and QoL outcomes in patients with epilepsy undergoing monotherapy with Phenytoin, Levetiracetam, Lacosamide, or Carbamazepine; as well as to study the correlation between cognitive performance and quality of life. By assessing these areas, the study intends to contribute evidence toward optimizing AED therapy concerning not only seizure control but also neuropsychological well-being and patient-centered outcomes.[7,8]

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MATERIALS AND METHODS:

Study Design & Setting: A prospective cross-sectional study conducted at a Tertiary care Hospital, Chennai, over six months (October 2024 – March 2025). A detailed Informed consent was taken from the study participants before enrollment in the study and the study was approved and governed by the Institutional Ethics Committee of SPS, VISTAS.

Sample & Grouping: 80 patients diagnosed with epilepsy, aged 18–60 years, divided into four equal groups (n=20) based on their AED**:**

- Group A: Phenytoin
- Group B: Levetiracetam
- Group C: Lacosamide
- Group D: Carbamazepine

Inclusion Criteria:

a) Adults Aged 18-60 who are diagnosed with epilepsy for at least 6 months receiving anti-epileptic drugs therapy (Phenytoin, Levetiracetam, Lacosamide, Carbamazepine).
b) Willing to provide consent and comply with study protocol

Exclusion Criteria:

a) Patients with other neurological disorders (eg: dementia, stroke) or psychiatric disorders (eg: schizophrenia) that could affect cognitive function should be excluded.
b) Alcoholic patients are excluded.

Sample size:

For a random sampling of a population of 100 persons with a confidence interval of 95% and a 5% margin of error, the sample size is found to be 80 is calculated by using Raosoft sample size calculator.

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RESULTS

1. Subject Characteritics

Subject characteristics		No of patients	Percentage
Age	18-28	8	15%
	29-38	34	35%
	39-48	19	25%
	49-59	19	25%
Gender	Male	42	60%
	Female	38	47.50%
Education	<12th	58	72.50%
	>12th	22	27.50%
Employment	Unemployed	28	35%
	Employed	52	65%
Income status	Low income	37	46.25%
	middle Income	33	41.25%
	upper income	10	12.50%

Table 1: Study participants demographics and characteristics

This table presents the demographic and socioeconomic distribution of the study population (N = 80). Most participants were in the 29–38 years age group (n = 34), followed by equal representation from the 39–48 and 49–59 age groups (n = 19 each). Males (n = 42) slightly outnumbered females (n = 38). The majority of patients had educational attainment below the 12th standard (n = 58), were employed (n = 52), and belonged to the low to middle-income groups (n = 70). This indicates a predominantly middle-aged, moderately educated, and economically disadvantaged population affected by epilepsy

2. MOCA SCORES (COGNITIGE ASSESSMENT)

Drug Group	MOCA SCORES (Mean±SD)	f value	P value
Group A (Phenytoin)	23.5 ± 3.77	0.62992	>0.05
Group B (Levetiracetam)	24.5 ± 3.95	0.65543	>0.05
Group C (Lacosamide)	24.95± 3.51	0.68874	>0.05
Group D (Carbamazepine)	23.65 ± 3.97	0.64412	>0.05

Table 2: MoCA Scores of all four groups

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The cognitive function of patients across the four antiepileptic drug groups was evaluated using the Montreal Cognitive Assessment (MoCA) scale. Mean MoCA scores ranged from 23.5 (Phenytoin) to 24.95 (Lacosamide). One-way ANOVA yielded an F value of 0.62992 with a p-value > 0.05, indicating no statistically significant difference among groups. Post hoc analysis with Tukey HSD confirmed the lack of significant pairwise differences, suggesting all AEDs had a comparable impact on cognitive function.

3. QOLIE – 31 SCORES (QUALITY OF LIFE ASSESSMENT)

Drug Group	QOLIE-31 SCORES (Mean ± SD)	f value	P value
Group A (Phenytoin)	64.52 ± 13.84	0.629918	>0.05
Group B (Levetiracetam)	67.05 ± 12.99	0.65543	>0.05
Group C (Lacosamide)	68.40± 12.84	0.68874	>0.05
Group D (Carbamazepine)	65.45 ± 13.26	0.644115	>0.05

Table 3: QOLIE-31 Scores of all four groups of participants.

Quality of life was assessed using the QOLIE-31 questionnaire. Mean scores ranged from 64.52 (Phenytoin) to 68.40 (Lacosamide). The one-way ANOVA showed an F value of 0.629918 and a p-value > 0.05, indicating no significant differences in quality of life across the treatment groups. This was further supported by Tukey's HSD post hoc test, confirming that none of the AED groups demonstrated a statistically superior or inferior quality of life profile.

4. PEARSON CORRELATION ANALYSIS FOR MOCA AND QOLIE-31

Drug	MOCA SCORES	QOLIE-31 SCORES	r-value	p-value
Phenytoin	23.5 ± 3.77	64.52 ± 13.84	0.9884	0.0008089
Levetiracetam	24.5 ± 3.95	67.05 ± 12.99	0.9907	0.0001016
Lacosamide	24.95± 3.51	68.40± 12.84	0.9872	0.0019953
Carbamazepine	23.65 ± 3.97	65.45 ± 13.26	0.9935	0.0000035

Table 4: comparison of MoCA and QOLIE-31 scores

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This table shows the correlation between cognitive scores (MoCA) and quality of life (QOLIE-31) within each drug group. All four groups demonstrated a strong positive correlation ($r > 0.98$), with statistically significant p-values (< 0.05). This implies that patients with higher cognitive scores also experienced better quality of life regardless of the antiepileptic drug used, highlighting a close association between cognitive health and overall well-being in epilepsy management.

DISCUSSION

This study assessed cognitive function and quality of life in 80 patients with epilepsy receiving monotherapy with either Phenytoin, Levetiracetam, Lacosamide, or Carbamazepine. The largest age group was 29–38 years (n = 34), and there was a slight male predominance (n = 42). Educationally, a majority (n = 58) had not completed 12th grade, and most were employed (n = 52). Socioeconomically, 70 patients belonged to low or middle-income groups. These characteristics represent a real-world, community-based epilepsy cohort and underline the need for AEDs that maintain cognitive function and support functional outcomes.

Cognitive assessment using the MoCA scale showed mean scores of 23.5 (±3.77) in the Phenytoin group, 24.5 (±3.95) for Levetiracetam, 24.95 (±3.51) for Lacosamide, and 23.65 (±3.97) for Carbamazepine. One-way ANOVA yielded an F value of 0.62992 and a p-value > 0.05, indicating no statistically significant difference among the four groups. Although Lacosamide showed slightly higher cognitive scores, post hoc Tukey HSD confirmed that these differences were not significant. This suggests that all four AEDs have comparable effects on cognitive performance in the studied population.

Quality of life was assessed using the QOLIE-31 scale, and mean scores were 64.52 (±13.84) for Phenytoin, 67.05 (±12.99) for Levetiracetam, 68.40 (±12.84) for Lacosamide, and 65.45 (±13.26) for Carbamazepine. The corresponding F value from ANOVA was 0.629918 with a p-value > 0.05, again indicating no statistically significant differences. Despite minor variations, especially in favor of Lacosamide and Levetiracetam, the overall QoL outcomes were similar across the drug groups, highlighting the multifactorial nature of QoL in epilepsy management.

A strong positive correlation was observed between MoCA and QOLIE-31 scores in all groups. Pearson correlation coefficients were r = 0.9884 (Phenytoin), 0.9907 (Levetiracetam), 0.9872

(Lacosamide), and 0.9935 (Carbamazepine), all with statistically significant p-values ($p < 0.05$). These results demonstrate a consistent relationship between cognitive performance and perceived quality of life, regardless of the AED used. Hence, preserving cognitive function may be a key determinant in enhancing overall QoL for epilepsy patients, and should be a major consideration when selecting long-term therapy.

CONCLUSION

This study evaluated cognitive function and quality of life among epilepsy patients receiving Phenytoin, Levetiracetam, Lacosamide, or Carbamazepine. The results showed no statistically significant difference in MoCA scores (23.5 to 24.95) or QOLIE-31 scores (64.52 to 68.40) among the four groups ($p > 0.05$), indicating that all AEDs had a comparable impact on cognition and quality of life. However, a strong positive correlation was observed between MoCA and QOLIE-31 scores in all groups ($r = 0.9872$ to 0.9935; $p < 0.05$), emphasizing the close relationship between cognitive function and overall well-being. These findings suggest that preserving cognitive abilities can significantly improve quality of life in epilepsy patients, irrespective of the AED used. Although no single drug proved superior, individualized AED selection remains essential based on patient tolerability and clinical context. Future longitudinal studies with larger populations are recommended to explore the long-term neuropsychological outcomes of different AEDs and guide comprehensive epilepsy care.

LIMITATIONS OF THE STUDY

- The study had a small sample size, limiting the generalizability of the results.
- Many participants had low literacy, which may have affected their understanding of the MoCA and QOLIE-31 assessments.
- Socio-economic differences among patients were not controlled and may have influenced outcomes.
- Cultural and regional factors specific to the Indian population may have affected perceptions of cognitive function and quality of life.

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DECLARATION:

The authors declare that they have no conflict of interest and financial interests that could influence the work done in this study.

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