ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCE AND SCHOOL OF MEDICINE

DEPARTMENT OF NEUROLOGY

MAGNITUDE OF COGNITIVE DYSFUNCTION AMONG PEOPLE WITH EPILEPSY WHO WERE RECEIVING FOLLOW-UP CARE AT TIKUR ANBESSA SPECIALIZED HOSPITAL, ADDIS ABABA, ETHIOPIA, 2025

By: Dr Joseph Bol Dhalbeny

Addis Ababa, Ethiopia

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By: Dr Joseph Bol Dhalbeny

Names of Advisors:

- **DR. ABENET TAFESSE (MD,Internist, Associate Professor of Neurology)**
- **DR. FIKERU TSHAYNEH (MD, Assistant Professor of Neurology)**
- **Dr. TEMESGEN DAMITE (MD, Assistant professor of neuroloy)**

A THESIS TO BE SUBMITTED TO SCHOOL OF MEDICINE, ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF MEDICINE IN NEUROLOGY SPECIALITY

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Accronyms and Abbreviations

AED	Antiepileptic drug
AOR	Adjusted Odds Ratio
CI	Confidence Interval
HADS	Hospital Anxiety and Depression Scale
IEDs	Interictal epileptiform discharges
MoCA	Montreal Cognitive Assessment
TASH	Tikur Anbessa Specialized Hospital
VIF	Variance Inflation Factor (VIF)

Abstract

Background: Cognitive impairment, defined as a decline in one or more cognitive domains, is a common complication that negatively affects quality of life. It is a well-documented and common feature of many seizure disorders, particularly among patients with temporal lobe epilepsy. These impairments may affect several cognitive domains, including memory, attention, executive function, and language abilities including their quality of life. Such data on its magnitude and its determinants however are limited in our setting.

Objective: To assess the magnitude of cognitive impairment and identify the associated factors among patients with epilepsy receiving follow-up care at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia.

Methods: An institution-based cross-sectional study was conducted from May 1 to May 30, 2025, among 308 systematically selected patients with epilepsy. Data were collected using structured questionnaires via face-to-face interviews and managed using Kobo Toolbox. Analyses were performed using SPSS version 26. Descriptive statistics summarized participant characteristics. Binary logistic regression identified factors associated with the presence of cognitive impairment, and variables with $p \leq 0.25$ in bivariable analysis were included in multivariable models. Ordinal logistic regression was also conducted to determine factors associated with increasing severity of cognitive dysfunction. Statistical significance was set at $p < 0.05$, and adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported.

Results: Overall, 55.5% of participants exhibited cognitive impairment. In multivariable analysis, older age and monthly household income were independently associated with cognitive dysfunction. Ordinal logistic regression indicated that polytherapy and older age categories were associated with increasing severity of cognitive impairment.

Conclusion: Nearly one in two patients with epilepsy in our setting had cognitive impairment, indicating a high prevalence among this population. Older age and polytherapy were identified as significant determinants, highlighting the importance of routine cognitive assessment and individualized management strategies in epilepsy care

Keywords: *Cognitive impairement, determinants, epilepsy, Tikur Anbessa Specialized Hospital, Ethiopia*

1. Introduction

1.1. Background

Global Context

Epilepsy is a chronic neurological disorder characterized by recurrent, unprovoked seizures caused by abnormal electrical activity in the brain (1). In addition to seizures, epilepsy is associated with several neurological and psychosocial complications, among which cognitive impairment is one of the most significant comorbidities. Cognitive impairment refers to a decline from a previous level of functioning in one or more cognitive domains, including complex attention, executive function, learning and memory, language, perceptual-motor function, and social cognition (2). The severity of cognitive impairment ranges from mild cognitive changes that do not significantly interfere with daily independence to severe deficits that impair comprehension, communication, and the ability to live independently (2).

Although seizures are the most recognized clinical manifestation of epilepsy, individuals living with epilepsy are at increased risk of a wide range of health problems, including cognitive dysfunction and mental health conditions (3). Cognitive impairment is frequently observed in different types of epilepsy. For example, studies have shown that approximately 70% of patients with temporal lobe epilepsy experience impairment in declarative memory, which represents the most common cognitive deficit in this group. Additionally, impairments in executive functioning and reduced intelligence levels have been reported in about 30% of patients with temporal lobe epilepsy (4).

Cognitive impairment in epilepsy may occur at the onset of the disorder or develop several years after the initial diagnosis. Multiple factors contribute to the development of cognitive dysfunction in individuals with epilepsy, including seizure-related factors such as seizure frequency and duration of illness, as well as treatment-related factors such as the use of antiepileptic medications and the number of drugs used in therapy (6). The interaction of these factors can significantly influence cognitive outcomes among patients with epilepsy.

Regional Context

In low- and middle-income countries, the burden of epilepsy and its associated cognitive complications is particularly high due to limited access to diagnostic services, delayed treatment initiation, and poor seizure control. Studies conducted in African settings indicate that cognitive impairment is a common comorbidity among individuals living with epilepsy.

For instance, a study conducted in Zambia among individuals with epilepsy and neurocysticercosis reported a considerable level of cognitive impairment, which significantly affected patients' quality of life (1). Similarly, research conducted in Benin demonstrated that people with epilepsy frequently experience impairments in memory, attention, and executive functioning, highlighting the substantial cognitive burden associated with the disease in African populations (5).

In addition to disease-related factors, socioeconomic challenges such as limited educational opportunities, stigma, and restricted access to specialized neurological care may further contribute to poor cognitive outcomes among individuals living with epilepsy in the region.

National Context and Research Gap (Ethiopia)

In Ethiopia, epilepsy remains a significant public health concern and contributes substantially to neurological morbidity and reduced quality of life. Recent studies conducted in different parts of the country have reported a considerable prevalence of cognitive impairment among patients with epilepsy.

A study conducted in South Gondar zone hospitals reported that cognitive adverse effects were common among patients with epilepsy, with factors such as seizure frequency, longer duration of illness, and the use of multiple antiepileptic medications significantly associated with cognitive impairment (8). Similarly, another study conducted in health institutions in the Gurage Zone found that a substantial proportion of patients with epilepsy experienced cognitive impairment, with polytherapy and medication-related problems identified as important contributing factors (7).

Furthermore, research conducted among patients with epilepsy in Addis Ababa reported a high level of cognitive impairment and identified poor adherence to antiseizure medications, low educational status, and limited physical activity as important factors associated with cognitive dysfunction (9).

Despite the growing evidence on cognitive impairment among patients with epilepsy in Ethiopia, the available studies remain limited and are mainly concentrated in specific regions and healthcare institutions. As a result, there is still insufficient evidence describing the

magnitude of cognitive impairment and its associated factors in many clinical settings. Therefore, assessing the magnitude of cognitive impairment and identifying associated factors among patients with epilepsy in the study area is important to generate context-specific evidence that can guide clinical management and improve patient outcomes.

1.2. Statement of the problems

The prevalence of cognitive impairment in patients with epilepsy is currently estimated to be 70–80%, but this can vary by region. The number of patients with epilepsy in developing countries tends to be higher than that of developed countries, and only a small portion of the patient population receives appropriate treatment; thus, it can be estimated that the prevalence of global cognitive impairment will be much higher in developing countries (10,11). In 2017, more than 291 million children aged less than 20 had epilepsy and intellectual disabilities, of which 95% lived in low and middle-income countries (12,13).

Cognitive impairments are a significant and often lifelong concern for individuals with epilepsy. In children, these impairments commonly present as learning disabilities, affecting academic performance and overall development, and often continue to impact their lives into adulthood (4). In newly diagnosed and untreated epileptic patients, cognitive problems are already present in more than 50% of patients. Furthermore, cognitive issues have been reported in approximately 30% to 40% of the general epileptic population, highlighting the widespread nature of this problem (14).

The susceptibility to the impairment is largely determined by demographic (age, sex, and level of education), epilepsy (age at onset, type of seizure, epilepsy syndrome, seizure frequency, etiology, location of epileptogenic focus, and duration of disease), and treatment (type and number of AEDs and duration of treatment) variables, which could vary across regions or countries (15). Demographic variables, particularly the level of education, determine the capacity of the brain to compensate for lesions caused by seizure-induced neuronal damage; hence, the cognitive function of the patients remains intact. In contrast, both epilepsy and treatment variables determine the success of seizure control and contribute to modulating the extent of seizure-induced neuronal damage and Interictal epileptiform discharges (IEDs) associated with the severity of global cognitive impairment in patients with epilepsy (16).

Cognitive impairment is a common but often overlooked consequence of epilepsy, impacting the quality of life in individuals, especially in Ethiopia, where epilepsy prevalence is high. The relationship between seizure frequency, medication, and cognitive outcomes remains

understudied, with cultural, social, and healthcare factors complicating diagnosis and treatment. This research aims to explore the extent of cognitive challenges faced by people with epilepsy in Ethiopia, understand associated factors, and provide evidence for tailored interventions to improve cognitive outcomes and enhance their quality of life.

1.3. Significance of the study

The findings of this study may be used as a resource for clinicians emphasizing cognitive dysfunction in the treatment and follow-up of patients with epilepsy and as a baseline for researchers conducting further studies. Additionally, this study aimed to provide important information for policymakers and program implementers at national and regional levels. The information derived from the study will be used to design methods and programs to epilepsy care and treatment. Furthermore, this study would serve as an input and a milestone for further studies to be undertaken in the future.

2. Literature review

2.1. The magnitude of cognitive impairment

A cross-sectional study conducted in the South Gondar Zone, Amhara Region, Ethiopia, shows that the magnitude of cognitive impairment among epileptic patients was 69.2% (14). Furthermore, a cross-sectional study conducted in Gurage Zone hospitals in Ethiopia shows that the magnitude of cognitive impairment is 25.6% (17). In addition to the studies mentioned above, another multicenter cross-sectional study conducted at randomly selected referral hospitals in the Amhara Region reported a cognitive dysfunction prevalence of 29% (18).

A multi-centric cross-sectional study conducted in Benin, West Africa, shows that the magnitude of cognitive impairment among epileptic patients was 74.29% (7). A cross-sectional study conducted in Malaysia shows cognitive impairment in terms of IQ in 34.1% of patients, total memory in 29.6%, and verbal fluency in 8.9% (15). A cross-sectional study conducted in Awka, the capital of a South-Eastern state in Nigeria showed that the magnitude of cognitive impairment among epileptic patients was 74.29% by community screening interview for dementia (19). A cross-sectional study conducted in the southern part of Nigeria found that the magnitude of epilepsy-associated global cognitive impairment among epileptic patients was 20.7% (20). In addition to the studies mentioned above, cross-sectional conducted in Indonesia (21) and Kinshasa, Democratic Republic of the Congo (22) reported the prevalence of epilepsy-associated cognitive impairment among epileptic patients to be 83.9% and 73.3%, respectively.

2.2. Factors associated with cognitive impairment

2.2.1. Sociodemogrpahic status

An institutional cross-sectional study conducted in South Gondar zone hospitals in the Amhara Region, Ethiopia (14), Agadir, Morocco (23), Mataram, Indonesia (21), and Fujian Medical University, China (15) shows that educational level was found to be significantly associated with cognitive impairment. A multicenter, institutional-based cross-sectional study conducted at randomly selected referral hospitals in the Amhara region and South Gondar zone hospitals in the Amhara Region, Ethiopia (14) shows that place of residence was found to be significantly associated with cognitive impairment (18). In addition to the studies mentioned above, a cross-sectional study conducted at Fujian Medical University in China found that patient age was significantly associated with cognitive impairment (15). A cross-sectional study conducted in Kinshasa, Democratic Republic of the Congo, found that both the sex of the patient and household income were significantly associated with cognitive impairment (22).

2.2.2. Disease-related characteristics

A cross-sectional study conducted in South Gondar Zone hospitals in the Amhara Region, Ethiopia (14), randomly selected referral hospitals in the Amhara Region (18), Mataram, Indonesia (21), Malaysia (24), and Agadir, Morocco (23) found that the duration of seizure disorder was significantly associated with cognitive impairment. In addition to the one mentioned above, another multicenter, institutional-based cross-sectional study conducted at randomly selected referral hospitals in the Amhara region (18), Kinshasa, Democratic Republic of the Congo(22), Agadir, Morocco (23), Malaysia (24) and China (15) shows that seizure frequency was found to be significantly associated with cognitive impairment. In addition to the studies mentioned above, another multicenter, institutional-based cross-sectional study conducted at randomly selected referral hospitals in the Amhara region (18), Benin (7), and Fujian Medical University, China (15) found that the type of seizures was significantly associated with cognitive impairment.

An institutional cross-sectional study conducted in the Gurage Zone, Ethiopia, found that having a family history of epilepsy was significantly associated with cognitive impairment (17). In addition to the studies mentioned above, another cross-sectional study conducted in Gurage Zone, Ethiopia (17), and Jilin, China (6) reported that depression and anxiety were significantly associated with cognitive impairment.

A multicenter, institution-based cross-sectional study conducted at randomly selected referral hospitals in the Amhara Region found that having a comorbid medical illness was significantly associated with cognitive impairment (18). In addition to the studies mentioned above, another cross-sectional study conducted in Kinshasa, Democratic Republic of the Congo (22), and Mataram, Indonesia (21), reported that early onset of epileptic seizures was found to be significantly associated with cognitive impairment.

A cross-sectional study conducted in Jilin, China, shows that brain surgery at a young age was found to be significantly associated with cognitive impairment (6). In addition to the studies mentioned above, another cross-sectional study conducted in the Gurage Zone, Ethiopia, found that a history of head injury was significantly associated with cognitive impairment (17).

2.2.3. Drug-related characteristics

An institutional cross-sectional study conducted in the Gurage Zone, Ethiopia (17), Malaysia (24), Chennai, India (8), and Agadir, Morocco (23) shows that polytherapy was found to be significantly associated with cognitive impairment.

A multicentre, institution-based cross-sectional study conducted at randomly selected referral hospitals in the Amhara Region (18) and Fujian Medical University, China (15) found that using a combination of anti-seizure drugs was significantly associated with cognitive impairment. In addition to the studies mentioned above, other studies conducted in South Gondar Zone hospitals in the Amhara Region, Ethiopia (14) and Kinshasa, Democratic Republic of the Congo (22) found that taking a combination of phenobarbital and phenytoin was significantly associated with cognitive impairment.

Conceptual framework

After reviewing various literatures, the conceptual framework for this study was developed to explain the factors associated with cognitive impairment (7,14,15,17,18,23).

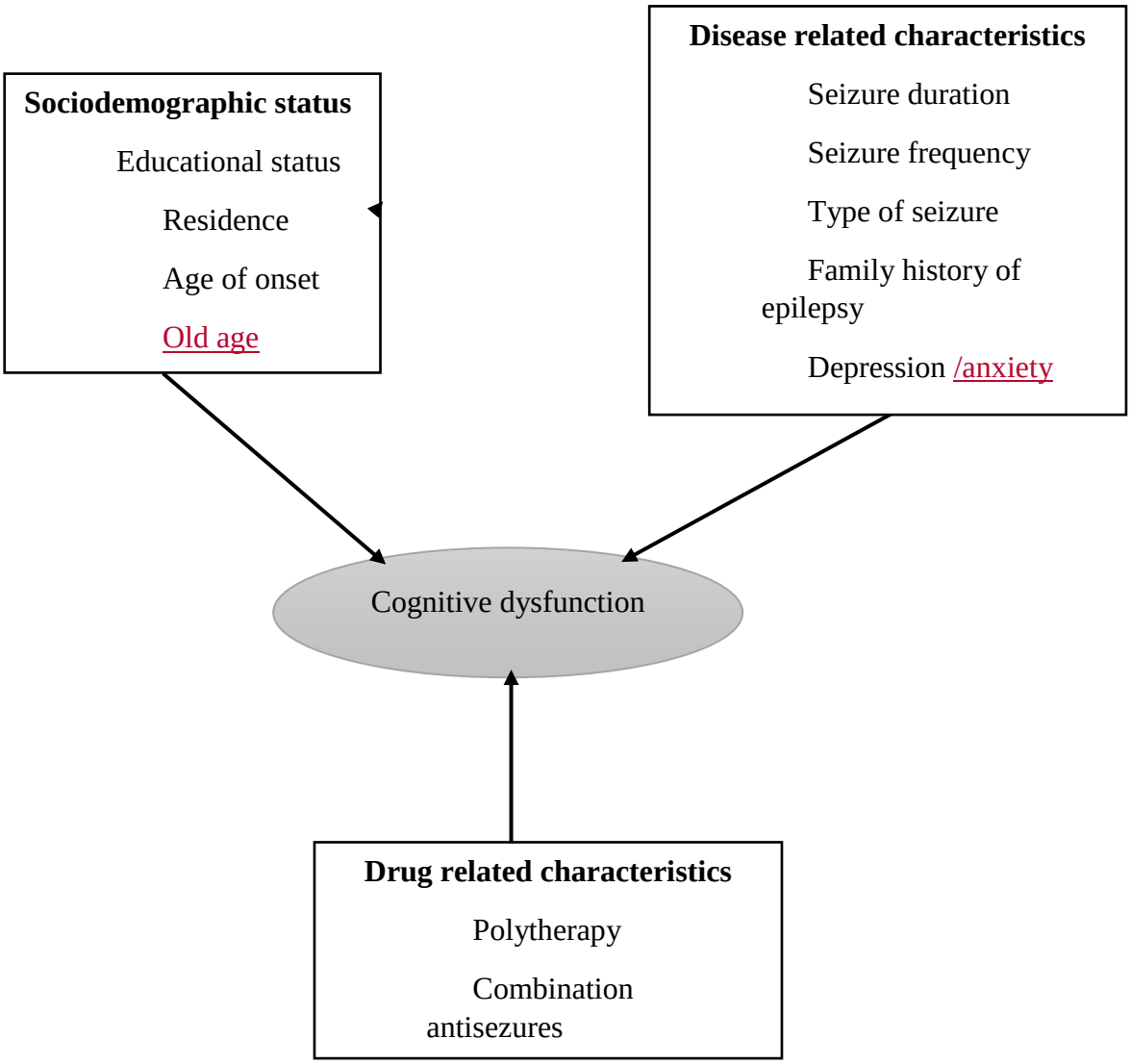


Figure 1: Developed conceptual framework for assessing factors associated with cognitive impairment among epileptic patients on follow-up at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2025

3. Objectives of the study

3.1. General objective

- To assess the magnitude of cognitive impairment and associated factors among epileptic patients on follow-up at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2025

3.2. Specific objectives

- To determine the magnitude of cognitive impairment among epileptic patients on follow-up at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2025
- To identify factors associated with cognitive impairment among epileptic patients on follow-up at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2025

4. Methods

4.1. Study area and period

This study was conducted in Tikur Anbessa Specialized (TASH), Addis Ababa, Ethiopia from April 1 to May 30, 2025. Tikur Anbessa Specialized Hospital is a prominent specialized hospital located in Addis Ababa, Ethiopia. The TASH is the teaching hospital of the College. TASH is the largest specialized hospital in Ethiopia, with over 700 beds, and serves as a training center for undergraduate and postgraduate medical students, dentists, nurses, midwives, pharmacists, medical laboratory technologists, radiology technologists, and others who shoulder the health problems of the community and the country at large. TASH provides a comprehensive range of services, including neonatal care, antenatal and postnatal care, child delivery, neurology services, gynecological and obstetric services, pediatric care, immunization, family planning, infertility treatment, health education, as well as laboratory, pharmacy, radiology services.

4.2. Study design

A facility-based cross-sectional study design was conducted in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia.

4.3. Populations

4.3.1. Source population

All patients with epilepsy whose ages were > 18 years and who attended the follow-up clinic at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia.

4.3.2. Study Population

All eligible patients with epilepsy whose ages were > 18 and who attended the follow-up at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia during the study period.

4.3.3. Study Unit

An individual randomly selected an epileptic patient and enrolled in the study.

4.4. Inclusion and Exclusion Criteria

4.4.1. Inclusion criteria

All willing patients with epilepsy whose ages were > 18 and who attended the follow-up at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, during the study period were included in the study.

4.4.2. Exclusion criteria

Epileptic patients who were severely ill, patients with pre-existing neurocognitive disorders, intellectual disabilities, and observable verbal communication problems were excluded from the study.

4.5. Sample size determinations

The sample size for this study was determined based on the magnitude of cognitive impairment and the factors significantly associated with cognitive impairment among epileptic patients. To ensure reliable and accurate results, the sample size was calculated for each specific objective, with the largest calculated sample size selected. For the first objective, the sample size was determined using the single population proportion formula with the following assumptions: level of confidence was 95%, (Zα/2) = 1.96**,** marginal of sampling error tolerated (d) =0.05 and p = 25.6% the magnitude of cognitive impairment from a similar study finding in Gurage Zone hospitals in Ethiopia (17). Therefore, the sample size was determined as follows:

$$n = \frac{\left(Z_{\frac{\alpha}{2}}\right)^2 \times p(1-p)}{d^2} = \frac{(1.96)^2 \times 0.256(1-0.256)}{(0.05)^2} = \mathbf{293}$$

The sample size for the second objective was calculated as follows: for the power of the study to be 80%, the ratio of exposed to unexposed was 1:1 with a 95% confidence interval, and the percentage of outcomes among unexposed and exposed was taken into account. Accordingly, the sample size for the second objective was calculated using Epi-Info version 7.0 software, as shown below.

Table 1: Sample size calculation for study on magnitude of cognitive impairment and associated factors among epileptic patients on follow-up at Tikur Anbessa Specialized Hospital (TASH), Ethiopia, Addis Ababa, Ethiopia, 2025

Factors that had an association with Cognitive impairment		Cognitive impairment		% of outcome in Exposed	% of outcomes in Non-exposed	Odds ration	Sample size	References
		Yes	No					
Residence	Rural	202	49	80.4	58.1	2.96	150	(14)
	Urban	150	108					
Medical illness	Yes	37	38	49.3	23.5	3.15	122	(18)
	No	66	214					
Monotherapy	Yes	39	108	8.1	26.5	4.09	152	(17)
	No	3	34					

The sample size for the second objective becomes 150, 122, and 152 for the 1st, 2nd, and 3rd factors, respectively. For the largest sample size, the calculated sample sizes for the first and second objectives were compared. Finally, after considering 5% as a non-response rate, the final sample size was 308.

4.6. Sampling techniques

First, a fresh list was prepared to identify the number of epileptic patients who have follow-ups by reviewing the Epilepsy clinic registration logbooks for the lat two months. A total of *954* epileptic patients were found to have follow-ups at Tikur Anbessa Specialized Hospital. From the prepared list, 308 participants were selected s through systematic random sampling and were invited to participate. The sampling fraction was calculated by dividing the total number of epileptic patients who had follow-ups at Tikur Anbessa Specialized Hospital. The sampling fraction is k $\approx$3 of clients. The number of the first study participants to be included in the sample is chosen by the lottery method. Thus, every three clients was included in the study. If a client is found ineligible based on inclusion and exclusion criteria, the next clients was considered.

4.7. Study variables

4.7.1. Dependent variable

The dependent variable was cognitive fuction status.

4.7.2. Independent variables

The independent variables include disease-related characteristics (seizure duration, seizure frequency, type of seizure, family history of epilepsy, depression, anxiety, seizure time of onset, history of head injury), sociodemographic status (educational status, residence, age of onset, sex, household income) and Drug related characteristics (polytherapy and combination anti-seizure medications).

4.8. Operational definitions

Medical illness refers to the presence of one or more chronic health conditions, including but not limited to Diabetes Mellitus (DM), Hypertension (HTN), and HIV/AIDS (14).

Cognitive dysfunction: A patient was considered to have cognitive dysfunction if they score less than 26 on the Montreal Cognitive Assessment (MoCA), a standardized tool used to screen for mild cognitive impairment. The MoCA assesses domains such as memory, attention, language, and executive functions, with a maximum score of 30. A score below 26 indicates possible cognitive impairment. An additional point was added for the participants with less than 12 years of education (18,25).

Depression and anxiety: Depression and anxiety was screened using the Hospital Anxiety and Depression Scale (HADS). If the participants scored ≥8 for each depression and anxiety sub-scale questions were considered as the participant has anxiety and depression respectively. The HADS is a 14-item self-report questionnaire, with 7 items each assessing anxiety and depression symptoms over the past week. Each item is scored from 0 to 3, giving subscale scores ranging from 0 to 21 (14,26).

4.9. Data Collection Tools and Procedures

4.9.1. Data collection tools

Data was collected through face-to-face interviews, which were adapted by reviewing different peer-reviewed published works (17,19,27–33). Data were collected in Amharic by trained data collectors under the supervision of the principal investigator. Cognitive dysfunction was assessed using the Amharic adaptation Montreal Cognitive Assessment (MoCA), which is a sensitive and rapid assessment tool for screening patients with cognitive dysfunction (34). Depression and anxiety was assessed by the HADS (35). HADS has been validated in Ethiopia, showing good internal consistency with a Cronbach alpha of 0.78 for the full scale, 0.76 for the anxiety subscale, and 0.87 for the depression subscale. This scale is commonly used to screen for symptoms of anxiety and depression and consists of 14 items, divided into two subscales: one for anxiety and one for depression, each containing 7 items. The items are rated on a four-point Likert scale (ranging from 0 to 3), with scores for each subscale ranging from 0 to 21 (35).

4.10. Data quality control and Management

The validity of the questionnaire was ensured by adapting it from relevant studies conducted by other researchers and modifying it to fit the local context. Data collectors and supervisors were trained for one day on the objectives of the study, how to keep the confidentiality of information, the contents of the questionnaire, filling out data collection formats, and data quality management by the investigator. A pretest was performed on 5% of the participants (21) in St. Paul's Hospital Millennium Medical College, a hospital near the study area. Based on the pretest results, necessary modifications and corrections were made. Two supervisors were supervising the data collectors. Furthermore, the investigator and supervisors were spot-checking and reviewing all the completed checklists daily during the data collection period to ensure completeness and consistency.

4.11. Data processing and analysis

The data was collected by Kobo Toolbox and exported to SPSS Version 27 for analysis. Data was cleaned by running the frequency. Descriptive statistics, such as frequency and percentage, was used to summarize descriptive data. The findings are presented as tables and graphs. Binary logistic regression analysis was employed to determine factors associated with low birth weight. After testing the assumptions of binary logistic regression, variables with a p-value < 0.25 at the binary logistic regression analysis were considered candidates for multivariable logistic regression analysis.

In the multivariable logistic regression model, a variable with a p-value < 0.05 was considered significantly associated with the outcome variable. Adjusted odds ratios (AOR) and 95% confidence intervals (CI) was calculated to measure the strength of the association between dependent and independent variables. The fitness of the final model was tested by Hosmer-Lemeshow's goodness-of-fit test. Multicollinearity among independently associated variables were checked by the multicollinearity diagnostic test, the variance inflation factor (VIF).

4.12. Ethical consideration

This study was reviewed and approved by the Ethical Review Board of Tikur Anbessa Specialized Hospital, neurology department. Before the fieldwork begins, necessary communications about the study's overall purpose was made with Tikur Anbessa Specialized Hospital administration bodies. The official letter of cooperation was obtained from the administration of Tikur Anbessa Specialized Hospital. Besides, the declaration of Helsinki was followed throughout the study. For confidentiality reasons, no personal identifiers were used on the data collection forms, a third party did not access the recorded data except the investigator, and confidentiality was assured throughout the study period.

4.13. Dissemination plan

The results of the study will be submitted to the Tikur Anbessa Specialized Hospital, Department of Neurology, and after approval, hard copies of the findings will be disseminated to other concerned bodies as well. The research paper will be presented at Tikur Anbessa Specialized Hospital as part of the defense and at annual and professional conferences. Finally, attempts will be made to publish results in national or international journals to disseminate worldwide.

5. Results

All epileptic patients receiving follow-up care in the period of April 1 to May 30, 2025 at Tikur Anbessa Specialized Hospital were assessed for eligibility during the study period. Of these, 308 participants fulfilled the inclusion criteria and were included in the final analysis as the calculated sample size. Data from all included participants were complete and were analyzed. The results are presented as socio-demographic, disease-related, and drug-related characteristics of the study participants, followed by the magnitude of cognitive dysfunction and factors associated with cognitive dysfunction.

5.1. Socio-demographic Characteristics of Study Participants

All sampled patients with epilepsy that had follow-up were included in the analysis . The mean age of the participants was 35.24 years, with a median age of 31 years (range: 18–85 years). Nearly half of the participants were young adults aged 18–24 years (46.1%), followed by those in early mid-adulthood (30–44 years) (30.2%). Participants aged 45–59 years accounted for 13.3%, while 7.8% were aged 60–74 years, and 2.6% were aged 75 years and above. Regarding sex distribution, 168 (54.5%) participants were female and 140 (45.5%) were male. More than half of the participants were single (55.9%), while 42.1% were married and 2.0% were widowed. In terms of educational status, 43.8% of participants had completed secondary education, 39.6% had primary education, 13.3% had attained college education or above, and 3.2% had no formal education. The majority of participants reported having no formal occupation (64.9%), whereas 22.1% were private employees, 4.9% were government employees, and 8.1% were engaged in other occupations. Most participants resided in urban areas (84.4%), while 15.6% lived in rural areas. With respect to monthly household income, 35.7% reported having no income, 19.2% earned between 5,000–10,000 ETB, 34.1% earned 10,001–20,000 ETB, 6.8% earned 20,001–40,000 ETB, and 0.3% earned 40,001–80,000 ETB per month. (Table 2)

Table 2. Socio-demographic characteristics of epileptic patients receiving follow-up care at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2025 (n = 308)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	Mean ± SD	35.24 ± —	—
	Median (IQR)	31 (—)	—
	Range	18–85	—
Age category	18–24 (Young adults)	142	46.1
	30–44 (Early mid-adulthood)	93	30.2
	45–59 (Late midlife)	41	13.3
	60–74 (Older adults)	24	7.8
	≥75 (Elderly)	8	2.6
Sex	Male	140	45.5
	Female	168	54.5
Marital status	Single	167	54.3
	Married	126	40.9
	Widowed	6	1.9
	Divorced	9	2.9
Educational status	No formal education	10	3.2
	Primary education	122	39.6
	Secondary education	135	43.8
	College and above	41	13.3
Occupation	No occupation	200	64.9
	Government employee	15	4.9
	Private employee	68	22.1
	Others	25	8.1
Place of residence	Urban	259	84.4
	Rural	49	15.6
Monthly household income (ETB)	No income	110	35.7
	< 5,000	12	3.9

	5,000–10,000	59	19.2
	10,001–20,000	105	34.1
	20,001–40,000	21	6.8
	40,001–80,000	1	0.3

5.2. Disease-related Characteristics of Participants

Among the 308 epileptic patients included in the study, nearly half (46.4%) had long-standing epilepsy, while 27.3% had established chronic epilepsy (6–10 years). Patients with early chronic epilepsy (1–5 years) accounted for 20.1%, and 6.2% had a new diagnosis (<1 year). The mean duration of epilepsy was 11.76 years, with a median duration of 10 years.

Regarding age at seizure onset, 46.4% of participants experienced seizure onset during adulthood (>18 years). Seizure onset during childhood (1–12 years) and adolescence (13–18 years) accounted for 25.3% and 23.4%, respectively, while 4.9% had infantile onset (<1 year). The mean age at seizure onset was 1.9 years, with a median age of 2 years.

With respect to seizure type, generalized tonic–clonic seizures (GTC) were the most common, reported by 65.6% of participants. This was followed by focal to bilateral tonic–clonic seizures (12.7%), focal aware seizures (9.1%), and focal impaired awareness seizures (7.1%). Other seizure types, including myoclonic, multiple generalized, atonic, and absence seizures, were less frequently reported.

A family history of epilepsy was reported by 2.9% of participants, while 97.1% reported no such history. The majority of participants (93.8%) had no history of head injury, whereas 6.2% reported a prior head injury. Regarding comorbid medical conditions, 40.6% of participants had at least one comorbidity, while 59.4% had none (Table 3).

Table 3. Disease-related characteristics of epileptic patients receiving follow-up care at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2025 (n = 308)

Variable	Category	Frequency (n)	Percentage (%)
Duration of epilepsy (years)	< 1 (New diagnosis)	19	6.2
	1–5 (Early chronic epilepsy)	62	20.1

	6–10 (Established chronic epilepsy)	84	27.3
	> 10 (Long-standing epilepsy)	143	46.4
	Mean ± SD (years)	11.76 ± —	—
	Median (IQR)	10 (—)	—
Age at seizure onset	< 1 year (Infantile)	15	4.9
	1–12 years (Childhood)	78	25.3
	13–18 years (Adolescence)	72	23.4
	> 18 years (Adulthood)	143	46.4
Type of seizure	Generalized tonic–clonic (GTC)	202	65.6
	Focal aware	28	9.1
	Focal impaired awareness	22	7.1
	Focal to bilateral tonic–clonic	39	12.7
	Myoclonic	6	1.9
	Multiple generalized	6	1.9
	Atonic	1	0.3
	Absence	2	0.6
	Other	2	0.6
	No	299	97.1

Family history of epilepsy	Yes	9	2.9
History of head injury	No	289	93.8
	Yes	19	6.2
Comorbid medical conditions	No	183	59.4
	Yes	125	40.6

5.3. Drug-related and Psychosocial Characteristics

Among the 308 epileptic patients included in the study, combination antiseizure therapy was the most commonly reported treatment (40.9%). Among those on monotherapy, phenytoin was the most frequently used antiseizure drug (21.1%), followed by phenobarbitone (15.3%), carbamazepine (11.7%), sodium valproate (7.8%), and lamotrigine (3.2%).

With respect to medication dosing frequency, 74.0% of participants reported taking antiseizure medications twice daily, while 26.0% reported once-daily dosing.

Regarding psychosocial status assessed using the Hospital Anxiety and Depression Scale (HADS), 66.9% of participants screened positive for anxiety, while 33.1% had no anxiety. Similarly, 89.3% of participants screened positive for depression, whereas 10.7% had no depressive symptoms (Table 4).

Table 4. Drug-related and psychosocial characteristics of epileptic patients receiving follow-up care at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2025 (n = 308)

Variable	Category	Frequency (n)	Percentage (%)
Type of antiseizure drug	Carbamazepine	36	11.7
	Sodium valproate	24	7.8
	Phenytoin	65	21.1
	Phenobarbitone	47	15.3
	Lamotrigine	10	3.2

	Combination therapy	126	40.9
Drug regimen	Monotherapy	181	58.8
	Combination therapy	127	41.2
Dose frequency	Once daily	80	26.0
	Twice daily	228	74.0
Anxiety (HADS-A)	No anxiety	102	33.1
	Anxiety present	206	66.9
Depression (HADS-D)	No depression	33	10.7
	Depression	275	89.3

5.4. Magnitude of Cognitive Dysfunction among people with Epilepsy

The magnitude of cognitive dysfunction among epileptic patients receiving follow-up care at Tikur Anbessa Specialized Hospital was assessed using the Montreal Cognitive Assessment (MoCA B). Overall, 171 participants (55.5%) were found to have cognitive dysfunction, while 137 participants (44.5%) had normal cognitive function.

Regarding the severity of cognitive dysfunction, nearly half of the participants (47.7%) had mild cognitive impairment (MCI). Moderate cognitive impairment was observed in 5.5% of participants, and 2.3% had severe cognitive impairment. The remaining 44.5% of participants demonstrated normal cognitive function. The distribution of cognitive function and severity levels is presented in Figure 2.

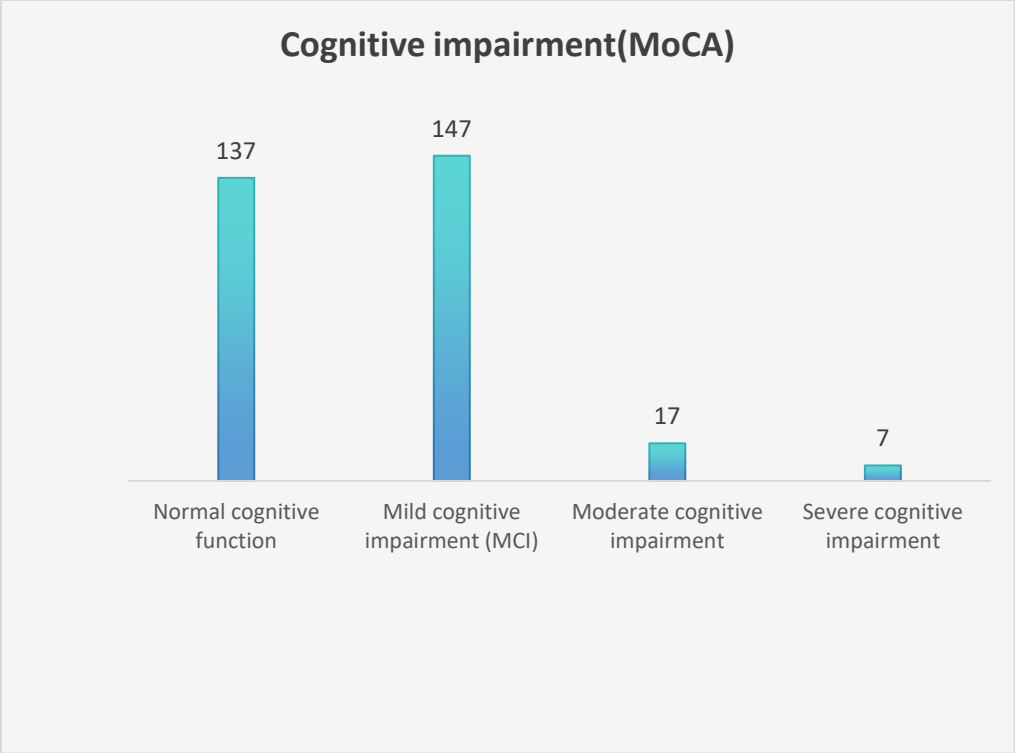


Fig 2: Magnitude and severity of cognitive dysfunction of patients with epilepsy

5.5. Bivariable and Multivariable Logistic Regression Analysis of Factors Associated with Cognitive Dysfunction

Bivariable logistic regression analysis was conducted to assess the association between cognitive dysfunction and 18 independent variables, with age analyzed both as a continuous and categorical variable. Among these variables, eight showed an association at the bivariable level ($p < 0.25$) and were therefore included in the multivariable logistic regression analysis. Crude odds ratios (CORs) with their corresponding 95% confidence intervals (CIs) and p-values are presented in Table 5. The variables that were significant at the bivariable level included combination of antiseizure drugs, frequency of medication intake, depression (HADS-D), type of antiseizure drug, duration of epilepsy, occupation, and age. Those variables were significant at the bivariable level ($p < 0.25$) and were entered into a multivariable logistic regression model to identify factors independently associated with cognitive dysfunction. After adjustment, two variables were found to be independently associated with cognitive dysfunction: age (continuous) and frequency of medication.

Increasing age was significantly associated with higher odds of cognitive dysfunction, with an adjusted odds ratio (AOR) of 0.946 per year increase (95% CI: —, $p < 0.001$). Frequency of

medication also showed a trend toward association (AOR = 1.993), though the p-value indicated borderline significance (p = 0.077). Other variables, including combination of drug, type of antiseizure drug, depression (HADS-D), duration of seizure, household income, and occupation, were not independently associated with cognitive dysfunction after adjustment.

The bivariable and multivariable logistic regression results are summarized in Table 5.

Table 5. Bivariable and Multivariable Logistic Regression Analysis of Factors Associated with Cognitive Dysfunction among Epileptic Patients Receiving Follow-up Care at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2025 (n = 308).

Variable	Category / Comparison	COR (Exp[B])	p-value (Bivariable)	AOR (Exp[B])	P-value (Multivariable
Combination of drug	Yes (41.2%) vs No (58.8)	0.086	<0.001		
Frequency of medication	Twice daily vs Once daily	0.344	<0.001	1.993	0.037
Depression (HADS-D)	Yes vs No	2.322	0.039		
Anti-seizure drug type	Reference: [Carbamazipine]	—	<0.001		
	Carbamazepine	24.857	<0.001		
	Sodium valproate	8.400	<0.001		
	Phenytoin	10.250	<0.001		
	Phenobarbitone	8.842	<0.001		
	Lamotrigine	14.000	<0.001		
Duration of epilepsy	>10 years vs <1 year	2.157	0.006		

Occupation	Government employee vs no occupation	0.375	0.026		
Age (Continuous)	Per 1 year increase	0.977	0.005	0.946	<0.001

5.7. Ordinal Logistic Regression Analysis for Severity of Cognitive Dysfunction

Bivariable ordinal logistic regression was conducted to identify factors associated with the severity of cognitive dysfunction among epileptic patients. Variables that met the criteria for inclusion ($p < 0.25$) were entered into a multivariable ordinal logistic regression model.

In the multivariable model, combination of antiseizure drugs and age category were independently associated with increasing severity of cognitive dysfunction. Patients taking a combination of drugs were significantly more likely to have more severe cognitive impairment compared to those on monotherapy (Estimate = -2.460, p = 0.016). Similarly, older age categories were associated with higher severity of cognitive dysfunction, with the youngest age group (18–24 years) showing significantly lower odds of more severe impairment compared to the reference group (Estimate = -2.243, p = 0.037). Other variables, including frequency of medication, depression, type of antiseizure drug, seizure duration, household income, marital status, and occupation, were not independently associated with severity of cognitive dysfunction after adjustment.

These results suggest that age and polytherapy are important determinants of cognitive dysfunction severity among epileptic patients.

Table 7. Multivariable ordinal logistic regression analysis of factors associated with severity of cognitive dysfunction among epileptic patients receiving follow-up care at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2025 (n = 308)

Variable	Category / Comparison	Estimate (β)	Std. Error	Wald	p-value	95% CI (Lower – Upper)

Combination of drug	Yes vs No	-2.460	1.022	5.793	0.016	-4.463 – -0.457
Age category	18–24 vs reference	-2.243	1.077	4.333	0.037	-4.354 – -0.131
	25–29	-1.744	1.044	2.787	0.095	-3.791 – 0.303
	30–44	-1.042	1.068	0.953	0.329	-3.135 – 1.051
	45–59	-0.201	1.014	0.039	0.843	-2.189 – 1.788
	60 - 74	0a	—	—	—	—
Frequency of medication	Twice daily vs Once daily	-0.607	0.356	2.901	0.089	-1.305 – 0.092
HADS-D (Depression)	Yes vs No	0.283	0.427	0.440	0.507	-0.553 – 1.119
Antiseizure drugs	Various categories	-.905	1.134	.637	.425	-3.127 - 1.317
Duration of seizure	Various categories	.435	.582	.557	.465	
Household income	Various categories	-.271	2.233	.015	.903	
Marital status	Various categories	-.304	.879	.138	.714	
Occupation	Various categories	.449	.518	.752	.386	

Model diagnostics and assumption checks were performed before interpreting the regression results. Multicollinearity among independent variables was assessed using the Variance Inflation Factor (VIF), and all variables had VIF values below 5 (range: 1.053–3.726), indicating no significant multicollinearity. The goodness-of-fit of the multivariable logistic regression model was evaluated using the Hosmer–Lemeshow test ($\chi^2 = 9.254$, df = 8, p = 0.321), which indicated an adequate model fit. Additionally, the proportional odds assumption for the ordinal logistic regression model was tested using the test of parallel lines and was not violated, confirming the appropriateness of the model.

6. Discussion

This study aimed to assess the magnitude of cognitive dysfunction and its associated factors among people with Epilepsy attending follow-up care at Tikur Anbessa Specialized Hospital. The overall prevalence of cognitive dysfunction with more than half of the participants exhibiting mild cognitive impairment. This finding is consistent with prior research. For example, Nau et al. (2018) reported that 74% of people with epilepsy and neurocysticercosis in Zambia had cognitive impairment, affecting memory, attention, and executive functioning [1]. Similarly, Kleen et al. (2012) highlighted that cognitive and behavioral comorbidities are highly prevalent in epilepsy, with deficits commonly observed in memory, attention, and executive domains, and often remain underrecognized in clinical practice [2].

Magnitude of Cognitive Dysfunction

The high prevalence observed in this study aligns with evidence suggesting that cognitive impairment is frequently reported among PWE, especially in clinical cohorts. Variations in prevalence estimates across studies likely reflect differences in assessment methods, patient characteristics, and seizure control [1–3]. The use of the Montreal Cognitive Assessment (MoCA) as a screening tool in our study is supported by prior work that reported MoCA to be effective in detecting cognitive dysfunction in people with epilepsy, even when other brief scales such as the Mini-Mental State Examination might fail to detect impairment [3].

Age as a Predictor of Cognitive Dysfunction

Older age was strongly associated with both the presence and severity of cognitive dysfunction, confirming a consistent pattern in the epilepsy literature. Cognitive performance tends to decline with advancing age, a trend that may be accelerated in epilepsy due to cumulative

seizure burden, network disruption, and age-related neurodegenerative changes [1,2]. Specifically, studies among older adults with epilepsy have demonstrated significantly higher rates of cognitive impairment compared with age-matched controls, particularly in memory and executive function domains [2].

Antiseizure Medication and Polytherapy

in this study, polytherapy (combination of drugs) was significantly associated with severity of cognitive dysfunction and is consistent with prior research indicating that multiple anti-seizure medications (ASMs) can have additive negative effects on cognition. Polytherapy has also been linked to poorer cognitive outcomes compared with monotherapy in several studies, including higher risk of impairment in memory and visuospatial functioning [1,4]. Mechanistically, cognitive side effects are thought to result from increased drug load and neurophysiological impacts on neural networks involved in cognition.

Frequency of Medication and Cognitive Effects

Although frequency of medication showed only borderline significance, after multivariable adjustment, the trend of higher cognitive dysfunction with more frequent dosing is biologically plausible. Frequent dosing often reflects more severe or refractory epilepsy, higher cumulative drug exposure, or daytime sedation — each of which has been associated with poorer cognitive outcomes in PWE [1].

Psychiatric Comorbidity

While psychosocial factors such as depression and anxiety were significant in the bivariate analysis, they did not retain their statistical significance in the multivariable logistic model. On the other hand, several studies have shown that mood disorders are independently associated with cognitive impairment in epilepsy, particularly in older populations where depression and anxiety significantly correlate with lower cognitive scores on MoCA assessments [5]. This suggests that affective symptoms may compound epilepsy-related cognitive deficits and should be screened routinely.

Public Health and Clinical Implications

The high burden of cognitive dysfunction identified in this study highlights the need for systematic cognitive screening in routine epilepsy care. Early identification of cognitive difficulties would allow clinicians to tailor treatment strategies — such as simplification of drug regimens, cognitive rehabilitation, and psychosocial interventions — that may mitigate cognitive decline and improve patient outcomes.

Strengths and Limitations

The present study has several important strengths. First, it utilized a **validated cognitive screening instrument, the Montreal Cognitive Assessment (MoCA)**, which is widely used for detecting mild cognitive impairment and provides a comprehensive evaluation of multiple cognitive domains. Second, the study applied **multivariable regression analysis** to control for potential confounding variables, thereby improving the reliability of the observed associations between independent variables and cognitive dysfunction. In addition, the study contributes valuable evidence on cognitive impairment among **patients with epilepsy in a resource-limited setting**, where such data are relatively scarce.

Limitations include the cross-sectional design, which precludes causal inferences, and possible residual confounding due to unmeasured factors such as seizure frequency or EEG abnormalities. Other than these, the study was conducted in a **single tertiary care hospital**, which may also limit the generalizability of the findings to other populations of patients with epilepsy. Theirfore, future longitudinal studies are needed to clarify causal pathways and the temporal evolution of cognitive dysfunction in epilepsy.

7. Conclusion and recommendation

Cognitive dysfunction is highly prevalent among epileptic patients receiving follow-up care at Tikur Anbessa Specialized Hospital, with more than half of participants affected and nearly half exhibiting mild impairment. Older age, lower household income, and use of combination antiseizure therapy (polytherapy) were identified as significant determinants of cognitive dysfunction and its severity.

These findings highlight the need for routine cognitive screening in epileptic patients, particularly among older adults and those on multiple medications. Healthcare providers should consider integrating cognitive assessment into regular follow-up visits and developing tailored interventions, such as medication review, psychosocial support, and cognitive rehabilitation

programs, to minimize cognitive decline. Additionally, addressing socioeconomic barriers through patient counseling and support programs may further reduce the risk of cognitive impairment. Future research should explore longitudinal trends in cognitive function and the impact of targeted interventions to improve outcomes in this population.

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Annexes

Annex I: Questionnaire

Information sheet and consent form

Title of the research project: Magnitude of cognitive impairment and associated factors among epileptic patients on follow-up at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2025.

I**nvestigator** – Dr Joseph Bol Dhalbeny

Advisors: Dr. Abenet and Dr. Fikru

Institution: Department of Neurology, Tikur Anbessa Specialized Hospital

Introduction

This information sheet and consent form are prepared with the aim of explaining the research project that you are asked to join by the research group. The research group includes one investigator, four trained data collectors, and two Supervisors.

Research objective: The objective of this study is to assess the Magnitude of cognitive impairment and associated factors among epileptic patients on follow-up at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2025.

Procedure: We invite you to participate in this project. If you are willing to participate in this project, you need to understand. Then after, the data collectors will interview you. You do not need to tell your name or give your telephone number to the data collector and all your responses and the results obtained will be kept confidential by using a coding system whereby no one will have access to your response.

Risk and /or Discomfort

By participating in this research project, you may feel that it has some discomfort, especially in wasting your time (a minimum of 30 minutes). We hope you will participate in the study for the sake of the benefit of the research result. There is no risk in participating in this research project.

Confidentiality: The information collected for this research project will be kept confidential stored in a file and kept locked without your name, but a code number assigned to it.

Benefit - If you participate in this research project, there may not be a direct benefit to you but your participation is likely to help us to meet the research objective.

Incentives/Payments for Participating: There is no monetary benefit or any provided incentives to you for participating in this research project.

Voluntary participation and withdrawal - Your decision to participate in this study is completely voluntary. If you decide to not participate in this study, it will not affect the care, services, or benefits to which you are entitled. If you decide to participate in this study, you may withdraw from your participation at any time without penalty.

Contact person - This research project was reviewed and approved by the Ethical Review Board of Tikur Anbessa Specialized Hospital. If you have any questions or concerns about this study or if any problem arises please contact:

Phone number: **Email:**

Your consent - I voluntarily agree to participate in this research program

Yes No

If yes, proceed to the next page

If No, please stop here

Name and signature of supervisor: _____Date_____

Name and signature of data collector: _____Date_____

Thank you for your cooperation!

Part I: Sociodemographic characteristics			
S/N	Questions	Responses	Skip
1.	Age of participants in years	_____	
2.	Educational status	1. No formal education 2. Primary education 3. Secondary education 4. College and above	
3.	Occupation	1. No occupations 2. Government employee 3. Private employee 4. Others	
4.	Residence	1. Urban 2. Rural	
5.	Sex	1. Male 2. Female	
6.	Marital status	1. Single 2. Married 3. Widowed 4. Divorced	
7.	Household estimated monthly income (ETB)	_____	
8.			
Part I: Disease-related characteristics			
9.	Duration of the seizure disorder (years)		
10.	Seizure frequency		
11.	Type of seizures		
12.	Family history of epilepsy	1. Yes 2. No	
13.	Age of seizure onset		
14.	History of head injury		
15.	Comorbid medical illness	1. Yes 2. No	
16.	Frequency of medication	1. Once daily 2. Twice daily	
17.	Comfortable with medication	1. Yes 2. No	
18.	Substance use	1. Yes 2. No	
Part I: Drug-related characteristics			
19.	Monotherapy	1. Yes 2. No	
20.	Combination of antisezures	1. Yes 2. No	
21.	Anti-seizure drugs	1. Phenytoin 2. Phenobarbitone 3. Valproate 4. Combination 5. Others	

Hospital Anxiety and Depression Scale (HADS)

Instructions: This questionnaire is designed to help your investigator know how you feel. Read each item and circle the reply that comes closest to how you have been feeling in the past week. Don't take too long over your replies: your immediate reaction to each item will probably be more accurate than a long thought-out response.

I feel tense or 'wound up':	**A**
Most of the time	3
A lot of the time	2
From time to time, occasionally	1
Not at all	0

I still enjoy the things I used to enjoy:	**D**
Definitely as much	0
Not quite so much	1
Only a little	2
Not at all	3

I get a sort of frightened feeling like something awful is about to happen:	**A**
Very definitely and quite badly	3
Yes, but not too badly	2
A little, but it doesn't worry me	1
Not at all	0

I can laugh and see the funny side of things:	**D**
As much as I always could	0
Not quite so much now	1
Definitely not so much now	2
Not at all	3

Worrying thoughts go through my mind:	**A**
A great deal of the time	3
A lot of the time	2
From time to time but not too often	1
Only occasionally	0

I feel cheerful:	**D**
Not at all	3
Not often	2
Sometimes	1
Most of the time	0

I can sit at ease and feel relaxed:	**A**
Definitely	0
Usually	1
Not often	2
Not at all	3

I feel as if I am slowed down:	**D**
Nearly all of the time	3
Very often	2
Sometimes	1
Not at all	0

I get a sort of frightened feeling like 'butterflies in the stomach':	**A**
Not at all	0
Occasionally	1
Quite often	2
Very often	3

I have lost interest in my appearance:	**D**
Definitely	3
I don't take as much care as I should	2
I may not take quite as much care	1
I take just as much care as ever	0

I feel restless as if I have to be on the move:	**A**
Very much indeed	3
Quite a lot	2
Not very much	1
Not at all	0

I look forward with enjoyment to things:	**D**
As much as I ever did	0
Rather less than I used to	1
Definitely, less than I used to	3
Hardly at all	2

I get sudden feelings of panic:	**A**
Very often indeed	3
Quite often	2
Not very often	1
Not at all	0

I can enjoy a good book, radio or TV program	**D**
Often	0
Sometimes	1
Not often	2
Very seldom	3

Questions relating to anxiety are indicated by an 'A' while those relating to depression are shown by a 'D'. Scores of 0-7 in respective subscales are considered normal, with 8-10 borderline and 11 or over indicating clinical 'caseness'

የሞንትሪያል የግንዛቤ ምርመራ (ሞካ-ቢ)

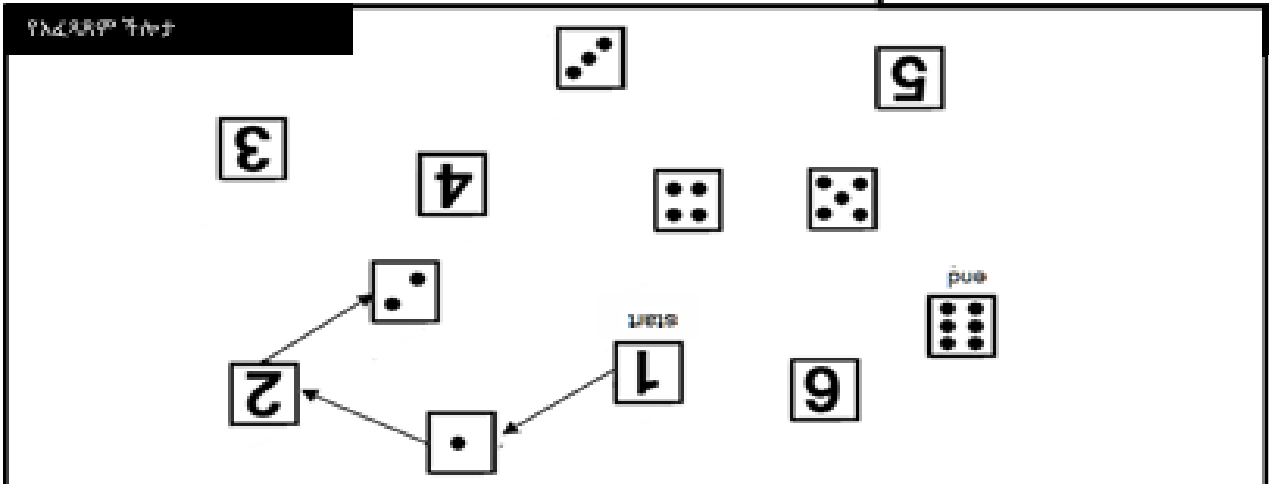
መመሠረታዊ

ስም_____

ዕድሜ _____ ፆታ __ _____

የትምህርትደረጃ_____የምርመራዉቀን _____

የመጠርያስም _____

የእይታዎች ችሎታ	ዉጤት
	የተጀመረበት ጊዜ _____ (/1)

ወዲያውኑማስታወስ		ፅሕረቆአበባ	መንገር	አጅ	ሰማያዊ	ማንኪያ	ነጥብየላቸውም
ያቸው በመሪተየተሳካቢሆንም 2 በሙከራዎችንደደርጉ	1ኛ ሙከራ						
	2ተኛ ሙከራ						

እቀላጥፎመናገር	በ1ደቂቃዉስጥ በሞሞራት የሚችሉትንያክል ፍራፍሬዎችይጥሩ	(/2)
	1.....2.....3.....4.....5.....6..... 7.....8.....9.....10.....11.....12..... 13.....14.....15.....16.....17.....18.....	ብዛት ዓይነት 2 ነጥቦች፡ ብዙቱ 11 በላይ ሞሞላይበላይ ከሆኑ፡ 1 ነጥብ፡ በሞሉ 11 ከሆነ፡ 0 ነጥብ፡ ሞሉቱ 10 ይሞሞ ከዚያነጥቅ ከሆነ፡

ግንዛቤ	[ ] ጊዜ(± 2 ሰዓት) [ ] ቀን [ ] ወር [ ] ዓመት [ ] ቦታ [ ] ከተማ	(/6)

ስሌት	የ1 ብር ሳንቲሞችን ከ 5 ብርእና 10 ብርኖቶችን በመጠቀም "1 ብር" ለሚያመጣላቸዉን የሚከፍሉበትን ጋመልገሉ ይጠየቃሉ። (ነጥቦች፡ 3 ወይንገሉ ችሎ 2 ነጥቦች፡ 2 ገመልገሉ ችሎ 1 ነጥብ፡ 1 ገመልገሉ ብቻ 0 ነጥብ፡ ለመጀመሪያ ጥያቄ ወይንም ለተሳሳተ መልስ)	(/3)
	[ ] 1..... [ ] 2. ..... [ ] 3.	

ረቂቅአስተሳሰብ	እነዚህነገሮችወደየትኛውምድብይመደባሉ? (ለምሳሌ፡ብርቱካንንፀሙዝ - ፍራፍሬ)	/3)
	[ ]ባቡር - ጀልባ [ ]ሰዓን - ደቡብ [ ]ከበሮ - ዋሽንት	

ዘግይቶ ማስታወስ		ፅሕረቆአበባ	መንገር	አጅ	ሰማያዊ	ማንኪያ	(/5)
ያለፍንጭ ለሞያስታወሱነጥቦች ይሰጣሉ	ያለፍንጭ ማስታወስ	[ ]	[ ]	[ ]	[ ]	[ ]	
(እንደግፎነት ነጥብ)	በምድብፍንጭ ማስታወስ	[ ]	[ ]	[ ]	[ ]	[ ]	
	በብዙ አማራጭ ፍንጭ ማስታወስ	[ ]	[ ]	[ ]	[ ]	[ ]	

በእይታ ማስተዋል	ወቀሰ	ቲሸርት	ውዝ	ወብራት	ሻማ	ብዛት= 9-10 ከሆነ 3 ነጥብ ብዛት= 6-8 ከሆነ 2 ነጥብ ብዛት= 4-5 ከሆነ 1 ነጥብ ብዛት= 0-3 ከሆነ 0 ነጥብ	(/3)
ምስሉችንይዘዘ፡ በአዕስሽንደ ያልከሆነጊዜ ተረቅቷል። አባሪወረቀትንይመልከቱ።	ሰዓት	ኩባያ	ቅጠል	ቁልፍ	ማንኪያ		

ስም ሙሞራት	እንሰሳትንይለዩ፡ አባሪወረቀትንይመልከቱ። [ ]የሜዳ አህያ [ ]ፒኮክ [ ]ነብር [ ]ቢራቢሮ	(/4)

ቅኩረት	በከብውስጥያሉትንቁሞሮችይጥሩ። አባሪወረቀትንይመልከቱ።	5 39 2394 0 2 1 67 4 6 7 5	ስህተት ____ብዛት ነጥብይሰጣል ምንምነጥብአይሰጥም፡	(/1)
በከብእና በሰራተኞወይን ውስጥያሉትንቁሞሮችያንብቡ። አባሪወረቀትንይመልከቱ።		8 5 1 3 0 2 9 2 0 4 9 7 8 6 1 5 7 6 4 8 3 9 2 0 3 9 4 0 2 1 6 8 7 4 6 7 5	ስህተት ____ብዛት 2 ነጥቦች፡ 2 ወይም ከዚያ በላይ ስህተት 1 ነጥብ፡ 1 ስህተት 0 ነጥብ፡ 4 ወይም ከዚያ በላይ ስህተት	(/2) የተጠናቀቀበት ሰዓት

Adapted by : Paruwyou Julayanont MD
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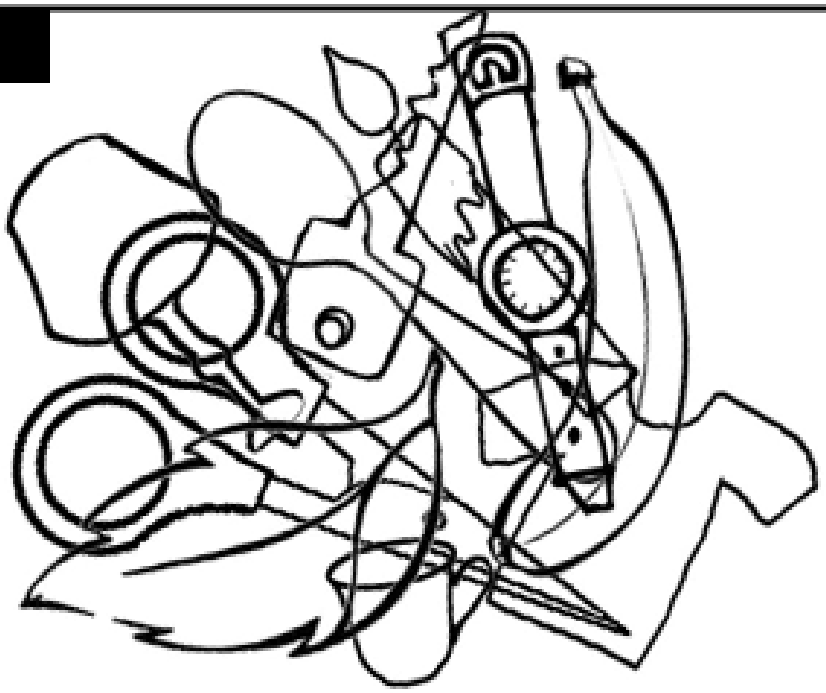
ጠቅላላ ውጤት (_____/30)
የትምህርትደረጃ≤ 6 ዓመት ሲሆነ ነጥብይጨምሩ።
ማስታወሻ፡ ከፍተኛ የሞይችሉ ነጥብይጨምሩ።
ጠቅላላ ጊዜ፤ ደቂቃ ሰከንድ

የሞንትሪያል የግንዛቤ ምርመራ (ሞካ-ቢ)

መሠረታዊ

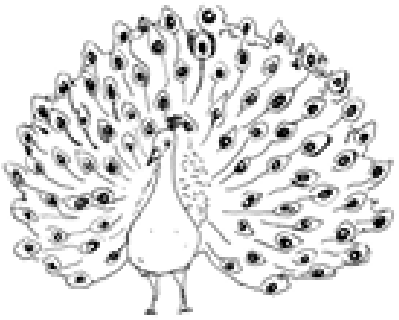
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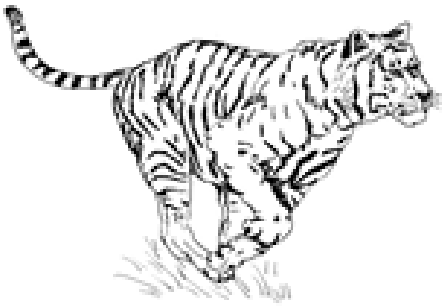
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ስም መጥራት









ትኩረት

1 5 8 3 9 2 0 3 9 4 0 2 1 6 8 7 4 6 7 5

3 8 5 1 3 0 2 9 2 0 4 9 7 8 6 1 5 7 6 4

1 5 8 3 9 2 0 3 9 4 0 2 1 6 8 7 4 6 7 5