ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCE AND SCHOOL OF MEDICINE DEPARTMENT OF NEUROLOGY

RESEARCH THESIS

Assessment of cognitive function and associated factors among Parkinson's disease patients and control group using IDEA cognitive screen at TASH, AA, Ethiopia.

(IDEA - Identification of dementia in elderly Africans, TASH- Tikur Anbessa Specialized Hospital)

Hanna Kiflu (MD), Neurology Senior Resident

A Thesis to be submitted to Tikur Anbessa Specialized Hospital, Neurology Department in Partial Fulfillment of the requirements for the postgraduate program of neurology

February, 2024

Addis Ababa University, College of Health Science, School of Medicine, and Department of Neurology

Assessment of cognitive function and associated factors among Parkinson's disease patients and control group using IDEA cognitive screen, TASH, A.A, Ethiopia.

By:

Dr. Hanna Kiflu - MD, Neurology Resident

(Year III)

Name Of Advisors:

Dr. Seid Ali (Internist, Consultant Neurologist, Associate Professor of Neurology)

Professor Getahun Mengistu (Internist, Consultant Neurologist, Associate Professor of Neurology)

A RESEARCH THESIS TO BE SUBMITTED TO TIKUR ANBESSA SPECIALIZED HOSPITAL, DEPARTMENT OF NEUROLOGY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE SPECIALIZATION CERTIFICATE IN NEUROLOGY.

February 2024 GC

Table of Contents

LIST OF TABLES & FIGURES ..... ***i***

LIST OF FIGURES ..... **i**

LIST OF TABLES ..... **i**

ACKNOWLEDGEMENTS ..... ***ii***

Acronyms ..... ***iii***

Abstract ..... ***iv***

1. Introduction ***1***

1.1 Background **1**

1.2 Statement of the problem **1**

1.3 Significance of the study **2**

2. Literature review ***3***

3. Objectives ***6***

3.1 General objective **6**

3.2 Specific objectives **7**

4. Methods and materials ***7***

4.1 Study area and period **7**

4.2 Study design **8**

4.3 Selection of study population **8**

4.3.1 Source population 8

4.3.2 Study population 8

4.3.3 Sample 8

4.4 Eligibility criteria **9**

4.4.1 Inclusion criteria 9

4.4.2. Exclusion criteria 9

4.5. Sample size determination **9**

4.6. Data collection procedure **10**

4.6.1. Data collection tools 10

4.6.2. Data collection 11

4.8 Study variables **11**

4.8.1. Dependent variables 11

4.7. Operational definition **12**

4.9 Data processing and analysis **12**

4.10 Data Quality Control **13**

4.11 Ethical consideration **13**

4.11. Dissemination of results **14**

5. Result ***14***

6. Discussion ***27***

7. Conclusion and recommendation ***30***

7.1 Recommendation **31**

7.2 Strengths and limitations of the study **32**

7.2.1 Strength 32

7.2.2 Limitation 33

References ***35***

Annexes ***38***

LIST OF TABLES & FIGURES

LIST OF FIGURES

Figure 1: IDEA score with age classification among Parkinson's disease patients

Figure 2: IDEA score with Age classification for control patients

Figure 3: IDEA score with sex among PD patients

Figure 4: IDEA score with sex for control patients

Figure 5: IDEA score with Parkinson's Hoehn and Yahr severity scale among PD patients,

Figure 6: IDEA score with educational status classification among PD patients

Figure 7: IDEA score with literacy level for control patients

Figure 8: Box Plot of IDEA Scores by Group: Parkinson's Disease Patients vs. Matched Controls

LIST OF TABLES

Table 1: Sociodemographic characteristics of Parkinson's disease patients and the control group

Table 2: Underlying surgical diagnosis of a control group

Table 3: IDEA score classification among PD patients and matched control group

Table 4: Sociodemographic factors and cognitive impairment of PD and matched control group

Table 5: Factors associated with Cognitive Impairment (dementia) in PD patients and their controls

Table: Parkinson's disease participants' characteristics and their COR, AOR, and P value

ACKNOWLEDGEMENTS

First of all, I would like to thank the Almighty Lord for helping me to make the study possible and secondly, I would like to express my heartfelt gratitude to my advisors Dr. Seid (Internist, consultant Neurologist) and Professor Getahun (Internist, consultant Neurologist) for their unreserved guidance and encouragement from the stage of title selection to the development of this thesis. My deepest gratitude goes to Addis Ababa University College of Health Sciences and the School of Medicine Department of Neurology for giving me this great opportunity and exposure, and for their relentless administrative support. I would also like to thank all those who have contributed to the success of the thesis development. Last but not least, my gratitude goes to my family and friends for their continuous support and encouragement.

Acronyms

AA- Addis Ababa

AAU – Addis Ababa University

CI – Cognitive impairment

CIND – Cognitive impairment without dementia

DM – Diabetes mellitus

DRS-2 - Mattis Dementia Rating Scale–2

IDEA – Identification of dementia in elderly Africans

LMICs – Low & middle-income countries

MCI – Mild cognitive impairment

MMSE –Mini mental state examination

MoCA - Montreal Cognitive Assessment

PANDA - Parkinson Neuropsychometric Dementia Assessment

PD – Parkinson's disease

PDD - Parkinson's disease with dementia

PD-CRS – Parkinson's Disease–Cognitive Rating Scale

RPC- Research and Publication Committee

SCOPA-COG - Scales for Outcomes of Parkinson's Disease–Cognition

SSA – Sub-Saharan African countries

TASH- Tikur Anbessa Specialized Hospital

WHO – World Health Organization

Abstract

Background: The global prevalence of Parkinson's disease (PD) is on the rise and is expected to reach nearly 9 million cases by 2030. Cognitive impairment (CI), which encompasses both dementia and cognitive impairment without dementia (CIND), represents a common complications of PD that carry significant clinical consequences. About 40% of individuals with PD develop dementia—this rate is six times greater than that of age-matched healthy peers. The Identification of Dementia in Elderly Africans (IDEA) cognitive screen is a concise, multi-dimensional assessment tool created to tackle the educational bias seen in other cognitive screening instruments used in sub-Saharan Africa. This research evaluates cognitive ability in PD patients utilizing the validated IDEA cognitive screen. In our clinical environment, there is a need for routine cognitive impairment screening among PD patients. This need arises from the lengthy and education-biased nature of currently available validated cognitive assessment tools. Conversely, the IDEA screen is a brief cognitive assessment that is practical for implementation in busy tertiary hospitals such as TASH.

Objective: To assess cognitive function and associated factors among Parkinson's disease patients and baseline characteristics matched control group using IDEA cognitive screen, Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

Methods: A comparative cross-sectional study was conducted using systematic random sampling on 150 PD patients and on 150 baseline-matched control group; age, sex, educational level & comorbidity at TASH from September to December 2024. Data were collected using pretested questionnaires and the IDEA cognitive tool by trained neurology residents & general practitioners. The data was cleaned, edited, entered, and analyzed using SPSS version 30. A non-parametric regression model was employed to determine factors associated with cognitive function impairment.

Results: Among 150 PD patients, 3.3% met the criteria for probable dementia and 9.3% for possible dementia based on IDEA screening. The prevalence of cognitive impairment in the PD group was 9.9% higher than in the matched control group. The median IDEA score was significantly lower in PD patients (12.4 ± 2.25) compared to controls (13.31 ± 1.53). Among PD patients, median IDEA scores declined progressively with older age and lower educational attainment. Illiteracy emerged as the sole significant predictor of cognitive impairment in multivariate analysis.

Conclusion: In this study, IDEA revealed probable or possible dementia in 12.6% of PD patients versus 2.7% of controls, reflecting a fourfold higher prevalence of cognitive impairment in PD. Illiteracy was the sole significant predictor of dementia in PD patients, highlighting residual educational bias despite IDEA's design for low-literacy settings. Key suggestions from the study

include developing education-stratified IDEA cutoffs for urban LMIC populations, validating IDEA against PD-specific diagnostic tools, improving healthcare-seeking behavior among PD patients, and supplementing IDEA with PD-focused cognitive screens to better capture PD-associated mild cognitive impairment. Further research, such as multicenter studies to establish normative data across diverse literacy and age groups, is also recommended.

1. Introduction

1.1 Background

The incidence of Parkinson's disease is rising considerably as the population ages. It is estimated that by 2030, the global count of cases will reach nearly 9 million, effectively doubling the current numbers. According to a WHO estimate from 2019, more than 8.5 million people currently live with Parkinson's disease, resulting in 5.8 million disability-adjusted life years (DALYs) associated with this illness. Parkinson's disease is a chronic and progressive condition that results from the degeneration of both dopaminergic and non-dopaminergic neurons, mainly in the brain. It presents with both motor and non-motor symptoms, including bradykinesia, resting tremors, rigidity, and balance issues. (3)

Parkinson's disease (PD) ranks as the second most common neurodegenerative disorder, second only to Alzheimer’s disease. A notable portion, between 20% and 30%, of non-demented individuals with PD face cognitive challenges. Furthermore, these patients are at an increased risk of developing dementia over time compared to those with normal cognitive function. Generally, the prevalence and incidence rates of PD in Africa are typically lower than those seen in American and European demographics. In Sub-Saharan Africa, the incidence of PD ranges from 7 cases per 100,000 individuals in Ethiopia to 67 cases per 100,000 in Nigeria. However, it remains uncertain whether Africa truly has a lower prevalence and incidence of PD, or if these disparities are due to differences in healthcare accessibility. (7)

Non-motor symptoms of Parkinson's disease are frequently more common in patients who are in the later stages of the condition. However, these symptoms can appear early or even prior to the onset of typical motor symptoms associated with Parkinson’s disease. Frequently reported psychiatric non-motor symptoms include depression, anxiety, apathy, and cognitive decline. Additionally, patients may suffer from sleep issues, autonomic dysfunction (which affects the cardiovascular, gastrointestinal, and urinary systems), and sensory problems. The incidence of dementia related to Parkinson’s disease is about 30%, with the lifetime risk potentially reaching up to 80%. Around 10-20% of individuals newly diagnosed with Parkinson’s disease show cognitive impairments, and nearly one-third of those affected contend with mild cognitive impairment. (8,9)

Cognitive deficits, which include dementia and cognitive impairment without dementia (CIND), represent a significant motor-related concern associated with Parkinson’s disease (PD). (9) About 40% of individuals with PD eventually develop dementia, a condition that occurs six times more frequently than in their healthy peers of the same age. While substantial cognitive decline is typically observed in the later stages of the disease, even slight cognitive changes can be noticeable in the initial stages of PD. (8) Dementia associated with PD is a type of cognitive decline that often arises in patients diagnosed with Parkinson’s disease, usually appearing several years after the initial motor symptoms manifest. (9)

The IDEA cognitive screening tool, designed to identify dementia among older adults in Africa, is a brief and thorough assessment developed from data collected from 1,198 elderly individuals evaluated for dementia in rural Tanzania. This tool was created to address the educational bias present in other cognitive screening tools used throughout sub-Saharan Africa. (12) In specific countries, including urban areas, the IDEA tool has shown comparable sensitivity to dementia when evaluated against established assessments like the MMSE.

1.2 Statement of the problem

Parkinson's disease (PD) is a neurological condition that is rapidly rising in prevalence, impairment, and mortality rates across the world. In 2016, it was estimated that there were 6.1 million individuals living with PD globally, an increase from 2.5 million in 1990, and this number is expected to surpass 12 million by the year 2040.

In light of the situation known as the "Parkinson pandemic," there has been an increased emphasis recently on the impact of Parkinson's disease in lower-middle-income and low-income countries, where the prevalence is expected to rise significantly. On the other hand, the global count of people living with dementia was projected to be 43.8 million in 2016, with forecasts indicating that this figure may exceed 100 million by 2050. (13)

At present, across all countries, people are living longer and aging more, and the incidence of Parkinson's Disease (PD) is also on the rise. Despite PD having both motor and non-motor symptoms, greater focus is still directed towards the motor symptoms. (9)

Despite this, the non-motor symptoms of Parkinson's disease (PD) result in more significant health consequences concerning the quality of life and health outcomes for those affected by PD. Cognitive decline in PD can occur with or without the presence of dementia. This challenge arises in the early stages of PD and significantly contributes to the morbidity and mortality associated with the disease. These effects are defined by a shorter life expectancy, diminished ability to perform daily activities, and an overall lower quality of life. (9).

In individuals who have recently been diagnosed with Parkinson's disease, whether they are newly diagnosed or not currently on dopaminergic treatments, self-reported memory issues may suggest an increased risk of cognitive decline; 30.3% of these patients indicated experiencing memory difficulties and were more likely to develop mild cognitive impairment (MCI) within two years of follow-up compared to those without reported memory problems. (12)

It is crucial to conduct early assessments for cognitive decline in individuals with Parkinson's disease. This early identification will allow us to implement timely interventions for those exhibiting cognitive issues, aiding us in managing the progression of the disease. It's worth noting that not all patients showing signs of cognitive impairment will develop dementia; some may maintain a stable condition, while others might improve their mental abilities.

1.3 Significance of the study

This study assessed the cognitive function of PD patients using the IDEA cognitive screen at TASH. It also tried to assess the associated factors of cognitive impairment among PD patients. It is the first study to use the IDEA cognitive screen in Ethiopia. It is a validated tool in different African countries in both community and hospital-based studies. It has comparable sensitivity for the detection of dementia with other well-practiced cognitive screens like MMSE and MoCA.

Studying cognitive impairment and screening cognitive function in patients with PD should be part of routine clinical care. IDEA is a brief yet sensitive cognitive screen that can be used in busy tertiary Hospitals like TASH. In addition, this study tried to give information on cognitive function in PD patients compared to baseline characteristics matched to the control group at TASH, AA.

It will also be used as an input for future research. More importantly, it will also help to improve the quality of life of PD patients who have cognitive impairment.TASH was chosen for this study because it is widely involved in delivering services for PD patients from all over the country. The hospital serves as the referral center for cases referred from various facilities in the country

2. Literature review

In a study that assessed the frequency, patterns, and predictors of cognitive impairment among 51 Nigerian individuals with Parkinson's Disease (PD) compared to 50 controls matched for demographics using the modified Community Screening Instrument for Dementia (CSI ‘D’), it was discovered that 21.6% of the PD patients displayed cognitive deficits, whereas only 4% of the control group did. Factors associated with cognitive dysfunction included an older age at the onset of PD, greater age overall, and a higher score on the UPDRS motor scale. (14)

A study conducted in Ethiopia on the non-motor symptoms of patients with Parkinson's disease indicated that almost 50% of the participants experienced varying levels of cognitive impairment. The findings highlight the necessity of evaluating Parkinson's disease patients in Ethiopia for cognitive deficits using a reliable assessment tool (28)

Various cognitive assessment tools have been validated for use in Parkinson's Disease (PD), including the Parkinson Disease–Cognitive Rating Scale (PD-CRS), the Parkinson Neuropsychometric Dementia Assessment (PANDA), the Scales for Outcomes of Parkinson Disease–Cognition (SCOPA-COG), the Mattis Dementia Rating Scale–2 (DRS-2), and the Montreal Cognitive Assessment (MoCA). (7).

In one study which is done in Nigeria and Tanzania on validity and reliability of the identification and intervention of dementia in elderly Africans (IDEA): concluded that The IDEA cognitive screen performed well in these populations and should prove useful in screening for dementia and delirium in other areas of sub-Saharan Africa.; however it recommended, further robust validation studies of the instrument. Also, the best cut-off of the IDEA needs clarification. (17)

In the research focused on the Development and Validation of the Identification and Intervention for Dementia in Elderly Africans (IDEA), the Study Dementia Screening Instrument was conducted among the elderly population in Tanzania to create a dementia screening tool suitable for use in healthcare settings or community environments, particularly among those with minimal formal education. The findings revealed that the 6-item brief dementia screening instrument demonstrates acceptable characteristics and has been validated as an effective screening tool (15)

In various studies, the risk and protective factors associated with cognitive impairment in Parkinson's Disease (PD) have been outlined. Some of the identified risk factors include male gender, variants of the MAPT gene, accumulation of alpha-synuclein and tau proteins in the brain, as well as having hypertension and diabetes mellitus. Conversely, factors that may offer protection include regular exercise, adherence to a Mediterranean diet, intake of vitamin D3, and consumption of caffeine. (10)

Additionally, the occurrence of hallucinations, advanced age, the general severity of motor symptoms, the presence of speech difficulties, later onset of Parkinson's disease, the intensity of bradykinesia, axial issues (such as postural instability and gait difficulties), lower educational attainment, the existence of depression, and being male are linked to a higher likelihood of cognitive decline. (11)

A cross-sectional study conducted in Sub-Saharan Africa aimed to establish normative values for IDEA and other straightforward assessments, revealing that older individuals, those with less education, and females tended to score lower on these evaluations. The study concluded that the cutoff scores for frequently utilized cognitive screening tools should be modified to align with local normative values, especially in contexts with lower educational attainment. (41)

About the cognitive impairment cut-off scores for the IDEA cognitive screen, several recommendations exist. A study conducted in Malaysia assessing the validity of IDEA found that a cut-off score of ≤ 11 achieved sensitivity and specificity rates of 90.9% and 89.7%, respectively (42). Additionally, research performed in outpatient and inpatient clinics in Tanzania and Nigeria, which validated IDEA against DSM-IV criteria for dementia diagnosis, established the following cut-off ranges: 0–7 indicates “probable dementia,” 8–9 denotes “possible dementia,” and 10–15 indicates “no dementia.” (43)

In a research study that evaluated the psychometric effectiveness of the 6-Item Cognitive Impairment Test as a bedside tool for identifying dementia in patients at general hospitals, it was found that the feasibility of 6-CIT was 97.9% for patients without dementia and 83.3% for those with dementia. This feasibility decreased from a moderate level of 93.8% to 53% as dementia

severity increased. The study calculated the sensitivity, specificity, accuracy, positive predictive value, and negative. (19)

A comparative cohort study examining the DSM-V and DSM-IV alongside CAM and IDEA for the detection of delirium in hospitalized older adults revealed that 18.7% were diagnosed with DSM-5 delirium, 18.7% with DSM-IV dementia, and 6.5% with delirium occurring concurrently with dementia. The CAM and IDEA cognitive assessments demonstrated excellent diagnostic precision for identifying delirium.

Furthermore, it indicates that utilizing specific cognitive and observational elements from the CAM and IDEA cognitive assessment may be equally effective as the complete screening tools for recognizing delirium, even in unresponsive patients. (21)

External validations took place in a hospital and community settings in Tanzania and Nigeria for cognitive impairment, dementia, and delirium. A cut-off value of 7/15 appears most accurate in identifying dementia in Tanzania and Nigeria. (12) The maximum possible score is 15 and the minimum 0, with a higher score indicating better cognitive function (13)

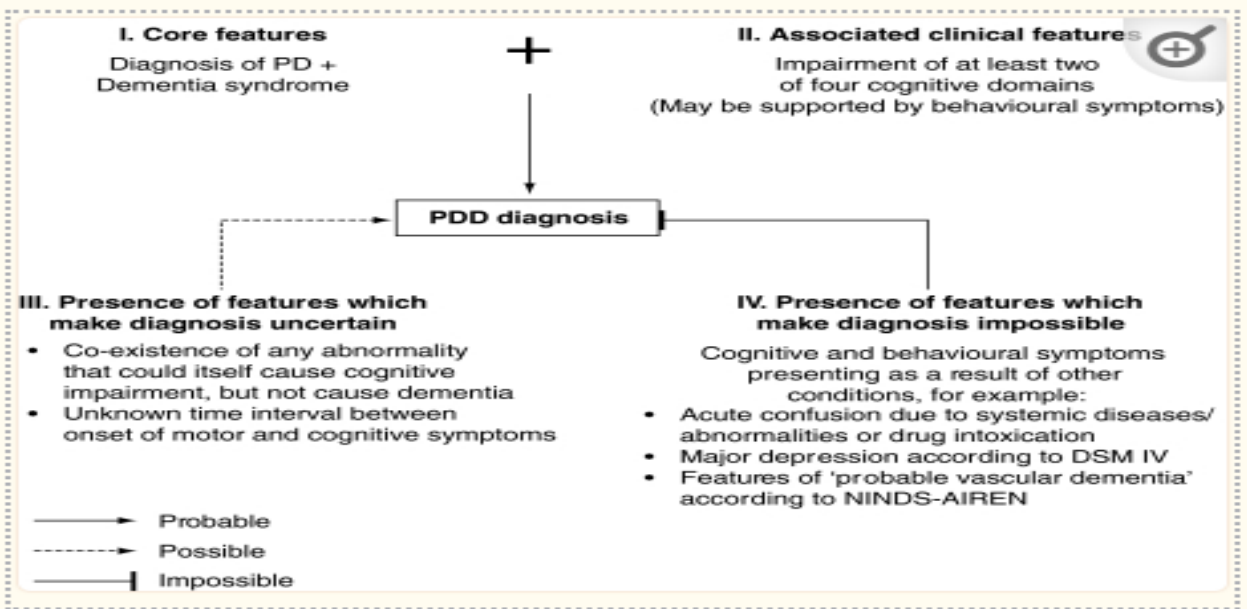
The IDEA cognitive screen consists of six components. The first four items assess the ability to identify a bridge based on its function, recognize the current day of the week, identify the name of the village chief, town mayor, or city governor, and count as many animals as possible in one minute (with 2 points for naming 8 or more animals, 1 point for 4 to 7 animals, and 0 points for 0 to 3 animals). The fifth item involves recalling 10 common words after a 5-minute interval, where each word correctly recalled earns 1 point, with a maximum score of 5 points. The sixth item assesses praxis through a matchstick design task, scoring from 0 (no matchsticks placed correctly) to 3 (all four matchsticks correctly arranged in the shape of a rake) (13)

A cohort study assessing the pragmatic diagnostic accuracy of 6CIT for dementia and MCI revealed that 6CIT exhibited strong sensitivity (0.88) and specificity (0.78) in identifying dementia; it also demonstrated greater sensitivity than the MMSE (0.59), although it was less specific (0.85). Furthermore, when diagnosing MCI, 6CIT again proved to be more sensitive (0.66) compared to the MMSE (0.51) but had lower specificity (0.70 versus 0.75). Weighted comparisons indicated a net advantage for 6CIT over MMSE in the diagnosis of both dementia and MCI.
According to the study, 6CIT is an acceptable and accurate test for the assessment of cognitive problems, its performance being more sensitive than the MMSE. Hence, 6CIT use should be considered as a viable alternative to MMSE in the secondary care setting. (22)

A preliminary investigation into the relationship between results on a 6-CIT and a modified BADL Scale was conducted among black older women in Khayelitsha, South Africa. The findings indicated a correlation between the results from the two assessment tools ($r = .49745$) at a 95% confidence level. It was determined that these instruments were culturally suitable for the black African elderly demographic, and low education levels did not serve as a confounding factor for the cognitive assessment and identification of early dementia in this group.
The study demonstrated that the 6CIT and modified BADL were shown to be easily administered, validated instruments to be used by community health workers. It also added the

importance of easily administered screening tools for dementia for the detection of the disease in the population. This might help the health authorities and occupational therapists in the provision of treatment plans to minimize the detrimental effects of the disease on the individuals, their families, and communities. (23)

A comprehensive literature review from 2017 focused on global scales for cognitive screening in patients with Parkinson's disease, highlighting various assessment tools for cognitive impairment in this population. The study categorized these global scales into four groups: "recommended," "recommended with caveats," "suggested," and "listed." As a result, the Montreal Cognitive Assessment, the Mattis Dementia Rating Scale Second Edition, and the Parkinson's Disease-Cognitive Rating Scale were designated as "recommended." The Mini-Mental Parkinson's and the Scales for Outcomes in Parkinson's Disease-Cognition were identified as "recommended with caveats." Additionally, six other scales received a classification of "suggested," while one scale was labeled as "listed" (24)
The MDS Task Force suggested four groups of characteristics that must be evaluated to ascertain if a diagnosis of PDD is likely, possible, or unlikely. (20)



3. Objectives

3.1 General objective

To assess cognitive function & identify associated factors among Parkinson's disease (PD) and baseline characteristics matched control group using the IDEA Cognitive Screen, Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia.

3.2 Specific objectives

To assess the cognitive function among Parkinson's disease patients and the control group using the IDEA cognitive screen

To describe the associated factors of cognitive impairment in Parkinson's disease patients and the matched control group

4. Methods and materials

4.1 Study area and period

The study was conducted in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia.

- Parkinson's disease patients were recruited from the neurology referral clinic
- The control group was recruited from patients awaiting elective surgery in the general surgery referral clinic. These participants were matched to the study group by age, sex, educational status, and comorbidities (Hypertension, diabetes mellitus, and dyslipidemia).

Controls were selected from elective preoperative patients for the following reasons:

- Minimal confounding illnesses: They had fewer conditions that could confound the outcome variable (cognitive function).
- Accessibility: They were easily accessible in a clinical setting.
- Stable health status: Their health status was relatively stabilized.

Common elective cases seen in the clinic include symptomatic cholelithiasis, goiter, breast mass, incisional and inguinal hernia, and anal fistula. The details of participants' diagnoses are presented in the Results section.

TASH is the largest referral hospital in Ethiopia, situated in the capital, Addis Ababa. Established in 1972, GC, the hospital was handed over to the School of Medicine by the Federal Ministry of Health in 1998 GC. It has evolved into a University teaching hospital affiliated with Addis Ababa University. The hospital provides extensive health care services to approximately half a million patients annually through its specialty clinics and inpatient service departments. It is now the main teaching hospital for both clinical and preclinical training of most disciplines. It has over 700 beds and about 1,700 professional and support staff in inpatient, outpatient, and emergency units. It is also an institution where specialized clinical services that are not available in other public or private institutions are rendered to the whole nation.

Specialized care in neurology is one of the services offered by the Hospital. Management of patients with Parkinson's disease is primarily conducted at the neurology referral clinic. The clinical care is mainly provided by consultant neurologists, along with 32 neurology residents

and nursing staff. In addition, residents from other specialties, such as internal medicine, neurosurgery, and psychiatry, also participate in the care of patients within the neurology referral clinic.

On average, the neurology referral clinic sees between 50 and 60 Parkinson's disease patients each month.

The hospital also offers a general surgery referral clinic as one of its services. Typical elective cases encountered at the clinic include symptomatic cholelithiasis, goiter, breast cancer, incisional and inguinal hernias, and anal fistula. Every month, the surgery referral clinic sees an average of 120 to 160 elective preoperative patients.

The research timeframe extended from April 2024 to December 2024 GC. During this period, efforts were made to finalize the research proposal, gather data, analyze it, and prepare the final draft of the study.

4.2 Study design

This study method is a comparative cross-sectional study.

4.3 Selection of study population

4.3.1 Source population

For Parkinson's disease- all patients who under follow up at neurology referral clinic at TASH, Addis Ababa, Ethiopia
For matched control group - all elective preoperative patients under follow up at general surgery clinic at TASH, Addis Ababa, Ethiopia

4.3.2 Study population

All Parkinson's disease patients and matched control group who meet the inclusion and exclusion criteria.

4.3.3 Sample

All Parkinson's disease patients and matched control group who meet the inclusion criteria selected using systematic random sampling in TASH

4.4 Eligibility criteria

4.4.1 Inclusion criteria

Parkinson's disease patients

-Patients with Parkinson's disease diagnosis who are attending clinical follow-up at neurology outpatient clinic in TASH, Addis Ababa, Ethiopia.
- Willing and able to provide informed consent.

Control group

-Patients scheduled for elective surgery and have follow up at general surgery referral clinic, TASH, Addis Ababa, Ethiopia

4.4.2. Exclusion criteria

For Parkinson's disease patients

- The presence of other factors that may cause cognitive impairment (Stroke, medication overdose, head trauma, delirium, metabolic abnormality, vascular dementia, epilepsy)
-Underlying psychiatric illness (MDD, anxiety, Schizophrenia)
- Severe sensory difficulties like blindness, deafness

For the control group

-Same with PD patients, additionally
- Current use of centrally acting medications (opioids, benzodiazepines)
-Patients with malignancy diagnosis

4.5. Sample size determination

The sample was calculated by assuming a Confidence interval of 95%.
A single population proportion formula,

$n = (Z)^2 p (1-p) / d^2$ used to estimate the sample size.

n - sample size
Z- Z score, which is 1.96, using a confidence interval of 95%
P- population proportion (assumed to be 35%=0.35)
d- margin of error, which is 0.05

Considering previous prevalence study at 35 %, P= 0.35, at 95% confidence interval, and marginal error of 5% were used for sample size calculation

$n = 1.96^2\ 0.35\ (1-0.35) / 0.05^2) / 1+(1.96^2\ 0.35\ (1-0.35) / 0.05^2$
n=350
The sample size, considering a 10% non-respondent rate, will be 385.

Since the total population is <10,000, I used the formula
n-final n / (1+n/N), since 50-60 PD patients visit the neurology clinic each month, N=240
=385 / (1+385/240) =148

A systematic random sampling technique is used to select both group participants
About 15 PD patients are seen per week, and for the study, about 9 cases per week are needed. Based on the systematic sampling formula, kth= 15/9 ~ 2, every other case was selected to be involved in the study group.
Similarly, a systematic sampling technique was used for the control group: 30 patients seen per week and for the study 12 cases per week needed, based on this Kth~3, every third patient from the general surgery clinic list.

SPSS matching propensity software was used to match controls on age, sex, education level, and comorbidities

We used equal size for cases and matched controls (1:1 ratio); therefore, the same number of controls are enrolled in this research.

4.6. Data collection procedure

4.6.1. Data collection tools

IDEA cognitive screen

IDEA cognitive screen is used for data collection. It has six items.

Items 1–4 involve being able to name a bridge from a description of its use, knowing the day of the week, knowing the name of the village chief/ town mayor/ city governor and naming as many

animals as possible in one minute (score 2 for ≥ 8 animals, score 1 for 4–7 animals, score 0 for 0–3 animals).

Item 5 is recall of 10 common words after 5 5-minute delay (score 1 point for each word up to a maximum of 5 points).
The sixth item is designed to measure praxis and involves a matchstick design test with scores ranging from 0 (no matchsticks placed correctly), to 3 (all four matchsticks placed correctly in the shape of a rake).

MDS-UPDRS tool

Part II and Part III components of the MDS-UPDRS tool are used to assess the motor phenotypes of PD patients. Based on the Stebbins GT ratio, motor phenotypes are classified into tremor dominant (≥1.15), Postural instability gait difficulty (≤0.90), and indeterminate type (>0.90,<1.15).
Stebbins ratio is calculated using part II and part III components of MDS-UPDRS. (44)

MDS-UPDRS- Part IV is also used to assess Hoehn & Yahr severity score among PD patients

Geriatric depression scale 15

It is a scale that is used to screen depression in elderly individuals. It is scored out of 15: ≤4 (normal), 5-8 (mild depression), 9-11 (moderate depression), 12-15 (severe depression). (45)

4.6.2. Data collection

Data was collected by five data collectors under the supervision of the investigator. Data collectors were general practitioners, pharmacists, and neurology residents. They are trained to collect and ensure the quality of data. The training held for 2 days about the objective of study and ways of handling data. The supervisor has certification from the movement disorder society regarding the MDS-UPDRS tool.

A pilot study was done to evaluate feasibility, duration, cost and improve upon the study design.

4.8 Study variables

4.8.1. Dependent variables

For PD patients
-Cognitive function assessment in PD patients using IDEA scale

For control group
- Cognitive function assessment in control group using IDEA scale

4.8.2. Independent variables

For PD patients
-Age
-Sex
-Level of education
- Age at onset of PD
-Similar family history
-Type of medical management
-Known comorbidity
- Motor phenotype
-Hoehn & Yahr PD stage
-Geriatric depression scale

For control group
-Age
-Sex
-Level of education
-Known comorbidity
-Geriatric depression scale

4.7. Operational definition

PD-MCI: According to MDS, it is defined as an insidious decline in cognitive abilities reported by the patient or informant or observed by the clinician, not caused by another comorbidity. In contrast to dementia, cognitive deficits are present on testing but do not interfere with the functional independence of the patient (19).

PDD: The MDS Task Force proposed four clusters of features requiring sequential consideration to determine whether a diagnosis of PDD is probable, possible, or impossible (20)

4.9 Data processing and analysis

The data was input and analyzed using SPSS version 30. Data cleaning was performed solely by the Investigator. Since the data did not follow a normal distribution, non-parametric tests, specifically the Mann–Whitney U test and chi-squared test, were employed. A descriptive summary of the data was illustrated in Tables and Figures. Frequency distributions were utilized to arrange the data and display the collected responses. Calculations for measures of central tendency and dispersion were carried out and applied to the study variables as necessary. To evaluate the independent impact of age, gender, education, and other independent variables on

screening performance, both univariate and multivariable logistic regression models were constructed. Crude and adjusted odds ratios with a 95% confidence interval were employed to assess the strength of the association between dependent and independent variables. Variables with a P-value < 0.05 were considered significant.
For data analysis, age was categorized into 15-year age bands, and education was categorized into "no formal education," "Below 7th grade," and "Above 7th grade."
Education was also dichotomized into "some formal education" and "no formal education" categories, since this categorization is known to have the greatest impact on cognitive scores in low literacy settings and allows a comparison with previous work in these and other LMIC settings
The Parkinson's disease severity using the Hoehn and Yahr scale (H&Y) was stratified to make subgroups smaller. Accordingly, mild disease severity includes stage 1 and 2 from the H&Y scale. Meanwhile, moderate-severe disease refers to stages 3, 4, and 5.
We assessed the prevalence of dementia based on the IDEA scoring from previous external validation: "a value of 0–7 is 'probable dementia, 8–9 is 'possible dementia, ' and 10–15 is 'no dementia. (17)
Geriatric depression scale 15, the score was stratified into "0-4" normal, "5-8", mild depression, "9-11" moderate depression, "12-15" severe depression.

The motor phenotypes of PD patients were classified based on the Stebbins GT ratio:≥1.15 "tremor dominant", ≤0.90 "Postural instability gait difficulty," and 0.90-1.15 "indeterminate type. "
Stebbins ratio is calculated using part II and part III components of MDS-UPDRS. (44)

4.10 Data Quality Control

The Investigator examined the appropriateness of the methodologies followed. The questionnaire was reviewed for completeness, and pre-testing was undertaken. The questionnaire was pre-tested on 5% of the sample in a similar setting, which is not part of the study. The response rate was one hundred percent. The main supervision will be taken by the supervisor, who will closely follow the activity daily. At the end of each data collection day, the principal investigator will check the clarity, consistency, completeness, and skip patterns of filled questionnaires and the list. And whether recorded information makes sense to ensure the quality of the data collected. There will be a meeting whenever necessary with the data collectors so that any ambiguity will be cleared by discussion.

4.11 Ethical consideration

Ethical clearance to conduct the study was obtained before the beginning of data collection from the Research and Publication Committee (RPC) of the Department of Neurology, TASH. The participants' rights were protected by explaining the purpose and significance of the study. Participants were reassured that their responses would remain anonymous, and no remarks would

be made that could identify patients. The clients were informed that their participation in the study would remain anonymous and that their privacy would be respected. They were provided with a comprehensive explanation that their involvement in the study was voluntary and that they could withdraw at any time without it affecting the care they received or any other statutory rights.

4.11. Dissemination of results

The study results will be disseminated to key stakeholders, including CHS, AAU, TASH, the Department of Neurology, and other appropriate institutions of higher education. The results will further be disseminated to the wider scientific community through abstract presentation at a conference and through publication in a peer-reviewed scholarly journal.

5. Result

5.1 Socio-demographic characteristics of PD patients & matched participants.

In the present study, we enrolled a total of 150 Parkinson's disease (PD) patients from Tikur Anbessa Specialized Hospital (TASH) in Addis Ababa, Ethiopia. The median age at PD diagnosis was 65 years & the mean age was 64 (±10.6) years, while the mean age of PD onset was 58 (±10.6) years. Men accounted for 71% of the participants (Table 1).

Twenty-three (15.3%) PD patients had an age at onset (AOO) below 50 years. The median duration of illness was 6 years (±4.3). Most (62%) PD patients exhibited a tremor-dominant (TD) motor phenotype, 26% presented with postural instability and gait difficulty (PIGD), and 12% were classified as indeterminate motor phenotypes.

More than half of the patients (68.7%) had Hoehn & Yahr (H&Y) stages 1 or 2. Twenty-six (17.3%)were classified as H&Y stage 3 or 4, while 1 patient (0.7%) exhibited features of H&Y stage 5. Eighty-five percent (85%) of patients were on levodopa monotherapy, 9% received trihexyphenidyl in combination with levodopa, and 6% had not yet initiated antiparkinsonian medications.
Sixteen (10.7%) patients reported a family history of PD diagnosis. Over half (58.7%) of PD patients had no known comorbidities; hypertension (29.3%) was the most common comorbidity, followed by diabetes mellitus and dyslipidemia (8%) and HIV infection (1.3%).

Regarding education, 24 (16%) patients were illiterate, 26 (17.3%) had completed primary school, and 100 (66.7%) had completed secondary or post-secondary education.

In the control group, the median age of participants was 64 years (interquartile range [IQR] = 12.25). Approximately two-thirds of the participants were male, and hypertension was the most frequently reported comorbidity among participants (Table 1).

Table 1 Sociodemographic characteristics of Parkinson's Disease Patients and Control Group TASH, AA from September to December 2024 GC: Medians, Frequencies, Mann-Whitney U Values, Chi-Square Values, and p-Values.

Sociodemographic factors		Parkinson' patients	Control group	Mann Whitney U and Pearson Chi-square	P value
Age in years		65 (60-70.25)	64 (57.75-70)	10553.5	0.353
Educational level		Above 7th grade	Above 7th grade	10848	0.515
GDS		No depression	No depression	10594.5	0.28
Is able to read and write	Yes	126 (84%)	135 (90%)	2.39	0.122
	No	24 (16%)	15 (10%)		
	No	124 (82.7%)	84 (56%)		
Comorbidities	Yes	62 (41.3%)	64 (42.67%)	0.055	0.815
	No	88 (58.67%)	86 (57.3%)		
Sex	Male	106 (70.7%)	101 (67.3%)	0.39	0.533
	Female	44 (29.3%)	49 (32.7%)		

The Mann-Whitney U test was used to compare the two groups on continuous and ordinal variables, including age, educational level, and geriatric depression scale scores. Results indicated no significant differences between the groups for these variables ($p > 0.05$). For categorical variables (sex, ability to read or write, and comorbidities), Pearson's chi-square test was used to evaluate the distribution of these variables between the groups. Most variables did not show significant differences, suggesting that the groups were well-matched (Table 1).

Table 2: Underlying surgical diagnosis of control group (n=150) at TASH, AA from September to December 2024 GC

Diagnosis	Male (Frequency)	Female (Frequency)
Hernia	20	6

Haemorrhoid	15	5
Symptomatic cholelithiasis	3	7
Simple multinodular goitre	3	7
Anal fissure	7	3
Hydrocele	12	
Breast fibroadenoma		4
Lipoma	18	5
Anal stenosis	9	4
GOO secondary to chronic PUD	11	3
Toxic multinodular goitre	3	5

5.2: IDEA score by age, sex, education level, motor phenotype, and H&Y severity score

Older participants (aged ≥65 years) exhibited lower median IDEA scores compared to younger participants, particularly those under 50 years, who demonstrated higher overall scores (Figs. 1 and 2). Both males and females had similar median IDEA scores (Figs. 3 and 4). Male participants showed more outliers but a smaller interquartile range (IQR) than females. Based on the Hoehn & Yahr (H&Y) severity scale, patients with moderate-to-severe disease had lower median scores (Fig. 5). The median scores increased progressively with higher levels of educational attainment (Figs. 6 and 7).

The median IDEA score was 13 (IQR = 11–14) for Parkinson's disease patients and 13 (IQR = 12–15) for the control group. A Mann-Whitney U test indicated that IDEA scores were significantly lower in Parkinson's disease patients compared to the control group ($U = 9029.5$, $Z = -3.01$, $p = 0.003$). The effect size was small ($r = 0.17$). These findings suggest that Parkinson's disease is associated with significantly greater cognitive impairment compared to the control group.(Fig.8)

Figure 8 Box Plot of IDEA Scores by Group: Parkinson’s Disease Patients vs. Matched Controls, Addis Ababa, Ethiopia (n = 300). From September to December 2024 GC

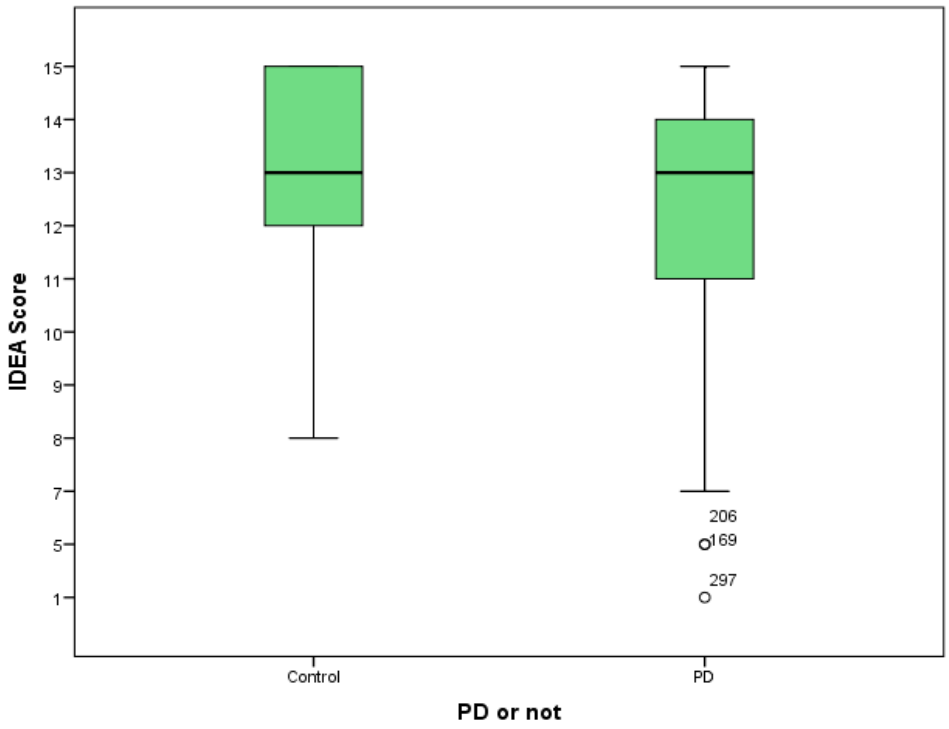


Figure 1: Box-plot of IDEA score with age classification among Parkinson disease patients, Addis Ababa, Ethiopia, (n = 150), September to December 2024 GC

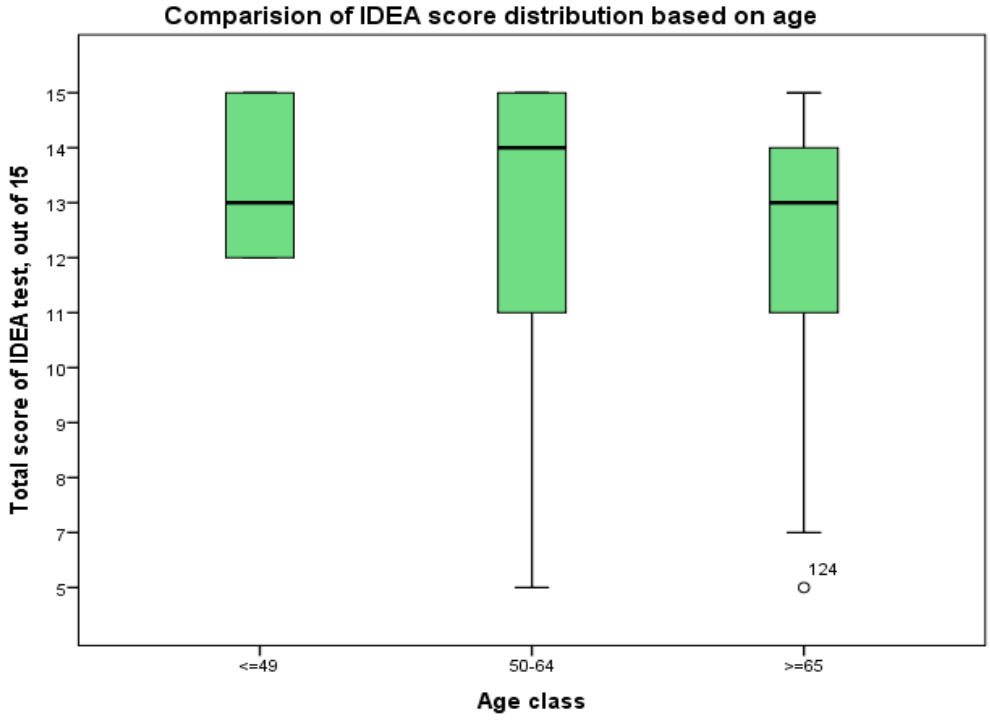


Figure 2 Box-plot of IDEA score with Age classification for control patients, Addis Ababa Ethiopia, (n = 150) September to December 2024 GC

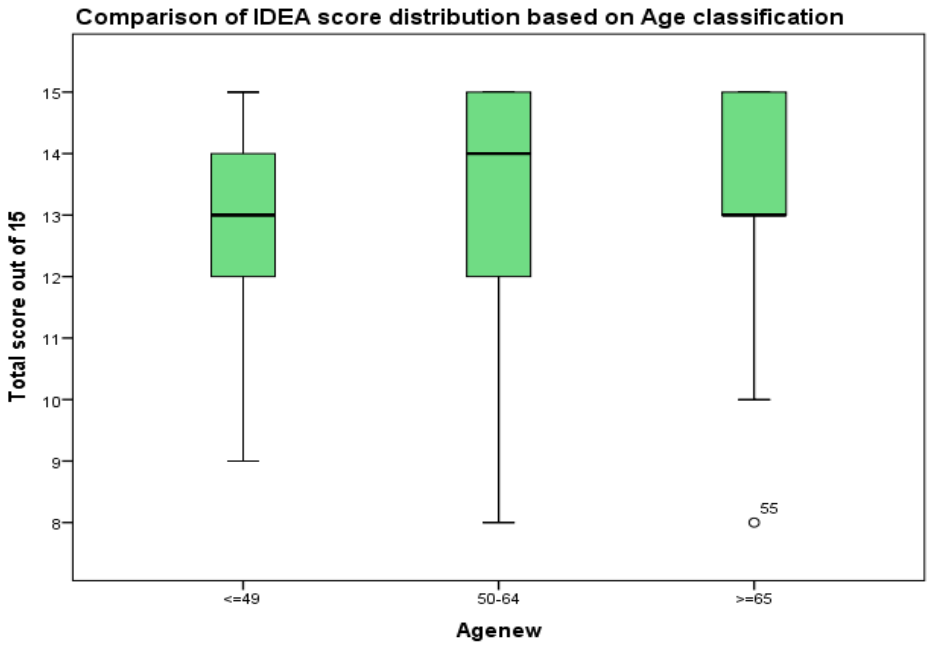


Figure 3 Box-plot of IDEA score with sex among Parkinson disease patients, Addis Ababa Ethiopia, (n = 150) September to December 2024GC

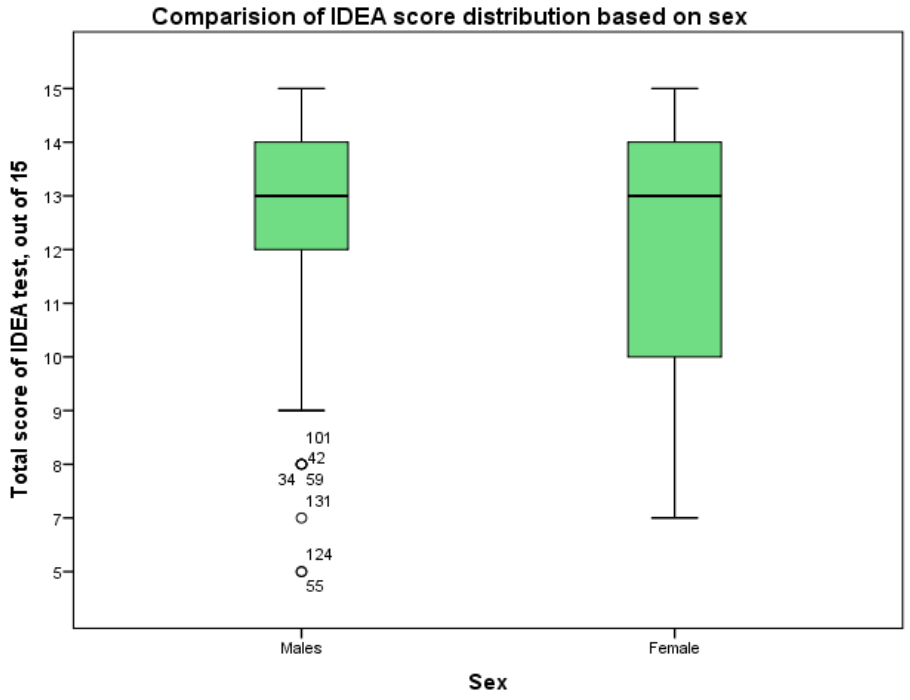


Figure 4 Box-plot of IDEA score with sex for control patients, Addis Ababa Ethiopia, (n = 150) from September to December 2024 GC

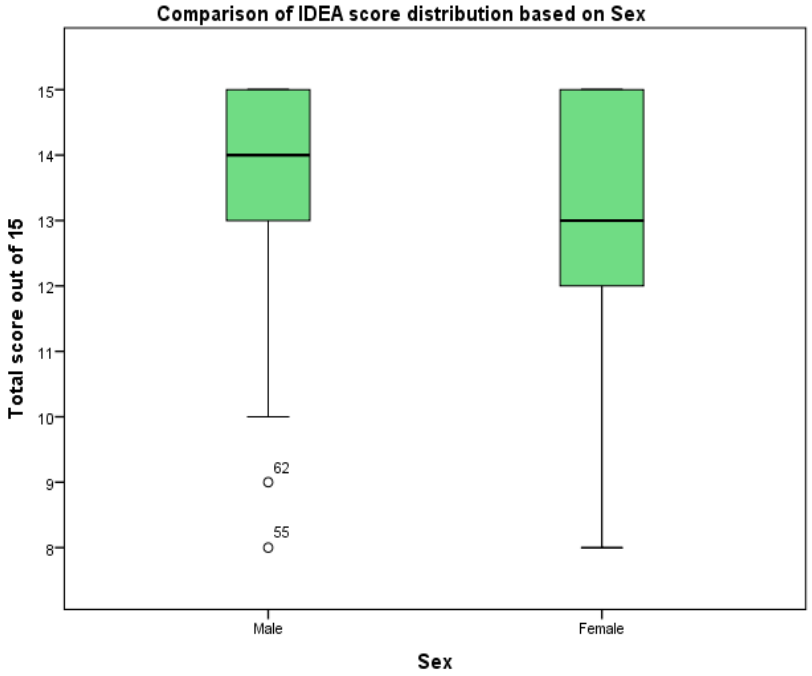


Figure 5 Box-plot of IDEA score with Parkinson Hoehn and Yahr severity scale among Parkinson disease patients, Addis Ababa Ethiopia, (n = 150) September to December 2024GC

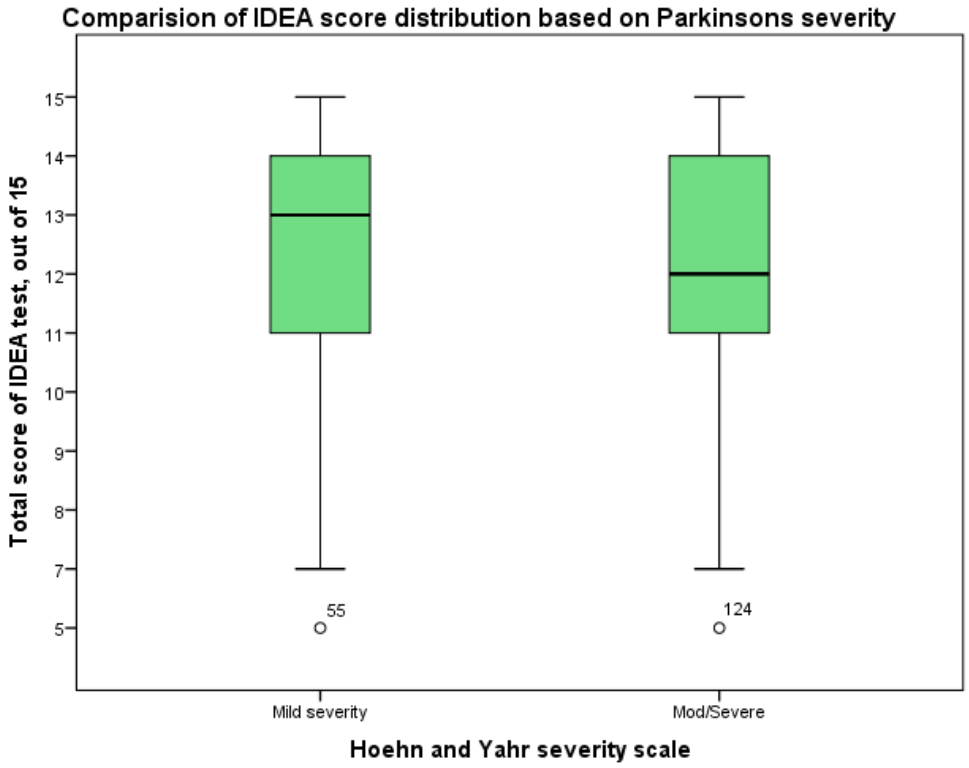


Figure 9 Box-plot of IDEA score with motor phenotypes among Parkinson disease patients, Addis Ababa Ethiopia, (n = 150)

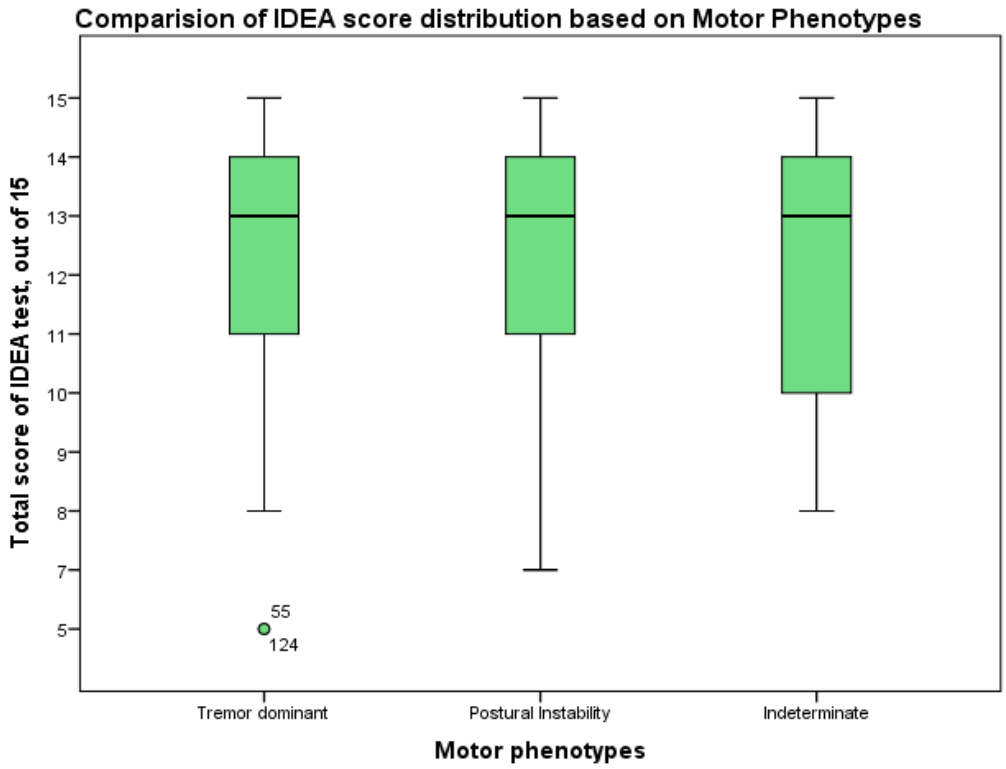


Figure 6 Box-plot of IDEA score with educational status classification among Parkinson disease patients, Addis Ababa Ethiopia, (n = 150) from September to December 2024GC

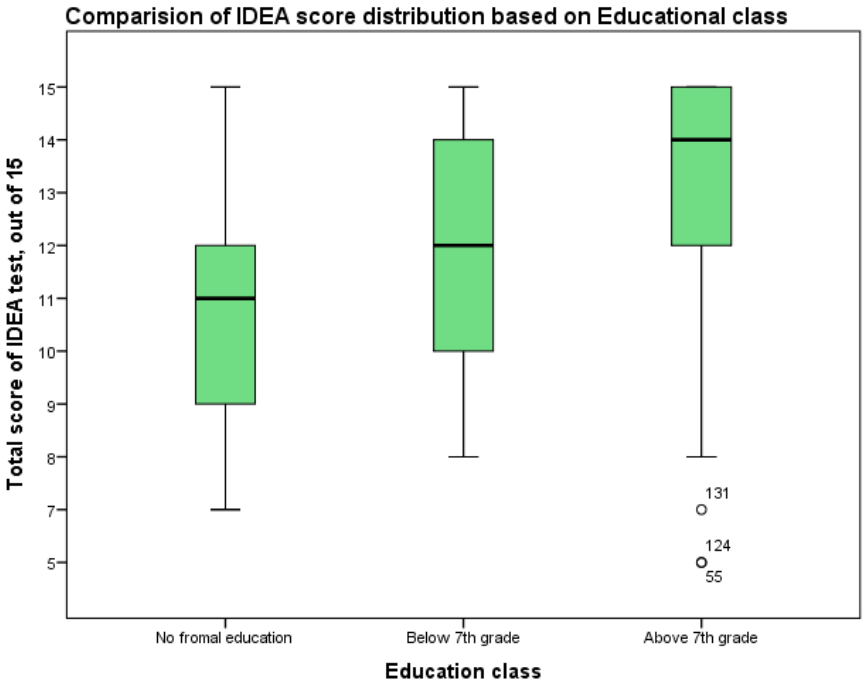
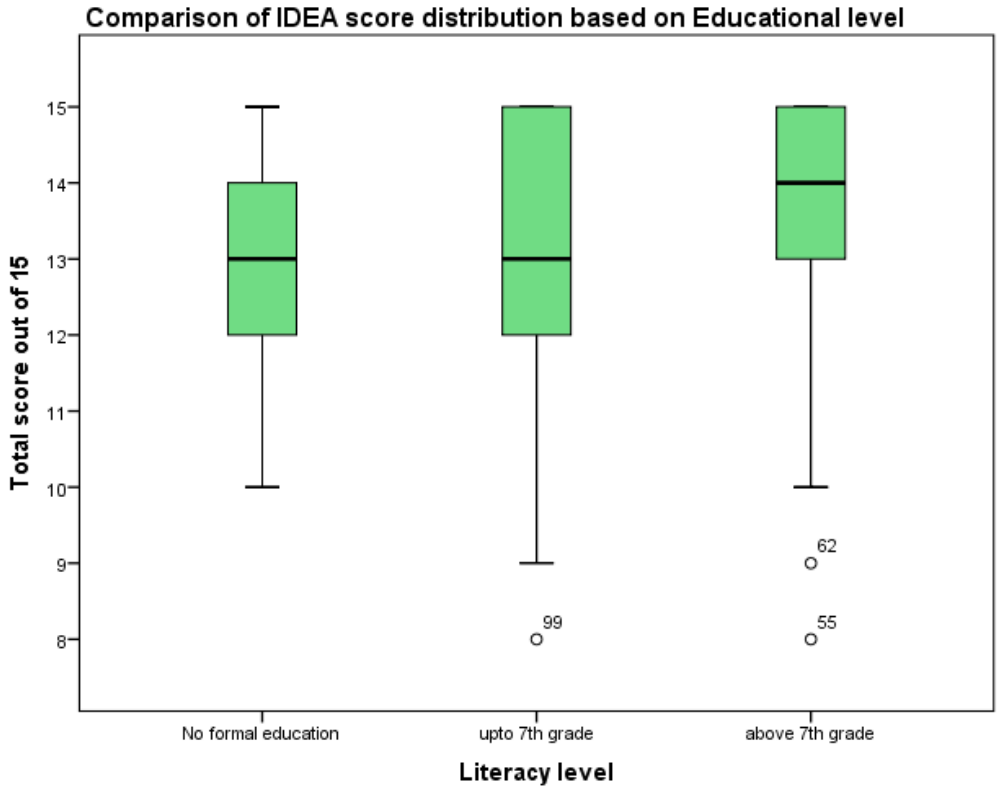


Figure 7 Box-plot of IDEA score with literacy level for control patients, Addis Ababa Ethiopia, (n = 150) from September to December 2024GC



5.3 Dementia prevalence in PD patients and control group using IDEA cognitive screen

We assessed the prevalence of dementia according to the IDEA cognitive screen, with scores categorized from a prior external validation: 0–7 = “probable dementia”, 8–9 = “possible dementia”, and 10–15 = “no dementia” (17)

Among Parkinson’s disease (PD) patients in this study, 3.3% were classified as having probable dementia and 9.3% as having possible dementia based on IDEA criteria (Table 3). This reflects a 9.9% higher prevalence of cognitive impairment in the PD group compared to the matched control group.

The mean IDEA score for the epidemiologically matched control group was 13.31 (±1.53), while PD patients had a mean score of 12.4 (±2.25).

Table 3: Frequency of IDEA score classification among Parkinson's disease patients and matched control group, Addis Ababa, Ethiopia, September to December 2024 GC

IDEA score	Parkinson's disease group	Control group
	Frequency (%)	Frequency (%)
Probable dementia (≤7)	5 (3.3)	0 (0)
Possible dementia (8-9)	14 (9.3)	4 (2.7)
No dementia (≥10)	131 (87.3)	146 (97.3)

Factors associated with dementia in both groups

Individual binary logistic regression models were used to assess the association between each independent variable and cognitive impairment.

Illiteracy (crude OR = 5.29; 95% CI: 2.11–13.27), Geriatric Depression Scale scores (crude OR = 2.78; 95% CI: 1.18–6.57; p = 0.12), and Parkinson's disease diagnosis (crude OR = 5.3; 95% CI: 1.76–15.96) were significantly associated with cognitive impairment in unadjusted analyses(Table 5). However, in the final multivariable model adjusting for all three covariates, only illiteracy (adjusted OR = 3.55; p = 0.019) and Parkinson's disease diagnosis(adjusted OR = 4.87; p = 0.006) remained significantly associated with cognitive impairment.

Specifically, illiterate individuals had nearly 3 times higher odds of cognitive impairment compared to literate individuals when assessed using the IDEA screening tool (Table 4).

After adjustment for covariates, Parkinson's disease (adjusted OR = 4.87; 95% CI: 1.57–15.09; p = 0.006) and illiteracy remained significantly associated with cognitive impairment relative to the epidemiologically matched control group.

Table 4: Sociodemographic factors and cognitive impairment of PD and matched control group, Addis Ababa, Ethiopia (n=150 for Parkinson's group and n=150 for control group), from September to December 2024 GC

Sociodemographic factors	Probable & Possible dementia (IDEA≤9)	
	Parkinson's disease	Control group

		Frequency (%)	COR *P value*	Frequency (%)	COR *P value*
Age Classification	≤49	14 (9.3%)	1 *0.437*	17 (11.3%)	1 *0.55*
	50-64	54 (36%)	1.3 (0.1,2.4) *0.804*	58 (38.7%)	0.6 (0.05, 6.7) *0.656*
	≥65	82 (54.7%)	2.4 (0.3, 20.4) *0.407*	75 (50%)	0.2 (0.01, 3.6) *0.288*
Sex	Male	106 (70.7%)	1	101 (67.3%)	1
	Female	44 (29.3%)	2.5 (0.9, 6.6) *0.07*	49 (32.7%)	2.1 (0.3, 15.4) *0.463*
Educational level	No formal education	24 (16%)	1 ***0.003***	18 (12%)	1 *0.41*
	Below 7th grade	26 (17.3%)	0.5 (0.1, 1.7) *2.61*	28 (18.7%)	1.2e+08 (0.0, -) *0.998*
	Above 7th grade	100 (66.7%)	0.1 (0.04, 0.4) ***0.001***	104 (69.3%)	3.2e+08 (0.0, -) *0.999*
Is able to read and write?	Yes	126 (84%)	1	135 (90%)	1
	No	24 (16%)	7 (2.4, 20) *0.00*	15 (10%)	0 (0,0) *1.00*
Comorbidities	None	88 (58.7%)	0.8 (0.3, 2) *0.568*	86 (57.3%)	0.0 (0.0, -) *0.997*
	Hypertension	48	1	42	1
	DM	16		24	
	Dyslipidemia	9		15	
	HIV	2		5	
Geriatric Depression Scale	No Depression	101 (67.3%)	*0.388*	109 (72.7%)	*0.06*

	Mild Depression	28 (18.7 %)	1.5 (0.4, 5.3) *0.512*	24 (16%)	4.7 (0.3, 77.8) *0.28*
	Moderate Depression	5 (3.3%)	2.3 (0.2, 22.4) *0.481*	8 (5.3%)	0.0 (0.0, -) *0.999*
	Severe Depression	16 (10.7 %)	3 (0.8, 11.2) ***0.096***	9 (6%)	30.9 (2.5, 383.2) ***0.008***

Table 5: Factors associated with Cognitive Impairment (dementia) in Parkinson's disease patients and their control, AOR and p-values, Addis Ababa, Ethiopia (n=300), September to December 2024 GC

Variables		Probable & Possible dementia (IDEA≤9)		COR	AOR	P value
		Yes	No			
Parkinson's disease diagnosis	Yes	19	131	5.3 (1.76, 15.96)	4.87 (1.57, 15.09)	***0.006***
	No	4	146	1	1	-
Age Classification	≤49	2	29	1	1	0.89
	50-64	7	105	0.97 (0.19, 4.91)	0.92 (0.16, 5.23)	0.93
	≥65	14	143	1.42 (0.31, 6.59)	1.18 (0.22, 6.41)	0.85
GDS	No depression	11	199	1	1	-
	Depression	12	78	2.78 (1.18, 6.57)	2.18 (0.86, 5.56)	0.102
Sex	Female	11	82	2.18 (0.92, 5.14)	1.5 (0.57, 3.96)	0.417
	Male	12	195	1	1	-
Literacy	Yes	14	247	1	1	-
	No	9	30	5.29 (2.11, 13.27)	3.55 (1.23, 10.27)	***0.019***

On the subgroup analysis of PD patients for cognitive impairment (dementia), no significant association was found on family history of PD, motor phenotypes, H&Y severity score, and type of medication use (Table 5)

Table 6: Parkinson disease participants' characteristics and their COR, AOR, and P value Addis Ababa Ethiopia (n=150), September to December 2024 GC

Variables		Cognitive impairment		COR	AOR	P value
		Yes	No			
Family history of PD	Yes	1	15	1	1	1
	No	18	116	2.33 (0.29, 18.71)	2.6 (0.27, 24.97)	0.41
Type of Medication use	None	0	1	1	-	0.75
	Levodopa /Carbidopa	16	117	-	-	1
	Artane	0	3	1	-	1
	Combined Levo and Carbidopa	3	10	-	-	1
Motor Phenotype	Tremor dominant	10	83	1	1	0.32
	Postural instability	5	34	1.22 (0.39, 3.84)	1.22 (0.38, 4)	0.74
	Indeterminate	4	14	2.4 (0.65, 8.62)	3 (0.72, 12.1)	0.13
Hoehn & Yahr staging	Stage 0	0	6	1	1	
	Stage 1	1	30			
	Stage 2	13	59			
	Stage 3	1	27	0.94 (0.32, 2.8)	0.75 (0.24, 2.37)	0.623
	Stage 4	4	8			
	Stage 5	0	1			

Associated factors of dementia in control group

For the control group, each variable (age, sex, educational level, literacy, comorbidities, and Geriatric Depression Scale score) was analyzed individually using Fisher's exact test to assess its association with dementia.

The resulting p-values were adjusted for multiple comparisons via the Bonferroni correction, with a corrected significance level of $\alpha = 0.01$. None of the variables showed a statistically significant association with dementia after correction.

Subsequently, all variables were included in a binary logistic regression model to evaluate their combined effect on cognitive impairment. Similarly, no significant associations were observed in the multivariable analysis at the conventional significance threshold ($\alpha = 0.05$).

6. Discussion

6.1 Baseline characteristics of PD patients

In this research, the typical age of individuals with Parkinson's disease (PD) was in their sixties, and the average age at which they first noticed symptoms was in their fifties. Approximately 25% of the individuals were identified as having young-onset PD (before reaching 50 years old). A greater occurrence of the condition was observed in males, who represented two-thirds of the population studied.

Over fifty percent of the participants were classified within Hoehn & Yahr (H&Y) stages 1 to 3, indicating a mild to moderate level of disease severity. The most common motor phenotype observed was tremor-dominant (TD), while postural instability and gait difficulty (PIGD) were next, and indeterminate phenotypes were the least frequent.

The findings align with research carried out in Ethiopia (28,29) and various international studies (30,31). Notably, the onset age of PD among our cohort was found to be younger compared to what has been recorded in Western demographics (33), suggesting a possible influence of local genetic or environmental variables.

The average duration of the disease among our participants was 6 years, which is consistent with results from Western countries (36,37) but slightly longer than previous regional estimates (28,32,33). This discrepancy may reflect differences in healthcare access or delays in obtaining a diagnosis. Around two-thirds (66.7%) of the patients with Parkinson's disease had attained secondary or post-secondary education, mirroring trends seen in Middle Eastern populations (38). The higher educational attainment in our sample might indicate that socioeconomic or cultural factors are affecting both healthcare-seeking behaviors and participation in research studies.

6.2 IDEA score distribution with age, sex, education level, and H&Y severity score on both groups.

In Parkinson's disease (PD) patients, we observed an inverse correlation between IDEA scores and age, with median scores declining progressively in older age groups. Similarly, lower educational attainment was associated with reduced IDEA scores, aligning with normative data from sub-Saharan Africa (SSA) (16). This pattern mirrors findings in Tanzanian and Nigerian

cohorts, where low education and advancing age significantly impacted cognitive screening outcomes (21).

Notably, matched controls in our study exhibited higher IDEA scores across all age, sex, and education strata compared to both PD patients and normative SSA populations (16, 21). This divergence likely reflects the higher baseline literacy rates in our control group, which may enhance IDEA performance independent of cognitive status.

Our findings suggest that the tool's original design—optimized for low-educated, elderly populations in LMICs—may underestimate cognitive impairment in settings with higher formal education.

6.3 Dementia prevalence among PD patients and control group using IDEA cognitive screen

Dementia associated with Parkinson's disease arises from the buildup of Lewy bodies in neurons, leading to dysfunction in the basal ganglia and disruptions in cortical areas. Specifically, the prefrontal cortex, caudate nucleus, and dorsomedial thalamus play key roles in the onset of dementia in individuals with PD. (40)

The factors that increase the likelihood of developing dementia in Parkinson's Disease (PD) include older age, more pronounced motor symptoms (UPDRS > 25), experiences of psychological stress, lower socioeconomic status, reduced educational attainment, and a clinical presentation characterized by postural instability gait difficulty. (40)
The IDEA cognitive screen assesses the probability of dementia based on established thresholds derived from extensive population-based studies conducted in sub-Saharan Africa (SSA): scores of 0–7 indicate probable dementia, 8–9 suggest possible dementia, and 10–15 signify no dementia. (16,21).

Based on these criteria, our research found that probable dementia was present in 3.3% of individuals with Parkinson's disease (PD), while possible dementia was observed in 9.3%, and 87.3% showed no signs of dementia. Interestingly, patients with PD were found to have four times the likelihood of cognitive impairment compared to matched controls from the general population (AOR = 4.87; 95% CI: 1.57–15.09; p = 0.006), highlighting the substantial impact of dementia among PD patients. This result is consistent with global patterns. For instance, a cohort study conducted in Norway with 171 PD patients indicated that the rates of dementia occurring annually in those with PD are 4 to 6 times greater than in populations without PD. (39).

In this investigation, the IDEA cognitive screen detected probable or possible dementia in 12.6% of patients with Parkinson's disease (PD) (AOR = 4.87; 95% CI: 1.57-15.09 p = 0.006). This rate is significantly lower than global estimates, where the cross-sectional prevalence of dementia in PD (PDD) is approximately 30%, and lifetime risks can be as high as 80% (8,9). For instance, a

study conducted in Norway involving 244 PD patients found a dementia prevalence of 26% at the initial assessment. (36).

A study conducted in Nigeria involving 51 patients with Parkinson's disease (PD) revealed that 21.6% experienced cognitive impairment (CI), compared to 4% in non-PD controls (33). A smaller group of 123 PD patients from Ethiopia indicated a CI prevalence of around 50% (28). Although the difference in CI rates between PD patients and non-PD controls corresponds with our findings (12.6% versus matched controls 2.6%), the dementia prevalence we noted in PD patients is lower than what is reported in most regional and global studies, even with our larger sample size of 150 PD patients.

The reduced prevalence of cognitive impairment identified in this investigation may be attributed to limitations associated with the IDEA cognitive screen, which was initially developed for detecting dementia in low- and middle-income countries (LMICs) such as those in sub-Saharan Africa (SSA), where populations frequently experience limited formal education and a greater number of elderly individuals (over 60 years) (18,23). Although the IDEA screen is viewed as educationally unbiased in settings with low literacy (16), its cognitive domains (such as memory and praxis) might not be sensitive or valid enough for identifying cognitive changes specific to Parkinson’s disease, especially among populations with higher levels of educational attainment.

Research from both global and local sources underscores the necessity for cognitive screening tools specifically designed for Parkinson's disease (PD). For example, studies conducted in Ethiopia suggest the use of validated PD-cognitive scales (28) to more effectively capture patterns of cognitive impairment. Conversely, guidelines from Western countries support the use of assessment tools such as the Montreal Cognitive Assessment (MoCA), the Mattis Dementia Rating Scale-Second Edition (DRS-2), and the Parkinson’s Disease-Cognitive Rating Scale (PD-CRS) because of their ability to detect PD-related cognitive deficits, including mild cognitive impairment (PD-MCI) (39). The binary classification system of the IDEA screen—categorizing individuals as “probable/possible dementia” versus “no dementia”—does not adequately differentiate PD-MCI, which may explain the lower prevalence reported in our study. Subsequent research should incorporate PD-MCI criteria to enhance the precision of cognitive screening.

The lack of multicenter normative data for IDEA scores within PD populations creates uncertainty regarding the establishment of optimal cutoffs for dementia and mild cognitive impairment.

6.4 Associated factors of dementia among PD patients and control group

Illiteracy emerged as a significant predictor of dementia in Parkinson's disease (PD) patients (AOR = 3.55; 95% CI (1.23, 10.27), P = 0.019). Despite the IDEA screen's design for accessibility in low-literacy populations (16, 21), our urban cohort—drawn from Addis Ababa—had lower illiteracy rates (24% in PD patients) compared to the original IDEA validation studies in rural Tanzania and Nigeria, where illiteracy is more prevalent (16, 21). This urban-rural disparity suggests that even minimal literacy gaps may influence IDEA performance, highlighting the need for population-specific adjustments in cognitive screening.

In the control group, no significant associations were observed between cognitive impairment and the independent variables examined (e.g., age, sex, education). This null finding may reflect the low prevalence of suspected dementia in this cohort, with 0% classified as probable dementia and 2.7% classified as possible dementia using the IDEA cognitive screen. Additionally, 23% of controls were under 60 years, whereas prior IDEA normative studies focused on populations aged ≥60 (16,21). Future studies with larger samples of older adults may clarify these associations.

While the IDEA screen minimizes literacy bias through non-verbal tasks (e.g., praxis), our findings imply that residual educational effects persist, particularly in transitional settings like urban Ethiopia. This contrasts with rural SSA contexts, where higher illiteracy rates align with IDEA's normative data. To optimize dementia screening in mixed-literacy populations

7. Conclusion and recommendation

This part concludes the study by summarizing the key research findings about research aims and research questions as well as the value and the contribution of thereof. It will also review the limitations and strengths of the study and propose opportunities for future research.

This study aimed to assess cognitive function and associated factors among Parkinson's patients and an epidemiologically matched control group using the IDEA cognitive screen at Tikur Anbessa Specialized Hospital, AA, Ethiopia. The IDEA tool, validated for dementia screening in elderly, low-education sub-Saharan African (SSA) populations (17), revealed probable or possible dementia, reflecting a fourfold higher prevalence of cognitive impairment in PD than controls. The study also showed that IDEA scores declined with age and lower education in PD patients, mirroring trends in sub-Saharan African (SSA) cohorts. However, controls outperformed both PD patients and SSA norms, likely due to higher literacy rates. Although this study showed a low prevalence of dementia in PD patients compared to previous studies (4, 5), it showed a four times increased prevalence of dementia in PD patients compared to the epidemiologically matched control group.

In this study, Illiteracy was the sole significant predictor of dementia in PD patients, underscoring residual educational bias despite IDEA's design for low-literacy settings. Other

associated factors like age, sex, H&Y severity score, medications, and motor phenotypes did not show a significant association. Controls found no associations, likely due to low dementia prevalence and younger age distribution.

These findings suggest that, compared to the control group, IDEA has better sensitivity for screening of dementia in PD patients. However, the IDEA screen's inability to detect PD-specific mild cognitive impairment (PD-MCI) and reliance on thresholds validated for elderly, low-literacy SSA populations may underestimate impairment in urban Ethiopian cohorts with higher education.

7.1 Recommendation

7.1.1 Adapting the IDEA cognitive tool for optimal use in our setup.

Based on the findings of this study, the following recommendations are proposed to improve the IDEA tool's utility in our setting:

1. Tool adaptation

    - Develop education-stratified IDEA cutoffs for urban LMIC populations.
    - Validate IDEA against PD-specific tools (e.g., MoCA, PD-CRS) to improve detection of PD-MCI.

2. For clinical practice

    - Supplement IDEA with PD-focused cognitive screens to capture subtle deficits.
    - Prioritize literacy-adjusted interpretations for PD patients, even in urban settings.

3. Further research

    - Conduct multicenter studies across Ethiopia to establish normative data across diverse literacy and age groups.
    - Conduct qualitative research to investigate the interplay between urbanization, education, and cognitive reserve in PD populations.
    - Explore biomarkers (e.g., α-synuclein, neuroimaging) to complement cognitive screening in LMICs.

- Conduct studies with older control cohorts (≥60 years) to validate IDEA's applicability in age-matched populations.

4. Address Urban-Rural Disparities: Tailor screening protocols:

- Urban settings: Use education-adjusted IDEA cutoffs.
- Rural settings: Retain original IDEA thresholds but validate locally to account for dialect/cultural differences.

5. Policy integration

- Advocate for IDEA's inclusion in national PD guidelines by

Highlighting its cost-effectiveness and cultural relevance compared to Western tools.

- Partner with the Ethiopian Ministry of Health to standardize dementia screening protocols.

6. Improving PD patients' health care-seeking behaviour

- Public Awareness of PD symptoms and campaigns on improving health care-seeking behaviour
- Educate communities about early cognitive symptoms in PD to reduce diagnostic delays.
- Prioritize literacy programs to mitigate education bias in screening, especially for women and rural populations.

By addressing education bias, urban-rural disparities, and PD-specific cognitive profiles, these strategies can enhance IDEA's accuracy and relevance in TASH as well as Ethiopia while preserving its practicality for low-resource settings.

7.2 Strength and limitation of the study

7.2.1 Strength

- ✓ This is the first study to assess cognitive impairment among Parkinson's disease patients using the IDEA cognitive screen at Tikur Anbessa Specialized Hospital in Ethiopia, contributing critical baseline data for future research where the knowledge gap seems to be a problem.
- ✓ Our study included 150 PD patients, one of the largest samples in Ethiopian PD research to date, enhancing statistical power and generalizability within the urban context.

- ✓ It provided a comprehensive characterization of motor phenotypes (e.g., tremor-dominant, PIGD) and disease severity (Hoehn & Yahr staging).

- ✓ The Control group matched for age, sex, and setting, reducing confounding biases and strengthening comparative analyses.

- ✓ This study applied the IDEA cognitive screen, validated for low-literacy SSA populations, ensuring relevance to local contexts while addressing educational disparities.

- ✓ In this study, illiteracy was identified as a significant predictor of dementia in PD, emphasizing the need for education-sensitive screening protocols.

- ✓ Our study adhered to validated IDEA thresholds and controlled for major confounders (e.g., age, education), enhancing internal validity.

7.2.2 Limitation

- ✓ The cross-sectional nature of the study limits the ability to establish causal relationships or track cognitive decline over time. It is also subjected to selection bias.
- ✓ The study did not cross-validate demented participants using standard dementia diagnostic tools like DSM- 5 criteria.
- ✓ Did not use PD-specific tools (e.g., MoCA, PD-CRS), missing subtle cognitive deficits critical for early intervention.
- ✓ For the control group, the study involved elective preoperative surgical patients, which can limit its generalizability for the general population.
- ✓ It did not screen and exclude acute pain in the control group, which can intervene with cognitive function
- ✓ It excluded PD patients with a known diagnosis of vascular dementia but did not screen PD patients for undiagnosed vascular dementia.
- ✓ Participants from a specialized hospital may represent a more health-literate or affluent subgroup, excluding marginalized populations with limited healthcare access.
- ✓ The study was conducted at a tertiary hospital in Addis Ababa, limiting generalizability to rural populations with lower healthcare access and education.
- ✓ IDEA's thresholds (probable/possible dementia vs. no dementia) failed to detect PD-MCI, likely underestimating cognitive impairment prevalence.
- ✓ Only 2.7% of controls had possible dementia, reducing the power to detect associations between variables (e.g., age, sex) and cognitive impairment.

Despite its limitations, the study provides foundational insights into PD-associated cognitive impairment in Ethiopia; its urban focus and IDEA's inherent limitations underscore the need for longitudinal, multicenter studies with PD-specific tools. Addressing these gaps will enhance dementia screening accuracy and inform culturally tailored interventions in resource-limited settings.

References

1. Ginanneschi A, Degl'Innocenti F, Maurello MT, Magnolfi S, Marini P, Amaducci L, et al.Evaluation of Parkinson's disease: a new approach to disability. Neuroepidemiology. 1991;10:282–287. doi: 10.1159/000110285. [Available from: Evaluation of Parkinson's disease: a new approach to disability - PubMed (nih.gov), Google Scholar].
2. World Health Organization (WHO). Parkinson disease. 2023. https://www.who.int/news-room/fact-sheets/detail/parkinson-disease.
3. Chou KL, Hurtig HI, Eichler AF. Diagnosis and differential diagnosis of Parkinson's disease. UpToDate. 2023.
4. Aarsland D, Kurz MW. The epidemiology of dementia associated with Parkinson's disease. 2010. [PubMed (nih.gov), Google Scholar].
5. Kumar AS, K R V. Epidemiology of Parkinson's Disease in Africa. 2019. [Definition of parkinson disease dementia- MDS Task force - Search (bing.com), Google Scholar].
6. Williams U, Bandmann O, Walker R. Parkinson's Disease in Sub-Saharan Africa: A Review of Epidemiology, Genetics and Access to Care. 2018. [PubMed (nih.gov), Google Scholar].
7. Thaler A, Alcalay RN. Diagnosis and Medical Management of Parkinson's Disease. Continuum (Minneap Minn). 2022.
8. Schapira A, Hartmann A, Agid Y. Parkinsonian disorders in clinical practice.
9. Watson GS, Leverenz JB. Profile of Cognitive Impairment in Parkinson's Disease. 2010. [Available from: PDF (researchgate.net), Google Scholar].
10. Gonzalez-Latapi P, Bayram E, Litvan I, Marras C. Cognitive Impairment in Parkinson's Disease: Epidemiology, Clinical Profile, Protective and Risk Factors. Behav Sci (Basel). 2021 May.
11. Marinus J, Zhu K, Marras C, Aarsland D, van Hilten JJ. Risk factors for non-motor symptoms in Parkinson's disease. Lancet Neurol. 2018;17:559–568. doi: 10.1016/S1474-4422(18)30127-3.
12. Gray WK, Paddick SM, Ogunniyi A, Olakehinde O, Dotchin C, Kissima J, et al. Population normative data for three cognitive screening tools for older adults in sub-Saharan Africa. Dement

Neuropsychol. 2021 Sep;15(3):339–349. doi: 10.1590/1980-57642021dn15-030005. [National Library of Medicine, Google Scholar].
13. Paddick SM, Gray WK, Ogunjimi L, Lwezuala B, Olakehinde O, Kisoli A, et al. Validation of the Identification and Intervention for Dementia in Elderly Africans (IDEA) cognitive screen in Nigeria and Tanzania. BMC Geriatr. 2015 Apr 25. doi: 10.1186/s12877-015-0040-1. [PubMed].
14. Akinyemi RO, Okubadejo NN, Akinyemi JO, Owolabi MO, Owolabi LF, Ogunniyi A. First published: 10 June 2008.
15. Aarsland D, Batzu L, Halliday GM, Geurtsen GJ, Ballard C, Chaudhuri KR, et al. Parkinson disease associated cognitive impairment. Nat Rev Dis Primers. 2021;7:47. doi: 10.1038/s41572-021-00280-3.
16. Gray WK, Paddick SM, Walker RW. Development and Validation of the Identification and Intervention for Dementia in Elderly Africans (IDEA) Study Dementia Screening Instrument. SAGE Journals. 2014 Feb 26.
17. Paddick SM, Gray WK, Ogunjimi L, Lwezuala B, Olakehinde O, Kisoli A, et al. Validation of the Identification and Intervention for Dementia in Elderly Africans (IDEA) cognitive screen in Nigeria and Tanzania. BMC Geriatr. 2015 Apr. PMID: 25908439. doi: 10.1186/s12877-015-0040-1.
18. Gale TM, Larner AJ. Validity and reliability of the 6-Item Cognitive Impairment Test for Screening Cognitive Impairment: study review. O'Sullivan D, O'Regan NA, Timmons S. 2016 Aug.
19. Hessler JB, Schäufele M, Hendlmeier I, Junge MN, Leonhardt S, Weber J, et al. The 6-Item Cognitive Impairment Test as a bedside screening for dementia in general hospital patients: results of the General Hospital Study (GHoSt). 2016 Jun.
20. Paddick SM, Lewis EG, Duinmaijer A, Banks J, Urasa S, Tucker L, et al. Identification of delirium and dementia in older medical inpatients in Tanzania: A comparison of screening and diagnostic methods. J Neurol Sci. 2018;385:156–163. doi: 10.1016/j.jns.2017.12.006. [PubMed].
21. Abdel-Aziz K, Larner AJ. Six-item cognitive impairment test (6CIT): pragmatic diagnostic accuracy study for dementia and MCI. Cambridge University Press. 2015 Jan 29.
22. Brodrick K. A preliminary study of a correlation between scores on a 6-item cognitive impairment test and a modified Bristol Activities of Daily Living Scale obtained from older women in Khayelitsha. 2001.
23. Skorvanek M, Goldman JG, Jahanshahi M, Marras C, Rektorova I, Schmand B, et al. Global scales for cognitive screening in Parkinson's disease: Critique and recommendations. Mov Disord. 2017.
24. Litvan I, Goldman JG, Troster AI, et al. Diagnostic criteria for mild cognitive impairment in Parkinson's disease: Movement Disorder Society Task Force guidelines. Mov Disord. 2012;27:349–356. [PMC free article].
25. Dubois B, Burn D, Goetz C, et al. Diagnostic procedures for Parkinson's disease dementia: recommendations from the Movement Disorder Society Task Force. Mov Disord. 2007;15:22. [PubMed].
26. Chou KL, Hurtig HI, Eichler AF. Diagnosis and differential diagnosis of Parkinson disease. UpToDate. 2022.
27. Ayele BA, Zewde YZ, Tafesse A, Sultan A, Friedman JH, Bower JH. Non-Motor Symptoms and Associated Factors in Parkinson's Disease Patients in Addis Ababa, Ethiopia: A Multicenter Cross-Sectional Study. Ethiop J Health Sci. 2021 Jul;31(4):837–846. doi: 10.4314/ejhs.v31i4.19.

28. Tafesse A, Bekele M, Enquselassie F. Health related quality of life in PD patients seen in the outpatient clinics of Tikur Anbessa Specialized Hospital (TASH) and Zewditu Memorial Hospital, (ZMH) Addis Ababa, Ethiopia. Ethiop Med J. 2017;55(4).
29. Shalash AS, Hamid E, Elrassas HH, Bedair AS, Abushouk AI, Khamis M, et al. Non-motor symptoms as predictors of quality of life in Egyptian patients with Parkinson's disease: A cross-sectional study using a culturally adapted 39-item Parkinson's disease questionnaire. Front Neurol. 2018;9:1–7. doi: 10.3389/fneur.2018.00357.
30. Ojagbemi AA, Akinyemi RO, Baiyewu O. Neuropsychiatric symptoms in Nigerian patients with Parkinson's disease. Acta Neurol Scand. 2013;128(1):9–16. doi: 10.1111/ane.12062.
31. Dorsey ER, Elbaz A, Nichols E, Abd-Allah F, Abdelalim A, Adsuar JC, et al. Global, regional, and national burden of Parkinson's disease, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet Neurol. 2018;17(11):939–953. doi: 10.1016/S1474-4422(18)30295-3.
32.Cubo E, Doumbe J, Martinez-Martin P, Rodriguez-Blazquez C, Kuate C, Mariscal N, et al.Comparison of the clinical profile of Parkinson's disease between Spanish and Cameroonian Cohorts. J Neurol Sci. 2014;336(1–2):122–126. doi: 10.1016/j.jns.2013.10.021.
33. Melka D, Tafesse A, Bower JH, Assefa D. Prevalence of sleep disorders in Parkinson's disease patients in two neurology referral hospitals in Ethiopia. BMC Neurol. 2019 Aug 22;19(1). doi: 10.1186/s12883-019-1431-2.
34. Farombi TH, Owolabi MO, Ogunniyi A. Falls and Their Associated Risks in Parkinson's Disease Patients in Nigeria. J Mov Disord. 2016;9(3):160–165. doi: 10.14802/jmd.16011.
35. Diederich NJ, Moore CG, Leurgans SE, Chmura TA, Goetz CG. Parkinson Disease With Old-Age Onset: A Comparative Study With Subjects With Middle-Age Onset.
36. Nwabuobi L, Zhang C, Henchcliffe C, Shah H, Sarva H, Lee A, et al. Characteristics and Outcomes of Parkinson's Disease Individuals Hospitalized with COVID-19 in a New York City Hospital System. 2022 Jul 11.
37. Najafi F, Mansournia MA, Abdollahpour I, Rohani M, Vahid F, Nedjat S. Association between socioeconomic status and Parkinson’s disease: findings from a large incident case–control study.
38. Skorvanek M, Goldman JG, Jahanshahi M, Marras C, Rektorova I, Schmand B, et al. Global scales for cognitive screening in Parkinson’s disease: Critique and recommendations. Mov Disord. 2018;33:208–218. doi: 10.1002/mds.27233. [PubMed].
39. Stern Y, Marder K, Tang MS, Mayeux R. Antecedent clinical features associated with dementia in Parkinson's disease. Neurology. 1993;43:1690–1692. doi: 10.1212/wnl.43.9.1690. [PubMed].
40. Gray WK, Paddick SM, Ogunniyi A, Olakehinde O, Dotchin C, Kissima J, et al. Population normative data for three cognitive screening tools for older adults in sub-Saharan Africa. Dement Neuropsychol. 2021;15(3):339–349. PMCID: PMC8485647. PMID: 34630921. doi: 10.1590/1980-57642021dn15-030005.
41. Rosli R, Tan MP, Gray WK, Subramanian P, Mohd Hairi NN, Chin AV. How Can We Best Screen for Cognitive Impairment in Malaysia? A Pilot of the IDEA Cognitive Screen and Picture-Based Memory Impairment Scale and Comparison of Criterion Validity with the Mini Mental State Examination. Clin Gerontol. 2017;40(4):249–257. doi: 10.1080/07317115.2017.1311978.
42. Gray WK, Paddick SM, Ogunniyi A, Olakehinde O, Dotchin C, Kissima J, et al. Population normative data for three cognitive screening tools for older adults in sub-Saharan Africa. Dement

Neuropsychol. 2021;15(3):339–349. PMCID: PMC8485647. PMID: 34630921. doi: 10.1590/1980-57642021dn15-030005.
43. Stebbins GT, Goetz CG, Burn DJ, Jankovic J, Khoo TK, Tilley BC. How to identify tremor dominant and postural instability/gait difficulty groups with the movement disorder society unified Parkinson's disease rating scale: comparison with the unified Parkinson's disease rating scale. Mov Disord. 2013;28(5):668–670. [PubMed].
44. Shin C, Park MH, Lee SH, Ko YH, Kim YK, Han KM, et al. Usefulness of the 15-item geriatric depression scale (GDS-15) for classifying minor and major depressive disorders among community-dwelling elders. J Affect Disord. 2019;259:370–375. doi: 10.1016/j.jad.2019.08.053.
45.Shin C, Park MH, Lee SH, Ko YH, Kim YK, Han KM, et al. Usefulness of the 15-item geriatric depression scale (GDS-15) for classifying minor and major depressive disorders among community-dwelling elders. J Affect Disord. 2019;259:370–375. doi: 10.1016/j.jad.2019.08.053. Epub 2019 Aug 20. PMID: 31470180.

Annexes

ANNEX I: Questionnaire Consent Form

Dear study Participant,

My Name is Dr. Hanna Kiflu. I am a third-year postgraduate Neurology Resident in Addis Ababa University College of Health Science. I am doing a research as a completion for my residency program on my topic of interest "Cognitive function assessment and associated factors among Parkinson's patients and epidemiological matched control groups using IDEA cognitive screen, In Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia"

The purpose of this study is to determine the cognitive function of Parkinson's disease patients and epidemiological matched control group using Identification and Intervention for Dementia in Elderly Africans (IDEA) screening tool in Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia

I am going to give you information and invite you to be part of this research. Before you decide, you can talk to anyone you feel comfortable with about the research.

Your personal data used in the study, as detailed in the information sheet will be handled in a strictly confidential way. It will take about 5 minutes of your time for interview. I request you to answer as truthfully as possible. Your willingness and participation in the study is very helpful in

identifying the problem related to the issue. There is no payment in participating in the research.

You have a right to withdraw at any time you want without any repercussion.

So do you agree to participate in this study? Yes/No

Thank you in advance for your cooperation.
Data collectors Name_____ sign: _____
Name of the principal Investigator: Hanna Kiflu
Mobile no: 0911976992
E-mail: emohanna30@gmail.com

Questionnaires for PD patients

Part I: Socio-demographic characteristics of Parkinson's disease patients

	Variables	**Response**
1	Study number	
2	I-care number (system card number), ካርድ ቁጥር	
3	Date	
4	Age (in years)	……years
5	Sex	A) Male B) Female
6	How many years in all did you spend studying in School, college or University?	…..years
7	Age at onset of PD?	Years
8	Similar family history?	A) Yes B) No
9	For how long have you known you have PD?	Time completed in years
10	Exposure to medication management	A) Yes B) No
11	Duration of medication management	Time completed in years
12	Type of medication management	Currently taking
13	Known Comorbidity (Diabetes mellitus, Hypertension, Dyslipidemia…	A) Yes, specify… B) No

Part II: SIDSA cognitive screening tool : Also done for control group

ባለ ስድስት ጥያቄ የመጀመሪያ ህመም መለያመጠይቅ- ለአፍሪካ (SIDSA)

የቃለ መጠይቅ ቀን	ቃለ-መጠይቅ አድራጊ ስም
የተሳታፊ ስም	የተሳታፊ መታወቂያ ቁጥር
U.1.1. ያታ	የቃለ መጠይቅ ቦታ
የመኖሪያ አድራሻ	
ስልክ ቁጥር (አስፈላጊ ነው)	
U.1.2. የልደት ቀን (የሚታወቅ ከሆነ)	U.1.3. እድሜ
ካልታወቀ / እርግጠኛ ካልተሆነ ታሪካዊ ክስተቶችን በመጠቀም ይገመት):	
U.1.4. ሥራ	U.1.5. በሥራ ላይ ናቸው?
ታካሚው ማንበብ እና መጻፍ ይችላሉ? (እባክዎን አንዱን ያክብቡ)	አዎ አይ
የትምህርት ደረጃ ምንም ከ1-4 ኛ ክፍል ከ5-7 ኛ ክፍል 8ኛ ክፍል ወይም ከዚያ በላይ የሁለተኛ ደረጃ ትምህርት ያጠናቀቀ ቀጣይ ትምህርት	

ለአስር ቃላት ዝርዝር ዝግጅት (ጥያቄ 5)

በመቀጠል የቃላት ዝርዝር አነብልዎታለሁ ። እባክዎን በጥንቃቄ ያዳምጡ እና እኔ ከጨረስኩ በኋላ መልሰው እንዲደግሙልኝ

እጠይቅዎታለሁ። (ቃላቱን በቀስታ ያንብቡ: :)

የመጀመሪያ ሙከራ፤ አሁን የሚያስታውሷቸውን ቃላት በሙሉ ይንገሩኝ ። (በትክክል የተጠቀሱትን ቃላት በሰንጠረዡ ላይ ምልክት ያድርጉ)

ሁለተኛ ሙከራ፤ አሁን ቃላቱን እንደገና አነብልዎታለሁ ፣ በጥሞና ያዳምጡ እና የቻሉትን ሁሉ እንዲደግሙ እጠይቅዎታለሁ ። አሁን ሊያስታውሷቸው የሚችሏቸውን ቃላት በሙሉ ይንገሩኝ ። (በትክክል የታወሱትን ቃላት በሰንጠረዡ ላይ ምልክት ያድርጉ)

ሦስተኛ ሙከራ፤ አሁን ቃላቱን ለመጨረሻ ጊዜ አነብልዎታለሁ ፣ በጥሞና ያዳምጡ እና የቻሉትን ሁሉ እንዲደግሙ እጠይቅዎታለሁ ። አሁን ሊያስታውሷቸው የሚችሏቸውን ቃላት በሙሉ ይንገሩኝ ። (በትክክል የታወሱትን ቃላት በሰንጠረዡ ላይ ምልክት ያድርጉ)

ቃል	የመጀመሪያ ሙከራ	ሁለተኛ ሙከራ	ሦስተኛ ሙከራ
ቅቤ			
ከንድ			
ደብዳቤ			
ንግስት			
ትኬት			
ሳር			
ጥማ			
ድንጋይ			
መጽሐፍ			
በትር			

1.	የአንድ ነገር ስም እነግርዎታለሁ እናም ምን እንደሆነ እንዲገልጹ እፈልጋለሁ ::ድፈይይ ምንድን ነው? (ትክክለኛው መልስ - ከወንዝ ፣ ከሸለቆ ወይም ከመንገድ ማዶ የሚያሻግር ነገር)	0 የተሳሳተ ከሆነ 2 ትክክል ከሆነ	**ውጤት ____ / 2**
2.	በአንድ ደቂቃ ውስጥ የቻሉትን ያህል የተሊያዩ እንስሳትን እንዲጠሩልኝ እፈልጋለሁ ::	0 - ከ 0-3 እንስሳት የጠሩ ከሆነ 1 - ከ4-7 እንስሳት የጠሩ ከሆነ 2 - 8 ወይም ከዚያ በላይ እንስሳት የጠሩ ከሆነ	**ውጤት ____ / 2**
3.	የዚህ ቀበሌ ዋና መሪ/ሊቀመንበር/አስተዳዳሪ ማን ነው?	0 የተሳሳተ ከሆነ 1 ትክክል ከሆነ	**ውጤት ____ / 1**
4.	ዛሬ ቀኑ ምንድን ነው?	0 የተሳሳተ ከሆነ 2 ትክክል ከሆነ	**ውጤት ____ / 2**
5.	ቅድም ያጠናናቸዉን አስር ቃላት ሊነግሩኝ ይችላሉ? የቻሉትን ያህል ለማስታወስ ይሞክሩ ::	0 ነጥብ ምንም ቃል የማይታወስ ከሆነ 1 ቃል ከታወሰ 1ነጥብ 2 ቃላት ከታወሱ 2 ነጥብ 3 ቃላት ከታወሱ 3 ነጥብ 4 ቃላት ከታወሱ 4 ነጥብ	**ውጤት ____ / 5**

6.	እነዚህን አራት የከብራት እንጨቶች በመጠቀም ከዚህ በታች የሚታየውን ቅርጽ መስራት ይችላሉን? አንድ ጊዜ አሳይዎታለሁ ከዚያ በኋላ በትክክል መገልበጥ አለብዎት :: (መርማሪው መጀመሪያ ከብራቶቹን በመጠቀም ቅርጹን አስመስሎ በመስራት እና በተለይም የከብራት እንጨቶቹ አናት ሁሉም በተመሳሳይ አቅጣጫ መጠቆም እንዳለባቸው ለተሳታፊው ይንገሩ፤በመቀጠልም መርማሪው ቅርጹን ከሠራ በኋላ የከብራት እንጨቶቹን ሰብስቦ ቃለ መጠይቅ ወደ ሚደረግላቸዉ ሰው ፊት ያኑሯቸው ::) 	በትክክል ለተከናወነው ለእያንዳንዱ የቅርጽ ክፍል 1 ነጥብ ይስጡ 1 ነጥብ - በውስጥ ያሉ ሁለት የከብራት እንጨት ራሶች በተመሳሳይ አቅጣጫ የሚያመለክቱ ከሆነ 1 ነጥብ - ከውጭ ያሉ ሁለት የከብራት እንጨት ወደ አንድ መአዘን የሚያመለክቱ ከሆነ 1 ነጥብ - የከብራት እንጨቶች አናት በትክክል ተስተካከለው ከተቀመጡ **ጠቅላላ ነጥብ ___ / 3**	
ከላይ ያለውን የከብረት እንጨት ቅርጽ ታካሚው እንዲያዩ ቅርፁን ሊሰሩ የሚያስችለውን ተግባር በድጋሚ ይስሩ			

ጠቅላላ ነጥብ	**/ 15**

ግለሰቡ ውጤት እንዳያመጡ የከለከላቸው የማየት ችግር አለባቸው? **አዎ/አይ**

ግለሰቡ ውጤት እንዳያመጡ የከለከላቸው የመስማት ችግር አለባቸው? **አዎ /አይ**

የተጀመረበት ሰአት ..... የተጠናቀቀበት ሰአት.....

Part III

MDS- UPDRS: Sub-scale

Please tick which matches the patient:each small boxes 0-4, from left to right

Tremor **Question:** Have you usually had tremors or shaking over the past week? **0 =** None. **1 =** I felt shaking or tremors but they don't cause problems. **2 =** I felt shaking or tremors and they cause problems with a few activities. **3 =** I felt shaking or tremors and faced problems with my daily activities because of them. **4 =** I faced problems with most or all activities because of my shaking or tremors.	☐	☐	☐	☐

Kinetic Tremor of the Hands **Instructions:** Have the patient do at least three finger-to-nose maneuvers with each hand reaching as far as possible to touch the examiner's finger. Ensure that the starting arm is in an outstretched position. Note: > The task must be performed slowly so they can't hide any tremor that could occur with fast movements. > Rate each hand separately. > Rate the highest amplitude observed. **0 =** No tremor. **1 =** The tremor is less than 1 cm in amplitude. **2 =** The tremor is 1 to 2 cm in amplitude. **3 =** The tremor is 3 to 9 cm in amplitude. **4 =** The tremor is at least 10 cm in amplitude.	☐ R ☐ L	☐ R ☐ L	☐ R ☐ L	☐ R ☐ L	☐ R ☐ L
Postural Tremor of the Hands **Instructions:** Instruct the patient to stretch their arms in front of them with their palms down. The wrist must be straight and the fingers must be comfortably separated from one another. Have them maintain this position for 10 seconds. Note: > Rate each hand separately > Rate the highest amplitude observed. **0 =** No tremor. **1 =** The tremor is less than 1 cm in amplitude. **2 =** The tremor is 1 to 2 cm in amplitude. **3 =** The tremor is 3 to 9 cm in amplitude. **4 =** The tremor is at least 10 cm in amplitude.	☐ R ☐ L	☐ R ☐ L	☐ R ☐ L	☐ R ☐ L	

Rest tremor amplitude

Instructions: Gather observations on rest tremor you've observed during the whole exam including sitting quietly, walking, and when some body parts are moving but the others are at rest.

Note:
> Score the maximum amplitude seen at any time. This will be the final score. Don't rate the persistence or intermittency of the tremor.

Instructions (2): Instruct the patient should sit quietly, their hands placed on the arms of the chair, their feet comfortably on the floor. Observe them for 10 seconds.

Note (2):
> Four limbs and lip/jaw are assessed separately.
> Score the maximum amplitude seen at any time. This will be the final score. Don't rate the persistence or intermittency of the tremor.

Extremity ratings:

0 = No tremor.

1 = The tremor is less than 1 cm in maximal amplitude.

2 = The tremor is 1 to 2 cm in maximal amplitude.

3 = The tremor is 3 to 9 cm in maximal amplitude.

☐ RUE	☐ RUE	☐ RUE	☐ RUE	☐ RUE
☐ LUE	☐ LUE	☐ LUE	☐ LUE	☐ LUE
☐ RLE	☐ RLE	☐ RLE	☐ RLE	☐ RLE
☐ LLE	☐ LLE	☐ LLE	☐ LLE	☐ LLE
☐ Lip/Jaw	☐ Lip/Jaw	☐ Lip/Jaw	☐ Lip/Jaw	☐ Lip/Jaw

4 = The tremor is at least 10 cm in maximal amplitude. Lip/Jaw ratings: **0 =** No tremor. **1 =** The tremor is less than 1 cm in maximal amplitude. **2 =** The tremor is equal to or more than 1 to but less than 2 cm in maximal amplitude. **3 =** The tremor is equal to or more than 2 but less than 3 cm in maximal amplitude. **4 =** The tremor is equal to or more than 3 cm in maximal amplitude.					

The Constancy of Rest Tremor **Instructions:** Observe the rest tremor during the examination and focus on the constancy of the rest tremor during the examination period. **0 =** No tremor. **1 =** The tremor is less than 1 cm in maximal amplitude. **2 =** The tremor is equal to or more than 1 to but less than 2 cm in maximal amplitude. **3 =** The tremor is equal to or more than 2 but less than 3 cm in maximal amplitude. **4 =** The tremor is equal to or more than 3 cm in maximal amplitude.	☐	☐	☐	☐	☐

Walking and Balance **Question:** Have you usually had problems with balance and walking over the past week? **0 =** No problems. **1 =** I am slow/ drag a leg but don't need a walking aid. **2 =** I sometimes use a walking aid but don't need help from someone else. **3 =** I usually use a walking aid to walk without falling but don't often need support from someone else. **4 =** I usually need another person to support me so I can walk safely without falling.	☐	☐	☐	☐
Freezing **Question:** Do you usually stop or freeze when you walk over the past week? **0 =** No problems. **1 =** I can easily start walking again after a brief freeze I didn't need help from someone else or a walking aid. **2 =** I have trouble starting to walk again when I freeze and I didn't need help from someone else or a walking aid. **3 =** I have a lot of trouble starting to walk again after freezing and sometimes need support from someone else or a walking aid afterward. **4 =** I need someone's help or a walking aid most or all of the time because of freezing.	☐	☐	☐	☐

Gait

Instructions: Ask the patient to walk at least 10 meters (30 feet) and then turn around and return to the examiner.

Measure the following:
> stride amplitude and speed
> height of foot lift
> heel strike during walking and turning
> arm swing

Note: Assess for "freezing of gait" while the patient is walking to obtain a score for the section after this. Also, observe their posture for the Posture section below.

0 = No problems.

1 = Minor gait impairment present but walks independently.

2 = Has substantial gait impairment but independently walks.

3 = Requires a walking device but not a person.

4 = Can only walk with another's person's assistance or cannot walk at all.

Freezing of Gait

Instruction: While assessing the gait, also assess for freezing of gait. Check if there are any hesitations or stuttering movements at the start and when turning and reaching the end of the task.

Note: Patients may not use sensory tricks during the test.

0 = No freezing.

1 = Freezes at the start, while turning, or walking through the doorway, and halts once during any of the aforementioned moments. Continues smoothly without freezing.

2 = Freezes at the start, while turning, or walking

through the doorway, and halts multiple times during any of the aforementioned moments. Continues smoothly without freezing. **3 =** Freezes once while straight walking. **4 =** Freezes multiple times while straight walking.				

Postural Stability **Instruction:** Stand behind the patient and inform them what's about to happen and tell them they may take a step back to avoid falling. When they understand, you will make pulls on the patient's shoulders while they are standing erect with eyes open and feet apart and parallel to each other. The first pull must be a demonstration. It will be milder and the reaction won't be rated. For the second pull, the shoulders must be pulled quickly and forcefully toward the examiner. The pull must be able to displace the patient's center of gravity. They'll have no choice but to take a step backward. Make sure to have space between the two of you so they may take steps but be ready to catch them. Note: > There must be a solid wall behind the examiner, 1 to 2 meters away, to count the number of retropulsive steps taken. > Don't allow them to bend forward to anticipate	☐	☐	☐	☐

the pull. > If the patient fails to understand the test, you may repeat the test. Ensure they understand so that the rating will be based on the limitations and not a lack of understanding of instructions. > Observe the patient's standing posture for the Posture section below. **0 =** No problems and can recover after one or two steps. **1 =** Takes 3-5 steps but can recover unaided. **2 =** Takes more than 5 steps but can recover unaided. **3 =** Falls if not caught by the examiner, stands safely but has an absence of postural response **4 =** Very unstable. Loses balance spontaneously after a gentle pull on the shoulders.						

Part IV: Parkinson's disease severity measure

	0	1	2	3	4	5
Hoehn and Yahr Stage **0 =** Asymptomatic **1 =** Only unilateral involvement. **2 =** No impairment of balance with bilateral involvement. **3 =** Physically independent but has mild to moderate involvement and some postural instability. Needs assistance to recover.	☐	☐	☐	☐	☐	☐

4 = Able to walk or stand unassisted even with severe disability. **5 =** Wheelchair bound or bedridden unless aided.						

Geriatric Depression Scale (Short Form)

Patient's Name: _____ Date: _____

Instructions: Choose the best answer for how you felt over the past week.

No.	Question	Answer	Score
1.	Are you basically satisfied with your life?	YES / NO	
2.	Have you dropped many of your activities and interests?	YES / NO	
3.	Do you feel that your life is empty?	YES / NO	
4.	Do you often get bored?	YES / NO	
5.	Are you in good spirits most of the time?	YES / NO	
6.	Are you afraid that something bad is going to happen to you?	YES / NO	
7.	Do you feel happy most of the time?	YES / NO	
8.	Do you often feel helpless?	YES / NO	
9.	Do you prefer to stay at home, rather than going out and doing new things?	YES / NO	
10.	Do you feel you have more problems with memory than most?	YES / NO	
11.	Do you think it is wonderful to be alive?	YES / NO	
12.	Do you feel pretty worthless the way you are now?	YES / NO	
13.	Do you feel full of energy?	YES / NO	
14.	Do you feel that your situation is hopeless?	YES / NO	
15.	Do you think that most people are better off than you are?	YES / NO	
		TOTAL	

Scoring:

Assign one point for each of these answers:

1. NO	4. YES	7. NO	10. YES	13. NO
2. YES	5. NO	8. YES	11. NO	14. YES
3. YES	6. YES	9. YES	12. YES	15. YES

A score of 0 to 5 is normal. A score above 5 suggests depression.

Questionnaires- For controls

Part I: Socio-demographic characteristics of control group

	Variables	**Response**
1	Study number	
2	I-care number (system card number), ካርድ ቁጥር	
3	Date	
4	Age (in years)	……years
5	Sex	A) Male B) Female
6	How many years in all did you spend studying in School, college or University?	…..years
7	Known Comorbidity (Diabetes mellitus, Hypertension, Dyslipidemia…	A) Yes, specify… B) No

Geriatric Depression Scale (Short Form)

Patient's Name: _____ Date: _____

Instructions: Choose the best answer for how you felt over the past week.

No.	Question	Answer	Score
1.	Are you basically satisfied with your life?	YES / NO	
2.	Have you dropped many of your activities and interests?	YES / NO	
3.	Do you feel that your life is empty?	YES / NO	
4.	Do you often get bored?	YES / NO	
5.	Are you in good spirits most of the time?	YES / NO	
6.	Are you afraid that something bad is going to happen to you?	YES / NO	
7.	Do you feel happy most of the time?	YES / NO	
8.	Do you often feel helpless?	YES / NO	
9.	Do you prefer to stay at home, rather than going out and doing new things?	YES / NO	
10.	Do you feel you have more problems with memory than most?	YES / NO	
11.	Do you think it is wonderful to be alive?	YES / NO	
12.	Do you feel pretty worthless the way you are now?	YES / NO	
13.	Do you feel full of energy?	YES / NO	
14.	Do you feel that your situation is hopeless?	YES / NO	
15.	Do you think that most people are better off than you are?	YES / NO	
		TOTAL	

Scoring:

Assign one point for each of these answers:

1. NO	4. YES	7. NO	10. YES	13. NO
2. YES	5. NO	8. YES	11. NO	14. YES
3. YES	6. YES	9. YES	12. YES	15. YES

A score of 0 to 5 is normal. A score above 5 suggests depression.