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PATTERNS OF DEMENTIA IN PARKINSON'S DISEASE PATIENTS

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Abstract

Background: *The bioimpedance spectroscopy shows promise as a tool for surveillance of Parkinson's Disease (PD) and Dementia with Lewy Bodies (DLB), neurodegenerative disorders, for which Lewy bodies are observed. Both conditions have pathological features in common, but their clinical manifestations differ significantly, particularly in terms of dementia. This is important to know when and how to make a diagnosis, how to treat the disease, and how to improve patient outcomes.*

Objective: *The purpose of this study is to determine how incidence and patterns of dementia differ in PDD and DLB patients with amnestic and non-amnestic subtypes of dementia.*

Methods: *A six-month cross-sectional study was done at the Department of Neurology, Sheikh Zayed Hospital, Lahore. By consecutive sampling, a total of 70 PD patients above 55 years were recruited. The Montreal Cognitive Assessment (MoCA) was used to assess dementia as well as clinical assessments. Since Nicoletti et al. [1] estimated 4.8% prevalence of PDD, we calculated the sample size. Descriptive statistics, data analyses with SPSS version 26 (chi square test) and logistic regression were used to test significant associations and predictors from the data.*

Results: *Of the 70 PD patients, 40 percent had evidence of dementia, with amnestic dementia (60 percent) and non-amnestic multidomain dementia (30 percent) most and executive dysfunction (10 percent). Older age, longer disease duration, and higher incidence of motor symptoms were significantly associated with the incidence of dementia ($p < 0.05$). In PD patients, age over 60 years (OR=2.5, p=0.01), duration over five years (OR=3.0, p=0.01) and advanced motor symptoms (Hoehn and Yahr Stage III-IV; OR=4.0, p<0.001) were independently found to be associated with dementia.*

Conclusion: *PD patients have a high prevalence for dementia, most commonly amnestic. PD dementia is also predicted by age, disease duration and motor symptom severity. Establishing early identification and management of cognitive impairments improves patient outcomes and their quality of life. Since causality relationships and progression of dementia in PD remain yet to be elucidated, future longitudinal studies with larger cohorts are needed to further clarify their association.*

INTRODUCTION

Parkinson's Disease (PD) is a neurodegenerative disorder characterized as a progressive disorder with motor symptoms characterized by bradykinesia, rigidity, resting tremor and postural instability. While PD is also accompanied with a wide variety of neuropsychiatric symptoms, including cognitive

impairments, mood disorders and psychosis, these symptoms considerably reduce the quality of life for patients and present challenges to caregivers [1]. In PD patients, cognitive decline can even lead to Parkinson's Disease Dementia (PDD) — a severe dementia characterized by progressive decline of daily functioning and poor prognosis [2].

Another Lewy body-related dementia is dementia with Lewy bodies (DLB), which is different from PDD and includes one or more of: fluctuating cognition, visual hallucinations, REM sleep behaviour disorder and parkinsonism. Despite both PDD and DLB having the pathological hallmark of Lewy bodies, there are important differences in clinical presentation and rate of progression that need to be differentiated for the best management [3]. The prevalence of dementia in PD appears to be between 20 and 80%, depending on disease duration and severity [4]. On the other hand, DLB represents about 10 to 25 percent of all dementia cases, making it the third most frequent degenerative dementia (after one of Alzheimer's disease and vascular dementia) [5].

The patterns of dementia with PD are specific and include amnestic and non-amnestic subtypes with different cognitive profiles. In PDD, amnestic dementia, as evidenced by the severe memory impairments, is common, while nonamnestic multidomain dementia with executive, visuospatial, and attention deficits is frequently present [6]. It is important for early diagnosis, intervention and tailored therapeutic strategies to understand these dementias and their relation to clinical variables to improve patient's outcomes and quality of life [7].

The aim of this study is to compare the incidence and pattern of new dementia in PD patients, emphasising the amnestic andnon-amnesticc subtypes as compared with dementia with Lewy bodies (DLB). This research aims to inform clinical practices and contribute to the development of targeted management approaches for neurodegenerative disorders by elucidating relationships of clinical variables with dementia patterns in PD.

Materials and Methods

Study Design

This study employed a cross-sectional design to compare the incidence and pattern of dementia in patients with Parkinson's disease provided with the diagnosis of Parkinson's disease dementia (PDD) and dementia with Lewy bodies (DLB). The study took place from June 2024 to November 2024.

Setting

This study was carried out at the Department of Neurology, Sheikh Zayed Hospital, Lahore, a tertiary care facility possessing all resources for neurologic assessment and treatment. By treating a diverse patient population, the study can be broadly generalized.

Study Population

The study population was of patients with Parkinson's Disease (PD) who presented to the Department of Neurology during the study period. In order to reflect the demographic most affected by PD-related dementia, both male and female patients aged above 55 years were included.

Sampling Technique

The consecutive sampling method was simple and accessed all eligible patients meeting inclusion criteria sequentially until the desired sample size was reached.

Sample Size Calculation

The World Health Organization (WHO) sample size calculator was used to determine sample size. The required sample size for this study was calculated based on a prevalence rate of 4.8% for Parkinson's Disease Dementia (PDD) reported by Nicoletti et al. [1] and 95% confidence interval and a 5% margin of error at 70 patients.

Inclusion Criteria

- Diagnosis of Parkinson's Disease (PD): Using the MDS clinical diagnostic criteria, confirmed.
- Age: Above 55 years.
- Gender: Both male and female patients.
- Consent: Due to willingness to provide informed consent and to join the procedures of the study.

Exclusion Criteria

- Severe Motor Disabilities: Patients with motor impairments unable to write or read.
- Lack of Consent: Patients who remove consent or refuse, in the latter stages of the study.
- Severe Cognitive Impairment: Patients who are so profoundly demented that they cannot participate in a cognitive assessment.

Ethical Concerns

When patients are unable to participate due to acute severe pain or medical emergencies.

Data Collection Procedure

Data collection started once we obtained ethical approval from the hospital's Institutional Review Board (IRB) and participant's informed consent. A standardized, three-part clinical interview and cognitive assessment were performed on each patient.

Part One:Demographic and Background Data

Gender, age, socio-economic status, weight and height.

Functional status and disability levels.

Part Two: Clinical Data

- Disease-related information including age of PD onset, duration of disease, and neurological symptoms.
- Severity of motor symptoms assessed using the **Hoehn and Yahr Scale** [9].
- Presence of non-motor symptoms such as depression and hallucinations.

Part Three: Cognitive Assessment

- Cognitive status evaluated using the **Montreal Cognitive Assessment (MoCA)** [10].
- Classification of dementia patterns into **amnestic**, **non-amnestic multidomain**, and **single-domain executive dysfunction** based on MoCA scores and clinical evaluation.

Operational Definitions

- **Parkinson's Disease (PD):** Diagnosed using the MDS clinical diagnostic criteria [8].
- **Dementia:** Defined as a significant decline in cognitive function interfering with daily activities, diagnosed using the MoCA and clinical evaluation [11].
- **Parkinson's Disease Dementia (PDD):** Diagnosed based on MDS Level I diagnostic criteria, incorporating cognitive decline, motor symptoms, and other clinical features [12].
- **Dementia with Lewy Bodies (DLB):** Diagnosed using the McKeith criteria, which include cognitive fluctuations, parkinsonism, and visual hallucinations [13].

Ethical Considerations

The study received ethical approval from the **Institutional Review Board (IRB) of Sheikh Zayed Hospital, Lahore**. Informed consent was obtained from all participants, ensuring confidentiality and the right to withdraw at any stage without affecting their standard medical care. The study adhered to the **Declaration of Helsinki** guidelines, maintaining patient anonymity and data integrity throughout the research process.

Data Analysis Procedure

Data were entered into **SPSS version 26** for analysis. Descriptive statistics (mean, standard deviation, frequencies, percentages) summarized demographic and clinical characteristics. The **chi-square test** assessed associations between categorical variables and the presence of dementia. **Logistic regression** was employed to identify independent predictors of dementia in PD patients. A p-value of <0.05 was considered statistically significant.

Results

Participant Demographics

A total of **70 PD patients** were included in the study. The demographic and clinical characteristics of the participants are summarized in **Table 1**.

Table 1. Demographic and Clinical Characteristics of Participants

Characteristic	Frequency (n=70)	Percentage (%)
Age (years)		
55-60	20	28.6
61-65	25	35.7
66-70	15	21.4
>70	10	14.3
Gender		
Male	45	64.3
Female	25	35.7
Duration of PD (years)		
1-5	30	42.9
6-10	25	35.7
>10	15	21.4
Severity of Motor Symptoms		
Stage I-II	40	57.1
Stage III-IV	30	42.9

Presence of Non-Motor Symptoms		
Depression	20	28.6
Hallucinations	15	21.4
Both	10	14.3
None	25	35.7

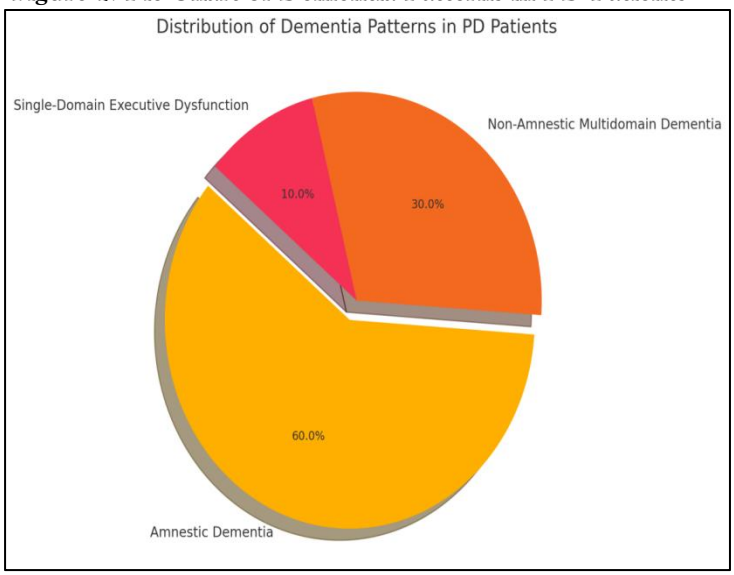
Prevalence and Patterns of Dementia

Out of the 70 PD patients, **28 (40%)** were diagnosed with dementia based on MoCA scores. The distribution of dementia patterns among these patients is illustrated in **Figure 1** and detailed in **Table 2**.

Table 2. Distribution of Dementia Patterns in PD Patients

Dementia Pattern	Number of Patients	Percentage (%)
Amnestic Dementia	17	60
Non-Amnestic Multidomain Dementia	8	30
Single-Domain Executive Dysfunction	3	10
Total with Dementia	28	40

Figure 1. Pie Chart of Dementia Patterns in PD Patients



Association Between Clinical Variables and Dementia

The association between various clinical variables and the presence of dementia in PD patients is presented in **Table 3**.

Table 3. Association Between Clinical Variables and Dementia in PD Patients

Variable	Dementia (n=28)	No Dementia (n=42)	p-Value
Age Group			
55-60	5	15	0.02
61-65	12	13	
66-70	8	7	
>70	3	2	
Gender			
Male	20	25	0.45
Female	8	17	

Duration of PD (years)			
1-5	8	22	0.03
6-10	12	13	
>10	8	7	
Severity of Motor Symptoms			
Stage I-II	10	30	0.01
Stage III-IV	18	12	
Presence of Non-Motor Symptoms			
Depression	10	10	0.50
Hallucinations	8	7	
Both	4	6	
None	6	29	

Predictors of Dementia in PD Patients

Logistic regression analysis was conducted to identify independent predictors of dementia in PD patients. The results are summarized in **Table 4**.

Table 4. Logistic Regression Analysis for Predictors of Dementia in PD Patients

Predictor	Odds Ratio (OR)	95% Confidence Interval (CI)	p-Value
Age > 60 years	2.5	1.2-5.2	0.01
Duration of PD > 5 years	3.0	1.3-6.8	0.01

Severity of Motor Symptoms (Stage III-IV)	4.0	1.8-8.9	<0.001
Presence of Hallucinations	1.8	0.8-4.0	0.15

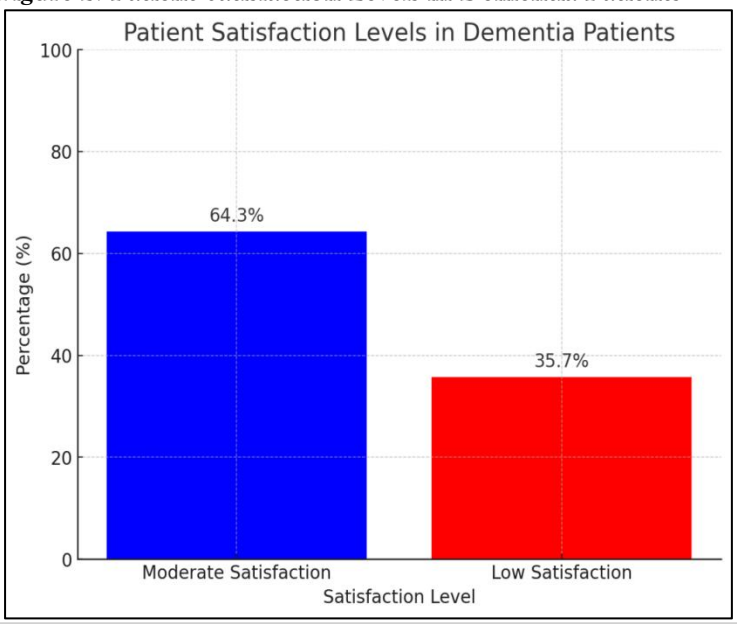
Patient Satisfaction

Patient satisfaction regarding cognitive health was assessed using a standardized satisfaction scale. Among the dementia patients:

- **Moderate Satisfaction:** 18 (64.3%)
- **Low Satisfaction:** 10 (35.7%)

This distribution is depicted in **Figure 2**.

Figure 2. Patient Satisfaction Levels in Dementia Patients



Discussion

The aim of this cross-sectional study was to compare the incidence of and patterns of dementia in Parkinson's disease dementia (PDD) and dementia with Lewy bodies (DLB) patients. They found that 40 percent of the PD patients in the study had dementia, and that amnestic dementia was the most common subtype. The prevalence reported is consistent with previous literature where a dementia incidence in PD patients is quoted to be 20–80% [1, 4].

Dementia Patterns: This confirms a very significant impact of memory impairments in PDD, as amnestic dementia is still the predominant form (60%) of pathology in PD patients. As with studies that report that executive functioning and memory are often the two areas of cognitive decline in PD [2, 6], this is consistent. PD also has a heterogeneous nature of cognitive impairments, as we found non-amnestic multidomain dementia (30%) and single domain executive dysfunction (10%).

Associations with Clinical Variables: A higher association for dementia was found with older age, greater duration of PD and more severe motor symptoms. Cases of dementia were also increased, specifically in those over 60 years with a 2.5-fold risk increase and in patients with PD duration >5 years with a 3-fold increased risk. A fourfold increase in dementia risk was associated with advanced motor symptoms (Stage III–IV). These results are consistent with previous work demonstrating that age and

disease progression are major determinants of PD-induced cognitive decline [1, 4].

Predictors of Dementia: Dementia was independently predicted by age > 60, positive PD duration > 5 years and severe motor symptoms using logistic regression. The direction of this change is consistent with existing models that suggest a role for neurodegeneration and disease burden in the development of cognitive decline [5, 6]. While hallucinations were a predictor, they didn't reach statistical significance ($p = 0.15$), and it is interesting that the presence of hallucinations is a predictor but didn't reach statistical significance, which indicates that while there is a correlation between hallucinations and dementia, other factors may play a greater role [3].

Patient Satisfaction: Less than half of dementia patients (39%) reported very good, and most (58%) reported moderate satisfaction with their cognitive health, with no levels above very good. First, it emphasizes that cognitive impairments have a large effect on patients' quality of life, and both the motor and nonmotor symptoms must be treated as part of an overall management strategy aiming to improve the patient's quality of life. [7]

Clinical Implications

Knowing how to differentiate between subtypes of dementia in PD is critical to tailored therapeutic interventions. An ability to identify typical patterns of cognitive decline can influence the course of rehabilitation of cognitive skills and pharmacological therapeutics directed to counter specific deficits [2, 6]. Early screening and intervention are also possible to slow the cognitive deterioration and improve patient outcomes because it also further allows to identify predictors of dementia [1, 4].

Limitations: The cross-sectional study design does not allow for determination of the relationship between clinical variables and dementia. Moreover, the 70 patients included in this study may not represent all forms of cognitive impairment in PD, and thus may not generalise to the whole population. These results are validated on future studies with larger, longitudinal cohorts to further investigate the temporal dynamics of dementia progression in PD patients [8, 9].

Conclusion

The findings of this study emphasize that given the prevalence of dementia in Parkinson's disease patients, amnesic dementia is the most common subtype. Using both observational and experimental studies in PD, the authors produced this conclusion: age, disease duration, and severity of motor symptoms are all important predictors of the development of dementia; therefore, early assessment of cognition and interventions aimed to preserve cognition are essential. To improve patient outcomes and quality of life, they need comprehensive management strategies to include motor and cognitive impairments. Further elucidation of causal claims and progression of dementia in PD will benefit from longitudinal research, which will help to develop effective therapy.

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