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STUDY OF COGNITIVE IMPAIRMENT DYNAMICS IN PARKINSON'S DISEASE IN THE KHOREZM REGION

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Abstract:

This study explores the prevalence and characteristics of cognitive impairment among Parkinson's disease patients in the Khorezm region of Uzbekistan. It highlights the major clinical and demographic factors influencing cognitive decline, including age, disease duration, and socio-economic status. The research underscores the urgent need for early screening and integrated multidisciplinary care strategies tailored to regional needs. By analyzing both motor and non-motor symptoms in a local context, the study provides valuable insights for healthcare practitioners and policymakers aiming to enhance the management and quality of life for Parkinson's patients in Central Asia.

Keywords: Parkinson's disease; Cognitive impairment; Dementia; Neurodegeneration; Khorezm region; Cognitive screening; Public health; Multidisciplinary care; Uzbekistan; Non-motor symptoms.

Introduction

Parkinson's disease (PD) is a chronic, progressive neurodegenerative disorder primarily affecting dopaminergic neurons in the substantia nigra region of the brain. Traditionally recognized for its motor symptoms such as bradykinesia, resting tremor, muscular rigidity, and postural instability, it has become increasingly evident that Parkinson's disease encompasses a wide array of non-motor manifestations as well. Among these, cognitive impairments have garnered considerable attention due to their profound impact on patients' autonomy, functional capacity, and overall quality of life.

Cognitive dysfunction in Parkinson's disease ranges from subtle deficits in executive functions and attention to more severe forms, including Parkinson's disease dementia (PDD), which may develop in later stages of the illness. These cognitive deficits often remain underdiagnosed or are detected only when they significantly impair daily activities, primarily because clinical assessments tend to prioritize motor symptoms. The recognition of cognitive decline as a core feature of Parkinson's disease marks a paradigm shift in the understanding of the disease's natural history and necessitates comprehensive patient management strategies that address both motor and cognitive domains.

While considerable research has been conducted on cognitive impairment in Parkinson's disease populations across Europe, North America, and East Asia, there remains a lack of region-specific data from Central Asia, particularly from Uzbekistan. The Khorezm region, located in the northwestern part of the country, is characterized by unique demographic, environmental, and socio-economic factors that may influence the manifestation and progression of neurodegenerative disorders. These factors include disparities in healthcare access, cultural perceptions of cognitive decline and aging, environmental exposure risks, and lifestyle patterns such as physical activity levels and diet, all of which could affect the epidemiology of cognitive impairment in Parkinson's disease.

Understanding the prevalence and nature of cognitive impairment in PD patients within the Khorezm region is crucial for several reasons. Firstly, early identification of cognitive decline can enable timely therapeutic interventions aimed at mitigating progression and maintaining independence. Secondly, detailed knowledge about cognitive profiles can guide healthcare providers in tailoring patient care plans and support services. Thirdly, regional data contribute to the broader scientific understanding of how environmental and socio-cultural factors interplay with neurodegenerative disease progression, which may inform public health strategies at both national and international levels.

Therefore, the present study aims to investigate the dynamics of cognitive impairment among Parkinson's disease patients in the Khorezm region. By systematically evaluating the cognitive status of patients and analyzing associated demographic and clinical variables, this research seeks to fill an important gap in the literature. Furthermore, findings from this study may lay the groundwork for future initiatives aimed at improving the quality of care for Parkinson's patients not only in Khorezm but potentially in other similar resource-limited settings as well.

Parkinson's disease (PD) is widely recognized as one of the most common neurodegenerative disorders, predominantly characterized by motor symptoms such as tremor, rigidity, bradykinesia, and postural instability. However, over recent decades, growing attention has been given to the non-motor symptoms of PD, particularly cognitive impairments, which significantly affect the patient's quality of life and disease prognosis. Cognitive dysfunction in Parkinson's disease manifests across a broad spectrum, from mild cognitive impairment (MCI) to full-blown Parkinson's disease dementia (PDD), and often remains underdiagnosed in clinical practice, especially in regions with limited healthcare resources such as the Khorezm region of Uzbekistan.

The Khorezm region, with its unique socio-demographic and environmental profile, presents a valuable context for studying the dynamics of cognitive impairment among Parkinson's patients. Prior to this investigation, there had been a lack of detailed epidemiological data on the prevalence, characteristics, and progression of cognitive dysfunction in this area. Thus, the present study was designed to explore these aspects, aiming to contribute to better clinical awareness and management practices.

This cross-sectional observational study involved 120 patients diagnosed with Parkinson's disease according to the UK Parkinson's Disease Society Brain Bank clinical diagnostic criteria. Patients were recruited from various neurological and outpatient clinics across Khorezm between January and December 2024. Participants underwent a comprehensive clinical and neuropsychological

evaluation. Cognitive functions were primarily assessed using the Montreal Cognitive Assessment (MoCA) and the Mini-Mental State Examination (MMSE), tools widely validated for detecting cognitive deficits in PD. Alongside cognitive testing, data on patient demographics (age, gender, education level), clinical history (disease duration, comorbidities), and motor symptom severity (using the Hoehn and Yahr staging system) were systematically collected.

The findings revealed a high prevalence of cognitive impairment among the studied cohort. Approximately 43% of the patients exhibited mild cognitive impairment, characterized by isolated or combined deficits in memory, executive function, and visuospatial skills, without significant impairment in daily functional abilities. Furthermore, 18% of patients were diagnosed with Parkinson's disease dementia, presenting with more profound impairments affecting multiple cognitive domains and impacting daily living activities. These results highlight the critical need for early cognitive screening in the management of PD, particularly since cognitive decline often progresses insidiously and may initially be overshadowed by motor symptoms.

Statistical analysis revealed significant associations between cognitive impairment and several clinical variables. Age was a prominent risk factor, with older patients demonstrating higher rates of cognitive deficits. Disease duration also correlated strongly with cognitive decline; patients with more than five years of disease history were substantially more likely to exhibit cognitive dysfunction than newly diagnosed patients. Moreover, the severity of motor symptoms, as assessed by the Hoehn and Yahr scale, was independently associated with worsening cognitive outcomes, suggesting that neurodegenerative processes contributing to motor and cognitive impairments may progress in parallel.

Interestingly, gender differences in cognitive impairment rates were observed but were not statistically significant. Male patients demonstrated slightly higher prevalence rates compared to female patients, a pattern consistent with some but not all international studies. Educational level emerged as a protective factor; patients with higher educational attainment performed better on cognitive assessments, supporting the cognitive reserve hypothesis that suggests education may confer resilience against neurodegenerative cognitive decline.

Environmental and socio-economic factors specific to the Khorezm region may also influence the observed patterns of cognitive impairment. Limited availability of specialized neurological services, delays in accessing healthcare, lower levels of public awareness about Parkinson's disease, and traditional cultural perceptions regarding aging and mental decline potentially contribute to underdiagnosis and late intervention. Additionally, lifestyle factors such as dietary habits, physical inactivity, and exposure to environmental toxins could play roles that warrant further investigation.

The pattern of cognitive decline observed in this cohort was consistent with the typical profile described in Parkinson's disease, with executive dysfunction and attention deficits appearing early, followed by memory impairments and visuospatial dysfunction as the disease advanced. Language abilities remained relatively preserved until later stages, while neuropsychiatric symptoms such as apathy, depression, and anxiety were commonly associated with cognitive decline, complicating the clinical picture.

From a clinical perspective, the findings of this study underline the importance of incorporating routine cognitive assessments into the standard care pathway for Parkinson's disease patients in the Khorezm region. Early identification of cognitive deficits allows for timely non-pharmacological and pharmacological interventions aimed at slowing progression and maintaining quality of life. Cognitive rehabilitation programs, patient education, caregiver support, and judicious use of cholinesterase inhibitors in appropriate cases are among the strategies that can be employed to address cognitive decline.

In conclusion, the findings of this study underscore the high prevalence and clinical significance of cognitive impairment among patients with Parkinson's disease in the Khorezm region. The results

clearly demonstrate that cognitive decline is not merely a late-stage complication of Parkinson's disease, but rather a core component that can manifest early and progress alongside motor symptoms. Age, disease duration, and severity of motor dysfunction were identified as major factors influencing cognitive deterioration, aligning with global trends reported in previous research. Furthermore, socio-economic and educational factors appeared to modulate the extent of cognitive deficits, suggesting that interventions aimed at increasing public awareness, improving healthcare access, and promoting cognitive reserve through education could have a beneficial impact on disease outcomes.

The specific challenges faced by patients in the Khorezm region — such as limited availability of specialized neurological services, late diagnosis, and cultural barriers to recognizing cognitive symptoms — highlight an urgent need for more comprehensive and accessible healthcare strategies. Implementing routine cognitive screening in clinical practice, training healthcare providers to recognize early signs of cognitive decline, and developing culturally sensitive education campaigns could significantly improve patient care and quality of life.

This study also emphasizes the importance of adopting a multidisciplinary approach to Parkinson's disease management, integrating neurologists, neuropsychologists, physical therapists, occupational therapists, and social workers to address the full spectrum of patient needs. Pharmacological treatments, including the careful use of cholinesterase inhibitors in appropriate cases, alongside non-pharmacological strategies such as cognitive training, social engagement, and physical activity, should be considered as part of a holistic intervention plan.

Moreover, the findings point to several avenues for future research. Longitudinal studies are needed to track the progression of cognitive impairment over time and to identify specific environmental, genetic, or lifestyle-related risk factors unique to the Khorezm population. Comparative studies between urban and rural settings within the region could also offer deeper insights into the role of environmental exposure and healthcare disparities in disease manifestation.

Ultimately, addressing cognitive dysfunction in Parkinson's disease is essential not only for prolonging survival but also for preserving dignity, autonomy, and overall life satisfaction for affected individuals. As the burden of Parkinson's disease is expected to rise globally due to aging populations, region-specific studies such as this one are invaluable for developing targeted public health policies and optimizing clinical practices tailored to local needs. By fostering greater awareness, promoting early diagnosis, and encouraging research investment, it is possible to mitigate the devastating impact of cognitive impairment on Parkinson's disease patients and their families in Khorezm and beyond.

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