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Hyposmia in Parkinson's Disease: Demographic and Cognitive Associations

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ABSTRACT

Background: As is known, hyposmia is one of the most common prodromal nonmotor features of Parkinson's disease (PD).
Objectives: This study investigates the relationship between hyposmia and cognitive status in patients with Parkinson's disease.
Methods: Data from 54 Parkinson's disease patients were analyzed, focusing on 20 individuals reporting impaired olfactory function. Patients with conditions such as nasal polyps, allergies, and colds, as well as those with hormonal imbalances, were excluded from the study. The sense of smell was assessed using everyday odor items from the Sniffin' Sticks Test (SST-12). Cognition was evaluated by the Mini-Mental State Examination (MMSE). Demographic parameters, including age, sex, ethnicity, and cognitive data, were investigated in all patients. Statistical comparisons and correlation analyses were conducted using SPSS-21 (IBM SPSS Statistics, Armonk, NY).
Results: Patients with hyposmia had a mean age of 64.8 (4.4 SD) years, significantly higher than the mean age of 58.2 (3.2 SD) years in patients without hyposmia ($p < 0.05$). MMSE scores were lower in the hyposmic group (mean: 21.1 (2.2 SD)) compared to non-hyposmic patients (mean: 26.6 (1.4 SD), $p < 0.05$). A significant negative correlation ($r = -0.47$) was found between age and MMSE scores in the hyposmic cohort. Males comprised 55.0% of the hyposmic group.
Conclusions: According to the above research in Parkinson's disease patients, hyposmia correlates with older age and lower MMSE scores, emphasizing its potential role as an indicator of expected cognitive dysfunction. Further investigations in this direction are required.
Keywords: Cognition; hyposmia; Parkinson's disease; smell.

BACKGROUND

Parkinson's disease (PD) is a progressive neurodegenerative disorder, representing nowadays a neurological condition with the fastest-growing rate and the primary cause of disability worldwide. Parkinson's disease doubled in number to almost 6 million patients between 1990 and 2015.[1] According to recent data, this population is expected to double again to nearly 12 million by 2040, primarily due to aging.[1] Other sources propose a similar growth trajectory, with estimates indicating that by 2030, the global prevalence of PD will increase substantially.[2] Parkinson's disease is primarily characterized by motor symptoms such as resting tremor, rigidity, akinesia, or bradykinesia, creating the hallmark of diagnostic symptoms. Additionally, other motor dysfunctions, such as discoordination, impaired handwriting, and speech deficits, can occur over time. However, non-motor or prodromal symptoms, including hyposmia, sleep disorders, gastrointestinal dysfunction, anxiety, and depressive episodes, may precede the motor symptoms of PD by up to 20 years.[3] Therefore, prodromal symptoms have gained attention as potential early indicators of disease progression. One of the most prominent and early-developed signs is considered to be hyposmia (reduced sense of smell), which has been shown to have significant diagnostic importance in PD,[4,5] based on the predetermined path of neuropathological distribution of Lewy bodies and neurites, which can be seen earliest in olfactory nerves and nuclei of the glossopharyngeal and vagal nerves, causing the majority of non-motor symptoms. On the other hand, cognitive impairment and/or dementia impact the quality of life and disease management as the later-stage complications of PD. This study explores the relationship between the early and late PD symptoms of hyposmia and cognitive status in patients with Parkinson's disease.

METHODS

A cohort of 54 Parkinson's disease (PD) patients, aged 50 to 70 years (30 males and 24 females), was examined for olfactory function at the First University Clinic of Tbilisi State Medical University during 2024.[1,2] Patients with known nasal polyps, allergies, upper respiratory infections, hormonal imbalances, or post-COVID-19 anosmia were excluded from the study.6 Olfactory function was assessed using the everyday odor Sniffin' Sticks Test 12-item version (SST-12), a simple and validated screening tool for smell dysfunction.[4-6] Cognitive status was evaluated using the Mini-Mental State Examination (MMSE).[7] Additionally, the age of onset of olfactory disturbances was recorded for each patient. Statistical analyses, including group comparisons and correlation studies, were conducted using SPSS version 21.3.

RESULTS

Among 54 patients with Parkinson's disease (PD), 20 reported loss or alteration of their sense of smell. Different hyposmia gradients were confirmed in 20 patients with Parkinson's disease (PD) (Tab.1).

TABLE 1. Smelling functional score in patients with Parkinson's disease

Classification	Sniffin Sticks Test (SST-12) Score Range	Number of Patients
Normosmia	≥11	34
Hyposmia	7–10	20
Anosmia	≤6	0

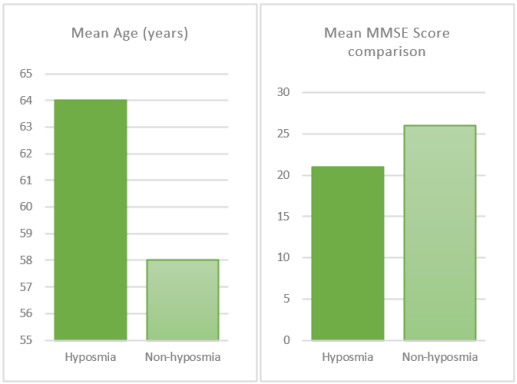
The mean age at which the smell disturbances were noticed amounted to (35.2±4.5). The study found that patients with hyposmia had a significantly higher mean age (64.8±4.4 years) than those without hyposmia (58.2±3.2 years; p<0.05) (Tab.2).

TABLE 2. Comparison of cognitive status in patients with and without smell disturbances

Parameter	Hyposmic patients (n=20)	Non-hyposmic patients (n=34)	P value
Mean Aage (years)	64.8±4.4	58.2±3.2	<0.05
Mini-Mental State Examination (MMSE) Score	21.1±2.2	26.6±1.4	<0.05
Male (%)	55.0	45.0	n.s.

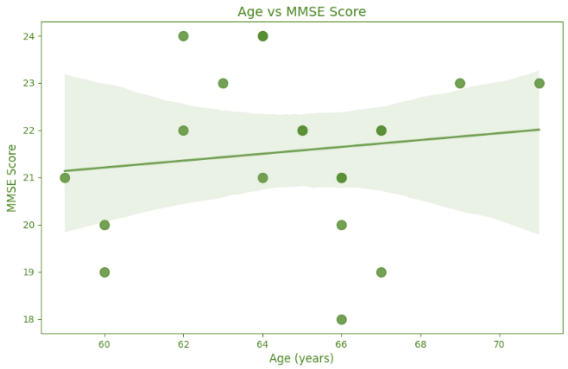
Furthermore, cognitive function, as assessed by MMSE scores, was notably lower in the hyposmic group (mean: 21.1±2.2) than in non-hyposmic patients (mean: 26.6±1.4; p<0.05) (Fig.1). The figure highlights the key finding that older age and lower MMSE scores are prominent among hyposmic patients.

FIGURE 1. A boxplot illustrating the mean age and the mean Mini-Mental State Examination (MMSE) scores of hyposmic and non-hyposmic PD patients



Additionally, males constituted 55.0% of the hyposmic group. A significant negative correlation (r=-0.47) (Fig.2) was found between age and MMSE scores in the hyposmic cohort, suggesting that older patients with hyposmia tend to have lower cognitive function.

FIGURE 2. Correlation between age and Mini-Mental State Examination (MMSE) scores in hyposmic patients

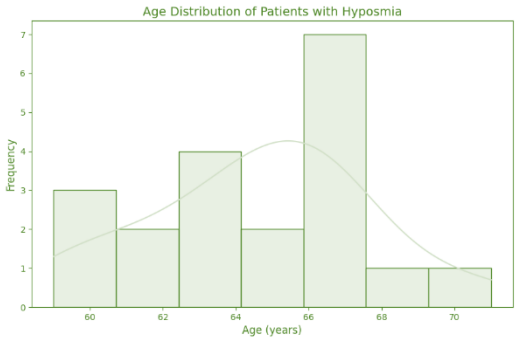


The scatter plot illustrates a significant negative correlation (r=-0.47) between age and MMSE scores among hyposmic PD patients. As age increases, cognitive performance (as measured by the MMSE) tends to decline.

DISCUSSION

The results of the presented study reveal a significant association between hyposmia (reduced sense of smell) and cognitive impairment in patients with Parkinson's disease (PD). In the present study, hyposmic patients tend to be older than their non-hyposmic counterparts (Fig.3).

FIGURE 3. Age distribution among hyposmic Parkinson's disease patients



The data indicate that hyposmia is more common in older patients, supporting the observed association between advancing age and olfactory dysfunction in PD.

Hyposmic patients also show lower MMSE scores, indicating more pronounced cognitive impairment. These

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findings suggest that hyposmia may serve as an early clinical indicator of PD patients at risk of cognitive decline.[7] The relatively low range of MMSE scores indicates consistent cognitive impairment across individuals with olfactory loss. It emphasizes the relevance of smell testing as a possible tool for early cognitive assessment in PD. Hyposmia has already been recognized as an early non-motor symptom of PD, but this study highlights its potential as a screening marker for later-stage cognitive decline. The hyposmic group in the study, which consisted predominantly of older individuals, showed a clear trend of advancing age, suggesting that olfactory dysfunction could be linked to disease progression and increasing neurodegeneration. This supports the idea that hyposmia may be an important clinical feature for early identification of cognitive deterioration, potentially allowing for earlier interventions and more targeted disease management strategies.

CONCLUSIONS

This study highlights the relationship between olfactory dysfunction and cognitive impairment in patients with Parkinson's disease, suggesting that olfactory testing could serve as an accessible, non-invasive tool to screen for cognitive impairment in PD. However, the findings should be interpreted in light of several limitations, including the small sample size and the lack of longitudinal data. Further large-scale studies are needed to confirm these findings and to explore underlying pathophysiological mechanisms, enabling more tailored and detailed management of Parkinson's disease.

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