Analysis of Clinical Features and Influencing Factors of Depression and Cognitive Dysfunction in Parkinson's Patients

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Abstract: *Objective:* To explore the clinical characteristics and analyze the influencing factors of depression and cognitive impairment in Parkinson's patients. *Methods:* 127 patients with Parkinson's disease who were treated in two hospitals from March 2021 to March 2023 were selected for this study. The assessment of depression was conducted using the Geriatric Depression Self-Rating Scale (GDS). In addition, cognitive function was evaluated through the Montreal Cognitive Assessment (MOCA), and the clinical attributes of patients with cognitive impairment were examined. The study also aimed to analyze the factors that influence cognitive impairment in this patient population. *Results:* The progression of the disease, presence of cognitive impairment, and the Hoehn-Yahr stage were identified as significant influencing factors for depression among the 127 patients with Parkinson's disease ($P < 0.05$). The factors that influence cognitive impairment included the level of education, Hoehn-Yahr stage, and depression ($P < 0.05$). *Conclusion:* Depression and cognitive dysfunction is relatively common in patients with Parkinson's disease. The occurrence of depression and cognitive dysfunction varies significantly based on factors such as the duration of the disease, varying drug dosages, and the severity of the condition. Therefore, it is necessary to treat patients with Parkinson's disease.

Keywords: Parkinson's disease; Depression; Cognitive impairment

1. Introduction

Parkinson's disease is a common degenerative disease of the nervous system among the elderly. The etiology of Parkinson's disease is still unclear, and it is mainly related to genetics, environmental factors and oxidative stress. Patients with Parkinson's disease are often accompanied by depression. Clinical manifestations of depression and cognitive impairment include negative emotions, loss of interest, anxiety, and sleep disorders, etc., which seriously affect the quality of life of patients. Despite the prevalence of depression and cognitive impairment in Parkinson's disease patients, there remains a lack of unified diagnostic criteria and comprehensive research on influencing factors. Research findings regarding depression and cognitive

impairment in Parkinson's disease patients have shown discrepancies, leading to variations in diagnostic criteria for these conditions in this patient group, which in turn results in a lack of targeted treatment. Risk factors for depression and cognitive impairment in patients with Parkinson's disease mainly include age, course of disease, drug dosage, severity and other factors, and many studies have explored the above factors. A study by Cai *et al.* [1] showed that the risk of depression and cognitive impairment in patients with Parkinson's disease is related to the course of the disease. Zeng *et al.* [2] discovered that factors such as age $\geq$ 60 years, disease duration $\geq$ 10 years, and the use of levodopa in combination with amphetamine or other antidepressants can contribute to an elevated risk of depression and cognitive impairment in individuals with Parkinson's disease. Hence, comprehending the clinical attributes and influencing factors of depression and cognitive dysfunction in Parkinson's disease patients holds significant importance for the prevention and treatment of these conditions in this patient population.

2. Materials and methods

2.1. General information

A total of 127 patients with Parkinson's disease who were treated in two hospitals from March 2021 to March 2023 were selected. Inclusion criteria: (i) fulfills the diagnostic criteria for Parkinson's disease through MRI, CT, and other diagnostic tests; (ii) capable of normal communication, is literate, and can effectively follow the study procedures; (iii) signed an informed consent. Exclusion criteria: (i) patients with cognitive impairment that is not caused by Parkinson's disease; (ii) patients with Parkinson-plus syndrome; (iii) received intervention or treatment before entering the study; (iii) the function of important body organs disorders or abnormal thyroid function. This study was approved by the Hospital Ethics Committee.

2.2. Methods

The nurses were responsible for all surveys, including data collection and scale assessment. Training was provided before the study was conducted, and only those who were qualified could participate in the study.

2.2.1. Depression assessment

The Geriatric Depression Self-Rating Scale (GDS) was utilized to evaluate the patient's depression status, encompassing a total of 30 items. The patient's mental state was assessed by examining their withdrawal, depression, strategies for managing irritability, and reflections on the past, present, and future. Positive responses marked as "Yes" and "No" were respectively assigned 1 and 0 points, while reversed items were scored 0 points for "Yes" and 1 point for "No." The cumulative score totaled 30 points, classifying no, mild, and moderate to severe depression at scores of 0–10 points, 11–20 points, and 21–30 points, respectively.

2.2.2. Cognitive function assessment

Montreal Cognitive Assessment (MOCA) was used to evaluate the patient's cognitive function, with a total of 8 items, and the highest score being 30 points. If the patient's education duration did not surpass 12 years, an additional point was included in the final score calculation. Moreover, when evaluating the MOCA score, if it remained within a higher range, the patient's cognitive impairment was indicated at 26 points. Conversely, scores below 26 points signified normal cognitive function (NC).

2.3. Observation indicators

(i) The age, gender, level of education, Parkinson's type, Hoehn-Yahr stage, onset-related symptoms and other

data of patients were collected. (ii) The incidence of depression and cognitive impairment in patients and their influencing factors of depression in patients were analyzed.

2.4. Statistical methods

The data collected were processed using SPSS 20.0. The measurement data were expressed as mean ± standard deviation, and the t-test was used for comparison between groups; the count data was expressed as the number of cases (%), and the x^2 test was used for comparison between groups. The influencing factors were analyzed by multivariate logistic regression analysis. $P < 0.05$ means the difference is statistically significant.

3. Results

3.1. Analysis of influencing factors of depression in Parkinson's patients

Multivariate logistic regression analysis found that course of disease, cognitive impairment, and Hoehn-Yahr stage were the influencing factors of depression in Parkinson's patients ($P < 0.05$), as shown **Table 1**.

Factor	β	SE	Wald x^2	OR	95% CI	P
Gender	0.315	0.186	2.650	1.484	0.933–2.132	0.096
Course of disease	0.536	0.272	4.034	1.698	1.023–2.838	0.044
Education level	0.469	0.321	2.362	1.624	0.868–2.960	0.126
Cognitive impairment	0.628	0.312	4.178	1.955	1.036–3.343	0.046
Hoehn-Yahr staging	0.598	0.287	4.354	1.831	1.046–3.167	0.048

3.2. Analysis of influencing factors of cognitive impairment in Parkinson's patients

Multivariate logistic regression analysis found that education level, depression and Hoehn- Yahr stage were the influencing factors of cognitive impairment in Parkinson's patients ($P < 0.05$). See **Table 2**.

Table 2. Analysis of influencing factors of cognitive impairment in Parkinson's patients

Factor	β	SE	Wald x^2	OR	95% CI	P
Gender	0.611	0.366	2.738	1.871	0.831–3.878	0.099
Course of disease	0.467	0.274	2.579	1.569	0.915–2.766	0.108
Age	0.378	0.217	3.523	1.484	0.972–2.232	0.062
Education level	0.517	0.265	3.963	1.650	1.017–2.747	0.047
Depression	0.361	0.171	5.301	1.459	1.047–1.977	0.022
Hoehn-Yahr staging	0.428	0.197	4.612	1.529	1.028–2.232	0.032
Parkinsonian gait	0.492	0.256	3.060	1.629	0.953–2.791	0.081
Freezing of gait	0.276	0.196	2.183	1.311	0.920–1.957	0.141
Hyposmia	0.338	0.227	2.275	1.378	0.917–2.127	0.131
Drooling	0.316	0.178	3.328	1.368	0.987–1.878	0.069

4. Discussion

Depression and cognitive impairment in patients with Parkinson's disease are mainly manifested as negative emotions (> 3 points), loss of interest (> 2 points), sleep disturbance (≥ 3 times/week, total sleep time < 6h),

among which depression is the most common symptom, accounting for 74.6%–92.5 %, followed by loss of interest, accounting for 54.4%–76.0 %. As the disease progresses, the severity of depression and cognitive impairment gradually increases. Retrospective analysis by Shen *et al.* [3] showed that the incidence of depression and cognitive impairment in patients with Parkinson's disease was 68.5%, and negative emotions was the most common symptom.

A prospective study of patients with Parkinson's disease aged ≥ 60 years found that patients with Parkinson's disease over the age of 65 were more likely to develop depression, while patients under the age of 65 were less prone to depression [4]. A study of patients with Parkinson's disease with a course of disease ≥ 10 years found that the risk of depressive symptoms in patients with a course of ≥ 10 years was significantly higher than that in patients with a course of < 10 years, which may be related to the degree of brain aging [5].

The diagnostic criteria for depression and cognitive dysfunction have not been unified, but they are all based on the Diagnostic and Statistical Manual of Mental Disorders-V (DSM-V). The current diagnostic criteria for depression and cognitive impairment in patients mainly includes the following: (i) depression accompanied by reduced recall of past positive experiences, (ii) loss of interest, (iii) energy decline, (iv) cognitive difficulties, (v) psychomotor retardation or agitation, decreased self-evaluation along with suicidal ideation and behavior, (vi) sleep disturbances like insomnia, restlessness, early awakenings, and (vii) appetite or weight [6-10]. Given the absence of a standardized diagnostic criterion for depression and cognitive dysfunction in Parkinson's disease patients, the clinical identification of these conditions predominantly relies on clinical presentations and laboratory assessments. Further investigation is required to differentiate and understand the relationships between these aspects [11-14].

Depression is a common mood disorder marked by persistent low mood, slowed thinking, reduced motivation, and loss of interest and energy, often accompanied by cognitive impairment. The clinical manifestations of depression can be divided into 3 subtypes: major depressive disorder (MDD), major depressive disorder (MDS) and subsyndromal symptomatic depression (SSD). The current standards available for the diagnosis of depression in Parkinson's disease mainly include the American Academy of Psychiatry (ACP) and the Chinese Classification and Diagnostic Criteria of Mental Disorders (CCMD-3). However, there are differences in the understanding and application of these three standards, resulting in the lack of a unified standard for the diagnosis of depression in patients with Parkinson's disease. At present, the most commonly used diagnostic methods include clinical symptomology, serological indicators, and mental examination [15]. However, there is an ongoing debate about whether depression affects the improvement of motor symptoms and complications in patients with Parkinson's disease.

In this study, we conducted a univariate analysis of the risk factors for depression and cognitive impairment in patients with Parkinson's disease, and the results showed that the incidence of depression was significantly higher in patients who were older than 60 years and received levodopa or levodopa plus amphetamine. The occurrence of cognitive impairment was notably greater in patients with a disease duration of ≥ 10 years who were using levodopa and/or amphetamine compared to those with a disease duration of ≤ 10 years ($P < 0.05$). The incidence of cognitive dysfunction in patients treated with levodopa plus carbidopa and amphetamine significantly exceeded that in patients treated with levodopa and carbidopa, with a statistically significant difference ($P < 0.05$). Likewise, the incidence of depression in patients using levodopa plus carbidopa and amphetamine was significantly higher than in those using only levodopa and carbidopa, with a statistically significant difference ($P < 0.05$).

Depression and cognitive impairment are prevalent in patients with Parkinson's disease, and the longer the course of the disease, the higher the incidence. Clinical features of depression and cognitive impairment

in Parkinson's disease encompass early-onset age, an early disease onset, severe symptoms, low treatment adherence, limited treatment efficacy, and a generally unfavorable prognosis [6]. Although there has been no unified diagnostic standard, there is a certain consensus in terms of the influencing factors. Therefore, there is a need to look out for depression and cognitive impairment among Parkinson's disease patients to allow early intervention and a personalized treatment. Early detection and timely intervention can significantly improve the quality of life of patients with Parkinson's disease, delay the progression of the disease, and reduce the risk of long-term complications. In recent years, as Parkinson's disease diagnosis and treatment have progressed and researchers have delved deeper into its etiology and pathogenesis, strategies for preventing and treating depression and cognitive dysfunction in Parkinson's disease patients are expected to further advance.

5. Conclusion

Depression and cognitive impairment are highly prevalent in patients with Parkinson's disease, and the incidence of depression and cognitive dysfunction varies greatly among patients with different course of disease, drug doses, and severity. Therefore, it is necessary to study the clinical characteristics of depression and cognitive impairment in patients with Parkinson's disease.

Disclosure statement

The authors declare no conflict of interest.

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