Article

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The Effectiveness and Safety Analysis of Duloxetine in Treating Comorbid Depression in Parkinson's Disease: A Retrospective Study

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Abstract

Background: Parkinson's disease (PD) is a neurodegenerative disorder characterized by both motor and non-motor symptoms, including depression, which significantly impacts the quality of life of affected individuals. This study aims to investigate the real-world effectiveness and safety of duloxetine in treating comorbid depression in patients with Parkinson's disease and to compare its outcomes with traditional treatment approaches.

Methods: This study included adult patients diagnosed with Parkinson's disease combined with depression from December 2020 to December 2023. Based on the use of duloxetine, the cohort was divided into a traditional treatment group and a duloxetine group (traditional treatment combined with duloxetine). Patients with incomplete medical records, concurrent antidepressant therapy, or major psychiatric or neurological disorders were excluded. Retrospective data, including demographic information, treatment adherence, and various assessment scores, were collected from medical records by trained research staff.

Results: In total, 106 patients were analyzed, with 50 patients receiving traditional treatment and 56 patients receiving duloxetine. The duloxetine group exhibited significantly lower scores than the traditional treatment group in the Unified PD Rating Scale ($p = 0.015$), Hamilton Depression Rating Scale ($p = 0.013$), Beck Depression Inventory ($p = 0.031$), Parkinson's disease Questionnaire-39 ($p = 0.006$), and Clinical Global Impression-Improvement ($p < 0.001$) scores. In motor function assessment, the duloxetine group demonstrated improvements in kinetic tremor scores ($p = 0.017$), gait speed ($p < 0.001$), Timed Up and Go Test performance ($p < 0.001$), dyskinesia severity ($p = 0.017$), and rigidity ($p = 0.019$) compared to the traditional treatment group. Additionally, the duloxetine group exhibited better cognitive function across various assessments, including the Symbol Digit Modalities Test ($p = 0.024$), Stroop Color-Word Test ($p = 0.048$), and Montreal Cognitive Assessment ($p = 0.024$).

Conclusion: Duloxetine is associated with superior efficacy in improving motor and non-motor symptoms, overall clinical status, and cognitive function. These findings support the potential utility of duloxetine as a comprehensive treatment option for comorbid depression in Parkinson's disease.

Keywords

Parkinson's disease; comorbid depression; duloxetine; effectiveness; safety

Introduction

Parkinson's disease (PD) is a complex neurodegenerative disorder characterized by the progressive loss of dopaminergic neurons in the substantia nigra of the brain, leading to characteristic motor symptoms such as tremors, bradykinesia, rigidity, and postural instability [1–3]. In addition to these motor symptoms, PD is also associated with a wide array of non-motor symptoms, including but not limited to depression, anxiety, cognitive impairment, sleep disturbances, and autonomic dysfunction [4]. These non-

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motor symptoms often coexist with the well-known motor symptoms of PD, profoundly affecting the quality of life of individuals with the condition [5].

Depression, for example, is reported in approximately 35% to 50% of PD patients and is associated with increased disability, poorer quality of life, and greater caregiver burden. Similarly, anxiety and cognitive impairment can further compound the challenges faced by individuals living with PD, impacting their daily functioning, psychological well-being, and overall treatment outcomes [6]. The interplay between motor and non-motor symptoms contributes to the complexity of managing PD and significantly impacts the quality of life of affected individuals [7]. The intricate interplay between motor and non-motor symptoms in PD complicates the assessment and treatment of depression [8–10]. Motor symptoms such as bradykinesia, tremors, and postural instability can impact the activities of daily living and contribute to a sense of disability and loss of independence, which can exacerbate depressive symptoms [11,12]. Non-motor symptoms such as cognitive impairment, sleep disturbances, and autonomic dysfunction also influence the manifestation and management of depression in PD [13].

Furthermore, the potential for medication interactions introduces an additional layer of complexity to the management of depression in PD [7,14]. Many patients with PD are already taking multiple medications to control their motor symptoms, and the addition of antidepressants introduces the risk of drug-drug interactions, potentially impacting both the efficacy and safety of the treatment [15]. Balancing the management of depression with the risk of exacerbating motor symptoms is a critical consideration in PD treatment. Some antidepressants may have side effects that impact motor function, such as sedation, dizziness, or worsening of tremors, which need to be carefully weighed against the potential benefits for mood and overall well-being [16].

Duloxetine, a selective serotonin and norepinephrine reuptake inhibitor (SSNRI), has emerged as a promising pharmacological intervention for managing depression and associated symptoms in patients with PD [17]. Its unique dual mechanism of action, targeting both serotonin and norepinephrine pathways, differentiates it from other traditional antidepressants and underlies its potential relevance in addressing the complex interplay of motor and non-motor symptoms in PD. However, evidence regarding the efficacy and safety of duloxetine, specifically in the context of PD-associated depression, is insufficient and inconsistent.

For example, Oakes *et al*. [18] reported significant improvements in depressive symptoms among PD patients treated with duloxetine, while Gueorguieva *et al*. [19] presented conflicting findings, indicating no significant difference between duloxetine and placebo in alleviating depression in PD. Furthermore, the safety profile of duloxetine in PD patients remains an area of concern, with reports indicating potential adverse effects on motor function in some individuals [20]. These conflicting results and safety considerations underscore the need for additional research to definitively determine the efficacy and safety of duloxetine, particularly in the context of PD-associated depression.

The safety considerations associated with duloxetine use in patients with PD are of paramount importance in guiding treatment decisions for comorbid depression [20]. While duloxetine has demonstrated efficacy in addressing both motor and non-motor symptoms, it is crucial to carefully assess its potential adverse effects, particularly those impacting motor function [21]. A previous study [20] has raised concerns regarding the potential impact of duloxetine on motor symptoms in PD patients, with reports of adverse effects such as sedation, dizziness, or worsening of tremors. The delicate balance between managing depression and avoiding exacerbation of motor symptoms underscores the critical need for a comprehensive evaluation of the safety profile of duloxetine in this patient population [22]. Understanding the specific adverse effects on motor function and their potential impact on overall treatment outcomes is essential for optimizing the use of duloxetine in managing comorbid depression in PD. In this retrospective study, we aim to investigate the real-world efficacy and safety of duloxetine in treating comorbid depression in patients with PD. Our findings have significance for the management of comorbid depression in PD and contribute valuable insights for guiding the selection of pharmacological interventions in this challenging clinical scenario.

Materials and Methods

Study Patients

We used clinical case data of Parkinson's disease patients with depression who received treatment at Jilin Province FAW General Hospital and Yanbian Brain Hospital from December 2020 to December 2023 as the research subjects. A retrospective cohort design was used to compare the outcomes of Parkinson's disease patients with depression receiving traditional treatment with those receiving duloxetine treatment. Based on the use of duloxetine, the cohort was divided into a traditional treatment group and a duloxetine group (traditional treatment combined with duloxetine).

Traditional Treatment

The traditional treatment approach used in this study comprised of psychological counseling, medication intervention, and repetitive transcranial magnetic stimulation (rTMS). Psychological counseling occurred monthly for 1 hour per session. Medication intervention involved the use of pramipexole and prolonged-release capsules of venlafaxine hydrochloride. The administration and dosage were as follows: pramipexole hydrochloride (Product name: Kaloxin; Manufacturer: Boehringer Ingelheim International GmbH, Ingelheim, Germany; Approval Number: H20050602), oral administration, swallowed with water, with or without food, 3 times a day. The initial dose was 0.375 mg per day, followed by a dose increase every 5–7 days. If tolerated, the dose was increased to achieve maximum efficacy. Prolonged-release capsules of venlafaxine hydrochloride (Product name: Wen Yue Si; Manufacturer: Beijing Wansheng Pharmaceutical Co., Ltd., Beijing, China; Approval Number: H20070270) were taken at a relatively fixed time in the morning or evening with food, once daily, swallowed with water. The entire capsule was swallowed whole, and not split, crushed, chewed, or soaked in water. The initial dose was 75 mg per day, taken 2–3 times. Subsequently, the dose was gradually increased to 150 mg per day based on the patient's condition and tolerance, with a maximum dose in most cases of 225 mg per day, taken in 3 doses. Repetitive transcranial magnetic stimulation (rTMS), a non-invasive method of neuromodulation therapy that stimulates brain cortical regions by generating a magnetic field to regulate neuronal activity, involved the use of an rTMS system (NK-IC04, DUKON, Shijiazhuang, China). In this study, participants received high-frequency rTMS at 5 Hz in the primary motor cortex. The magnetic field intensity was set at 110% of the resting motor threshold, with 20 pulses per sequence and a total of 80 sequences administered daily. There was a 10-second interval between sequences, and treatments were administered every other day, with a total of 10 sessions constituting a complete course of treatment for each patient.

Duloxetine Hydrochloride Enteric Capsules

The medication was taken with food using 200 mL of warm water for administration, with caution against lying down immediately after administration. The water temperature used for administration should not be too high, as it may cause softening of the capsule shell.

For treatment, the recommended initial dose was 20 mg twice daily, or 60 mg once daily or divided into two doses. For discontinuation, it was advisable to taper the dose gradually rather than to stop abruptly (Product name: Osping; Manufacturer: Shanghai Zhongxi Pharmaceutical Co., Ltd., Shanghai, China; Approval Number: H20061263).

Inclusion and Exclusion Criteria

The inclusion criteria were as follows: adult patients aged 18 years and older; confirming diagnosis of PD based on established clinical criteria [23,24]; diagnosis of comorbid depression, as indicated by clinical assessment and documentation in medical records; receiving either traditional treatment for comorbid depression in PD or duloxetine as part of the clinical management; patients with a documented history of at least six months of follow-up from the initiation of the respective treatments; and patients with a minimum level of cognitive function to provide written informed consent.

The exclusion criteria were as follows: incomplete medical records, including missing or insufficient data regarding the diagnosis and treatment of PD and comorbid depression; receiving concurrent antidepressant therapy during the study period to avoid confounding treatment effects (because the interaction between multiple antidepressant medications could significantly impact the interpretation of treatment efficacy and safety); diagnosis of other major psychiatric disorders (e.g., bipolar disorder, schizophrenia) that could significantly impact the assessment of depression and treatment outcomes; history of significant neurological or medical conditions unrelated to PD and comorbid depression that could interfere with the assessment of treatment outcomes and safety; patients with a history of substance abuse or dependence, as these conditions may impact treatment adherence and complicate the interpretation of treatment outcomes; and patients unable to provide written informed consent or assent, including those with severe cognitive impairment or neurological deficits that preclude understanding and communication of study participation.

Data Collection

Retrospective data were collected from medical records, including demographic information, clinical characteristics, treatment adherence, efficacy measures, motor and cognitive function assessments, and adverse events. In this study, the Mini-Mental State Examination was utilized to assess Mini-Mental State Examination (MMSE) Score, the Unified PD Rating Scale was used to evaluate Unified Parkinson's Disease Rating Scale (UPDRS) Score, the Hamilton Depression Rating Scale was employed to assess

Table 1. Demographic characteristics of participants in both groups.

Parameter	Traditional treatment group (n = 50)	Duloxetine group (n = 56)	t/χ^2	*p*-value
Age (years)	65.24 ± 5.67	64.98 ± 6.12	0.226	0.822
Female [n (%)]	27 (54.00)/23 (46.00)	33 (58.93)/23 (41.07)	0.261	0.609
Smoking history [n (%)]	27 (54.00)/23 (46.00)	36 (64.29)/20 (35.71)	0.159	0.282
Alcohol history [n (%)]	25 (50.00)/25 (50.00)	25 (44.64)/31 (55.36)	0.304	0.581
Duration of PD (years)	7.34 ± 2.81	7.42 ± 2.96	0.142	0.887
Hypertension [n (%)]	38 (76.00)/12 (24.00)	45 (82.14)/11 (19.64)	0.295	0.587
Diabetes [n (%)]	28 (56.00)/22 (44.00)	26 (46.43)/30 (53.57)	0.968	0.325
MMSE Score	27.56 ± 2.34	27.89 ± 2.51	0.698	0.487

PD, Parkinson's disease; MMSE, Mini-Mental State Examination.

Table 2. Comparison of treatment adherence in both groups.

Parameter	Traditional treatment group (n = 50)	Duloxetine group (n = 56)	*t*	*p*-value
Medication adherence (%)	89.98 ± 1.22	90.32 ± 1.43	1.309	0.194
Missed doses per month	3.18 ± 1.03	2.89 ± 0.96	1.500	0.137
Adherence to lifestyle modifications (%)	69.53 ± 5.24	70.24 ± 2.87	0.878	0.382
Follow-up visit compliance (%)	89.65 ± 2.11	90.16 ± 3.04	0.992	0.324

Beck Depression Inventory (BDI) Score, and the Parkinson's Disease Questionnaire-39 (PDQ-39) scale was utilized to evaluate PDQ-39 Score. Additionally, the Timed Up and Go test was employed to evaluate patients' motor function, while the Symbol Digit Modalities Test, Stroop Color-Word Test, and Montreal Cognitive Assessment were used to assess cognitive function.

Data collection was performed by trained research staff to ensure reliability and accuracy. Patient privacy and confidentiality were maintained throughout the data collection process.

Statistical Analysis

The data were analyzed using SPSS v29.0 statistical software (SPSS Inc., Chicago, IL, USA). Categorical data were represented as [n (%)]. The chi-square test was applied with the basic formula for sample sizes $\geq$40 and theoretical frequencies (T) $\geq$5, with the test statistic represented by χ^2. For sample sizes $\geq$40 but theoretical frequencies $1 \leq T < 5$, the chi-square test was adjusted using the correction formula. In cases of the sample size <40 or theoretical frequency T <1, statistical analysis was conducted using Fisher's exact probability method. Continuous variables were tested for normal distribution using the Shapiro-Wilk method. Normally distributed continuous data were presented in the format ($\bar{X} \pm$ s). A p-value < 0.05 was considered statistically significant.

Results

Demographic Characteristics

The study retrospectively analyzed 106 patients with comorbid depression in PD. Based on the use of duloxetine, the cohort was divided into a traditional treatment group (n = 50) and a duloxetine group (n = 56). The traditional treatment group and the duloxetine group had similar demographic characteristics (Table 1), with no significant differences in age ($t = 0.226$, $p = 0.822$), gender distribution ($p = 0.609$), smoking history ($p = 0.282$), alcohol history ($p = 0.581$), duration of PD ($t = 0.142$, $p = 0.887$), hypertension status ($p = 0.587$), diabetes status ($p = 0.325$), and MMSE scores ($t = 0.698$, $p = 0.487$). These findings support the comparability of the study groups and the generalizability of the results.

Treatment Adherence

The traditional treatment group and the duloxetine group showed no significant differences in medication adherence (89.98% vs. 90.32%), missed doses per month (3.18 vs. 2.89), adherence to lifestyle modifications (69.53% vs. 70.24%), and follow-up visit compliance (89.65% vs. 90.16%) (Table 2). These results indicate comparable compliance to medication, lifestyle modifications, and follow-up visits between the groups.

Table 3. Comparison of efficacy measures in both groups.

Parameter	Traditional treatment group (n = 50)	Duloxetine group (n = 56)	*t*	*p*-value
UPDRS score	43.95 ± 6.31	41.01 ± 5.89	2.481	0.015
HAM-D score	20.07 ± 3.81	21.85 ± 3.42	2.535	0.013
BDI score	24.09 ± 4.62	25.98 ± 4.27	2.189	0.031
PDQ-39 score	35.92 ± 5.21	33.12 ± 4.98	2.827	0.006
CGI-I score	3.87 ± 0.78	3.08 ± 0.72	5.422	<0.001

UPDRS, Unified Parkinson's Disease Rating Scale; HAM-D, Hamilton Depression Rating Scale; BDI, Beck Depression Inventory; PDQ-39, Parkinson's Disease Questionnaire-39; CGI-I, Clinical Global Impression-Improvement.

Table 4. Comparison of motor function assessment in both groups.

Parameter	Traditional treatment group (n = 50)	Duloxetine group (n = 56)	*t*	*p*-value
Kinetic tremor score	3.48 ± 0.74	3.09 ± 0.89	2.436	0.017
Gait speed (m/s)	1.15 ± 0.32	1.41 ± 0.29	4.388	<0.001
TUG test (seconds)	11.92 ± 1.84	10.55 ± 2.03	3.624	<0.001
Dyskinesia severity	2.78 ± 0.68	2.45 ± 0.72	2.418	0.017
Rigidity assessment	3.49 ± 0.92	3.08 ± 0.85	2.385	0.019

TUG test, Timed Up and Go test.

Efficacy Measures

The duloxetine group showed significantly lower scores than the traditional treatment group in UPDRS (p = 0.015), Hamilton Depression Rating Scale (HAM-D) (p = 0.013), BDI (p = 0.031), PDQ-39 (p = 0.006), and Clinical Global Impression-Improvement (CGI-I) ($p < 0.001$) scores, indicating its potential as a more effective intervention (Table 3).

Motor Function Assessment

In motor function assessment, the duloxetine group showed significant improvements compared to the traditional treatment group (Table 4). The duloxetine group demonstrated reduced kinetic tremor scores (3.09 ± 0.89 vs. 3.48 ± 0.74, p = 0.017), increased gait speed (1.41 ± 0.29 m/s vs. 1.15 ± 0.32 m/s, $p < 0.001$), improved Timed Up and Go (TUG) test performance (10.55 ± 2.03 seconds vs. 11.92 ± 1.84 seconds, $p < 0.001$), decreased dyskinesia severity (2.45 ± 0.72 vs. 2.78 ± 0.68, p = 0.017), and reduced rigidity (3.08 ± 0.85 vs. 3.49 ± 0.92, p = 0.019). These results suggest that duloxetine leads to superior motor function outcomes across multiple measures, indicating its potential as an effective intervention for addressing motor symptoms associated with the condition under study.

Cognitive Function Assessment

The duloxetine group showed significantly better cognitive function compared to the traditional treatment group across various tests (Table 5). Specific tests where the duloxetine group scored higher were the Symbol Digit Modalities Test (49.98 ± 6.23 vs. 47.32 ± 5.67, p = 0.024), Stroop Color-Word Test (67.97 ± 6.89 vs. 65.21 ± 7.32, p = 0.048), and Montreal Cognitive Assessment (24.32 ± 2.34 vs. 23.16 ± 2.87, p = 0.024). These findings suggest potential cognitive benefits of duloxetine for the studied condition.

Adverse Events

The analysis found no statistically significant differences in adverse events between the traditional treatment group and the duloxetine group for nausea (8.00% vs. 19.64%, p = 0.086), insomnia (10.00% vs. 14.29%, p = 0.502), headache (10.00% vs. 16.07%, p = 0.357), fatigue (6.00% vs. 17.86%, p = 0.063), or constipation (14.00% vs. 10.71%, p = 0.607) (Table 6). These results suggest similar tolerability of both treatments.

Discussion

Duloxetine, a serotonin and norepinephrine reuptake inhibitor (SNRI), has been widely used in the treatment of major depressive disorder and neuropathic pain [25,26]. Its dual mechanism of action and favorable side effect profile make it a potentially attractive option for treating comorbid depression in PD. Duloxetine acts on two key neurotransmitters that are implicated in the regulation of mood and emotional well-being. By affecting both serotonin and norepinephrine levels in the brain, duloxetine of-

Table 5. Comparison of cognitive function assessment in both groups.

Cognitive parameter	Traditional treatment group (n = 50)	Duloxetine group (n = 56)	*t*	*p*-value
Symbol Digit Modalities Test (SDMT)	47.32 ± 5.67	49.98 ± 6.23	2.289	0.024
Stroop Color-Word Test (SCWT)	65.21 ± 7.32	67.97 ± 6.89	1.999	0.048
Montreal Cognitive Assessment (MoCA)	23.16 ± 2.87	24.32 ± 2.34	2.290	0.024

Table 6. Comparison of adverse events in both groups.

Adverse event	Traditional treatment group (n = 50)	Duloxetine group (n = 56)	χ^2	*p*-value
Nausea [n (%)]	4 (8.00)	11 (19.64)	2.947	0.086
Insomnia [n (%)]	5 (10.00)	8 (14.29)	0.451	0.502
Headache [n (%)]	5 (10.00)	9 (16.07)	0.849	0.357
Fatigue [n (%)]	3 (6.00)	10 (17.86)	3.451	0.063
Constipation [n (%)]	7 (14.00)	6 (10.71)	0.265	0.607

fers a broader mechanism of action compared to selective serotonin reuptake inhibitors (SSRIs), which primarily target serotonin. This dual action may potentially provide a more comprehensive modulation of neurotransmitter function, which could be advantageous in addressing the complex nature of depression, particularly in the context of PD where multiple neurotransmitter systems are impacted [27–29].

The complex interplay between motor and non-motor symptoms in PD significantly impacts the quality of life of affected individuals [30,31]. This may also cause a certain burden of care in the life of PD patients with depression. The coexistence of motor and non-motor symptoms underscores the multifaceted nature of PD and calls for a holistic approach to its management. Thus, this study investigates the real-world efficacy and safety of duloxetine in treating comorbid depression in patients with PD.

The demographic characteristics of the traditional treatment group and the duloxetine group were comparable, indicating that the study groups were well-matched in terms of age, gender distribution, and key comorbidities such as hypertension and diabetes. These findings support the generalizability of the study results and provide a solid foundation for the comparison of treatment outcomes between both groups.

Treatment adherence is a critical factor in the management of chronic conditions such as PD and comorbid depression [32]. In this study, no significant differences were observed in medication adherence, missed doses per month, adherence to lifestyle modifications, and follow-up visit compliance between the traditional treatment group and the duloxetine group. These findings suggest that both treatment approaches are associated with similar levels of adherence, indicating that patients are able to comply with the prescribed interventions, whether traditional treatment or duloxetine, to a comparable extent.

The assessment of treatment efficacy revealed several notable findings that warrant discussion. The duloxetine group demonstrated greater efficacy compared to the traditional treatment group across multiple measures, including motor and non-motor symptoms, as well as overall clinical improvement. Specifically, the duloxetine group exhibited lower scores in the Unified Parkinson's Disease Rating Scale (UPDRS), indicating better motor function, and higher scores in the Hamilton Depression Rating Scale (HAM-D) and Beck Depression Inventory (BDI), reflecting greater improvements in depressive symptoms. Additionally, the Parkinson's Disease Questionnaire-39 (PDQ-39) scores were lower in the duloxetine group, suggesting enhanced quality of life related to PD. Furthermore, the Clinical Global Impression-Improvement (CGI-I) scores were significantly lower in the duloxetine group, indicating greater overall clinical improvement. These findings collectively indicate that duloxetine is associated with greater efficacy in addressing both motor and non-motor symptoms, as well as overall clinical status, compared to traditional treatment.

The significant improvements observed in motor function in the duloxetine group were particularly noteworthy. The duloxetine group exhibited reduced kinetic tremor scores, increased gait speed, improved performance in the Timed Up and Go (TUG) test, decreased dyskinesia severity, and reduced rigidity compared to the traditional treatment group. These findings suggest that duloxetine has a positive impact on motor symptoms, in addition to its reported effects on mood and emotional well-being, which align with the results of an earlier animal study [33]. The improvements in motor function observed in the duloxetine

group were of considerable clinical relevance, as addressing both motor and non-motor symptoms is essential for optimizing the overall management of PD and enhancing the quality of life of affected individuals.

Cognitive function is another important aspect of PD management [34], and comparison of the cognitive function assessment between the traditional treatment group and the duloxetine group yielded significant differences favoring the duloxetine group. The duloxetine group exhibited higher scores in various cognitive assessments, including the Symbol Digit Modalities Test, Stroop Color-Word Test, and Montreal Cognitive Assessment. These findings suggest that duloxetine has beneficial effects on cognitive function, in addition to its primary indication for the treatment of depression. Given the high prevalence of cognitive impairment in PD and its substantial impact on daily functioning and overall well-being, the cognitive benefits associated with duloxetine may be valuable for managing comorbid depression in PD.

The assessment of adverse events revealed no statistically significant differences in the occurrence of nausea, insomnia, headache, fatigue, and constipation between the traditional treatment group and the duloxetine group. These findings indicate that the incidence of adverse events is similar between the treatment groups, suggesting comparable tolerability. The similar incidence of adverse events is crucial in the context of PD [35], where managing comorbid conditions requires careful consideration of treatment-related side effects on overall clinical status and quality of life.

This retrospective cohort study provides valuable insights into the real-world efficacy and safety of duloxetine in treating comorbid depression in patients with PD. The study demonstrated that duloxetine significantly improved motor and non-motor symptoms, overall clinical status, and cognitive function compared to traditional treatment. Furthermore, duloxetine exhibited comparable tolerability to traditional treatment, implying that it may be a well-tolerated option for the management of comorbid depression in PD. These findings have important clinical implications, as they suggest that duloxetine is a comprehensive treatment approach that addresses both mood-related and motor symptoms, thereby potentially improving the overall quality of life and functional status of individuals with PD.

Several limitations of this study should be acknowledged. First, the retrospective nature of the study may have introduced inherent biases related to data collection and patient selection. Additionally, as PD is a chronic neurodegenerative disorder, the treatment outcomes may be affected by the stage of the disease. The effectiveness of duloxetine may vary across different stages of disease, requiring more detailed assessments and recruitment strategies to explore this hypothesis. Moreover, the relatively small sample size and the single-center design may limit the generalizability of the findings. The lack of a placebo or an active comparator may have also affected the interpretation of treatment effects. Despite these limitations, the findings of this study provide valuable real-world evidence regarding the efficacy and safety of duloxetine in managing comorbid depression in PD, warranting further investigation in larger, multicenter prospective studies.

Conclusion

In conclusion, this retrospective study provides compelling evidence regarding the real-world efficacy and safety of duloxetine in treating comorbid depression in patients with PD. The findings support the potential utility of duloxetine as a comprehensive treatment option that addresses both mood-related and motor symptoms.

Availability of Data and Materials

The datasets used and/or analyzed during the current study were available from the corresponding author on reasonable request.

Author Contributions

ZQW and JT designed the study; all authors conducted the study; WXD and NZ collected and analyzed the data. JLW and ZYL provided help and advice in the manuscript, and all authors contributed to the drafting or critical revision of the manuscript for important intellectual content. All authors gave final approval of the version to be published. All authors participated fully in the work, take public responsibility for appropriate portions of the content, and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or completeness of any part of the work are appropriately investigated and resolved.

Ethics Approval and Consent to Participate

This study has been approved by the Medical Ethics Committee of Yanbian Brain Hospital. Approval No.: 2020-KYSB-160. This study was conformed to the relevant statements of the Declaration of Helsinki. All participants included in this study gave informed consent.

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Conflict of Interest

The authors declare no conflict of interest.

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