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Examining Factors Related to Health-Related Quality of Life in People With Parkinson's Disease

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Abstract

Purpose: Parkinson's disease (PD) results in a range of dysfunctions and disabilities as it progresses to later stages. All these not only affect a patient's physical well-being but also emotional, social, and spiritual well-being. To tailor interventions that can address these concerns, this study aimed to examine the impacts of PD on their health-related quality of life (HRQOL).

Design: A cross-sectional study with 123 PD patients.

Methods: Measures included the following: Hospital Anxiety and Depression Scale, Unified PD Rating Scale–Motor Examination, Hoehn and Yahr Stage, PD Questionnaire-8. Associating factors of HRQOL was examined using stepwise linear regression.

Findings: Psychological distress and functional impairment are significantly associated with the HRQOL of the PD population. Psychological distress is associated most to the variance of HRQOL (42.4%).

Conclusion: Considering that PD is chronic, rehabilitation programs should be applied to address not just functional but also psychosocial needs of PD patients.

Clinical Relevance: Early recognition and management of psychological distress in PD patients is indispensable to promote their HRQOL.

Keywords: Anxiety; depression; HRQOL; Parkinson's disease; psychological distress.

Introduction

Parkinson's disease (PD), one of the most prevalent movement disorders and neurodegenerative diseases among older elders, results in a range of dysfunctions and disabilities. It is characterized by four cardinal motor symptoms, including resting tremor, rigidity, bradykinesia, and postural instability (Auyeung et al., 2012; Jankovic, 2008). Along the illness trajectory of PD, the conditions become more fluctuating and less predictable. People with PD experience more functional impairment and more frequent on–off phenomenon, the longer they had the condition. The condition is also associated with a range of nonmotor symptoms, including anxiety, depression, memory problems, and sleep disturbance (Prakash, Nadkarni, Lye, Yong, & Tan, 2016). The complexity and symptom burden of this condition result in increased healthcare needs, which greatly impair the well-being and health-related quality of life (HRQOL) of people living with PD (Corallo et al., 2017; Dowding, Shenton, & Salek, 2006).

Because PD is predominantly characterized as a motor disorder, past research has mainly focused on the impacts of motor symptoms (Connolly & Lang, 2014; Ellis et al., 2011). Existing treatments for PD primarily focus on the pharmacological and surgical management of motor symptoms. Rehabilitation programs developed by health professionals mainly emphasize physical functioning (Clarke et al., 2009; Kwok, Choi, & Chan, 2016). Less attention has been given to the psychological outcomes experienced by the patients with PD. Health professionals, family, and friends tend to overlook their psychological needs, especially given the difficulties patients have in expressing emotions, which could often be masked by their motor symptoms, such as apathy, masked face, and low tone voice. Recently, researchers have

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suggested that nonmotor symptoms can sometimes be more disabling than motor symptoms in PD patients (Pfeiffer, 2016). Psychological distress has been studied as one of the main determinants in chronic illness research. A high level of psychological distress is associated with exacerbated disability, rapid progression of physical symptoms, high incidence of relapse, poor treatment compliance, sedentary lifestyle, increased healthcare cost, and caregiver distress (Low et al., 2015; Menza et al., 2009; van Uem et al., 2016). Thus, psychological distress not only impairs functions, self-care capacity, and HRQOL of people with PD but also greatly increases their care demand and healthcare cost (Dowding et al., 2006; Low et al., 2015).

To tailor interventions that can address the complex health needs of PD patients, a better understanding of the associating factors of their HRQOL is indispensable. In this study, the "biopsychosocial" model of health depicts the relationships between sociodemographic characteristics, functional impairment, psychological distress, and HRQOL (Engel, 1981). We aimed to examine the factors associated with HRQOL and compare the associations of functional impairment and psychological distress on HRQOL with the adjustment of potential confounders in people with PD. The objectives of this quantitative phase were as follows: (a) to profile the level of functional impairment, psychological distress, and HRQOL among people with PD; (b) to investigate the important associating factors of HRQOL; and (c) quantify the proportion of variance in HRQOL accounted by these factors.

Methods

Study design

A cross-sectional correlation study was conducted. The interview involved the administration of questionnaires on psychological distress in terms of anxiety and depression, disease-specific HRQOL, severity of motor symptoms, disease staging, and a sociodemographic sheet. Ethical permission was obtained from the appropriate ethics committee at the administering institution in January 2016 (CREC Ref. No. 2015.712).

Participants

The study was conducted in a neurological clinic of a large acute hospital. The subjects were diagnosed with idiopathic PD, aged 18 years and above, and able to communicate reliably. The following exclusion criteria were considered: (a) subjects who scored ≤6 on the Abbreviated Mental Test or (b) those with PD of other etiologies and history of stroke, head injury, epilepsy, or other diseases of the central nervous system. These criteria were set with the intention to exclude individuals who are mentally incompetent to provide informed consent or provide reliable responses or that the symptoms reported were due to other medical conditions to enhance the generalizability and validity of the study.

Cross-sectional Correlation Study

Instruments

Psychological Distress

Psychological distress in terms of anxiety and depression was measured by the Hospital Anxiety and Depression Scale (HADS; Leung, Ho, Kan, Hung, & Chen, 1993; Zigmond & Snaith, 1983). This scale has been suggested for use in a population with PD because somatic symptoms that may potentially overlap parkinsonian manifestations are not assessed in this scale (Rodriguez-Blazquez, Frades-Payo, Forjaz, de Pedro-Cuesta, & Martinez-Martin, 2009). The HADS consists of two subscales, namely, anxiety and depression. Each subscale consists of seven items, and each item is rated by a 4-point scale (range: 0–3). The full scale demonstrated optimal cutoff value of ≥15, with a sensitivity of .79 (95% CI [0.66, 0.90]) and specificity of .80 (95% CI [0.69, 0.91]; Leung et al., 1993). The anxiety subscale demonstrated optimal cutoff value of ≥8, with a sensitivity of .89 and a specificity of .75, whereas the depression subscale demonstrated optimal cutoff value of ≥8, with a sensitivity of .80 and a specificity of .88 (Olssøn, Mykletun, & Dahl, 2005). Hence, in the present study, the levels of anxiety and depression are considered clinically relevant at a cutoff value of ≥8 on each subscale and ≥15 for the full scale, suggesting the presence of overall psychiatric conditions, anxiety, and depression.

The Chinese version of HADS has demonstrated satisfactory validity and reliability with a Cronbach's alpha of .86 for the overall scale, .82 for the depression subscale, and .77 for the anxiety subscale (Leung et al., 1993; Zigmond & Snaith, 1983).

Health-Related Quality of Life

PD Questionnaire-8 (PDQ-8) is a short eight-item questionnaire quantifying the effect of PD on the HRQOL of patients (Jenkinson, Fitzpatrick, Peto, Greenhall, & Hyman, 1997). This questionnaire assesses eight domains, including mobility, activities of daily living (ADL), emotional well-being, social support, cognitions, communication, bodily discomfort, and stigma. A PDQ-8 summary index was generated in this study. A high index score indicates a negative HRQOL. The Chinese PDQ-8 has been validated with Cronbach's alpha of .87, and construct validity has been demonstrated against the Hoehn and Yahr (H&Y)

Stage and the Unified PD Rating Scale (UPDRS) Motor scores (Tan, Lau, Au, & Luo, 2007).

Severity of Motor Symptoms

The UPDRS–Part III Motor Examination (UPDRS-III) is a 27-item assessor-rated instrument assessing the severity of the motor symptoms of PD. Each item is scored on a 0–4 categorical scale, where 0 indicates no impairment and 4 represents severe impairment. The total score is 108. A high score corresponds to motor disabilities. This scale has demonstrated excellent internal consistency with Cronbach's alpha of .95 (Stebbins & Goetz, 1998).

Data Collection

All participants consecutively attending the clinic were screened for eligibility. A neurologist (M. A.) screened the patients' medical condition and then referred the potential participants to a registered nurse (J. K.) for screening and subject recruitment, if appropriate. Written informed consent was sought. Consented participants were asked to complete a demographic sheet and a set of questionnaires. For those who could not read the questionnaires, J. K. assisted them in questionnaire administration. All UPDRS-III assessments were performed by M. A. Data were collected in a private consultation room to ensure privacy.

Data Analysis

Descriptive statistics was used to describe the sociodemographic background of the patients and outcomes. The normality of variables was assessed by using a skewness statistics and normal probability plot. Stepwise multiple linear regressions were conducted to examine the independent association of psychological distress to HRQOL after adjusting for sociodemographic characteristics, including age, gender, number of children, allowance status, marital status, and level of education, and disease characteristics, including disease staging and severity of motor symptoms. IBM SPSS 22.0 was used for all statistical analyses. All statistical tests were two-tailed tests, with level of significance set at .05.

Results

Characteristics of Respondents

A convenience sample of 123 people with PD completed the questionnaires, with a response rate of 97.6%. The sociodemographic characteristics and health conditions of patients with PD are shown in Table 1. Their mean age was 70.4 years (*SD* = 9.2), ranging from 51 years to 97 years. More than half of them were female (51.2%), and about 40% of them received primary education or less. The majority of these patients were married (72.4%), and they lived with their spouses, families, or friends (85.3%). The median of H&Y Stage was 3 (interquartile range: 2–4). About half of them were with mild PD (H&Y Stage 1–2), whereas 20.3% and 30% of them were with moderate (H&Y Stage 3) and severe (H&Y Stage 4–5) stages, respectively. Their mean UPDRS-III score was 24.0 ± 13.5.

Table 1 Sociodemographics Characteristics (*n* = 123)

Variables	*n* (%)	Mean (*SD*)
Age, years	123 (100)	70.4 (9.2)
Gender		
Male	60 (48.8)	
Female	63 (51.2)	
Marital status		
Single	7 (5.7)	
Married	89 (72.4)	
Divorced/separated	11 (8.9)	
Widowed	16 (13.0)	
No. of children		2.5 (1.5)
Education level		
Illiterate/primary	47 (38.2)	
Secondary	54 (43.9)	
Tertiary	22 (17.9)	
Living status		
Living alone	9 (7.3)	
Living with spouse	41 (33.3)	
Living with families/friends	64 (52.0)	
Old age home	9 (7.4)	
Social security allowance	54 (43.9)	
Comprehensive Social Security Assistance (CSSA) scheme	11 (8.9)	
Normal disability allowance	28 (22.8)	
Higher disability allowance	7 (5.7)	
Old age allowance	8 (6.5)	
The Hoehn and Yahr Scale		
1–1.5	4 (3.3)	
2–2.5	57 (46.3)	
3	25 (20.3)	
4	19 (15.4)	
5	18 (14.7)	

Psychological Distress

In Table 2, the mean HADS score was 16.2 ± 7.8. The mean anxiety and depression subscale scores were 7.4 ± 4.3 and 8.8 ± 4.4, respectively. Using a cutoff score of 15, we identified more than half of them (54.5%) with psychological distress, and we observed that 49.6% and 59.3% of them showed anxiety and depressive symptoms, respectively. Among a larger proportion of female patients were screened with psychological distress (female 60%, male 49.2%). For the subgroup analysis between individuals with and without psychological distress, the mean H&Y Stage (t = −3.2, p = .002), UPDRS-III (t = −2.98, p = .002), and PDQ-8 (t = −9.37, p < .001) of the patients significantly differed.

Table 2 Mean scores in the HADS, PDQ-8, and UPDRS-III (*n* = 123)

	All (*n* = 123)	Mild (H&Y 1–2) (*n* = 61)	Moderate (H&Y 3) (*n* = 25)	Severe (H&Y 4–5) (*n* = 37)	*p*	Female (*n* = 63)	Male (*n* = 60)	*p*
				N (%)				
HADS ≥ 15	67 (54.5)	26 (42.6)	13 (52)	28 (75.7)		36 (60)	31 (49.2)	
HADS–Anxiety ≥ 8	61 (49.6)	22 (36.1)	17 (68)	22 (59.5)		30 (50)	31 (49.2)	
HADS–Depression ≥ 8	73 (59.3)	30 (49.2)	15 (60)	28 (75.7)		36 (60)	37 (58.7)	
	Mean (*SD*)							
HADS	16.2 (7.8)	13.8 (8.0)	16.2 (6.0)	20.0 (7.1)	.003	16.4 (7.0)	16.0 (8.5)	.036
Anxiety	7.4 (4.3)	6.3 (4.5)	8.0 (3.8)	8.9 (3.8)	.045	7.5 (4.0)	7.4 (4.6)	.040
Depression	8.8 (4.4)	7.6 (4.2)	8.2 (3.6)	11.1 (4.3)	.001	4.2 (4.2)	8.6 (4.6)	.472
PDQ-8 summary index	34.4 (20.1)	27 (19.2)	34.3 (18.8)	46.6 (16.3)	<.000	32.8 (18.7)	35.9 (21.4)	.295
Mobility	2.2 (1.3)	1.6 (1.3)	2.0 (1.1)	3.1 (1.0)	<.000	2.2 (1.3)	2.2 (1.4)	.583
ADL	1.7 (1.2)	1.3 (1.2)	1.6 (1.0)	2.5 (1.0)	<.000	1.5 (1.2)	1.9 (1.2)	.803
Emotional well-being	1.4 (1.1)	1.3 (1.1)	1.2 (1.2)	1.7 (1.1)	.381	1.4 (1.1)	1.3 (1.1)	.873
Social support	0.9 (1.1)	0.7 (1.0)	1.0 (1.0)	1.2 (1.2)	.247	0.7 (1.0)	1.1 (1.1)	.107
Cognition	1.1 (1.2)	0.8 (1.1)	1.0 (1.1)	1.5 (1.1)	.031	1.0 (1.1)	1.2 (1.2)	.102
Communication	1.2 (1.2)	0.8 (1.0)	1.1 (1.2)	1.8 (1.1)	.001	1.0 (1.0)	1.3 (1.2)	.026
Bodily discomforts	1.4 (1.1)	1.1 (0.9)	1.6 (1.2)	1.7 (1.2)	.013	1.6 (1.0)	1.1 (1.2)	.393
Stigma	1.3 (1.2)	1.2 (1.2)	1.3 (1.3)	1.5 (1.3)	.816	1.2 (1.2)	1.4 (1.3)	.157
UPDRS-III	24.0 (13.5)	16.7 (8.2)	23.5 (8.8)	36.5 (14.2)	<.001	23.8 (13.4)	24.3 (13.7)	.824

Note. Continuous variables were compared between the two groups using the one-way analysis of variance and independent *t* test, respectively. HADS = Hospital Anxiety and Depression Scale (a higher score indicates higher level of anxiety and depression; a cutoff value of 15 for the full scale is used to indicate the presence of psychological distress); PDQ-8 = Parkinson's Disease Questionnaire-8, scored 0–4 per item (higher scores indicate worse HRQOL); UPDRS-III = The Unified Parkinson's Disease Rating Scale–Part III Motor Examination (higher scores indicate more motor disabilities); H&Y = Hoehn and Yahr; ADL = activities of daily living.

Health-Related Quality of Life

Regarding the quality of life, we found that the mean PDQ-8 score of patients was 34.4 ± 20.1, which ranged from 0 to 78 (Table 2). When the mean PDQ-8 item scores were compared, the aspects associated with physical and psychological well-being scored high. Whereas aspects concerning cognition and social impact scored low, the mean mobility subscale score (2.2 ± 1.3) was the highest, followed by the subscale scores of ADL (1.7 ± 1.2), emotional well-being (1.4 ± 1.1), bodily discomfort (1.4 ± 1.1), stigma (1.3 ± 1.2), communication (1.2 ± 1.2), cognition (1.1 ± 1.2), and social support (0.9 ± 1.1).

Associations of Sociodemographic Features, Clinical Characteristics, and HRQOL

The associations of sociodemographic features, clinical characteristics, and HRQOL are summarized in Table 3. Sociodemographic characteristics including age, gender, marital status, educational level, and financial allowance showed no significant correlation with PDQ-8 summary index. However, several significant but weak associations were noted between some sociodemographic factors and PDQ-8 item scores. Age positively correlated with PDQ-8 item score in mobility problems ($r = .193$, $p = .033$). Men positively correlated with PDQ-8 item scores in ADL impairments ($r = .187$, $p = .039$) and social support ($r = .183$, $p = .043$) and negatively correlated with PDQ-8 item score in bodily discomfort ($r = -.223$, $p = .013$). Level of education negatively correlated with item scores in mobility ($r = -.190$, $p = .035$) and communication ($r = -.181$, $p = .046$).

All clinical conditions including disease staging ($\gamma = 0.411$, $p < .001$), anxiety ($\gamma = 0.732$, $p < .001$), depression ($\gamma = 0.655$, $p < .001$), and severity of motor symptoms ($\gamma = 0.402$, $p < .001$) were significantly correlated with the PDQ-8 summary index score.

Independent Association of Psychological Distress on HRQOL

In stepwise multiple regressions (Table 4), sociodemographic characteristics accounted for 6.9% of the variance of HRQOL. Adding disease staging and severity of motor symptoms in the model accounted for additional 17.9% of the variance of HRQOL ($p < .001$). Although adding anxiety and depression to the final model accounted for additional 42.4% of the variance of HRQOL ($p < .001$), anxiety (standardized $\beta = .538$, $p < .001$), depression (standardized $\beta = .231$, $p = .003$), and severity of motor

Table 3 Correlations of sociodemographic features, clinical characteristics, and HRQOL (*n* = 123)

	Age	Gender	Education	H&Y Staging[b]	UPDRS-III[a]	HADS[a]	HADS-Anxiety	HADS-Depression
Age[a]	1.00							
Gender[b]	*ns*	1.00						
Education[b]	−.181*	*ns*	1.00					
H&Y Staging[b]	*ns*	*ns*	*ns*	1.00				
UPDRS-III[a]	*ns*	*ns*	*ns*	.682***	1.00			
HADS[a]	*ns*	*ns*	−.181*	.347***	.293***	1.00		
HADS-Anxiety[a]	*ns*	*ns*	−.182*	.258***	*ns*	.892***	1.00	
HADS-Depression[a]	*ns*	*ns*	*ns*	.361***	.374***	.897***	.601***	1.00
PDQ-8[a]	*ns*	*ns*	*ns*	.411***	.402***	.774***	.732***	.655***
PDQ-8 Mobility[a]	.193*	*ns*	−.190*	.514***	.56***	.477***	.412***	.44***
PDQ-8 ADL[a]	*ns*	.187*	*ns*	.437***	.543***	.51***	.413***	.499***
PDQ-8 Emotions[a]	*ns*	*ns*	*ns*	*ns*	*ns*	.647***	.653***	.505***
PDQ-8 Social Support[a]	*ns*	.183*	*ns*	.201*	*ns*	.535***	.559***	.4***
PDQ-8 Cognition[a]	*ns*	*ns*	*ns*	.264**	*ns*	.522***	.515***	.149***
PDQ-8 Communication[a]	*ns*	*ns*	−.181*	.373***	.427***	.636***	.543***	.595***
PDQ-8 Bodily Discomforts[a]	*ns*	−.223*	*ns*	.21*	*ns*	.371***	.372***	.293**
PDQ-8 Stigma[a]	*ns*	*ns*	*ns*	*ns*	*ns*	.557***	.565***	.434***

Note. HRQOL = health-related quality of life; *ns* = nonstatistically significant; H&Y = Hoehn and Yahr; UPDRS-III = The Unified Parkinson's Disease Rating Scale–Part III Motor Examination; HADS = Hospital Anxiety and Depression Scale; PDQ-8 = Parkinson's Disease Questionnaire-8; ADL = activities of daily living.

[a] Pearson's correlation coefficient.

[b] Spearman correlation coefficient.

symptoms (standardized β = .182, *p* = .042) significantly and independently associated with HRQOL.

A sensitive analysis was conducted including those independent variables with *p* values of <.1 in the univariate analysis with HRQOL using stepwise modeling. Consistently, anxiety (standardized β = .557, *p* < .001), severity of motor symptoms (standardized β = .232, *p* < .001), and depression (standardized β = .234, *p* = .002) significantly and independently associated with HRQOL. In the three-step stepwise modeling, anxiety (*p* < .001), severity of motor symptoms (*p* < .001), and depression (*p* = .002) accounted for additional 53.5%, 8.8%, and 3% change of HRQOL variance, respectively.

Discussion

We aimed to examine the factors associated with HRQOL and the impact of psychological distress, such as anxiety and depression, on the PD population. The findings showed that psychological distress was highly prevalent among this group of people, and 49.6% and 59.3% of them suffered from anxiety and depression.

Table 4 Stepwise regression on HRQOL (*n* = 123)

	Step 1		Step 2		Step 3	
Variables	Standardized β	*p*	Standardized β	*p*	Standardized β	*p*
Age	.086	.470	−.048	.669	−.040	.589
Gender	.017	.871	−.001	.989	.027	.661
No. of children	−.019	.860	.053	.606	.076	.269
Allowance	.149	.141	.062	.507	.009	.882
Marital category	.184	.078	.147	.124	.137	.033
Education: primary as reference						
Education: secondary	−.072	.536	−.111	.297	−.031	.664
Education: tertiary	−.142	.203	−.101	.320	.010	.889
UPDRS-III			.215	.092	.182	.042
H&Y Staging			.266	.036	.093	.280
HADS-Anxiety					.538	<.001
HADS-Depression					.231	.003
R^2	6.9%		24.8%		67.2%	
ΔR^2 (*p*)			17.9% (*p* < .001)		42.4% (*p* < .001)	

Note. HRQOL = health-related quality of life; H&Y = Hoehn and Yahr; UPDRS-III = The Unified Parkinson's Disease Rating Scale–Part III Motor Examination; HADS = Hospital Anxiety and Depression Scale; PDQ-8 = Parkinson's Disease Questionnaire-8.

Consistent with previous studies, the prevalence rates of anxiety and depression were 27.1%–56% and 27.6%–58%, respectively (Barone et al., 2009; Chen et al., 2010; Ravina et al., 2007; Shulman, Taback, Rabinstein, & Weiner, 2002). Anxiety and depression are much more common in patients with PD than those in patients with other chronic medical conditions, including cancer (anxiety, 2.5%–30.9%; depression, 2.6%–26.9%; Nikbakhsh, Moudi, Abbasian, & Khafri, 2014), chronic kidney disease (anxiety, 11.7%–25.7%; depression, 9.3%–22.6%; Stasiak, Bazan, Kuss, Schuinski, & Baroni, 2014), and diabetes mellitus (anxiety, 12.7%–27.6%; depression, 11.2%–26.3%; Rajput, Gehlawat, Gehlan, Gupta, & Rajput, 2016). This finding highlights the importance of detecting and addressing psychological distress in PD management.

In contrast to previous studies noting that age is one of the significant factors associated with HRQOL (Muslimovic et al., 2008; Schrag, Jahanshahi, & Quinn, 2000a), our findings showed that all sociodemographic characteristics of the patients were generally not significantly associated with their HRQOL. A possible explanation is that there was a higher proportion of patients with minimal PD (H&Y Stage 1) in the previous studies (25% vs. 3.3%), and their findings were largely based on those who had solely unilateral involvement of symptoms with minimal or no functional disability. In such case, HRQOL might correlate stronger with age. In the present study, most of the subjects had mild-to-moderate PD, lived with family or spouse, and had secondary education or above. All these characteristics would affect the scores on the instruments. Although no sociodemographic factors showed significant correlation with the PDQ-8 summary score, several significant associations were found among some PDQ-8 item scores. Women perceived more bodily discomforts than men; this finding is congruent with current evidence suggesting that women demonstrated higher pain sensitivity and lower pain threshold and tolerance than men (Fillingim, King, Ribeiro-Dasilva, Rahim-Williams, & Riley, 2009). However, men perceived more functional impairments and social problems than women do, possibly because of the gender role differences. Men tended to achieve muscularity, which emphasized physical strength and independence, and they may feel more emasculated by the disability (Solimeo, 2008). Hence, educational interventions should be sensitive to address the specific concerns owing to the gender role differences. Furthermore, people with higher level of education perceived less problems in mobility and communication. This finding resembled previous European PD studies (Cubo et al., 2002), suggesting more educated individuals may have more functional reservoir and better self-care to compensate for the loss in mobility and communication owing to the illness. Thereby, education is essential in promoting positive self-care behaviors and enhancing HRQOL of PD individuals. Sociodemographic factors are important in the care planning process, which affects the perception, expectation, and ability of PD individuals to function normally in daily living.

Unlike other studies that examined the associating factors of HRQOL (Ravina et al., 2007; Schrag, Jahanshahi, & Quinn, 2000b), we not only examined the independent association of sociodemographic features but also investigated the additional effect of disease characteristics and psychological distress on HRQOL. Sociodemographic features only represented 6.9% of the variance of HRQOL, whereas disease characteristics, including disease staging and severity of motor symptoms, comprised an additional 17.9% of the variance of HRQOL. These results were in line with the current literature, in which motor symptoms and functional impairments are the major associating factors of HRQOL, and managing motor symptoms has been considered a fundamental care for people with PD (Clarke et al., 2009; Kwok et al., 2016). On top of sociodemographic and disease characteristics, it is remarkable that psychological distress accounted for an additional 42.4% of the variance of HRQOL. A recent systematic review of behavioral interventions revealed that psychological well-being of people with PD has not been addressed well in research and clinical settings despite the prominent impact of psychological distress on HRQOL (Kwok et al., 2016). The primary results of the reviewed trials mainly focused on physiological and functional well-being, whereas the effect of reviewed interventions on psychosocial well-being has not been sufficiently investigated. Future studies should emphasize psychological well-being in the PD rehabilitation process and adopt psychological parameter as the primary outcome of interest. In addition to the pharmacological management of motor symptoms and functional rehabilitation, psychological care is necessary for improving the HRQOL of people with PD. Education interventions should be expanded to include coping skills for anxiety and depression, on top of medical management of PD symptoms.

In this study, the severity of motor symptoms, anxiety symptoms, and depressive symptoms were major associating factors of the HRQOL of patients with PD. Among these symptoms, anxiety demonstrated the strongest explanatory power and effect on HRQOL, followed by depressive symptoms and severity of motor symptoms. Although depressive symptoms were more prevalent than anxiety in our study, anxiety may be more impairing on HRQOL than depressive symptoms among PD patients. Various psychological factors, such as rumination, could possibly explain this insight (Julien, Rimes, & Brown,

Key Practice Points

- Expressions of psychological distress are often masked by motor symptoms in PD patients.
- Anxiety and depressive symptoms are highly prevalent and more impairing than motor symptoms on HRQOL of PD patients.
- Rehabilitation programs should be applied to address not just functional but also psychosocial needs of PD patients.
- A psychosocial intervention study for PD patients who experience psychological distress is warranted.

2016). Patients with chronic illnesses are prone to rumination, especially when they feel unrestrained or overwhelmed by changes caused by their disease (Kabat-Zinn & Hanh, 2013). This repetitive thinking process increasingly triggers persistent feelings of psychological distress, such as inadequacy, insecurity, worthlessness, and helplessness, which will increase anxiety and intensify depressive symptoms. The feelings of anxiety rather than depression may predominate during instances of rumination, thereby causing patients to constantly worry about things that might threaten their sense of control and well-being, whether real or imagined. Depression aggravates anxiety, in turns, and exacerbates motor symptoms in people with PD, and antiparkinsonian medication may also aggravate anxiety symptoms (Vázquez, Jimenez-Jimenez, García-Ruiz, & García-Urra, 1993). Thus, the early recognition and nonpharmacological management of anxiety and depression is crucial to promote patients' well-being (Stefanova, Ziropadja, Petrovic, Stojkovic, & Kostic, 2013).

Although explanations and management of anxiety and depression in PD have typically focused on the biomedical-based mechanisms, current evidence supports adopting psychosocial approaches to managing these problems. For example, psychoeducation and acceptance-based interventions were effective for anxiety and depression management in people with various chronic illnesses (Cimpean & Drake, 2011; Kabat-Zinn & Hanh, 2013). However, there is a dearth of evidence regarding community-based behavioral interventions in people with PD. Despite great advancement has been made in motor symptom management, comparatively minimal attention has been given to the psychological impacts of PD (Marsh, 2013). Psychological distresses, such as anxiety and depression, have not been adequately screened and managed in clinical settings until the psychiatric problems progress to an advanced stage. Access to psychiatric services for psychological assessment and intervention for people with PD is rather limited and expensive. Given the limited resources on psychiatric services and evidence of the adverse side effects of pharmacological antidepressant treatments in PD, health professionals should consider adopting alternative behavioral interventions as a potential alternative or adjunct to pharmacotherapy to people with PD, who experience psychological distress. Further research on community-based nonpharmacological behavioral interventions is crucial (Dobkin et al., 2013). Community engagement and partnerships are essential for early recognition and effective management of these psychiatric problems (Plumb, Weinstein, Brawer, & Scott, 2012). Clinicians, allied health professionals, and community stakeholders should collaborate to develop community-based nonpharmacological interventions to optimize the rehabilitation process and holistic well-being of patients with PD.

Limitations

These findings were obtained from a convenience sample through a cross-sectional study in a single center, which could have possibly introduced selection bias. The use of quantitative closed-ended questions in interviews may have limited the amount of information obtained. The causes of high level of psychological distress and impaired HRQOL cannot be determined in the current study. The perception of patients with the illness and their interpretations of the current treatment regimens would tremendously affect their outcomes, adherence, and coping strategies. To tailor interventions that can promote patients' well-being, subsequent exploratory qualitative research is essential to elucidate and complement these quantitative findings.

Conclusion

This study reveals the effect of PD on the psychological well-being and HRQOL of the patients. Psychological distress and functional impairment are highly prevalent and significantly affect the HRQOL of people with PD. The illness experience of patients with PD is greatly underresearched but is of huge influence on the well-being and development of comprehensive care model for the PD population. Considering the chronic and fluctuating nature of PD, rehabilitation programs should be applied not just to address functional but also psychosocial needs of PD patients (Kwok, Kwan, Auyeung, Mok, & Chan, 2017). Community engagement and partnerships are essential to support the community living with PD.

Authorship

J. K., M. A., and H. C. are all involved in the conception, organization and execution of the study. J. K. collected the data. M. A. performed all neurological assessments.

J. K. drafted the paper. M. A. and H. C. revised the paper for important intellectual content. H. C. supervised the project. All authors have read and approved the final version of the manuscript. All authors declared that this is our original work, which has not received prior publication and is not under consideration for publication elsewhere.

Conflict of Interest

No conflict of interest has been declared by all authors.

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