Subjective poor sleep quality in Chinese patients with Parkinson’s disease without dementia

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Abstract

Parkinson’s disease (PD) is a common progressive neurological disorder and is composed of motor and non-motor symptoms. Sleep disturbances are frequent problems for patients with PD. The relationship between sleep disturbances with Hoehn and Yahr (H&Y) staging have been demonstrated. However, the relationship between sleep disorders and H&Y is still unclear in patients with PD without dementia in Chinese PD patients. In this study, we interviewed 487 non-demented PD patients of Chinese Han descents by H&Y classification. We found that night sleep quality was significantly associated with the severity of PD \((P = 0.008)\). Panic disorder severity scale (PDSS) total scores were correlated with PD non-motor symptoms scale (PDNMS) scores \((r = -0.528, P < 0.001)\), the Hamilton depression scale (HAMD) scores \((r = -0.545, P < 0.001)\) and the Hamilton anxiety scale (HAMA) scores \((r = -0.498, P < 0.001)\). Our results indicated that sleep quality deteriorated with the advancing of PD in Chinese non-demented patients with PD. Depression and anxiety may partly explain sleep disturbances in non-demented patients with PD.

Keywords: sleep quality, depression, anxiety, Parkinson disease, non-demented

INTRODUCTION

Parkinson’s disease (PD) is a common progressive neurological disorder involving 1.7% of the geriatric population in China\([1]\) and 2.0% of the elderly population globally\([2]\), respectively. There are no specific neuro-imaging modalities and reliable biomarkers for the diagnosis of PD until now. PD is usually diagnosed clinically based on the UK Brain Bank criteria\([3]\), which are composed of 4 aspects mainly referring to motor symptoms, including bradikinesia, rigidity, rest tremor and postural instability. Depression, dementia, drug-induced psychosis, impulsivity and sleep disturbances may complicate the course and management of PD and lead to a variety of short- and long-term negative outcomes. Recent studies have focused on non-motor symptoms besides motor signs.

Non-motor symptoms such as sleep disturbances and mood disorders are common in patients with PD. Sleep disturbances have been reported to occur in...
90% of patients with PD. In general, sleep disorders are broadly categorized into 2 types that include daytime manifestation and nocturnal sleep. The most common sleep problem is nocturnal sleep in the early stage of PD, including nocturia and nighttime cramps. Mood disorders have also been reported to occur in 50% of patients with PD. Moreover, mood disorder could worsen sleep disturbance. The main manifestations of mood disorders are depression and anxiety. The depressive mood could lead to poor sleep in mild and moderate PD. In addition, a correlation had been demonstrated in patients with PD from the USA between sleep disturbances or mood disorders with Hoehn and Yahr (H&Y) staging, which classifies PD mainly by motor symptoms. However, the relationship between non-motor symptoms and motor symptoms was not clear in Chinese patients with PD without dementia. Chaudhuri et al. developed a specific scale, the PD sleep scale (PDSS) and confirmed its validity and reliability on sleep quality. In 2008, the PDSS was translated into Chinese and its validity and reliability on sleep quality were confirmed in Chinese PD population. In this study, we sought to investigate changes in sleep in Chinese non-demented PD patients and further study the relationship between sleep quality and PD.

**SUBJECTS AND METHODS**

**PD patient selection**

All consecutive patients with PD were recruited from the neurology outpatient clinics at the authors' affiliated institutions from March 2010 to May 2012. All patients were diagnosed with idiopathic PD by movement disorders neurologists according to the UK Brain Bank criteria. Patients with severe cognitive impairment or their Mini Mental State Examination (MMSE) score < 24 were excluded. Patients with cerebrovascular disease, encephalitis, trauma and drug-induced Parkinson's syndrome were excluded by referring to CT or MRI scan findings. Parkinson’s plus syndrome, conditions suffering from a serious physical illness, previous history and family history of mental illness, and patients treated by antidepressant or anxiolytics were also excluded from this study. The study protocol was approved by the local institutional review boards at the authors’ affiliated institutions.

**Statistical analysis**

Descriptive statistical analyses were performed. Binary logistic regression models were constructed to examine the relationship between the PDSS and many factors. The one-way ANOVA test was used for continuous data. The chi-square test was used for unordered categorical variables and Kruskal Wallis test was used for ordinal categorical variables. The Pearson correlation coefficient was used for assessing the association between the PDSS and other scales, and between H&Y and other scales. \( P \leq 0.05 \) was considered significant. All logistic regression models were adjusted for gender and age. Statistical computations were performed by using the statistical package for the social sciences (SPSS Version 13.0, SPSS Inc., Chicago, IL, USA).

**RESULTS**

We interviewed 487 PD patients without dementia. The demographic characteristics of the patients are shown in Table 1 with H&Y classification. With H&Y classification, there were 317 (65.9%) patients with mild PD, 147 (29.3%) with moderate PD and 23 (4.8%) with severe PD. Age, sex, disease duration,
education status and MMSE scores were not signifi-
cantly different among the three groups. The PDSS
total score was 118.72 ± 21.0 for patients with mild
PD, 117.08 ± 19.36 for patients with moderate PD
and 108.83 ± 24.62 for patients with severe PD. There
were no statistical differences among the three groups.
Moreover, the scores of PDSS sub-items were not dif-
f erent among the three groups except the sub-item of
sleep quality. The score of sleep quality (item 1-3) was
25.38 ± 4.19 for patients with mild PD, 24.6 ± 4.65
for patients with moderate PD and 22.79 ± 5.01 for pa-
tients with severe PD (P = 0.008). The total scores of
the HAMD scale were 10.41 ± 7.43 for patients with
mild PD, 10.83 ± 8.08 for patients with moderate PD
and 11.46 ± 7.43 for patients with severe PD. The total
scores of HAMA scale were 118.72 ± 21.01 for pa-
tients with mild PD, 117.08 ± 19.36 for patients with
moderate PD and 108.83 ± 24.62 for patients with
severe PD. Both scores were not different among the
three groups.

The relationship between H&Y classification and
the other variants are shown in Table 3. There were
no significant correlations between H&Y classifica-
tion and the scores of PDSS, HAMA and HAMD. The
relationship between the PDSS and the other variants
are shown in Table 3. On one hand, PDSS total scores
correlated with PDNMS scores (r = -0.528, P < 0.001),
HAMD scores (r = -0.545, P < 0.001) and HAMA
scores (r = -0.498, P < 0.001). On the other hand, the

Table 2 Demographic characteristics of patients with Parkinson’s disease by H&Y category

| Characteristics       | Hoehn-Yahr staging |        |        |
|-----------------------|--------------------|--------|--------|
|                       | Mild (stages 1-2)  | Moderate (2.5-3) | Severe (4-5) |
| N (%)                | 317 (65.9%)        | 147 (29.3%) | 23 (4.8%) | P |
| Male/Female          | 193/124            | 89/53  | 10/14  | 3.861 |
| Age (years)          | 70.77 ± 58.09      | 68.99 ± 9.65 | 69.50 ± 11.00 | 0.931 |
| Disease duration     | 432.44 ± 1177.43   | 400.03 ± 667.20 | 758.08 ± 1257.61 | 0.303 |
| Education0/1/2/3/4/5 | 17/48/89/75/46/42  | 12/26/33/22/22 | 5/6/6/2/2 | 0.633 |

PDSS

| Sleep quality (1-3)  | 25.38 ± 4.19        | 24.6 ± 4.65 | 22.79 ± 5.01 | 0.008 |
| Nocturnal restlessness (4,5) | 14.77 ± 4.74 | 14.83 ± 4.47 | 13.75 ± 4.27 | 0.561 |
| Nocturnal psychosis (6,7) | 16.11 ± 3.75 | 15.65 ± 4.10 | 14.62 ± 4.55 | 0.132 |
| Nocturia (8)          | 7.25 ± 2.68        | 7.16 ± 2.58 | 5.96 ± 2.90 | 0.073 |
| Nocturnal motor-symptoms (9-13) | 40.03 ± 7.81 | 39.91 ± 6.75 | 38.79 ± 9.16 | 0.743 |
| Daytime somnolence (14.15) | 15.18 ± 5.38 | 14.93 ± 3.37 | 12.92 ± 4.37 | 0.086 |
| PDSS total score      | 118.72 ± 21.01     | 117.08 ± 19.36 | 108.83 ± 24.62 | 0.072 |
| PDNMS                 | 12.77 ± 9.35       | 13.16 ± 9.92 | 14.79 ± 9.77 | 0.587 |
| MMSE                  | 28.13 ± 1.13       | 28.34 ± 1.87 | 27.86 ± 1.76 | 0.712 |
| HAMD                  | 10.41 ± 7.43       | 10.83 ± 8.08 | 11.46 ± 7.43 | 0.732 |
| HAMA                  | 118.72 ± 21.01     | 117.08 ± 19.36 | 108.83 ± 24.62 | 0.214 |

Education level: 0: Illiterate; 1: Primary school education; 2: Middle school education; 3: High school education; 4: College education; 5: Graduate education. PDSS: Parkinson’s Disease Sleep Scale; PDNMS: Parkinson’s Disease Non-motor Symptoms Scale; HAMD: Hamilton Depression Rating Scale; HAMA: Hamilton Anxiety Scale; MMSE: Mini Mental State Examination.

Table 3 Correlation of H&Y staging, PDSS and other variants

| H&Y   | PDSS  | PDNMS | HAMD  | HAMA  | Age  | Duration |
|-------|-------|-------|-------|-------|------|----------|
|       | r     | P     |       |       |      |          |
| H&Y   | -0.079| 0.083 |       |       |      |          |
| PDNMS | 0.032 | 0.480 |       |       |      |          |
| HAMD  | 0.025 | 0.577 |       |       |      |          |
| HAMA  | 0.086 | 0.060 |       |       |      |          |
| Age   | 0.057 | 0.214 |       |       |      |          |
| Duration | 0.046 | 0.313 |       |       |      |          |
| PDSS  | -0.528| 0.000 |       |       |      |          |
| PDNMS | -0.545| 0.000 |       |       |      |          |
| HAMD  | 0.043 | 0.349 |       |       |      |          |
| HAMA  | -0.498| 0.000 |       |       |      |          |
| Age   | 0.031 | 0.495 |       |       |      |          |
| Duration | 0.043 | 0.349 |       |       |      |          |

PDSS: Panic disorder severity scale; PDNMS: Parkinson’s Disease Non-motor Symptoms Scale; HAMD: Hamilton Depression Rating Scale; HAMA: Hamilton Anxiety Scale.

PDSS was not correlated with age, disease duration
and education status.

DISCUSSION

Sleep disturbances were firstly reported in the
original description by James Parkinson[16]. Recently,
sleep disturbances have been well-known phenomena
in patients with PD, and the PDSS has been used as
an easy and reliable instrument for measuring sleep
disturbances in PD[17]. Our results showed a tendency

- increased PDSS scores were significantly correlated with HAMA and HAMD scores, indicating a close relationship between sleep disturbances and mood and cognitive symptoms in PD.
- Age, disease duration, and education status were not significantly correlated with PDSS scores, suggesting that these factors do not significantly influence sleep quality in PD.
- No significant correlations were found between H&Y classification and PDSS scores, indicating that sleep disturbances are not significantly correlated with disease severity.

In conclusion, sleep disturbances in PD are significantly correlated with mood and cognitive symptoms, but not with age, disease duration, or education status.
of the worsening of PDSS total scores with advancing H&Y stage; however, it was not statistically significant. The results were a little different from previous studies. Tse et al. found that the mean total PDSS correlated with H&Y score\(^1\), and Chaudhuri’s results showed similar association.\(^2\) However, our PDSS total scores were as high as those of Chaudhuri’s study, which indicated impaired sleep of these non-demented patients with PD. The results showed that PD patients without dementia had nocturnal sleep and daytime somnolence problems of any stage. Dhawan et al. compared nocturnal disturbances among PD and healthy people by using the PDSS and confirmed that nocturia, nighttime cramps, dystonia and daytime somnolence were important factors for PD.\(^3\) Earlier reports had attributed daytime sleepiness to nocturnal sleep fragmentation. For daytime sleepiness, we found that excessive daytime sleep was more common in patients with advanced PD compared with patients with early/moderate disease. The results are consistent with those reported data that daytime sleepiness is prevalent in almost 50% patients with PD.\(^4\) Thus, sleep problem plagues non-demented patients with PD.

In this study, poor night sleep quality was significantly associated with severity of PD without dementia. The major problems were poor night sleep quality, difficulty in falling asleep and difficulty in staying asleep. Most sub-items of PDSS were not different at each PD stage, including nocturnal restlessness, nocturnal psychosis, nocturia, nocturnal motor symptoms and daytime somnolence except the sub-item of sleep quality. H&Y stages are classified mainly depending on those motor signs. Recently, several methods have been well developed to improve the motor symptoms of PD, including drugs, deep brain stimulation, and rehabilitation training\(^5\)\(^-\)\(^7\). The greater the improvement of motor symptoms is, the greater the amount of drugs is. However, those drugs could also lead to side effect of sleep disorders.\(^8\) Our results showed that the good control of nocturnal motor symptoms could partly explain difference of our results from previous reports.

Depression and anxiety are the most common non-motor aspects of PD, with a reported prevalence of approximately 50% and 40%, respectively. Both depression and anxiety appear to be more predictive of distress than motor disability in PD.\(^9\) Depression and anxiety contribute to disability and impaired life quality in PD. But our results found that the relationship between depression and anxiety with the severity of PD was not significantly close. In our study, depression and anxiety were significantly associated with sleep disturbance in non-demented PD patients. This result is similar to the result of Borek’s report\(^7\). The previous studies found that mood disorders were important risk factors for poor sleep quality in PD.\(^9\) Borek et al.\(^9\) found that severe depression or anxiety worsened poor sleep quality. In contrast with Menza’s report,\(^3\) their results did not agree with our results. They confirmed that depression and anxiety did not contribute significantly to all variances in sleep quality. The reason may be that these researchers used different scales to assess mood.

Patient age and duration of PD were important risk factors for sleep quality. Sleep quality deteriorated along with growing age or the protracted course of disease. Our results showed that the above two factors were not associated with sleep quality in these non-demented PD.

In summary, our study found that sleep quality deteriorated with the advancing of PD in Chinese non-demented patients with PD. Depression and anxiety may partly explain sleep disturbance in these non-demented patients with PD. These results could contribute to increasing the recognition of sleep disturbances and lead to better treatment of depression and anxiety in those non-demented patients with PD.

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