The evaluation of sleep quality, anxiety disorder and depression in older adults with Parkinson disease

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ABSTRACT

Aim: The aim of this study was to examine the prevalence ratios of sleep disorder, anxiety and depression in older adults with Parkinson disease in addition to the relationship between these complaints and the stage and duration of the disease.

Material and Method: Epworth sleepiness scale, Pittsburgh sleep quality index, Insomnia severity index, Beck depression inventory, Hamilton anxiety scale were applied on a total of 585 older adults followed up with Parkinson disease diagnosis. The acquired results were interpreted by comparing with the data of the control group comprised of 585 healthy individuals.

Results: A total of 585 older adult with Parkinson disease and 585 healthy controls were included in the study. Each group was comprised of 255 female (43.59%) and 330 male (56.41%) participants. Mean age of the Parkinson group was 68.14±7.01 years, whereas mean age of the control group was 65.08±6.43 years. Mean Hoehn Yahr scale was determined in the Parkinson group as 1.8; while mean UPDRS was 29.8. Daytime functions and subjective sleep quality were worse at a statistically significant level in the patient group according to Pittsburgh sleep quality index (p=0.014, p=0.019, respectively). The most significant difference was observed in ESS when the scale scores of the patient and control groups were compared (p<0.001). A positive and statistically significant correlation was determined between the Beck depression inventory score and unified Parkinson's disease rating scale and Hoehn Yahr scale (p=0.023, p=0.034, respectively). While depression ratio increases with increasing stages of the disease, anxiety ratios increased with increasing disease duration. A positive and statistically significant correlation was determined between the weight of the disease and the score obtained from the somatic section of HAM-A (p=0.022).

Conclusion: The presence of depression and anxiety should be questioned especially in older adult with Parkinson disease who are clinically more severe and who have been undergoing treatment for a longer period of time; patients with treatment related complications should be evaluated with regard to sleep disorders. It should be kept in mind that the Parkinson disease is not related only with motor symptoms but that an effective treatment of the non-motor symptoms will also improve the quality of life of the patients.

Keywords: Anxiety, depression, older adults, Parkinson disease, sleep disorders

INTRODUCTION

Sleep disturbances associated with Parkinson disease are common and have many negative effects on the quality of life of patients with Parkinson disease (1). Daytime sleepiness, insomnia, REM-sleep behaviour disorder, and restless-legs syndrome are the most of observed sleep disorders in people with Parkinson disease (2). In order to identify sleep disturbances, regular screening using validated questionnaires such as the Pittsburgh sleep quality index (PSQI) or the medical outcomes study sleep scale are recommended (3). In order to assess daytime sleepiness, the usage of Epworth sleepiness scale (ESS) (4), the inappropriate sleep composite score or the Stanford sleepiness scale are recommended (5).

Parkinson disease which is the second most frequently observed neurodegenerative disease in the world affects 1% of individuals above the age of 60 (6). Whereas it has a prevalence ratio of 111/100.000 in our country (7). Known as a movement disorder and characterized primarily by motor symptoms such as tremor, rigidity, bradykinesia; the non-motor symptoms of the disease which significantly reduce the quality of life of patients such as depression, anxiety disorder, daytime sleepiness and insomnia are generally ignored (8).

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As is the case in all other chronic diseases, various psychiatric problems can also be observed in Parkinson disease. Depression is the most frequently observed psychiatric problem in patients with Parkinson disease with a prevalence ranging between 17-50% (9,10). Anxiety disorders can be seen in patients with Parkinson disease at ratios of 40-82% which is higher when compared with the normal population or other chronic neurological diseases (11-15). It has been reported in previous studies that the number of depression and anxiety cases increase with increasing stage and duration of the disease (16). Various problems such as insomnia, daytime sleepiness can be observed in patients with Parkinson disease. The prevalence of insomnia is around 60-76% in patients with Parkinson disease (17,18). The correlation between depression and sleep disorder in patients with Parkinson disease has been put forth in previous studies (19). Sleep disorders can be observed due to the disease itself as well as the medications used. Daytime sleepiness is observed most frequently in this patient group from among all sleep disorders. It may be followed by insomnia, sleep quality disorder at varying ratios (17,18,20).

This study specifically focused on older adult with Parkinson disease. In the study, the ratios of depression, anxiety and sleep disorders in older patients with Parkinson disease were examined along with the relationship between these complaints and the stage and duration of the disease. So our study tries to put forth the necessity for clinicians to question these generally overlooked symptoms in older adult with Parkinson disease.

MATERIAL AND METHOD

Study Design and Participants
The study was performed by the local ethical committee of Bezmialem Vakif University, including the number of the approval document and the date of the approval (Registration number: 2011- KAEK-25 2019/01-03). All procedures were performed adhered to the ethical rules and the Helsinki Declaration of Principles.

We recruited 585 adults aged 65 and over with Parkinson disease consecutively from the Department of Neurology, Training and Research Hospital in İstanbul, Metropolitan Municipality Hospital in Izmir, from September 2019 to January 2020. The control group was comprised of patient relatives and healthy hospital staff members without any neurological and systemic disease.

The patients diagnosed with Parkinson disease by a neurology specialist according to the United Kingdom Brain Bank Parkinson Disease Diagnostic Criteria were included in the study (21). Staging of the disease was carried out via Hoehn Yahr scale (HYS), whereas the clinical weight assessment was performed via unified Parkinson's disease rating scale (UPDRS). Unified Parkinson's disease rating scale is comprised of four main sections evaluating the mental states, behaviors and psychological moods of the patients along with their daily life activities, motor functions and treatment complications. The 42 items of the test were scored between 0-4. High scores indicated bad clinical development (22). There is a Turkish inter-rater reliability study of UPDRS (23).

Hoehn-Yahr scale was used for evaluating the severity and progression of the disease (24). Brain tomography or cranial magnetic resonances were examined for all patients. Factors such as medications, poisonings, vascular reasons, hypoxia, trauma, infections, normal pressure hydrocephaly and brain tumors which may lead to secondary Parkinsonism along with Parkinson plus syndromes were excluded from the study. All participants were subject to detailed physical and neurological examination after which their histories and demographic characteristics were recorded.

Beck depression inventory developed by Beck et al. (25) was used for evaluating depression. The purpose of this test is to measure the level of depressive symptoms and higher total scores indicate the severity of the level of depression. The inventory is comprised of 21 self-report questions with a maximum score of 63. In the present study, scores of 0-9 represented=minimal depression, 10-16=mild depression, 17-29=moderate depression, 30-63=severe depression (25). It was shown by Hisli to be valid and reliable in a Turkish sample (26).

The Hamilton anxiety scale (HAM-A) developed by Hamilton is comprised of two sections that question the physical and mental effects of anxiety. Including a total of 14 questions, the test has a maximum score of 56 with scores ranging between 6-14 indicating minor anxiety; whereas scores of 15 and above indicated major anxiety. Those with scores of 6 and above from the HAM-A scale were evaluated as having anxiety (27). The Turkish validity and reliability study of HAM was conducted by Yazıcı et al. (28).

Three different tests were used for evaluating the sleep quality in patients with Parkinson disease. These were ESS, PSQI and Insomnia severity index (ISI).

Epworth sleepiness scale developed by Johns MJ (4) in 1991 was used for evaluating daytime sleepiness. The maximum score that can be obtained from this test is 24 with scores of and above indicating issues of daytime sleepiness (4). The Turkish validity and reliability study of ESS was conducted by İzci et al. (29).

The Pittsburgh sleep quality index developed by Buysse et al. (3) is a test that evaluates sleep quality and disorder during the past one month. The scale is comprised of seven sub-titles of Subjective sleep quality (K1), sleep latency (K2), sleep duration (K3), sleep efficiency (K4), sleep disturbances (K5), use of sleeping medication (K6) and daytime dysfunction (K7) with a maximum score of 21. Total PUKİ scores of above 5 indicate bad sleep quality (3). The Turkish validity and reliability of the Pittsburgh Sleep Quality Index was conducted by Ağargün et al. (30)

Insomnia severity index was developed in 2001 by Bastien et al. (31) for evaluating insomnia severity. Comprised of a total of 7 questions, the maximum score that can be obtained from the test is 28. Scores of 0-7 indicate clinically insignificant insomnia, scores of 8-14 indicate insomnia lower threshold, scores of 15-21 indicate clinical insomnia (moderate level) whereas scores of 22-28 indicate clinical insomnia (severe) (31). The Turkish validity and reliability of the Pittsburgh Sleep Quality Index was conducted by Boysan et. al. (32).

Statistical Analysis

Statistical analyses were performed using SPSS version 21.0 (SPSS Inc. Chicago, IL, USA). Shapiro-Wilk test was used for evaluating whether the variables comply with the normal distribution or not. The variables that comply with the normal distribution were presented as mean±standard deviation with the t-test used for comparisons between two independent groups. The variables that do not comply with the normal distribution were presented as median (minimum-maximum) values with the Mann-Whitney U test used for the comparisons between two independent groups. Categorical variables were presented with frequency and percentage values [n (%)] with the Pearson chi-square test, Fisher's exact chi-square test and Fisher-Freeman-Halton tests used for comparisons. Spearman correlation coefficient was used for examining the relationships between the variables. The level of significance was taken as $p < 0.05$.

RESULTS

A total of 585 older adult with Parkinson disease and 585 healthy controls were included in the study. Each group was comprised of 255 female and 330 male participants. Mean age of the Parkinson group was 68.14±7.01 years, whereas mean age of the control group was 65.08±6.43 years. Mean HYS was determined in the Parkinson group as 1.8; while mean UPDRS was 29.8. There were no statistically significant differences between the two groups with regard to age, gender, BMI, hypertension, diabetes and restless leg syndrome (RLS) prevalence. **Table 1** presents the demographic characteristics of the patient and control groups.

Table 1. Comparison of demographic characteristics of patients and control groups.

Variables	Patient, (n,%)	Control (n,%)	p
Gender			1.000
Male	330 (56.41)	330 (56.41)	-
Female	255 (43.59)	255 (43.59)	-
Age*	68.14±7.01	65.08±6.43	0.079
BMI*	29.01±5.41	27.31±3.11	0.161
Marital status			0.621
Married	30 (5.13)	15 (2.56)	-
Single	465 (79.49)	435 (74.36)	-
Widow	90 (15.38)	135 (23.08)	-
Hypertension	255 (43.59)	210 (35.89)	0.711
Diabetes mellitus	180 (30.77)	60 (10.25)	0.389
Restless leg syndrome	120 (20.51)	105 (17.95)	1.087
* Variables are given as mean±standard deviation; BMI, Body mass index			

Daytime sleepiness was observed to be high at a statistically significant level in the Parkinson group according to ESS ($p < 0.001$). While the daytime sleepiness was 53.85% in the Parkinson group; this ratio was determined as 5.12% in the control group. The ratio of those with bad sleep quality according to PSQI was 82.06% in the Parkinson group, whereas the ratio was 61.54% in the control group; however, the difference was not statistically significant (p=0.219). A statistically significant difference could not be determined between the two groups when BDI, HAM-A, ISI and PUKI were compared. **Table 2** presents the correlations for the patient and control groups.

Table 2. Comparison of patient and control groups

Variables	Patient (n,%)	Control (n,%)	p
HAM-A			0.211
None	315 (53.85)	195 (33.33)	
Minor	240 (41.03)	270 (46.15)	
Major	30 (5.12)	120 (20.52)	
BDI			0.692
Minimal	435 (74.36)	360 (61.53)	
Mild	105 (17.95)	165 (28.21)	
Moderate	45 (7.69)	60 (10.26)	
ISI			0.889
Insignificant	510 (87.17)	525 (89.74)	
Lower threshold	30 (5.13)	45 (3.33)	
Moderate	30 (5.13)	15 (2.56)	
Severe	15 (2.57)	0 (0.00)	
ESS			<0.001
Negative	270 (46.15)	555 (94.88)	
Positive	315 (53.85)	30 (5.12)	
PSQI			0.219
Good	105 (17.94)	225 (38.46)	
Poor	480 (82.06)	360 (61.54)	
HAM-A: Hamilton anxiety scale, BDI: Beck depression inventory, ISI: Insomnia severity Index, ESS: Epworth sleepiness scale, PSQI: Pittsburg sleep quality index			

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The most significant difference was observed in ESS when the scale scores of the patient and control groups were compared. While the mean ESS score for the patient group was 9; the mean score was 3 for the control group (p<0.001). The scores obtained from the 1st component of PSQI that reflects subjective sleep quality and the 7th component that reflects the daytime functions were higher at a statistically significant level in the Parkinson group compared to the control group (p=0.014, p=0.019, respectively). Interestingly, ISI score was higher in the control group (p=0.045). There were no statistically significant differences between the two groups with regard to the other variables. **Table 3** presents the comparison of the test scores for the patient and control groups.

A positive and statistically significant correlation was determined between the BDI score and UPDRS and HYS. A positive and statistically significant correlation was determined between the weight of the disease and the score obtained from the somatic section of HAM-A. This is an indication that the prevalence of anxiety increased with increasing duration of the disease. A positive and statistically significant correlation was determined between the 4th section of UPDRS including treatment complications and the 5th component of HAM-A and PSQI that includes sleep disorders. The prevalence of anxiety and sleep disorders increased with increasing complications of the disease. A negative and statistically significant correlation was determined between the 3rd component of PSQI defining sleep duration and the 1st section of UPDRS that reflects the mental state, behavior and mental state. **Table 4** presents the correlations in the patient group.

Table 3. Testing between patient and control groups comparison of scores

Variables	Patient (n)	Control (n)	p
Beck depression inventory (BDI)	90	120	0.633
Hamilton anxiety scale-psychic HAM-A(P)	30	15	0.201
Hamilton anxiety scale-somatic HAM-A(S)	45	65	0.614
Hamilton anxiety scale (HAM-A)	75	105	0.236
Insomnia Severity Index (ISI)	15	60	0.045
Epworth sleepiness scale (ESS)	135	45	<0.001
Pittsburg sleep quality index (PSQI) K1	15	0	0.013
Pittsburg sleep quality index (PSQI) K2	15	15	0.558
Pittsburg sleep quality index (PSQI) K3	35	15	0.075
Pittsburg sleep quality index (PSQI) K4	0	0	0.153
Pittsburg sleep quality index (PSQI) K5	15	15	0.880
Pittsburg sleep quality index (PSQI) K6	0	15	0.374
Pittsburg sleep quality index (PSQI) K7	15	0	0.020
Pittsburg sleep quality index Total	105	105	0.343

PSQI, Subjective sleep quality; K1, Subjective sleep quality; K2, Sleep latency; K3, Sleep duration; K4, Sleep efficiency; K5, Sleep disturbances; K6, Use of sleeping medication; K7, Daytime dysfunction

Table 4. Correlations in the patient group

Variables	HYS	Initial	UPDRS1	UPDRS2	UPDRS3	UPDRS4	UPDRS-T	p
BDI	0.004	0.720	0.470	0.181	0.599	0.209	0.051	0.120
HAM-A (P)	0.035	0.359	0.911	0.259	0.839	0.129	0.519	0.481
HAM-A (S)	0.669	0.709	0.512	0.851	0.461	0.141	0.931	0.010
HAM-A (T)	0.107	0.581	0.321	0.391	0.810	0.007	0.710	0.121
ISI	0.510	0.371	0.931	0.549	0.869	0.389	0.571	0.959
ESS	0.418	0.089	0.279	0.841	0.949	0.391	0.841	0.609
PSQI K1	0.311	0.669	0.701	0.829	0.351	0.869	0.349	0.949
PSQI K2	0.719	0.389	0.359	0.709	0.951	0.709	0.851	0.689
PSQI K3	0.279	0.349	0.029	0.741	0.571	0.249	0.899	0.851
PSQI K4	0.467	0.329	0.468	0.679	0.749	0.281	0.443	0.877
PSQI K5	0.426	0.439	0.581	0.062	0.281	0.039	0.339	0.069
PSQI K6	0.249	0.610	0.359	0.179	0.571	0.321	0.211	0.161
PSQI K7	0.631	0.589	0.131	0.331	0.161	0.731	0.599	0.861
PSQI Total	0.919	0.331	0.219	0.191	0.531	0.589	0.459	0.259

BDI, Beck depression inventory; HYS, Hoehn Yahr scale; UPDRS, Unified Parkinson's disease rating scale; HAM-A, Hamilton anxiety scale; (P), psychic; (S), Somatic; (T), Total; ISI, Insomnia severity index; ESS, Epworth sleepiness scale; PSQI, Subjective sleep quality; K1, Subjective sleep quality; K2, Sleep latency; K3, Sleep duration; K4, Sleep efficiency; K5, Sleep disturbances; K6, Use of sleeping medication; K7, Daytime dysfunction

DISCUSSION

In our study, minimal depressive symptoms were observed in 7% of the patients with Parkinson disease, mild depression in 17% and moderate depression in 3%. Severe depression was not observed in any of our patients. A positive correlation was determined in our study between the BDI score and UPDRS and HYS. These findings supported the opinion that the prevalence of depression increases with increasing severity of the diseases and were in accordance with literature. In this study, daytime sleepiness was higher at a statistically significant level in the Parkinson group. Another interesting result of our study is; while depression ratio increases with increasing stages of the disease, anxiety ratios increased with increasing disease duration.

When we make an evaluation with the results of similar studies in the literature; it was determined as a result of a study carried out on patients with Parkinson disease with 80 participants that the ratios are 41.25%, 32.5% and 87% for depression, anxiety and the coupling of depression and anxiety, respectively. The number of depression and anxiety cases increased with increasing of UPDRS severity score (16,17).

It was determined in another study that the ratio of anxiety was higher at a statistically significant level among patients with Parkinson disease compared to the control group (17). The number of anxiety cases increased with increasing severity and duration of the disease. The anxiety ratio in our study in the Parkinson group was determined as 45.73%, however no statistically significant difference could be determined with the control group. High anxiety ratio in the control group may be due to the fact that majority of the control group is comprised of healthcare employees. While a statistically significant relationship could not be determined in our study between the severity of the disease and anxiety; a statistically significant relationship was determined between the somatic part of HAM-A and disease duration. This is an indication that the somatic complaints of the patients increased with increasing disease duration. anxiety prevalence also increased in our study with the increasing of treatment complications. This can be evaluated as a non-motor symptom that develops during the course of the disease while it should also be kept in mind that it can be related with a side effect of the medications used. These results put forth the necessity of questioning anxiety during polyclinic assessment of complicated patients with Parkinson disease who have been undergoing treatment for long periods of time.

It was determined in another study carried out with 636 patients with Parkinson disease that the ratio of sleep disorder among patients with Parkinson disease was higher at a statistically significant level compared with the control group. While it was observed according to PSQI that K1, K4, K5 and K7 have been disrupted in patients with Parkinson disease; K2 has not been affected. This is an indication that sleeplessness observed among patients with Parkinson disease affects the unity and totality of sleep but does not have any impact on the start of sleep (33). It was observed in our study that the K1 and K7 scores were high at a statistically significant level in the patient group. K3 score was also determined to be high in the patient group but not at a statistically significant level. A statistically significant difference could not be determined between the K2, K4, K5, K6 scores. In conclusion, we observed in our study that the subjective sleep quality and daytime functions have been affected adversely at a statistically significant level in the Parkinson group. Even though sleep duration was disrupted in the Parkinson group, the difference was not statistically significant. A statistically significant difference could not be observed between the Parkinson and control groups with regard to sleep latency, sleep effectiveness, sleep disorder and use of medication. The acquired results were in accordance with the findings in literature. While it was observed in a study during which ESS and multiple sleep latency test (MSLT) were used for evaluating daytime sleepiness in patients with Parkinson disease that daytime sleepiness is observed in 46.3% of the patients according to ESS which is a subjective test; it was observed that the ratio decreased to 13.4% when MSLT is used which is an objective test (34). We also determined a high ratio of 53.85% in our study for daytime sleepiness according to ESS. Even though this is in accordance with literature, this may be due to the fact that an objective test was not used in our study for determining daytime sleepiness.

All components of PSQI were observed to be distinctively disrupted in patients with Parkinson disease in another study on sleep disorders. Highest score was observed in the daytime functions according to PSQI (K7=1.6). This was followed respectively by sleep disorders (K5=1.3), sleep latency (K2=1.2) and sleep quality (K1=1.2) (37). It was also determined in our study in accordance with literature findings that daytime functions (K7=1) and sleep quality (K1=1) scores were higher in the Parkinson group compared with the controls.

It was determined in our study that the ratio of insomnia is 27.5% among young patients with Parkinson disease, while this ratio was 55.2% among older adults with Parkinson disease. Insomnia, nightmares and RLS are observed less frequently in young-onset patients with Parkinson disease and they had better sleep quality (36). The mean age of the patients with Parkinson disease in our study was 68.14±7.01 years. We are of the opinion that the advanced mean age of our study group is related with the negative results related with sleep disorders and daytime sleepiness.

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Similar to the findings in literature, daytime sleepiness was observed to be higher in patients with Parkinson disease in our study. Daytime sleepiness may have developed secondary to disrupted nighttime sleep. Pain, nocturia, RLS, obstructive sleep apnea syndrome, depression can be indicated as reasons for nighttime sleep disorder. These have to be examined and treated if possible in order to prevent daytime sleepiness. Daytime sleepiness may have also developed secondary to dopaminergic treatment. Finally, daytime sleepiness may develop due to the disease itself by affecting the sleep-wake cycle (37). Medications such as L-dopa and dopamine agonist that may lead to daytime sleepiness were not classified separately in our study. Even though this can be considered as a limitation, almost all of our patients were using L-dopa, dopamine agonist or both. Taking this into consideration, we thought that such a classification will not be very meaningful.

It was reported in a study carried out on 128 patients with Parkinson disease that K2 is correlated with the first section of UPDRS that reflects the mental state, behavior and mood. Similarly, a statistically significant relationship was determined between the first part of ISI and measured insomnia. A statistically significant relationship could not be determined between any part of UPDRS and daytime sleepiness measured via ESS (38). We also determined statistically significant relationships in our study between K3 and behavior and mood, between K5 and treatment complications. A statistically significant relationship could not be determined in our study between any section of UPDRS and insomnia measured via ISI and daytime sleepiness measured via ESS. In conclusion, sleep duration decreased in our patients with worsening mental state, behavior and mood. The ratio of sleep disorders increased with increasing treatment complications. The acquired findings in our study indicate that it is necessary to consider treatment complications when evaluating the patients with Parkinson disease with regard to sleep disorders.

Disease duration was determined to be correlated with K2 and K4 in another study (39). A statistically significant relationship could not be determined in our study between the disease duration and any component of PSQI. The impact of disease duration on any of the components of sleep could not be put forth in our study.

Nocturia was among the primary reasons for sleep disorders in older patients. ISI scores were determined to be correlated with urinary problems and constipation (38). The ISI scores of the control group in our study were higher at a statistically significant level. This may be due to the fact that majority of our patients were early stage patients with Parkinson disease and also to the fact that insomnia related with motor symptoms has not yet emerged. In addition, the fact that the control group was comprised of patient relatives and hospital employees may have resulted in the high ISI scores in this group.

The fact that medication use has not been reported in our study is a limitation. Another limitation of the study is that objective tests such as polysomnography have not been carried out to put forth sleep disorders. All of our patients were either early or medium stage patients with Parkinson disease according to HYS. This may have also been effective in the fact that insomnia and daytime sleepiness related with motor symptoms have not yet developed.

CONCLUSION

The presence of depression and anxiety should be questioned especially in more severe Parkinson patients who have been undergoing treatment for longer periods of time and the patients with treatment related complications should be evaluated with regard to sleep disorders. It should be kept in mind that the Parkinson disease is not comprised only of motor symptoms and that an effective treatment of non-motor symptoms will improve the quality of life of the patients significantly.

ETHICAL DECLARATIONS

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