

Sleep Disorders in Patients with Parkinson Disease and its Correlation to Motor Symptoms Severity

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Abstract

Background: Sleep disturbances are non-motor manifestations, which occurs in up to 96% of patients with Parkinson's Disease (PD). They include insomnia, disorders of daytime somnolence, sleep-related breathing disorders, Restless Legs Syndrome (RLS) and rapid eye movement behavior disturbances. Sleep disorders have significant impact on the quality of life in Parkinson's disease patients.

Method: This was a cross-sectional descriptive study conducted at three neurology referral hospitals. The aim was to assess the frequency and pattern of sleep disturbances among patients with PD. Questionnaires were used to obtain the demographic, clinical features and evaluation of sleep disturbances using PD Sleep Scale-2 (PDSS-2). The correlation of quality of sleep with the duration of the disease and severity of motor symptoms was assessed using Hoehn and Yahr staging. SPSS version 25 was the tool used for analysis-p value <0.05.

Results: 71 patients with confirmed PD were studied. Males represented 70.4% and the mean age was 64.66 ± 9.6 years. 38% had significant nocturnal sleep disturbances (PDSS-2 ≥ 18). The most common sleep disorders were nocturia 72%(51), sleep maintenance insomnia 46% (38), sleep refreshment 46%(34), waking up due to pain in arms or legs 45%(32) and (21%) 15 had nocturnal hallucinations. Poor sleepers exhibited longer disease duration but revealed no association with PD severity.

Conclusion: In 71 patients with Parkinson's disease, one-third had significant sleep disturbances. PDSS-2 score was positively correlated to prolonged duration but not motor symptoms' severity.

Keywords: Parkinson patients; Sleep disorders; Insomnia; Rapid eye movement sleep disorders; Restless leg syndrome

Introduction

Parkinson's disease is a chronic, progressive and disabling disorder characterized by both motor and non-motor symptoms. Millions of people worldwide are affected by this disease, the second most prevalent neurodegenerative condition next to Alzheimer's disease [1].

The English physician James Parkinson first defined Parkinson's disease in his 1817 monograph "An Essay on the Shaking Palsy." Parkinson described several people who displayed resting tremors, shuffling gait, stooped posture, sleep problems and constipation [2].

The four cardinal motor symptoms of Parkinson's disease are tremor, rigidity, bradykinesia and postural instability; the secondary motor symptoms include diminished arm swing, decreased blink rate, masked faces (hypomimia), decreased voice volume (hypophonia) and

difficulty turning over in bed. The non-motor symptoms of Parkinson's disease are: neuropsychiatric, cognitive, dysautonomia and sleep disorders which include insomnia, somnolence, excessive daytime sleepiness, restless legs syndrome, sleep attacks, periodic limb movements of sleep and Rapid Eye Movement (REM) sleep behavior disorder [3]. Sleep disturbances occur in up to 96% of patients with Parkinson's disease and appear to arise from a combination of neurochemical and neurodegenerative changes in central sleep regulatory centers such as the forebrain, thalamus and midbrain dopamine neurons [4]. In addition, many drugs used in the treatment of PD can affect sleep. For example, selegiline-metabolized to methamphetamine and amphetamine-may cause insomnia [5].

The range of sleep disturbances in PD comprises the full spectrum of sleep disorder categories outlined in the International Classification

of Sleep Disorders 3rd edition (ICSD-3). The categories of sleep disturbances apparent in patients with PD thus comprise insomnia, disorders of daytime somnolence, sleep-related breathing disorders, circadian disorders and sleep-related movement disorders, namely Restless Legs Syndrome (RLS) and parasomnias [6].

Materials and Methods

The study was an observational, cross sectional; hospital-based study. It was conducted from January to October 2022 at outpatient's clinic in three specialized neurology centers in the National Center for Neurosciences (NCNS), Bashayir teaching hospital and medani teaching hospital. Ethical approval was obtained from the Ethical Committee at the Research Unit- Educational Development Center (EDC), Sudan Medical Specialization Board (SMSB) and acceptance from the council of MD Clinical Neurology-SMSB and verbal informed consent from the patients. A total of 70 patients were enrolled in the study. The inclusion criteria were, patients with idiopathic Parkinson disease and age more than 18. Patients documented to have atypical parkinsonism, severely ill or have poor communication were excluded. Data was collected using pre-designed questionnaires were filled by the investigator (with history points taken from the patient through a personal interview and thorough neurological examination performed) including, evaluation of demographic and clinical characteristics, duration of the disease, medication history, motor status assessment using Hoehn and Yahr stage (H&Y stage) and nocturnal sleep impairment using PDSS-2 (Arabic version). Data was analyzed by computer using descriptive statistics mean and Standard Deviation (SD) for age, frequency table's and charts using Statistical Package for Social Sciences (SPSS) software version 25. With reference of P-value of less than 0.05 and CL 95% to be consider as significant.

The quantitative variables described using the mean ± standard

deviation, while qualitative ones described by frequency and percent. To test the relation between variables, chi-square or fisher exact is used for qualitative data, while spearman used for quantitative variables.

Results

Among 71 patients with Parkinson Disease (PD) males represented (50, 70.4%) and females (21, 29.6%). The age of the patients ranged between 37-90 years with mean of (64.66 ± 9.6) years. 56.7% (38) had PD for less than 5 years, while 40.3% (27) had the disease between 5 to 10 years and only 3% more than 10 years. The severity of motor status patients in H&Y stage were 1,2,3,4 and 5 were 22.5%, 38%, 25.4%, 11.3% and 2.8%, respectively. Most patients were in early stages 60.6% and late stages represent 39.0%. The severity of sleep disturbance in patients with PD was classified based on the cutoff value of 18 for the PDSS-2, with the good sleeper (0–17) and poor sleeper (18–60). Majority of our patients 58.8% self-reporting not sleeping well, however (27, 38%) were classified as poor sleepers (PDSS-2=18–60) with the mean score of PDSS-2 of 13.76. The most commonly occurrence sleep disorders are nocturia 51(72%) followed by sleep maintenance insomnia 33(46%) and sleep refreshment 33(46%), pain in arms and legs 45%, sleep onset insomnia 42% and difficulty in turning in bed 41%.the least occurrence is nocturnal hallucination 15(21%). Correlation analysis demonstrated that poor sleepers exhibited longer disease durations, the P-value (0.013). Also a positive correlation with age, P-value of (.044) was noted. But failed to prove association with sex the P-value (0.994) or higher PD severity, the P- value (.239). Table 1 shows correlation between PD duration and PDSS-2 outcome in 71 patients with Parkinson's disease, Sudan 2022. Table 2 Cross table of severity of the disease (Hoehn and Yahr staging) and PDSS-2 outcome.

Category			Sleeping		
			Good sleeper	Poor sleeper	Total
Duration	Less than 5 years	Count	29	9	38
		% within sleeping	69.00%	36.00%	56.70%
	5 to 10 years	Count	12	15	27
		% within sleeping	28.60%	60.00%	40.30%
	More than 10 years	Count	1	1	2
		% within sleeping	2.40%	4.00%	3.00%
Total		Count	42	25	67
		% within sleeping	100.00%	100.00%	100.00%

Table 1: PD duration and PDSS-2 outcome in 71 patients with Parkinson's disease, Sudan 2022.

Category			Final outcome		
			Good sleeper	Poor sleeper	Total
Stages	Early stages	Count	29	14	43
		% within final outcome	65.90%	51.90%	60.60%
	Late Stages	Count	15	13	28
		% within final outcome	34.10%	48.10%	39.40%
Total		Count	44	27	71
		% within sleeping	100.00%	100.00%	100.00%

Table 2: Cross table of severity of the disease (Hoehn and Yahr staging) and PDSS-2 outcome.

Discussion

Seventy-one patients with PD were evaluated to identify the frequency and pattern of sleep disturbances among Sudanese patients with Parkinson's disease. More than one-third (38%) had significant sleep disturbance (PDSS-2) with a cut-off point of 18. This finding goes with previous studies done in DO-Porto for assessing the association of sleep and central parkinsonian pain, which reported that (33%) of patients with PD have significant ND using PDSS-2 with cut-off 18 [7]. They stated that these patients with sleep disturbances have more severe motor symptoms, motor fluctuation, more frequent pain and lower functional independence. On the other hand, the Ethiopian study in 2019 showed that 43.9% of PD patients had significant nocturnal disturbances using the same cut-off point [8]. In contrast, the Taiwanese study in 2019 (15) revealed that 47.8% were poor sleepers (PDSS-2=15-60). This result is higher than our study, which can be explained by usage of the lower cut off value. In contrast, the Desai I, Gupta R, study done during the Covid epidemic showed that 72% had poor sleep quality (PDSS-2 \geq 15) [9]. They attributed the high prevalence to the effect of the Covid-19 epidemic.

The most reported sleep disorder in our study was nocturia (72%); sleep maintenance insomnia (46%), sleep refreshment (46%), pain in arms and legs (45%), sleep onset insomnia (42%) and difficulty in turning in bed (41%). Less than one fifth had nocturnal hallucination (21%). While an Ethiopian study reported that the most frequent sleep problems were nocturia (73.5%), difficulty with mobility in bed (37.4%), distressing dreams (36.1%) and sleep maintenance insomnia (34.8%) [8].

There was no significant correlation of sleep disturbances with the severity of motor status (P 0.239). A significant correlation of severity of sleep disturbance with the duration of the disease was found (P 0.013).

This goes with a study done in Norway. While a Chinese study showed; higher PDSS-2 scores were associated with longer disease duration and higher H and Y stage [10].

The Taiwanese study showed poor sleepers to have longer disease durations, higher Levodopa Equivalent Daily doses (LEDs), higher PD severity, more depression and anxiety symptoms, poorer QoL and more frequent unemployed status [11]. Zhang Y, et al. study supported the previous two studies stating that sleep disorders were associated with longer disease duration and higher modified H and Y stage [12].

Conclusion

One-third of Parkinson's patients had significant sleep disturbances and a significant correlation of higher PDSS-2 with age and disease

duration. However, it found no association with the severity of the motor symptoms. In conclusion, this cross-sectional study of 71 confirmed Parkinson's Disease (PD) patients revealed a high prevalence of sleep disturbances, affecting 38% of participants. The most common issues included nocturia, sleep maintenance insomnia, sleep refreshment difficulties, waking up due to pain in limbs and nocturnal hallucinations. Males comprised the majority (70.4%), with a mean age of 64.66 ± 9.6 years. While poor sleepers exhibited longer disease duration, no significant association was found between sleep quality and PD severity. These findings underscore the considerable impact of sleep disturbances on the quality of life for individuals with PD. As sleep-related issues are prevalent non-motor manifestations, early recognition and targeted interventions could potentially enhance overall well-being in PD patients. Further research may explore the intricate relationship between sleep patterns, disease progression and therapeutic strategies to improve sleep quality in this population.

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