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# No increased risk of obstructive sleep apnea in Parkinson's disease

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## Abstract

Pulmonary function abnormalities in Parkinson's disease (PD) might predispose patients to obstructive sleep apnea (OSA) and daytime sleepiness. Fifty-five idiopathic PD patients (mean age = 63.9) underwent three consecutive nights of in-laboratory polysomnography on their usual dopaminergic medications. Sleep apnea severity was compared to published, normative, population-based data from the Sleep Heart Health Study. Demographic and clinical data were compared in patients with and without OSA. The apnea-hyponea index (AHI) was stable across nights in PD patients, and was not different between PD patients and normative controls. Epworth Sleepiness Scale scores, Body Mass Index, and snoring did not correlate with AHI. Severity of OSA is stable across multiple nights in PD patients. Rates of OSA in PD are similar to those seen in the general population. Daytime sleepiness, snoring, and obesity may not be helpful in identifying OSA in PD.

### Keywords

Parkinson's Disease; Obstructive Sleep Apnea; Excessive Daytime Sleepiness

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## INTRODUCTION

Parkinson's disease (PD) predisposes patients to airway and lung function abnormalities that could increase risk for obstructive sleep apnea (OSA). Upper airway obstruction measured by spirometry occurs in 24–65% of PD patients[1–3], and may be documented even in patients without respiratory symptoms[4]. This upper airway obstruction may occur as rhythmic oscillation with a 4–8 Hz rate or may occur irregularly as complete occlusion[4]. Complete occlusions are thought to be due to rigidity and hypokinesia affecting the upper airway[4]. Restrictive lung disease is also present in PD[2], and is hypothesized to be due to chest wall rigidity resulting in decreased compliance[4], autonomic dysfunction[2], or a side effect of pleuropulmonary-toxic medications (i.e. ergot-derived dopamine agonists)[2]. In those patients in whom kyphoscoliosis develops, lung volumes may be reduced[4]. We hypothesized that these pulmonary abnormalities would predispose PD patients to a higher frequency of OSA. Additionally, the early involvement of the autonomic nervous system in PD[5] could predispose patients to OSA. We evaluated whether patients with PD are more likely to have OSA than controls.

Apart from these pathophysiologic considerations, identification of OSA in PD may be important clinically as a cause of potentially treatable symptoms. For example, daytime sleepiness has been identified as a major problem in the day-to-day lives of PD patients[6]. Further, daytime sleepiness may be a prognostic indicator for incident PD[7], and is thought to reflect both disease and medication effects[6, 8]. An additional goal of the current work thus was to examine the association between reported sleepiness and OSA in a PD population.

## METHODS

### Subjects

Subjects were fifty-five individuals (mean age = 63.9; SD = 9.1; 45.4% ≥ age 65) with idiopathic PD diagnosed by a neurologist specializing in movement disorders. A convenience sample of subjects was recruited from the movement disorders clinic of our academic medical center regardless of the presence or absence of daytime sleepiness or any sleep symptoms. There were 37 men and 18 women. The mean (SD) duration since PD diagnosis was 5.8 (4.4) years. Mean daily dose of dopamine agonists, measured as pergolide equivalents, was 2.1 (1.7) mg. Mean levodopa daily dosage was 331 (400) mg. Mean body mass index (BMI, $kg/m^2$) was 26.8 (8.8); twenty percent had BMI > 30.

### Procedures

The study protocol was approved by our Institutional Review Board, and all subjects gave written informed consent before participating. Subjects were studied with in-laboratory polysomnography for three consecutive nights while taking their usual medications. Sleep staging followed conventional criteria. Apneas were scored regardless of the presence or absence of oxygen desaturation or arousal, but hypopneas were only scored if accompanied by at least a 4% oxygen desaturation from baseline[9]. Apnea-hypopnea index (AHI) was computed as apneas plus hypopneas per hour of sleep time. OSA of moderate or greater severity was defined by an AHI ≥ 15. Demographic information including gender, height, and weight was collected on all patients. Each completed a questionnaire which included an Epworth Sleepiness Scale (ESS)[10], questions about their typical night of sleep (sleep duration, number of awakenings per night, sleep latency, presence of vivid dreams, presence of nightmares, trouble falling asleep, trouble staying asleep, early morning awakenings, snoring, and nocturia), and questions about daytime symptoms related to sleep (hours spent napping, presence of restless legs syndrome symptoms).

Internight reliabilities were calculated between nights 1, 2, and 3 using Spearman correlations and night-to-night differences were tested using Wilcoxon signed-rank tests. To compare rates of OSA in our patients to normative data, we employed previously published results from the very large (n=6132), population-based Sleep Heart Health Study (SHHS), the overall cohort of which had a mean age 62.9 (SD 11.0)[9, 11]. This population consisted of middle-aged and older adults sampled from throughout the United States who were of comparable age and gender distribution to our PD population (47 vs. 45% above age 65, 47 vs. 67% male). Subjects were grouped by AHI severity ranges of < 1.5, 1.5–4.9, 5–14.9, 15–29.9, and ≥ 30 and PD patients were compared to normative controls using Chi-square. Relationships between AHI above or below 15/hr and demographic and clinical data were evaluated with t-test.

## RESULTS

Mean (SD) AHIs for Nights 1, 2, and 3 were 6.3 (9.4), 8.0 (10.6), and 6.9 (9.2) respectively. Spearman correlation showed high correlation across the three nights, with correlation coefficients of 0.76 for nights 1 and 2, 0.60 for nights 1 and 3, and 0.76 for nights 2 and 3, all $p < 0.0001$. Pairwise comparisons of AHI between nights were all non-significant. Because of the relative stability of these measures across nights, 3-night data were averaged for all subsequent analyses. Table 1 summarizes comparisons between data from our patients and published normative data (SHHS) on breathing disturbance in sleep. These data clearly indicate that our PD patients had no more sleep apnea than the control population ($p = 0.53$ when using a single cut point of AHI = 15 to define the presence of apnea, $p = 0.87$ when stratifying AHI into five severity categories, as in Table 1).

Patients with an AHI ≥ 15 were more likely to be male ($p = 0.03$) and to have a shorter duration of PD diagnosis ($p = 0.048$). Those with AHI ≥ 15 had a non-significant trend toward being older ($p = 0.10$). BMI, ESS, levodopa daily dosage, dopamine agonist daily dosage, and other surveyed clinical features did not predict AHI.

## DISCUSSION

Given the known upper airway and lung function abnormalities in PD, we expected an increased frequency of OSA relative to a control population, but our PD patients had similar rates of OSA to those seen in SHHS. A few previous polysomnographic studies of PD patients have reported on OSA, and these found rates of OSA of at least moderate severity (AHI > 15) of 20–27%[12–16]; using an AHI of greater than 10, another study found a higher prevalence of 56% in PD[17]. These rates are somewhat higher than what we saw here, but some of these studies may have used patients who were selected because of excessive daytime sleepiness or who were referred for polysomnography for clinical purposes, so some bias might exist to overestimate the prevalence of OSA in PD. In a study using hospitalized patients without PD as controls, Cochen de Cock and colleagues actually found a lower rate of OSA in PD than in controls, with 21% of PD patients showing moderate or severe OSA[14]. Taken together, these results suggest that OSA is unlikely to be more common in PD than in the general population. Our reporting of 165 total nights of sleep in 55 patients makes this one of the largest series to date to investigate OSA in PD. Further, the use of multiple nights within patients shows that sleep apnea severity is stable from night to night in this patient population.

Of the clinical and demographic features measured in our population, only male gender and shorter duration of PD were associated with sleep apnea. Factors commonly used to screen patients for potential sleep apnea prior to a diagnostic study, such as snoring, daytime sleepiness, and elevated BMI, were not predictive of sleep apnea in these PD patients. The

absence of a relationship between ESS and OSA in our patients is particulary noteworthy. The frequent presence of daytime sleepiness in PD, whether a component of the disease itself or the medications used to treat it[12], could weaken sleepiness as a relevant predictor of OSA in this population.

One limitation of our study is that we employed previously published data on normative levels of sleep apnea, rather than controls established within our laboratory. Although the latter are sometimes preferred, the population-based, age-comparable data on sleep apnea prevalence established by the SHHS, which encompasses a wide range of socioeconomic subpopulations from different geographic regions of the United States, may actually provide enhanced generalizability of the data on sleep apnea across a wide range of participants that could not be available at any single site. Our data do not argue against the fact that some patients with idiopathic PD or other parkinsonian conditions[18] may develop OSA and may benefit from treatment, but they do suggest that for idiopathic PD patients as a group, OSA does not represent a condition with higher than expected prevalence relative to a population of comparable demographics.

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## Table 1

Frequency of sleep apnea of varying severity in PD patients and controls

| | AHI < 1.5 | AHI 1.5–4.9 | AHI 5–14.9 | AHI 15–29.9 | AHI ≥ 30 |
|---|---|---|---|---|---|
| PD patients | 18 (32.7%) | 13 (23.6%) | 16 (29.1%) | 6 (10.9%) | 2 (3.6%) |
| SHHS controls | 1691 (27.6%) | 1598 (26.1%) | 1751 (28.6%) | 719 (11.7%) | 373 (6.1%) |

$p = 0.87$

Data represent the total number of subjects in each category of AHI severity, followed by percentage of total number of subjects within the group (patients or controls). Data for controls from[9].