Excessive Daytime Sleepiness and Nighttime Sleep Quality in Thai Patients with Parkinson's Disease

Suwanna Setthawatcharawanich MD*, Kitti Limapichat MD*,
Pornchai Sathirapanya MD*, Kanitpong Phabphal MD*

** Division of Neurology, Department of Medicine, Songklanagarind Hospital, Faculty of Medicine, Prince of Songkla University, Hat Yai, Songkhla, Thailand*

Objective: *To study the prevalence of excessive daytime sleepiness (EDS) and nighttime sleep quality (NSQ) in Thai patients with Parkinson's disease (PD) and compare their sleep characteristics with controls.*
Material and Method: *The Epworth Sleep Scale (ESS), the Pittsburgh Sleep Quality Index (PSQI) and questions about sudden onset of sleep (SOS) were applied in a study of 73 PD patients without dementia to that of healthy controls.*
Results: *There were 36 females and 37 males with a mean (SD) age of 65.9 (9.1) years. All patients had a mean Hoehn and Yahr stage of 2.0 (range 0 to 4). EDS and poor NSQ were found in 15.1% and 37% of patients, respectively. There was a significant difference in the mean PSQI total scores (p = 0.003) between patients and controls. The subset analysis of the components of PSQI revealed that sleep disturbance and the need of medication to sleep had significantly higher scores than those of controls. Twenty point five percent of patients had experienced SOS occurring during driving, meals, and working. Four point one percent of patient with SOS had had an accident.*
Conclusion: *This study demonstrated a prevalence of EDS and poor NSQ in Thai patients with PD. Screening for these two problems among PD patients should be considered in routine practice evaluations.*

Keywords: *Excessive daytime sleepiness, Nighttime sleep quality, Parkinson's disease*

J Med Assoc Thai 2014; 97 (10): 1022-7
Full text. e-Journal: *http://www.jmatonline.com*

Sleep disorder is common non-motor complications in advanced Parkinson's disease (PD) involving both daytime and nighttime. The most common daytime sleep problems is excessive daytime sleepiness (EDS) occurring in 15% to 50% of patients[1]. PD patients with EDS may experience 'Sudden onset of sleep (SOS)' or a 'sleep attack' (sudden, irresistible sleep) leading to dangerous situations such as motor vehicle accidents[2,3]. In the same way, nocturnal awakening (sleep fragmentation) is the most common nighttime sleep problem occurring in 22% to 66% of patients[4,5]. Such patients may report frequent awakenings during the night and difficulty falling back to sleep. These can result in a reduction of total sleep time with subsequent daytime fatigue and sleepiness[6]. Both EDS and sleep fragmentation not only worsen motor symptoms but also affect the quality of life of both patients and caregivers[7,8]. However, it is underrecognized and undertreated. Tanasavimon et al[9], found that 76% of PD patients had at least one sleep problem detected by the modified Parkinson's disease sleep scale, while only 58% of patients had self-reported sleep problems. This study aimed to evaluate the prevalence of EDS and nighttime sleep quality (NSQ) in Thai patients with PD and compare their sleep characteristics with controls.

Correspondence to:
Setthawatcharawanich S, Division of Neurology, Department of Medicine, Songklanagarind Hospital, Faculty of Medicine, Prince of Songkla University, Hat Yai, Songkla 90110, Thailand.
Phone: 074-451-482, Fax: 074-429-385
E-mail: ssuwanna@medicine.psu.ac.th

Material and Method

Patients with PD from the Outpatient Neurological Clinic at Songklanagarind Hospital were recruited between March 2009 and May 2010. Parkinson's disease was diagnosed according to The United Kingdom Parkinson's Disease Society Brain Bank clinical criteria for the diagnosis of probable Parkinson's disease[10,11]. Eligible criteria were PD patients who had no dementia (defined by a Thai Mental State Examination score of 24 or greater[12]) and able to understand Thai. Patients with atypical Parkinsonism disorder, other diseases of the central nervous system, and systemic diseases (e.g. neoplasm, chronic obstructive pulmonary disease, and organ failure) that can affect sleepiness were excluded. The authors selected a group of age- and sex-matched healthy controls that did not have any diseases and

did not take sedative medications. The spouses or caregivers of the patients were excluded.

All participants independently completed the following questionnaires. 1) Epworth Sleepiness Scale (ESS)[13] evaluating the chance of falling asleep in eight different situations during the day (while sitting and reading, while watching TV, while sitting inactively in a public place, while as a passenger in a car for an hour without a break, while lying down to rest in the afternoon when circumstances permit, while sitting and talking to someone, while sitting quietly after lunch without alcohol, and in a car, while stopping for a few minutes in traffic). 2) Three questions about sudden onset of sleep (Have you experienced an event of suddenly or unpredictably falling asleep without warning during driving, meal and working? Have you experienced sudden onset of sleep causing an accident? What were the consequences of the accident?). 3) The Pittsburg Sleep Quality Index (PSQI)[14] evaluating several aspects of nighttime sleep. 4) Thai Geriatric Depression Scale (TGDS)[15].

The demographic data such as age, sex, disease duration, the Hoehn & Yahr staging of PD[16] (range from 0 = no sign of disease to 5 = wheelchair bound), the Unified Parkinson's Disease Rating Scale (UPDRS) part II (symptoms), III (motor examination), Schwab and England scale of activity of daily living, current medications including anti-Parkinson and sedative drugs were recorded.

All data were analyzed using the percentage test, Students t-test, and Mann-Whitney U test to assess the differences between patients and controls. The Pearson Correlation Coefficients were used to evaluate relations between the variables. The ESS scores ranged from 0 to 3 for each situation; thus, yielding a maximum total score of 24. A score greater than 10 was indicative of EDS[17]. The items from PSQI questionnaire were grouped into seven components including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, need of medication to sleep, and daytime dysfunction due to sleepiness. Each component's score was recalculated and recorded in a range of 0 to 3 points. Thus, the total score had a range of 0 to 21, 0 = no difficulty and 21 = severe difficulties in all areas. A total PSQI score greater than 5 was defined as a poor sleeper or poor NSQ[14]. In the same way, a TGDS score of 12 or greater was indicative of depression.

The present study was approved by the Ethics Committee of the Faculty of Medicine, Prince of Songkla University and a written informed consent was obtained from each participant. Descriptive statistics in term of frequency and percentage, mean, standard deviation (SD), and range were used to report the results. All data analyses were performed with SPSS for Windows (Version 11.5); statistical significance was defined as $p<0.05$.

Results

Seventy-three patients with PD including 36 females (49.3%) 37 males (50.7%) participated in the study. Their demographic data were displayed in Table 1. The mean (SD) age was 65.9 (9.1) years, the mean (SD) of disease duration was 5.4 (4.3) years, and the mean (range) Hoehn & Yahr stage was 2.0 (range 0 to 4). Additionally, the mean (SD) UPDRS II, III, and Schwab and England scale of activity of daily living were 10.4 (5.1) and 15.1 (8.2), 88.4% (9.9), respectively. Ninety-five point nine percent of patients were taking levodopa and 38.4% of these were receiving dopamine agonists. The mean (range) daily dose of levodopa was 513.7 (0 to 1,400) mg. The proportion of patients using nighttime sleep medications was 32.9% and depression was found in 34.2% of the patients. The study found that 15.1% and 37% of patients had EDS and poor NSQ, respectively. Eighteen point five percent of patients with poor NSQ had EDS, and, vice versa, 45.5% of patients with EDS had poor NSQ. There was no significant correlation between the scores of both ESS and PSQI and age, sex, duration of disease, UPDRS II, III, Schwab and England scale

Table 1. Baseline characteristics of patients with Parkinson's disease

Characteristics	Patients (n = 73)
Sex: male (%)	37 (50.7)
Age: mean (SD), years	65.9 (9.1)
Disease duration: mean (SD), years	5.4 (4.3)
Hoehm and Yahr stage: mean (range)	2.0 (0 to 4)
UPDRS II: mean (SD)	10.4 (5.1)
UPDRS III: mean (SD)	15.1 (8.2)
Schwab and England scale of activity of daily living: mean (SD), %	88.4 (9.9)
Levodopa use: number (%)	70 (95.9)
Levodopa dose: mean (range), mg	513.7 (0 to 1,400)
Dopamine agonist use: number (%)	28 (38.4)
Nighttime sleep medication: number (%)	24 (32.9)

UPDRS = unified Parkinson's disease rating scale

of activity of daily living, Hoehn & Yahr staging, levodopa dose, motor fluctuation, and depression score. However, a significant association between using nighttime sleep medication and poor NSQ (p = 0.03) was detected, but there was no significant association between using nighttime sleep medication and EDS. Additionally, patients using nighttime sleep medication had a significantly higher mean PSQI total scores than those not using medication [9.9 (2.7) vs. 3.3 (1.10, p = 0.00].

Compared with controls, there were no significant difference in the number of EDS, poor NSQ and score of ESS. However, a significant difference in mean PSQI total scores (p = 0.003) between patients and controls was observed. The subset analysis of the components of PSQI revealed that two out of its seven components including sleep disturbance and the need of medication to sleep had significantly higher scores than those of controls (Table 2). Twenty point five percent of patients had experienced SOS, 4.1%, 1.4%, and 15.1% of which occurred during driving, meals, and working, respectively. Furthermore, 4.1% of patients with SOS had experienced accidents (without need of hospitalization). The mean (SD) score of ESS of patients with SOS tended to be greater than of those without SOS [8.5 (5.6) vs. 6.0 (4.2), p = 0.05].

Discussion

The present study demonstrated EDS and poor NSQ occurring in 15.1% and 37% of patients with PD, respectively, findings that were comparable to those of previous studies[5,9,18,19]. In PD patients, there are several factors associated with EDS including dopamine agonists, levodopa, total load of dopaminergic drugs, severity of PD, and duration of dopaminergic therapy[6]. In the same way, factors related with nighttime sleep disturbance are depression, total load of dopaminergic drugs, better cognition, disease severity, rigidity, bradykinesia, more motor fluctuation, and periodic limb movements during sleep[1,6,19]. No associations were found between these factors and both EDS and poor NSQ in the authors' series, which might be due to the small sample size. Furthermore, the present study found no significant difference in the prevalence of EDS and poor NSQ between patients with PD and controls. This meant that healthy elderly adults might have sleep problems related to age or may have comorbidities disturbing

Table 2. Assessment of daytime sleepiness and nighttime sleep quality in patients with Parkinson's disease

Types of assessment	Patients (n = 73)	Controls (n = 73)
Daytime sleepiness assessment		
EDS (ESS score >10): number (%)	11 (15.1)	15 (20.5)
ESS score: mean (SD)	6.6 (4.7)	7.1 (4.8)
ESS situation score: mean (SD)		
While sitting and reading	0.9 (1.1)	1.2 (1.0)
While watching TV	1.2 (1.1)	1.4 (1.0)
While sitting inactive in a public place	0.8 (1.0)	0.7 (0.9)
While as a passenger in a car for an hour without a break	1.0 (1.2)	1.0 (0.9)
While lying down to rest in the afternoon when circumstance permit	1.5 (1.1)	1.6 (1.1)
While sitting and talking to someone	0.2 (0.6)	0.2 (0.5)
While sitting quietly after lunch without alcohol	1.0 (1.0)	0.9 (0.9)
In a car, while stopped for a few minutes in traffic	0.2 (0.5)	0.2 (0.7)
Nighttime sleep quality assessment		
Poor sleep quality: number (%)	27 (37.0)	18 (24.7)
PSQI: mean (SD)	5.5 (3.3)*	4.1 (2.3)
PSQI component score: mean (SD)		
Overall sleep quality	0.6 (0.8)	0.7 (0.6)
Sleep latency	1.4 (1.1)	1.2 (0.9)
Duration of sleep	0.7 (1.0)	0.6 (0.9)
Sleep efficiency	0.2 (0.6)	0.1 (0.5)
Sleep disturbance	1.6 (0.7)$^{+}$	0.0 (0.5)
Need medication to sleep	0.3 (0.8)$^{\#}$	0.1 (0.3)
Day dysfunction due to sleepiness	0.6 (0.7)	0.4 (0.6)

EDS = excessive daytime sleepiness; ESS = Epworth sleepiness scale; PSQI = the Pittsburg sleep quality index
* p = 0.003; $^{+}$ p = 0.000; $^{\#}$ p = 0.02

sleep[20]. In a community-based survey in Thailand, 46.3% of people over 60 years of age were found to have insomnia[21]. Depression and poor perceived health were factors associated with insomnia. However, the prevalence of insomnia was very low in healthy older adults after adjustments for comorbidities[22-24]. These inferred that sleep problems are associated with comorbidities rather than age per se.

One of the major concerns about EDS is SOS or sleep attack, which can lead to dangerous situations. The present study found that 20.5% of patients had experienced SOS during driving, meals, and working, leading to minor trauma. Those with SOS had higher scores of ESS than those without SOS. Tan et al[18], reported that 13.9% of PD patients had SOS and median scores of ESS higher than those without SOS [11.0 (range 4-22) vs. 4.0 (range 0-15)]. Meindorfner et al[3], reported that 8% of PD with a driving license had experienced SOS and 28% of these had accidents. The risk factors of accident were high ESS scores, SOS while driving and moderate motor symptoms of PD. Screening for EDS among PD patients needs to be included in routine practice evaluations. Patients with high ESS scores should be educated on recognizing the alarming symptoms, taking precaution in high-risk workplaces and the importance of never driving when sleepy.

The present study reported that 32.9% of patients used sleep medications and 18.5% of patients with poor NSQ had EDS. Additionally, patients using nighttime sleep medication had high scores of the mean PSQI totals. This implied that even with sleep medication to relieve the symptoms, it was still insufficient to maintain good quality of sleep and emphasized the need of more efficacious intervention. Poor sleep is associated with poor physical function and increased risk of falling in older adults[25]. PD is a disorder that commonly leads to recurrent falls[26]. Since patients with PD and poor NSQ carry a greater risk of falling, proper evaluation of PD features, recognition of sleep disturbances and treatment strategies are important to reduce falls among them.

Uncertainty associated with self-rating reports was a limitation in this study. However, the authors instructed the patients to average their scores for individual question over the previous month, which tended to reduce conflicting answers. Additionally, the study was conducted by using a screening questionnaire assessing both daytime and nighttime sleep problems and was not assessed with the gold standard measure, namely polysomnography. However, questionnaire is the most popular tool for population surveys of sleep problems in the context that it is easy to administer, practical and a less expensive tool. Finally, the results of the present study were not representative of the entire range of PD patients because the study excluded PD patients with dementia who could not finish the test satisfactorily.

In conclusion, the present study demonstrated the prevalence of EDS and poor NSQ in Thai patients with PD. While EDS had a greater risk of SOS leading to dangerous events, poor NSQ was associated with a greater risk of falling. The authors suggest paying more attention to identifying patients at risk with the above-mentioned dangers in daily patient care practice as well as developing preventive and therapeutic strategies for such patients.

What is already known on this topic?

Excessive daytime sleepiness (EDS) and nocturnal awakening are two most common sleep disturbances in advanced Parkinson's disease. EDS is associated with the risk of sudden onset of sleep leading to dangerous situations such as vehicle accident. Nocturnal awakening results in reduction of total sleep time with subsequent daytime fatigue and sleepiness leading to a greater risk of falling. Both EDS and nocturnal awakening affect quality of life of both patients and caregivers.

What this study adds?

EDS and poor nighttime sleep was found in early Parkinson's disease. Screening for these two problems among PD patients from an early-stage of the disease should be considered as part of the routine practice evaluation.

Acknowledgement

This study was supported by the faculty of Medicine Research Foundation, Prince of Songkla University (Project code 49/372-056).

Potential conflicts of interest

None.

References

1. Thorpy MJ, Adler CH. Parkinson's disease and sleep. Neurol Clin 2005; 23: 1187-208.
2. Hobson DE, Lang AE, Martin WR, Razmy A, Rivest J, Fleming J. Excessive daytime sleepiness and sudden-onset sleep in Parkinson disease: a survey by the Canadian Movement Disorders

Group. JAMA 2002; 287: 455-63.
3. Meindorfner C, Korner Y, Moller JC, Stiasny-Kolster K, Oertel WH, Kruger HP. Driving in Parkinson's disease: mobility, accidents, and sudden onset of sleep at the wheel. Mov Disord 2005; 20: 832-42.
4. Tandberg E, Larsen JP, Karlsen K. A community-based study of sleep disorders in patients with Parkinson's disease. Mov Disord 1998; 13: 895-9.
5. Porter B, Macfarlane R, Walker R. The frequency and nature of sleep disorders in a community-based population of patients with Parkinson's disease. Eur J Neurol 2008; 15: 50-4.
6. Comella CL. Sleep disorders in Parkinson's disease: an overview. Mov Disord 2007; 22 (Suppl 17): S367-73.
7. Happe S, Berger K. The association between caregiver burden and sleep disturbances in partners of patients with Parkinson's disease. Age Ageing 2002; 31: 349-54.
8. Pal PK, Thennarasu K, Fleming J, Schulzer M, Brown T, Calne SM. Nocturnal sleep disturbances and daytime dysfunction in patients with Parkinson's disease and in their caregivers. Parkinsonism Relat Disord 2004; 10: 157-68.
9. Tanasanvimon S, Ayuthaya NI, Phanthumchinda K. Modified Parkinson's Disease Sleep Scale (MPDSS) in Thai Parkinson's disease patients. J Med Assoc Thai 2007; 90: 2277-83.
10. Hughes AJ, Daniel SE, Kilford L, Lees AJ. Accuracy of clinical diagnosis of idiopathic Parkinson's disease: a clinico-pathological study of 100 cases. J Neurol Neurosurg Psychiatry 1992; 55: 181-4.
11. Hughes AJ, Ben Shlomo Y, Daniel SE, Lees AJ. What features improve the accuracy of clinical diagnosis in Parkinson's disease: a clinicopathologic study. Neurology 1992; 42: 1142-6.
12. Train The Brain Forum Committee. Thai Mental State Examination (TMSE). Siriraj Hosp Gaz 1993; 45: 359-74.
13. Johns MW. A new method for measuring daytime sleepiness: the Epworth sleepiness scale. Sleep 1991; 14: 540-5.
14. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res 1989; 28: 193-213.
15. Train The Brain Forum Committee. Thai Geriatric Depression Scale-TGDS. Siriraj Hosp Gaz 1994; 46: 1-9.
16. Hoehn MM, Yahr MD. Parkinsonism: onset, progression and mortality. Neurology 1967; 17: 427-42.
17. Johns MW. Sensitivity and specificity of the multiple sleep latency test (MSLT), the maintenance of wakefulness test and the epworth sleepiness scale: failure of the MSLT as a gold standard. J Sleep Res 2000; 9: 5-11.
18. Tan EK, Lum SY, Fook-Chong SM, Teoh ML, Yih Y, Tan L, et al. Evaluation of somnolence in Parkinson's disease: comparison with age- and sex-matched controls. Neurology 2002; 58: 465-8.
19. Verbaan D, van Rooden SM, Visser M, Marinus J, van Hilten JJ. Nighttime sleep problems and daytime sleepiness in Parkinson's disease. Mov Disord 2008; 23: 35-41.
20. Ancoli-Israel S, Ayalon L, Salzman C. Sleep in the elderly: normal variations and common sleep disorders. Harv Rev Psychiatry 2008; 16: 279-86.
21. Sukying C, Bhokakul V, Udomsubpayakul U. An epidemiological study on insomnia in an elderly Thai population. J Med Assoc Thai 2003; 86: 316-24.
22. Foley DJ, Monjan A, Simonsick EM, Wallace RB, Blazer DG. Incidence and remission of insomnia among elderly adults: an epidemiologic study of 6,800 persons over three years. Sleep 1999; 22 (Suppl 2): S366-72.
23. Vitiello MV, Moe KE, Prinz PN. Sleep complaints cosegregate with illness in older adults: clinical research informed by and informing epidemiological studies of sleep. J Psychosom Res 2002; 53: 555-9.
24. Foley D, Ancoli-Israel S, Britz P, Walsh J. Sleep disturbances and chronic disease in older adults: results of the 2003 National Sleep Foundation Sleep in America Survey. J Psychosom Res 2004; 56: 497-502.
25. Ancoli-Israel S. Sleep and its disorders in aging populations. Sleep Med 2009; 10 (Suppl 1): S7-11.
26. Grimbergen YA, Munneke M, Bloem BR. Falls in Parkinson's disease. Curr Opin Neurol 2004; 17: 405-15.

ภาวะง่วงนอนมากเกินในเวลากลางวัน และคุณภาพการนอนในเวลากลางคืนในผู้ป่วยพาร์กินสันไทย

สุวรรณา เศรษฐวัชราวนิช, กิตติ ลิ่มอภิชาต, พรชัย สถิรปัญญา, คณิตพงษ์ ปราบพาล

วัตถุประสงค์: เพื่อศึกษาความชุกของภาวะง่วงนอนมากเกินในเวลากลางวัน และคุณภาพการนอนในเวลากลางคืนในผู้ป่วยพาร์กินสันไทย และเปรียบเทียบลักษณะการนอนกับกลุ่มควบคุม

วัสดุและวิธีการ: นำแบบวัดอาการง่วงหลับเอปเวิร์ธ (Epworth Sleepiness Scale, ESS) และดัชนีคุณภาพการนอนพิทซ์เบิร์ก (Pittsburg Sleep Quality Index, PSQI) และคำถามเกี่ยวกับการโงกหลับกะทันหัน มาศึกษาในผู้ป่วยพาร์กินสันที่ไม่มีสมองเสื่อม และกลุ่มควบคุม

ผลการศึกษา: ผู้ป่วยหญิง 36 ราย และผู้ป่วยชาย 37 ราย อายุเฉลี่ย 65.9 ปี (ค่าเบี่ยงเบน 9.1) มีระดับความรุนแรงของโรคระดับ 2 (ช่วง 0-4) พบ ความชุกของภาวะง่วงนอนมากเกินในเวลากลางวัน และคุณภาพการนอนไม่ดีในเวลากลางคืน เท่ากับร้อยละ 15.1 และ 37 ตามลำดับ ค่าเฉลี่ยของคะแนน PSQI ในผู้ป่วย แตกต่างจากกลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ ($p = 0.003$) เมื่อวิเคราะห์ในองค์ประกอบของ PSQI พบว่า องค์ประกอบ การรบกวนการนอน และความต้องการใช้ยานอนหลับของผู้ป่วย มีคะแนนสูงกว่ากลุ่มควบคุมอย่างมีนัยสำคัญ ร้อยละ 20.5 ของผู้ป่วยมีการโงกหลับกะทันหันซึ่งเกิดขึ้นในระหว่างขับรถ รับประทานอาหาร และทำงาน ในจำนวนนี้ ร้อยละ 4.1 ประสบอุบัติเหตุ

สรุป: การศึกษานี้แสดงความชุกของภาวะง่วงนอนมากเกินในเวลากลางวัน และคุณภาพการนอนไม่ดีในเวลากลางคืนในผู้ป่วยพาร์กินสันไทย การคัดกรองปัญหาการนอนทั้งสองนี้ควรจะพิจารณาทำในการประเมินผู้ป่วยตามปกติในเวชปฏิบัติ