

Advanced Age and Depression are Associated with Poor Sleep Quality in Older Adults: Outpatients Setting at a Tertiary Care in Northeast Thailand

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Background: Poor sleep quality is common and related to worse health outcomes in older adults. It is thus crucial to identify and treat modifiable risk factors.

Objective: To determine the factors associated with poor sleep quality in older adults in outpatient settings.

Materials and Methods: A cross-sectional study was conducted between October 1, 2019 to January 31, 2022, at Srinagarind Hospital in Thailand. Subjects aged ≥60 years at an outpatient clinic of the internal medicine department were included. Sleep quality was evaluated by the Pittsburgh Sleep Quality Index (PSQI). Demographic data, PSQI, Patient Health Questionnaire (PHQ)-9, and Montreal Cognitive Assessment (MoCA) scores were obtained. Factors associated with poor sleep quality were analyzed using stepwise backward multiple logistic regression, and results were presented as adjusted odds ratio (aOR) with 95% confidence interval (CI).

Results: The study enrolled 198 subjects. Of these, the frailty occurred in 28.78%. The prevalence of poor sleep quality was 40.9%. The independent factors associated with poor sleep quality were advanced age (aOR of 1.07, 95% CI 1.01 to 1.13, p=0.04) and high PHQ-9 score (aOR of 1.49, 95% CI 1.27 to 1.80, p<0.001).

Conclusion: The prevalence of older adults in outpatient settings with poor sleep quality was high. Factors associated with poor sleep quality were advanced age and depression. Screening and treating depression in older adults who have poor sleep quality may help improve their sleep quality.

Keywords: Factor; Poor sleep quality; Older adults; Depression; Advanced age; Outpatient setting

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Sleep is a physiological process that accounts for approximately one-third of humans' lives⁽¹⁾. Several theories have been developed to explain why we sleep such as inactivity theory, energy conservation theory, restorative theory, and brain plasticity theory⁽²⁾. It is involved in emotion and mood, pain and hormone regulation, memory, cognition, alertness, and immune function⁽³⁾.

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Sleep quality is evaluated based on the following attributes: sleep latency, wake after sleep onset, sleep duration, and sleep efficiency⁽⁴⁾. Good sleep quality can lead to higher emotional satisfaction, mental and physical restoration, feeling energized, and refreshed upon waking. Poor sleep quality, however, can result in negative effects such as fatigue, irritability, and daytime dysfunction⁴. Poor sleep quality is a common complaint in clinical practice, and its prevalence has been reported as 37% to 66% in older adults⁽⁵⁻⁸⁾. It is associated with multiple comorbidities including hypertension⁽⁹⁾, cognitive impairment^(10,11), poor quality of life^(12,13), and frailty⁽¹⁴⁾. Identifying older adults at risk of poor sleep quality is important in clinical practice, as many of the risk factors are modifiable. Previous studies from around the world have found the following factors to be associated with poor sleep quality in older adults: increasing of age^(6,15,16), anxiety⁽⁶⁾, depression^(5,7,16-19), female sex^(5,20,21), cigarette smoking⁽⁷⁾, higher education levels⁽⁵⁾, chronic obstructive

pulmonary disease⁽²¹⁾, and major medical conditions such as hypertension, diabetes mellitus, cerebrovascular disease, cancer, and gastrointestinal disease⁽²⁰⁾. Most of these previous studies were community-based^(5-7,20,21), and data from outpatient settings in tertiary care hospitals – in which patients' conditions tend to be more complicated – are limited. Hence, the present study was conducted and aimed to evaluate the factors associated with poor sleep quality of older adults who attended the outpatient clinic.

Materials and Methods

This was a cross-sectional study conducted as part of a research project entitled “Prevalence of frailty and related adverse events in older patients of Internal Medicine outpatient clinic”⁽²²⁻²⁴⁾. The prevalence of frailty of this study was 28.78%⁽²⁴⁾. The study was approved by the Ethics Committee of Khon Kaen University (approval number HE631065).

Subjects

The present study enrolled older adults who aged 60 years or over visited the Internal Medicine Outpatient Clinic at Srinagarind Hospital, Faculty of Medicine, Khon Kaen University between October 1, 2019 to January 31, 2022. The exclusion criteria were as follows: 1) acute illness, 2) inability to speak or read Thai, and 3) declining to participate in the present study.

All eligible subjects were invited to participate in the study. After providing written informed consent, the subjects were interviewed to ascertain demographic data, body mass index, concurrent comorbidities, and medication. Montreal Cognitive Assessment (MoCA), self-report Patient Health Questionnaire (PHQ)-9 (Thai version) and self-report Pittsburgh Sleep Quality Index (PSQI; Thai version) scores were obtained.

Pittsburgh Sleep Quality Index (PSQI)

The PSQI is a self-report questionnaire to evaluate sleep quality. It consists of 19 items, which were divided into 7 components⁽²⁵⁾. A global PSQI score >5 indicates poor sleep quality with a sensitivity of 89.6% and specificity of 86.5%⁽²⁵⁾. The Thai version of the PSQI was translated and validated by Sitasuwan et al. and has exhibited excellent internal consistency, with a Cronbach's alpha of 0.837, and test-retest reliability, with an intraclass correlation coefficient of 0.89⁽²⁶⁾. A Thai version of PSQI score >5 was found to yield a sensitivity of 77.78% and specificity of 93.33% for indicating poor sleep quality⁽²⁶⁾.

Montreal Cognitive Assessment (MoCA)

The MoCA is a well-validated screening tool for cognitive impairment. A higher score indicates better

cognitive function, and a score of ≤ 25 suggests cognitive impairment⁽²⁷⁾. The sensitivity of the MoCA for detecting mild cognitive impairment (MCI) has been reported at 90% and for Alzheimer's disease (AD) at 100%. The specificity of the MoCA is 87%. Additionally, the positive predictive value (PPV) and negative predictive value (NPV) for detecting MCI were 89% and 91%, and those for AD were 89% and 100%⁽²⁷⁾. The Thai version of the MoCA was translated and validated by Tangwongchai et al.⁽²⁸⁾ and was found to have excellent internal consistency, with a Cronbach's alpha of 0.914. This questionnaire had a sensitivity of 80% and specificity of 80% for detecting MCI and 100% and 98% for detecting AD⁽²⁸⁾.

Patient Health Questionnaire (PHQ)-9

The PHQ-9 is a self-administered questionnaire for screening depression. It consists of 9 items based on the criteria for major depressive disorder⁽²⁹⁾. A higher score represents greater severity of depression. A PHQ-9 score ≥ 10 was found to have a sensitivity and specificity of 88% for major depression⁽²⁹⁾. The Thai version of the PHQ-9 was translated and validated by Lotrakul et al.⁽³⁰⁾. The internal consistency of the Thai version PHQ-9 was found to be satisfactory, with a Cronbach's alpha of 0.79. The optimal cut-off score was ≥ 9 , which yielded a sensitivity of 84%, specificity of 77%, PPV of 0.21, NPV of 0.99, positive likelihood ratio of 3.71, and area under the receiver operating characteristic (ROC) curve of 0.89⁽³⁰⁾.

Statistical analysis

The sample size calculation was based on a previous study by Thichumpa et al.⁽⁵⁾, which found the prevalence of poor sleep quality to be 0.44. Based on estimating an infinite population proportion formula with a proportion of 0.44, alpha (α) of 0.05, Z (0.975) of 1.96, and error of 0.1, the minimum required sample size was 95 subjects. A total of 198 cases were included.

Categorical data are shown as numbers and percentages. Normally distributed continuous data are presented as mean and standard deviation (SD) and non-normally distributed data as median and interquartile range (IQR). The authors used the Chi-square test or Fisher's exact test, as appropriate, to compare categorical variables. The mean was compared using an independent t-test and the median using the Mann-Whitney U test. Factors associated with poor sleep quality were analyzed using univariate analysis – presented as a crude odd ratio (cOR) with a 95% confidence interval (CI) – and stepwise backward multiple logistic regression analysis. Factors with $p < 0.2$ or that have been previously reported as being clinically significant were included in the stepwise backward multiple logistic regression analysis, presented as an adjusted odd ratio (aOR) with 95% CI. A p-value of less

than 0.05 was considered statistically significant. Statistical analysis was performed using R version 4.1.2.

Results

One hundred and ninety-eight subjects were included in the study. Of these, 81 (40.9%) were determined to have poor sleep quality. The median (IQR) PSQI was 5 (3 to 7). Most subjects were married and had fewer than 12 years of education. Baseline characteristics are shown in Table 1.

The factors associated with poor sleep quality in older adults were analyzed by the univariate and stepwise backward multivariate analysis and were shown in Table 2. On univariate analysis, the factors associated with poor sleep quality were age (cOR of 1.02, 95% CI 1.00 to 1.07, p=0.04), diabetes mellitus (cOR of 2.1, 95% CI 1.15 to 3.75, p=0.02), chronic kidney disease (cOR of 2.08, 95% CI 1.00 to 4.46, p=0.05), and PHQ-9 score (cOR of 1.47, 95% CI 1.28 to 1.74, p<0.001). On multivariate analysis, the factors associated with poor sleep quality were age (aOR of 1.07, 95% CI 1.01 to 1.13, p=0.04) and PHQ-9 score (aOR of 1.49, 95% CI 1.27 to 1.80, p<0.001).

Discussion

The prevalence of poor sleep quality in this study was high at 40.9%, which was comparable to the findings of previous studies in northern Thailand⁽⁵⁾ and China⁽⁶⁾. Another study from Thailand found the prevalence of poor sleep quality among older adults to be 66.3%⁽⁷⁾. Our study found that higher age and PHQ-9 scores were associated with poor sleep quality. Previous studies have also found an association between age and sleep quality^(6,15,16). Possible reasons for this are 1) age-related changes in sleep architecture, i.e., increased sleep latency, frequent arousal, longer WASO, increases in stage 1 and stage 2 of non-rapid eye movement (NREM) sleep, decreases in slow-wave sleep, shorter total sleep time, and poorer sleep efficiency^(31,32), 2) higher prevalence of sleep disorders in older adults, such as insomnia⁽³³⁾, obstructive sleep apnea⁽³⁴⁾, restless leg syndrome⁽³⁵⁾, and periodic limb movement disorder⁽³⁶⁾, and 3) a greater prevalence of comorbidities affecting sleep such as congestive heart failure, chronic respiratory disorders, pain and disorders associated with pain, gastroesophageal reflux disease (GERD), nocturia, Parkinson’s disease,

Table 1. Baseline characteristic of study subjects

Baseline characteristics	Good sleep quality (n=117)	Poor sleep quality (n=81)
Femal, n (%)	75.0 (64.1)	49.0 (60.5)
Age mean (SD)	68.3 (6.3)	69.0 (5.5)
BMI mean (SD)	24.4 (4.2)	25.02 (4.7)
Educational level, n (%)		
<12 years	87.0 (74.4)	55 (67.9)
≥12 years	30.0 (25.6)	26.0 (32.1)
Marital status, n (%)		
Unmarried	45.0 (38.5)	24.0 (29.6)
Married	72 (61.5)	57.0 (70.4)
Underlying disease, n (%)		
Hypertension	73 (62.4)	55 (67.9)
Diabetes mellitus	35 (29.9)	38 (46.9)
Stroke	9 (7.7)	7(8.6)
COPD/Asthma	10 (8.6)	2(2.5)
CKD	15 (12.8)	19(23.5)
PHQ-9 score median (IQR)	0 (0,0)	2 (0,4)
Polypharmacy, n (%)	47 (40.2)	46(56.8)
Current alcohol consumption, n (%)	16 (13.7)	10 (12.4)
Cigarette smoking, n (%)		
Current cigarette smoking	5 (4.3)	3 (3.7)
Former cigarette smoker	29 (24.8)	19 (23.5)
MoCA mean (SD)	18.8 (5.6)	20.1 (4.5)
MoCA <20, n (%)	63.0 (53.8)	38.0 (46.9)

SD=standard deviation; BMI=body mass index (kg/m²); COPD=chronic obstructive pulmonary disease; CKD=chronic kidney disease; PHQ-9=patient health questionnaire-9; MoCA=Montreal Cognitive Assessment

Polypharmacy=current use of ≥5 drugs

Table 2. Factors associated with poor sleep quality

Variables	Univariate			Multivariate		
	cOR	95% CI	p-value	aOR	95% CI	p-value
Male	1.17	0.64 to 2.09	0.60			
Age (year)	1.02	1.00 to 1.07	0.04	1.07	1.01 to 1.13	0.04*
BMI	1.03	0.97 to 1.1	0.31			
Education ≥12 years	1.37	0.73 to 2.56	0.32			
Unmarried status	0.67	0.36 to 1.22	0.20	0.62	0.29 to 1.25	0.18
HT	1.28	0.7 to 2.3	0.43			
DM	2.1	1.15 to 3.75	0.02*	1.71	0.86 to 3.41	0.12
COPD/Asthma	0.27	0.04 to 1.06	0.09	0.24	0.03 to 1.06	0.09
CKD	2.08	1.00 to 4.46	0.05			
PHQ-9 score	1.47	1.28 to 1.74	<0.001*	1.49	1.27 to 1.80	<0.001*
MoCA score	1.05	0.99 to 1.12	0.07			
Numbers of medication use	1.1	0.99 to 1.23	0.07	1.07	0.94 to 1.21	0.29
Current alcohol consumption	0.88	0.37 to 2.05	0.78			
Current cigarette smoking	0.86	0.17 to 3.61	0.84			

cOR=crude odd ratio; aOR=adjusted odd ratio; CI=confidence interval; BMI=body mass index (kg/m²); HT=hypertension; DM=diabetes mellitus; COPD=chronic obstructive pulmonary disease; CKD=chronic kidney disease; PHQ-9=patient health questionnaire-9; MoCA=Montreal Cognitive Assessment

* p<0.05

dementia, hypertension, diabetes mellitus, stroke, renal disease, obesity, and cancers, as well as the use of some medications⁽³⁷⁾.

A higher depression score (PHQ-9) was associated with poor sleep quality in our study, similar to the findings of previous reports^(5,7,17-19). Impaired sleep continuity, sleep duration and reduction of slow-wave sleep have been found in depression⁽³⁸⁾. In addition, a growing body of evidence suggests that depression is associated with insomnia^(33,39,40), obstructive sleep apnea⁽⁴¹⁻⁴³⁾, and restless leg syndrome⁽⁴⁴⁾, all of which could help explain these findings.

In the present study, poor sleep quality was not associated with MoCA score. However, previous studies have reported such an association. For example, An et al. reported that PSQI score was weakly correlated with MoCA score (Pearson’s correlation of -0.12, p<0.001)⁽⁴⁵⁾, as did Parra-Díaz et al. (Pearson’s correlation of -0.32, p<0.001)⁽⁴⁶⁾ and Liao et al. (Pearson correlation of 0.487, p<0.05)⁽⁴⁷⁾. Our contradictory findings might be explained by 1) poor sleep quality not being associated strongly enough with the MoCA score, 2) our sample size being relatively smaller than those in the prior studies, and 3) the subjects having less severe cognitive impairment, making poor sleep quality less obvious. Further study is needed for clarification.

The present study emphasizes the high prevalence of poor sleep quality among older adults at an outpatient setting and modifiable associated factors. Poor sleep quality reflects various underlying sleep disorders such as insomnia, obstructive sleep apnea, restless leg syndrome, and periodic limb movement disorder. It is thus recommended that sleep

quality be evaluated in these patients, depression be assessed using the PHQ-9 questionnaire, and the primary cause of poor sleep quality be investigated, as doing so can lessen the risk adverse health outcomes.

The present study had some limitations. First, some factors found to be significantly associated with poor sleep quality in previous studies were not associated in the present study, which might have been due to the relatively small sample size. Second, definite causal relationships were difficult to determine because of the study design. Third, sleep quality was assessed using the PSQI questionnaire rather than objective measurements from polysomnography or actigraphy, which may have led to misclassification. Fourth, some factors could attribute to sleep quality including pain, itching, and nocturia were not evaluated in this study.

Conclusion

The prevalence of poor sleep quality was high in the older adults outpatients enrolled in this study. Factors associated with poor sleep quality were advanced age and higher levels of depression. We suggest that older adults who have poor sleep quality in outpatient settings should be screened and treated for depression to improve sleep quality.

What is already known on the topic?

Poor sleep quality is prevalent in older adults. There are several factors associated with poor sleep quality in community settings.

What this study adds?

Advanced age and depression associated with poor sleep quality in older adults who visited outpatients department. Screening and treating depression might improve sleep quality.

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Conflict of interest

The authors declare no conflict of interest.

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