Original article

Associations between sleep problems and geriatric conditions in older adults

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Abstract

Objective: To investigate the prevalence of sleep problems and the relationships between sleep problems and geriatric conditions in older adults in Thailand.

Methods: A retrospective cross-sectional study was conducted using electronic medical records of older adults aged 60 years and older who visited the Family Medicine Outpatient Department of Maharaj Nakorn Chiang Mai Hospital, Thailand, between October 2020 and September 2021. Collected data included age, gender, comorbidities, and the Comprehensive Geriatric Assessment (CGA) on sleep problems, depression, dementia, knee osteoarthritis, hearing problems, visual problems, oral problems, falling, and polypharmacy. Logistic regression analysis was used to explore associations between sleep problems and geriatric conditions.

Results: Of the 217 eligible participants, mostly female, 27.6% reported sleep problems. The mean age of participants with and without sleep problems were 68.87 ± 6.65 and 67.66 ± 5.67 years old, respectively. Those with sleep problems had significantly more proportion of depression and the number of geriatric conditions than those without sleep problems. After adjusting for age, gender, and comorbidities, a significant association was found between sleep problems and depression (AOR = 12.76, 95% CI = 2.07 - 78.59). There was no significant association between sleep problems and other geriatric conditions.

Conclusion: Depression is a significant factor associated with sleep problems in older adults. Healthcare providers should evaluate and provide treatment for depression in older adults with sleep problems to improve overall health outcomes.

Keywords: depression, geriatric conditions, older adults, sleep problems

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นิพนธ์ต้นฉบับ

ความสัมพันธ์ระหว่างปัญหาการนอนหลับและภาวะสุขภาพที่พบบ่อยในผู้สูงอายุ

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บทคัดย่อ

วัตถุประสงค์ : เพื่อศึกษาความชุกของปัญหาการนอนหลับและความสัมพันธ์ระหว่างปัญหาการนอนหลับและภาวะสุขภาพที่พบบ่อยในผู้สูงอายุ

วิธีการ : การศึกษาภาคตัดขวางย้อนหลังที่โรงพยาบาลมหาราชนครเชียงใหม่ ใช้เวชระเบียนอิเล็กทรอนิกส์ของผู้สูงอายุ 60 ปีขึ้นไปที่มารับบริการ ณ ห้องตรวจเวชศาสตร์ครอบครัวระหว่างเดือนตุลาคม พ.ศ. 2563 ถึงกันยายน พ.ศ. 2564 ข้อมูล ได้แก่ อายุ เพศ โรคร่วม และผลการประเมินผู้สูงอายุแบบองค์รวม ได้แก่ ปัญหาการนอนหลับ ภาวะซึมเศร้า สมองเสื่อม โรคข้อเข่าเสื่อม ปัญหาการได้ยิน ปัญหาการมองเห็น ปัญหาช่องปาก การหกล้ม และการใช้ยาร่วมกันหลายขนาน ใช้การวิเคราะห์ logistic regression หาความสัมพันธ์ระหว่างปัญหาการนอนหลับและภาวะสุขภาพที่พบบ่อยในผู้สูงอายุ

ผล : กลุ่มตัวอย่าง 217 คน ส่วนใหญ่เป็นเพศหญิง มีปัญหาการนอนหลับร้อยละ 27.6 อายุเฉลี่ยกลุ่มที่มีและไม่มีปัญหาการนอนหลับคือ 68.87 ± 6.65 ปีและ 67.66 ± 5.67 ปี ตามลำดับ กลุ่มที่มีปัญหาการนอนหลับมีสัดส่วนภาวะซึมเศร้าและจำนวนภาวะสุขภาพที่พบบ่อยในผู้สูงอายุมากกว่ากลุ่มที่ไม่มีปัญหาการนอนหลับอย่างมีนัยสำคัญทางสถิติ การวิเคราะห์ logistic regression โดยควบคุมอายุ เพศ และโรคร่วม พบความสัมพันธ์ที่มีนัยสำคัญทางสถิติระหว่างปัญหาการนอนหลับและภาวะซึมเศร้า (AOR = 12.76, 95% CI = 2.07 – 78.59) แต่ไม่พบความสัมพันธ์ที่มีนัยสำคัญระหว่างปัญหาการนอนหลับกับภาวะสุขภาพที่พบบ่อยในผู้สูงอายุอื่น ๆ

สรุป : ภาวะซึมเศร้าเป็นปัจจัยสำคัญที่เกี่ยวข้องกับปัญหาการนอนหลับ ผู้ให้บริการด้านสุขภาพควรประเมินและให้การรักษาภาวะซึมเศร้าในผู้สูงอายุที่มีปัญหาการนอนหลับเพื่อช่วยให้สุขภาพโดยรวมของผู้สูงอายุดีขึ้น

คำสำคัญ : ปัญหาการนอนหลับ, ผู้สูงอายุ, ภาวะซึมเศร้า, ภาวะสุขภาพที่พบบ่อยในผู้สูงอายุ

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Previous knowledge: Sleep problems are common among older adults, but there is unclear information regarding the association between sleep problems and geriatric conditions in this population. Understanding this association could lead to more comprehensive care.

New knowledge: Sleep problems affect 27.6% of older adults and are associated with depression, one of geriatric conditions. However, this study did not find a relationship between sleep problems and other geriatric conditions, although those with sleep problems had significantly more number of geriatric conditions than those without sleep problems.

Applications: Healthcare providers should evaluate and provide treatment for depression in older adults with sleep problems to enhance their sleep quality and improve their quality of life.

Introduction

The global population is undergoing a significant and rapid increase in older adults. By 2050, the number of people aged 60 and older would be expected to double worldwide, exceeding two billion.[1] Thailand is experiencing a similar trend, with a significant rise in older adults. In 2019, approximately 1.02 billion people globally were 60 years and older, accounting for 13% of the total population, aligning with Thailand's data of around 11.6 million older adults, representing 18% of the country's population.[2] Thailand is officially entering an aging society, posing unprecedented healthcare challenges due to the higher burden of chronic conditions and disabilities experienced by older adults.[3]

Geriatric conditions significantly impact health outcomes in older adults, affecting their well-being. Conditions such as falls, frailty, cognitive impairment, and urinary incontinence can lead to functional decline, reduced quality of life, increased hospitalization, and mortality risk.[4] These conditions often require complex and comprehensive interventions to address their multifactorial nature. By early identifying geriatric conditions through comprehensive assessments and providing tailored interventions, healthcare professionals can promote better health outcomes, improve quality of life, and reduce caregiver burden for older adults.[5]

Among geriatric conditions, sleep problems are common in the older population and can significantly impact their health.[6] Sleep disorders, including insomnia, sleep-disordered breathing, and restless legs syndrome, are prevalent among older adults.[7] Poor sleep quality in older adults has been linked to adverse health outcomes, such as cognitive decline, falls and accidents, exacerbation of chronic conditions, and impaired immune function.[8,9] On the other hand, other geriatric conditions, including falls, frailty, and urinary incontinence, have been independently associated with poorer sleep quality and increased use of sleep medications among older adults.[10]

In addition to these challenges, oral health problems, like bruxism and periodontal diseases, can lead to sleep disruptions due to pain and overall body inflammation.[11] Also, auditory problems like tinnitus or significant hearing loss can make sleep

difficult. Tinnitus can disturb the silence of the night, while significant hearing loss may disrupt circadian rhythms by eliminating environmental sound cues.[12] Chronic medical conditions, including dyslipidemia and hypertension, have strongly been correlated with sleep disturbances.[13] Dyslipidemia has been linked to decreased sleep durations and compromised sleep quality, possibly due to hormone-induced alterations in lipid metabolism.[14] Hypertension and obstructive sleep apnea (OSA) share a bidirectional relationship where both conditions are worsened by each other. The intermittent hypoxia and recurrent airway obstructions typical of OSA contribute to the worsening and increased severity of hypertension.[15] This relationship is primarily due to heightened sympathetic nervous activity, resulting in higher diastolic blood pressure, and altered nocturnal blood pressure patterns.[15] Persistent sleep disturbances can enhance sympathetic nervous system activity and induce hormonal changes, both of which can further disrupt sleep quality.[16]

Apart from physical health, sleep disorders are commonly linked with mental health conditions like depression, bipolar disorder, post-traumatic stress disorder, and anxiety disorders.Nearly 90% of people with depression experience insomnia. Previously thought to be a symptom of depression, recent studies show that insomnia can precede and increase the risk of developing depression.[17]

It is believed that identifying the conditions that are associated with sleep problems would lead to more comprehensive care for older adults.[18] This study aims to examine the prevalence of sleep problems and associations between sleep problems and geriatric conditions among older adults. The findings are expected to provide insights into the relationships between sleep problems and geriatric conditions and contribute to improving sleep quality and promoting better health outcomes for older adults.

Methods

A retrospective cross-sectional study was conducted at the Family Medicine Outpatient Department (OPD), Maharaj Nakorn Chiang Mai Hospital. The study population consisted of government or state enterprise officers aged 60 years and older who received healthcare services at the Family Medicine OPD between October 2020 and September 2021. The electronic medical records of all relevant patients were reviewed, excluding those with incomplete health assessment data. Demographic and clinical characteristics were extracted, including age, gender, blood pressure, laboratory results (fasting blood sugar, low-density lipoprotein, and high-density lipoprotein), smoking history, and components of the Comprehensive Geriatric Assessment (CGA) for geriatric conditions. This study was approved by the Research Ethics Committee, Faculty of Medicine, Chiang Mai University (FAM-2565-08755)

The Comprehensive Geriatric Assessment (CGA) at the Family Medicine OPD

The CGA is a multidimensional, multidisciplinary diagnostic process used to determine an older adult's medical, psychosocial, and functional capabilities, whose results were used to develop a coordinated and integrated plan for their treatment and follow-up.[19] The CGA toolkit is extensively used both

within Thailand and internationally. The Department of Family Medicine, Chiang Mai University, developed this version based on the Thai version crafted by the Institute of Geriatric Medicine within the Department of Medical Services, Ministry of Public Health.[20] The assessments include:

1) Sleep problems: Sleep problems were assessed by asking two questions about sleep behaviors; 1) Do you have any problems sleeping? and 2) Do you feel drowsy or fatigued during the day? Having sleep problems was defined as at least a positive response to any of the questions. Those who reported sleep problems were further inquired about the nature of these issues.

2) Depression: The 2Q screening tool was used to screen for depression.[21] It consisted of two questions about feelings over the past two weeks; 1) Have you felt down, depressed, or hopeless? and 2) Have you felt a little interest or pleasure in doing things? A possible risk of depression was defined as at least a positive response to any of the questions.

3) Cognitive assessment: The Thai Mental State Examination (TMSE) was utilized to measure six domains of cognitive abilities, including orientation, registration, attention, calculation, language, and recall.[22] The TMSE has different scoring for each item, with a total score of 30 points. A score of less than 24 was considered suspected dementia.

4) Knee osteoarthritis: Two screening questions were used to identify knee osteoarthritis; 1) Do you have knee osteoarthritis? and 2) Do you have knee pain? Those who affirmatively responded to the second question were further asked about symptoms related to knee osteoarthritis, including crepitation, tenderness, morning stiffness lasting less than 30 minutes, enlargement, and warmth. The presence of two or more of these symptoms indicated a high probability of osteoarthritis of the knee.[23]

5) Hearing assessment: Hearing problems were assessed by asking "Do you have any hearing problems?" and performing a finger rub test. A positive answer or test result indicated hearing problems.

6) Visual assessment: Visual problems were assessed by measuring visual acuity with the Snellen chart and asking "Do you have clear vision only in the center but blurred peripheral vision or do you often bump into doors or objects?" A positive answer or test result indicated visual problems.

7) Oral health assessment: Oral health assessment consisted of an oral examination and screening questions for oral health risks, such as oral health care and poor oral health or hygiene. Abnormalities from the examination or positive answers indicated oral problems.

8) Falling assessment: Falling was assessed by asking about previous falls. Any prior fall indicated falling.

9) Polypharmacy: Medication use was assessed by asking "How many different medications do you regularly take?" and medication reconciliation. Five or more current medications indicated polypharmacy.[24]

Statistical analysis

All data were analyzed using statistical software. Descriptive statistics were used to analyze the data, i.e. frequency, proportion, percentage,

mean, and standard deviation (SD). The chi-square test and t-test were used to explore subgroup differences. The logistic regression analysis was used to determine the associations between sleep problems and geriatric conditions, with an adjustment for age, gender, and comorbidities simultaneously. Each association was estimated using adjusted odds ratio (AOR) with a 95% confidence interval (95% CI). A statistical significance was set at $p < .05$.

Results

Participants' characteristics

Of a total of 217 participants included in this study, 60 (27.6%) had sleep problems. Demographics and clinical characteristics among those with and without sleep problems are described in Table 1. The mean age of the former and latter groups were 68.87 ± 6.65 years and 67.66 ± 5.66 years, respectively. Most participants in both groups were female (71.6% and 65.6%, respectively). There was no statistically significant difference between the groups in the proportions of comorbidities (hypertension, diabetes, and dyslipidemia), blood pressure, laboratory results, and cardiovascular risk.

Types of sleep problems

The most common types of sleep problems among 60 participants with sleep problems were waking up after falling asleep (35.0%), difficulty

Table 1 Participants' characteristics (n = 217)

	Having sleep problems (n = 60)	No sleep problems (n = 157)	p-value
Age (mean ± SD)	68.87 ± 6.65	67.66 ± 5.66	.181[a]
Gender, n (%)			
Male	17 (28.3)	54 (34.4)	.395[b]
Female	43 (71.7)	103 (65.6)	.395[b]
Comorbidities, n (%)			
Hypertension	52 (86.6)	124 (78.9)	.196[b]
Diabetes	17 (28.3)	35 (22.3)	.351[b]
Dyslipidemia	48 (80.0)	135 (85.9)	.278[b]
Blood Pressure, (mean ± SD)			
Systolic blood pressure (mmHg)	136.20 ± 12.32	134.89 ± 13.33	.510[a]
Diastolic blood pressure (mmHg)	78.01 ± 7.12	77.97 ± 8.60	.969[a]
Tools (mean ± SD)			
TMSE	27.34 ± 3.08	27.79 ± 2.44	.273[a]
Laboratory results (mean ± SD)			
Fasting blood sugar (mg/dl)	102.63 ± 14.23	104.62 ± 17.55	.447[a]
Low-density lipoprotein (mg/dl)	97.84 ± 34.63	104.25 ± 26.28	.160[a]
High-density lipoprotein (mg/dl)	59.34 ± 17.23	59.66 ± 15.97	.901[a]
Personal history, n (%)			
Current smoking	2 (0.8)	4 (2.5)	.752[b]

Abbreviations: SD, standard deviation; TMSE, Thai Mental State Examination.
Note: Statistical analyses were performed using the t-test (a) for continuous variables and the chi-square test (b) for categorical variables.

sleeping (31.7%), and waking up to urinate (28.3%). A smaller group of patients (5.0%) reported experiencing noisy sleep disturbances (Table 2).

Prevalence of geriatric conditions

The three most common geriatric conditions were oral health problems (51.6%), knee osteoarthritis (28.1%), and polypharmacy (27.2%), respectively. There were statistically significant differences in the proportion of depression and the number of geriatric conditions between those with and without sleep problems. However, no significant difference in other conditions was found between groups (Table 3).

Association between sleep problems and geriatric conditions

There was a significant association between sleep problems and depression (AOR = 12.76, 95% CI = 2.07 - 78.59), even after adjusting for age, gender, and comorbidities. However, no significant association between other geriatric conditions and sleep problems was found (Table 4).

Table 2 Types of sleep problems (n = 60)

	n (%)
Waking up in the middle of the night after falling asleep	21 (35.0)
Difficulty sleeping	19 (31.7)
Waking up to urinate in the middle of the night	17 (28.3)
Noisy disturbances while sleeping	3 (5.0)

Table 3 Prevalence of geriatric conditions

	Total (N = 217) n (%)	Having sleep problems (n = 60) n (%)	No sleep problems (n = 157) n (%)	p-value
Depression	7 (3.3)	5 (8.3)	2 (1.3)	.009
Dementia	13 (6.1)	5 (8.3)	8 (5.1)	.375
Knee osteoarthritis	61 (28.1)	17 (28.3)	44 (28.0)	.964
Hearing problem	49 (22.6)	17 (28.3)	32 (20.4)	.219
Eye problems	56 (25.8)	15 (25.0)	41 (26.1)	.867
Oral problems	112 (51.6)	35 (58.3)	77 (49.0)	.221
Falling	58 (26.7)	18 (30.0)	40 (25.5)	.501
Malnutrition	5 (2.3)	0 (0.0)	5 (3.2)	.162
Polypharmacy	59 (27.2)	19 (31.7)	40 (25.5)	.359
Number of Geriatric conditions				.007
1 - 2 conditions	117 (55.9)	25 (41.7)	92 (58.6)	
3 - 4 conditions	60 (27.6)	30 (50.0)	30 (19.1)	
> 5 conditions	7 (3.3)	4 (6.7)	3 (1.9)	

Note: Statistical analyses were performed using the chi-square test for categorical variables.

Table 4 Associations between sleep problems and geriatric conditions

	Adjusted odds ratio	95% confidence Interval	p-value
Age	1.04	0.98 - 1.11	.191
Female	1.37	0.64 - 2.89	.412
Hypertension	1.73	0.65 - 4.59	.273
Type 2 diabetes	1.41	0.65 - 3.04	.383
Dyslipidemia	0.59	0.24 - 1.43	.244
Depression	12.76	2.07 - 78.59	.006
Dementia	1.09	0.29 - 4.05	.898
Osteoarthritis knee	0.83	0.38 - 1.79	.639
Hearing problems	1.54	0.74 - 3.19	.245
Visual problems	0.71	0.30 - 1.65	.422
Oral health problems	1.83	0.85 - 3.88	.117
Falling	1.15	0.54 - 2.45	.710
Polypharmacy	1.16	0.56 - 2.39	.693

Discussion

This study shows that almost one-third of elderly participants experience sleep disturbances, underscoring its significance within this age group, in line with previous studies.[25,26] Notably, these sleep-related problems often appear alongside other geriatric conditions, especially in those diagnosed with depression and dementia.[11,27] Similar to the previous findings,[28] the patient's characteristics, including age and gender, were not associated with sleep problems. The presence of common comorbidities such as hypertension, type 2 diabetes, and dyslipidemia also did not demonstrate a significant association with sleep problems, confirming previous evidence.[29] These findings imply that factors beyond age, gender, and comorbidities may influence sleep problems in older adults.[30]

Regarding geriatric conditions, hearing problems did not demonstrate a significant associations with sleep problems, as with the previous inconclusive evidence.[31] However, the findings that dementia, falling, and osteoarthritis did not show significant associations with sleep problems contrast with previous studies.[32-35] The economic status of participants in this study might allow for better healthcare access and preventive measures, leading to early intervention and risk reduction in older adults.[36,37] Additionally, the sample size might not have been sufficient to detect any association among these conditions.[38] However, individuals with a higher number of geriatric conditions are more likely to experience sleep problems due to several complex factors. Multiple geriatric conditions can lead to chronic illnesses, chronic pain, and functional decline, which directly impact sleep.[39]

A statistically significant association between depression and sleep problems found in this study highlights the critical link between mental health and sleep problems in the older population.[40] Individuals with depression may experience sleep pattern

disruptions, contributing to the development or exacerbation of sleep problems.[41] Previous studies reported that individuals with depression have a higher prevalence of insomnia compared to those without depression.[42,43] In the elderly, sleep disruptions, such as hypersomnia (prolonged sleep durations) and insomnia (challenges in initiating or maintaining sleep), frequently emerge as hallmark symptoms of depression. The linkage between these sleep challenges and depression often forms a cyclical relationship where sleep issues amplify the severity of depressive signs, which in turn can exacerbate sleep difficulties. Some pathological mechanisms have been attempted to explain how depression is associated with sleep problems, one of which is the release of cytokines. Cytokines are elevated and can cause inflammation in depression, which in turn can interfere with sleep.[44] Additionally, depression can result in elevated levels of stress hormones such as cortisol, which can also affect sleep.[45] Cortisol is known to suppress rapid eye movement (REM) sleep, the stage of sleep when vivid dreams occur, and can also interfere with the sleep-wake cycle.[46] In addition, the altered activity of the hypothalamic-pituitary-adrenal (HPA) axis has been shown to play a role in the development of depression and sleep problems.[47] These pathophysiological mechanisms can contribute to the high prevalence of sleep problems in individuals with depression.

To better address sleep problems in older adults, it is essential to identify and treat depression, as it is often a major contributing factor. Healthcare providers should conduct regular screening for signs and symptoms of depression in older patients and consider referral to mental health professionals for treatment when indicated.[48] Moreover, healthcare providers may also incorporate evidence-based therapies, such as cognitive-behavioral therapy for insomnia (CBT-I), to help improve sleep quality in older patients with depression.[41] By applying these strategies, healthcare providers can help improve mental health and overall health outcomes in the older population.[41]

Several limitations should be considered when interpreting these results. This study has limited generalizability due to its tertiary hospital setting and focus on older adults who were able to visit the hospital, suggesting a relatively healthier population. This limits the extrapolation of the findings to other older populations or healthcare settings. Additionally, the study's limited sample size poses a challenge when analyzing the association between sleep problems and depression, resulting in its wide confidence interval. Further, the reliance on data collection from relatively brief, self-reporting screening questionnaires and medical records could introduce recall bias and incomplete or inaccurate documentation. However, the reviewed variables relied on the questionnaires used during the routine care process, which is always completed. Finally, the study did not include certain potential confounding factors, such as dosage and route of medication and lifestyle-related factors, which could influence sleep problems in older adults. Further studies that include these influential variables are needed to fully understand the underlying mechanisms that contribute to sleep problems and to develop

effective interventions to improve health outcomes in this population.

Conclusion

This study found that depression may be a significant factor associated with sleep problems in older adults. It reinforces previous evidence that depression should be proactively screened to improve health outcomes in older adults with sleep problems.

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