

ORIGINAL ARTICLES

Factors associated with sleep disorders among patients with rheumatoid arthritis treated at Bach Mai Hospital in 2025-2026

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ABSTRACT

Objective: We conducted this study to analyze the factors associated with sleep disorders among rheumatoid arthritis patients treated at Bach Mai Hospital.

Methods: This cross-sectional descriptive study was conducted at the Rheumatology Center, Bach Mai Hospital, from October 2025 to February 2026 among 202 inpatients diagnosed with rheumatoid arthritis according to the 2010 American College of Rheumatology (ACR) criteria. Pittsburgh Sleep Quality Index (PSQI) and case report form had been utilized to assess sleep disorders among patients. Data were entered into REDCap and analyzed using STATA SE 15.0. Poisson regression was applied to identify factors associated with sleep disorder. The study was approved by the Ethics Committee of Bach Mai Hospital.

Results: Sleep disorders prevalence differed significantly by age group (82.0% vs. 52.7%, $p<0.001$), marital status (83.3% vs. 60.8%, $p=0.001$), household income ($p<0.001$), hypertension (87.5% vs. 60.1%, $p<0.001$), diabetes (92.5% vs. 60.4%, $p<0.001$), exacerbation frequency, swollen joints, painful joints, and treatment adherence (all $p<0.001$). Poisson regression identified older age (PR=1.32, 95% CI: 1.06–1.65) and ≥ 3 exacerbations annually (PR=1.21, 95% CI: 1.02–1.44) as independent factors associated with sleep disorder.

Conclusions: These findings were similar to previous results and Routine screening for sleep disorders should be considered in patients with rheumatoid arthritis, particularly among older adults and those with frequent exacerbations.

Keywords: sleep disorder, rheumatoid arthritis, associated factors

INTRODUCTION

Rheumatoid arthritis (RA) is a chronic systemic autoimmune disease characterized by the production of autoantibodies attacking the synovial membranes of joints, resulting in persistent inflammation and progressive joint destruction (1). The most common clinical manifestations include pain and swelling of the small and medium-sized joints, prolonged morning stiffness, and recurrent inflammatory flare-ups (1). As a chronic disabling disease, RA imposes a substantial burden on healthcare systems and markedly impairs patients'

physical function and quality of life.

Recent evidence suggests that RA adversely affects mental health, leading to higher prevalences of depression, anxiety, and sleep disorders than those observed in the general population (2). Specifically, patients with RA may have a higher risk of sleep disturbance than those without RA with RR=2.37 (95% CI: 1.80-3.11) (3). The most frequently reported sleep disorders include insomnia, obstructive sleep apnea (OSA), and restless legs syndrome (RLS) (4). Many patients experience difficulty initiating



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sleep, maintaining sleep, poor sleep quality, and persistent daytime fatigue. These sleep disturbances may further aggravate pain, fatigue, disease activity, and functional impairment, ultimately compromising treatment outcomes and quality of life (4,5).

Previous studies have also demonstrated that sleep disorders in patients with RA are influenced by a wide range of demographic, psychological, and disease-related factors. Older age, gender, and other sociodemographic characteristics have been associated with poorer sleep quality (6). Psychological factors, particularly stress and anxiety, are also recognized as important contributors to sleep disturbances (7). Furthermore, disease-related characteristics, including poor treatment adherence, frequent disease exacerbations, prolonged disease duration, and higher disease activity, have been reported to increase the risk of sleep disorders among patients with RA (6,8).

In Vietnam, several studies have investigated sleep disturbances in patients with musculoskeletal diseases. Nguyen Thi Hoa et al. reported that the prevalence of sleep disturbances among patients with osteoarthritis was 76.7%, with insomnia being the most common sleep disorders (9). Similarly, Nguyen Thi Nhu Hoa et al. found that 32.3% of patients with psoriatic arthritis experienced sleep disorders, with sleep duration disturbances being the predominant complaint (10). Although these studies highlight the growing concern regarding sleep disorders in patients with musculoskeletal diseases, evidence focusing specifically on patients with RA remains limited in Vietnam. Therefore,

this study was conducted to identify factors associated with sleep disorders among patients with RA treated at the Rheumatology Center, Bach Mai Hospital in 2025-2026.

RESEARCH METHODS

Study design: This study was designed as a cross-sectional descriptive study.

Study location and duration: This study was conducted at the Center for Rheumatology of Bach Mai Hospital from October 2025 to February 2026.

Study population: Patients were invited to participate in this study if they were inpatients treated in the Center for Rheumatology of Bach Mai Hospital and had established diagnosis of RA by the center rheumatologists relied on the ACR 2010 criteria. Patients were excluded from this study if they had refused to participate in the study or had an emergency or life-threatening condition.

Sample size and sampling method: The minimum sample size was calculated using the single-proportion formula, assuming a prevalence of 75.32% (8), a 95% confidence level, and an 8% margin of error, resulting in a required sample size of 120 participants. All patients who met inclusion and exclusion criteria were included in this study. At the end of the study, the final sample size was 202 participants.

Study variables and indicators

In this study, three groups of independent variables were included.

Firstly, demographic variables consisted of gender (male/female), age group (under 60 years old/ ≥ 60 years old), marital status (married/other), living arrangement (living alone/living with family or relatives), and household income group (low/medium/high). In addition, body mass index (BMI) was calculated according to the World Health Organization (WHO) formula and classified using the WHO recommendations for Asian populations and the guideline of Vietnamese Ministry of Health as underweight ($<18.5 \text{ kg/m}^2$), normal weight ($18.5\text{--}22.9 \text{ kg/m}^2$), overweight ($23.0\text{--}24.9 \text{ kg/m}^2$), and obese ($\geq 25.0 \text{ kg/m}^2$) (11,12). Marital status was categorized as married or other, with the latter including single, widowed, and divorced participants.

Secondly, medical history variables consisted of history of hypertension (yes/no), history of diabetes (yes/no), psychological stress (yes/no), and alcohol use history (yes/no). All medical history information was obtained through routine clinical history taking and physical examination conducted during standard clinical practice.

Thirdly, RA-related variables consisted of disease duration (<1 year/ $1\text{--}5$ years/ $5\text{--}10$ years/ >10 years), number of exacerbations per year ($<3/\geq 3$), swollen joints (yes/no), painful joints (yes/no), and treatment adherence (fully adherent/not fully adherent). Treatment adherence was assessed by the treating rheumatologist during routine clinical follow-up. Patients were considered fully adherent if they attended scheduled follow-up appointments and complied with the prescribed medication regimen as instructed by their physician. Patients who missed scheduled follow-up visits or did not

adhere to the prescribed treatment regimen were classified as not fully adherent.

In this study, we utilized the Pittsburgh Sleep Quality Index (PSQI) to assess sleep quality and screened sleep disorders among patients with RA. The PSQI is a standardized self-administered questionnaire developed by Buysse et al. at the Department of Psychiatry, University of Pittsburgh School of Medicine, and first published in 1989. It consists of 19 self-rated questions used to evaluate sleep quality over the previous month and five additional questions completed by a bed partner or roommate for clinical purposes; however, these five questions are not included in the scoring. The 19 self-rated items generate seven component scores, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Each component is scored from 0 to 3, yielding a global PSQI score ranging from 0 to 21, with higher scores indicating poorer sleep quality. The PSQI had been validated and widely used in the Vietnamese population. Sleep disorders could be screened by using the Vietnamese version of the Pittsburgh Sleep Quality Index (PSQI), which was translated and validated by To Thi Minh Ngoc et al. The cut-off points at 5 was used to define sleep disorders. At this cut-off, the Vietnamese PSQI demonstrated a sensitivity of 87.76% and a specificity of 75.0%, indicating a reliable tool for detecting sleep disorders both in community and clinical practice. In addition, the PSQI is recommended by the Vietnamese Ministry of

Health as a psychological assessment tool for evaluating sleep disorders in patients with common mental disorders (13,14).

Data tool and collection: A standardized research case report form (CRF) was developed based on the standard hospital medical record and included demographic characteristics, medical history, RA-related characteristics, clinical manifestations, laboratory findings, physical and mental health assessments, and the Pittsburgh Sleep Quality Index (PSQI). Patients who met the inclusion and exclusion criteria were informed about the study objectives, procedures, and their rights as participants. Those who agreed to participate voluntarily provided written informed consent before enrollment. Demographic information, medical history, disease history, and clinical manifestations were collected through face-to-face interviews and routine clinical history taking and physical examination conducted by the investigators. All patient information was collected and handled in accordance with the confidentiality regulations of Bach Mai Hospital to ensure the privacy and security of participants' personal and medical information.

Data processing and analysis

Data from paper-based case report forms were entered into the REDCap system managed by administrators at Hanoi Medical University. The dataset was then exported in Stata (.dta) format and analyzed using STATA SE version 15.0. Quantitative variables were summarized using means and standard deviations, whereas qualitative variables were presented as frequencies and

percentages. Descriptive comparisons of categorical variables were performed using the Chi-square test. Factors associated with sleep disorders were examined using multivariable Poisson regression with robust variance to estimate adjusted prevalence ratios (aPR) and 95% confidence intervals. Variables included in the multivariable model were selected a priori based on evidence from previous literature and their clinical relevance. Multicollinearity was assessed using the variance inflation factor (VIF), and no substantial multicollinearity was detected (all VIF values <5). Because the prevalence of sleep disorders in this study was higher than 10%, logistic regression was not used, as odds ratios may substantially overestimate the strength of association in cross-sectional studies with common outcomes (15). Although log-binomial regression can directly estimate prevalence ratios (PRs), it frequently encounters convergence problems (15). Previous studies by Zou and by Barros and Hirakata demonstrated that Poisson regression with robust variance provides valid estimates of PRs for binary outcomes and yields results comparable to those obtained from log-binomial regression while avoiding convergence issues (16). Therefore, Poisson regression with robust variance was selected for the multivariable analysis. A p-value <0.05 was considered statistically significant.

Ethics Approval

Before enrollment, all participants were thoroughly informed about the study objectives,

procedures, potential benefits, and their rights as research participants. Written informed consent was obtained from all participants before data collection. The study was observational in nature and focused solely on describing the prevalence of sleep disorders and their associated factors among patients with RA; therefore, it did not interfere with the participants' diagnostic evaluation or treatment. Participants were free to withdraw from the study at any time without any consequences for their medical care or other disadvantages. The study was approved by the Department of

Psychiatry, Hanoi Medical University, and the Rheumatology Center, Bach Mai Hospital. Ethical approval was granted by the Ethics Committee of Bach Mai Hospital (Decision No. 163/BM-HDDD, dated October 21st, 2025). The study was also approved by Hanoi Medical University under the thesis assignment decision (Decision No. 655/QD-DHYHN, dated February 24th, 2026).

RESULTS

Table 1. General characteristics of participants

Variables	Value	Frequency	Proportion (%)
Gender	Male	42	20.8
	Female	160	79.2
Age	Mean $\pm$ SD	59.24 $\pm$ 13.25	
Marital group	Married	130	64.4
	Other	72	35.6
Living arrangement	Living alone	30	14.9
	Living with family/relatives	172	85.1
Household income group	Low	29	14.4
	Medium	119	58.9
	High	54	26.7
History of hypertension	No	138	68.3
	Yes	64	31.7
History of diabetes	No	149	73.8
	Yes	53	26.2
Psychological stress	No	95	47.0
	Yes	107	53.0

Table 1 showed that females accounted for the majority of participants (79.2%), while males accounted for 20.8%. The mean age of participants was 59.24 ± 13.25 years. Most participants were married (130 participants, 64.4%), whereas 35.6% belonged to other marital groups. Regarding medical and psychiatric history, 31.7% had hypertension, 26.2% had diabetes.

Table 2. The distribution of sleep disorders among demographic factors

Variables	Value	Sleep disorder, n (%)		p-value ^a
		Yes	No	
Total sample	n (%)	139 (68.8)	63 (31.2)	
	Mean ± SD	8.81 ± 4.70		
Gender	Male	31 (73.8)	11 (26.2)	0.432
	Female	108 (67.5)	52 (32.5)	
Age group	Under 60-year-old	48 (52.7)	43 (47.3)	<0.001
	60 years or older	91 (82.0)	20 (18.0)	
Marital group	Married	79 (60.8)	51 (39.2)	0.001
	Other	60 (83.3)	12 (16.7)	
Living arrangement	Living alone	25 (83.3)	5 (16.7)	0.063
	Living with family/relatives	114 (66.3)	58 (33.7)	
Household income group	Low	26 (89.7)	3 (10.3)	<0.001
	Medium	86 (72.3)	33 (27.7)	
	High	27 (50.0)	27 (50.0)	
BMI classification	Underweight	9 (60.0)	6 (40.0)	0.116
	Normal	93 (64.6)	51 (35.4)	
	Overweight	19 (86.4)	3 (13.6)	
	Obese	13 (81.3)	3 (18.8)	

^a Chi-squared test

Table 2 showed that the prevalence of sleep disorders among 202 participants was 68.8% screened by PSQI score, and the mean of score was 8.81 ± 4.70 . This prevalence was significantly different ($p < 0.05$) among age groups ($p < 0.001$), marital group ($p = 0.001$), and household income group ($p < 0.001$). Specifically, participants aged 60 years or older had a higher prevalence of sleep disorders compared to those aged under 60 years (82.0% vs 52.7%). Married participants had a lower prevalence of sleep disorders than other marital groups (60.8% vs 83.3%). Regarding household income, the low-income group showed the highest prevalence of sleep disorders (89.7%).

Table 3. The distribution of sleep disorders among medical history group

Variables	Value	Sleep disorder, n (%)		p-value ^a
		Yes	No	
History of hypertension	No	83 (60.1)	55 (39.9)	<0.001
	Yes	56 (87.5)	8 (12.5)	
History of diabetes	No	90 (60.4)	59 (39.6)	<0.001
	Yes	49 (92.5)	4 (7.5)	
Psychological stress	No	60 (63.2)	35 (36.8)	0.102
	Yes	79 (73.8)	28 (26.2)	
Alcohol use history	No	115 (69.3)	51 (30.7)	0.759
	Yes	24 (66.7)	12 (33.3)	

^a Chi-squared test

Table 3 showed the different distribution of prevalence of sleep disorders among medical history groups. Specifically, participants with hypertension had a higher prevalence of sleep disorders compared with those without hypertension (87.5% vs 60.1%, $p<0.001$). Similarly, participants with diabetes had a higher prevalence of sleep disorders than those without diabetes (92.5% vs 60.4%, $p<0.001$). Patients with psychological stress had a higher prevalence of sleep disorders than those without psychological stress did (73.8% vs. 63.2%), but this difference was not significant ($p=0.102$). years or older had a higher prevalence of sleep disorders compared to those aged under 60 years (82.0% vs 52.7%). Married participants had a lower prevalence of sleep disorders than other marital groups (60.8% vs 83.3%). Regarding household income, the low-income group showed the highest prevalence of sleep disorders (89.7%).

Table 4. The distribution of sleep disorders among rheumatoid arthritis characteristics

Variables	Value	Sleep disorder, n (%)		p-value ^a
		Yes	No	
Disease duration	Less than 1 year	20 (64.5)	11 (35.5)	0.223
	1-5 years	40 (60.6)	26 (39.4)	
	5-10 years	38 (74.5)	13 (25.5)	
	More than 10 years	41 (75.9)	13 (24.1)	
Exacerbations per year	Less than 3	76 (58.0)	55 (42.0)	<0.001
	At least 3	63 (88.7)	8 (11.3)	
Swollen joints	Yes	90 (83.3)	18 (16.7)	<0.001
	No	49 (52.1)	45 (47.9)	
Painful joints	Yes	104 (78.8)	28 (21.2)	<0.001

	No	35 (50.0)	35 (50.0)	
Treatment adherence	Fully adherent	58 (56.9)	44 (43.1)	<0.001
	Not fully adherent	81 (81.0)	19 (19.0)	

^a *Chi-squared test*

Table 4 showed the different distribution of prevalence of sleep disorders among different RA groups. In particular, participants with at least 3 exacerbations per year had a significantly higher prevalence of sleep disorders than the other group did (88.7% vs. 58.0%, $p < 0.001$). Sleep disorders were more common among participants with swollen joints than those without swollen joints (83.8% vs 52.1%, $p < 0.001$), and among those with painful joints than those without painful joints (78.8% vs 50.0%, $p < 0.001$), with significant statistical difference. Fully adherent participants had a significantly lower prevalence of sleep disorders compared to those not fully adherent (56.9% vs 81.0%, $p < 0.001$).

Figure 1 showed the associated factors of sleep disorders adjusted by poisson regression. The number of exacerbations of RA per year and participants' age were the two factors significantly associated with the prevalence of sleep disorder. Specifically, the prevalence of sleep disorders among patients aged 60 years and older was 1.32 times higher than this prevalence among the rest group (PR=1.32, 95% CI: 1.06 – 1.65). Patients with at least 3 exacerbations per year also had more likelihood of having sleep disorders than those with less than 3 exacerbations per year with PR=1.21, 95% CI: 1.02 – 1.44.

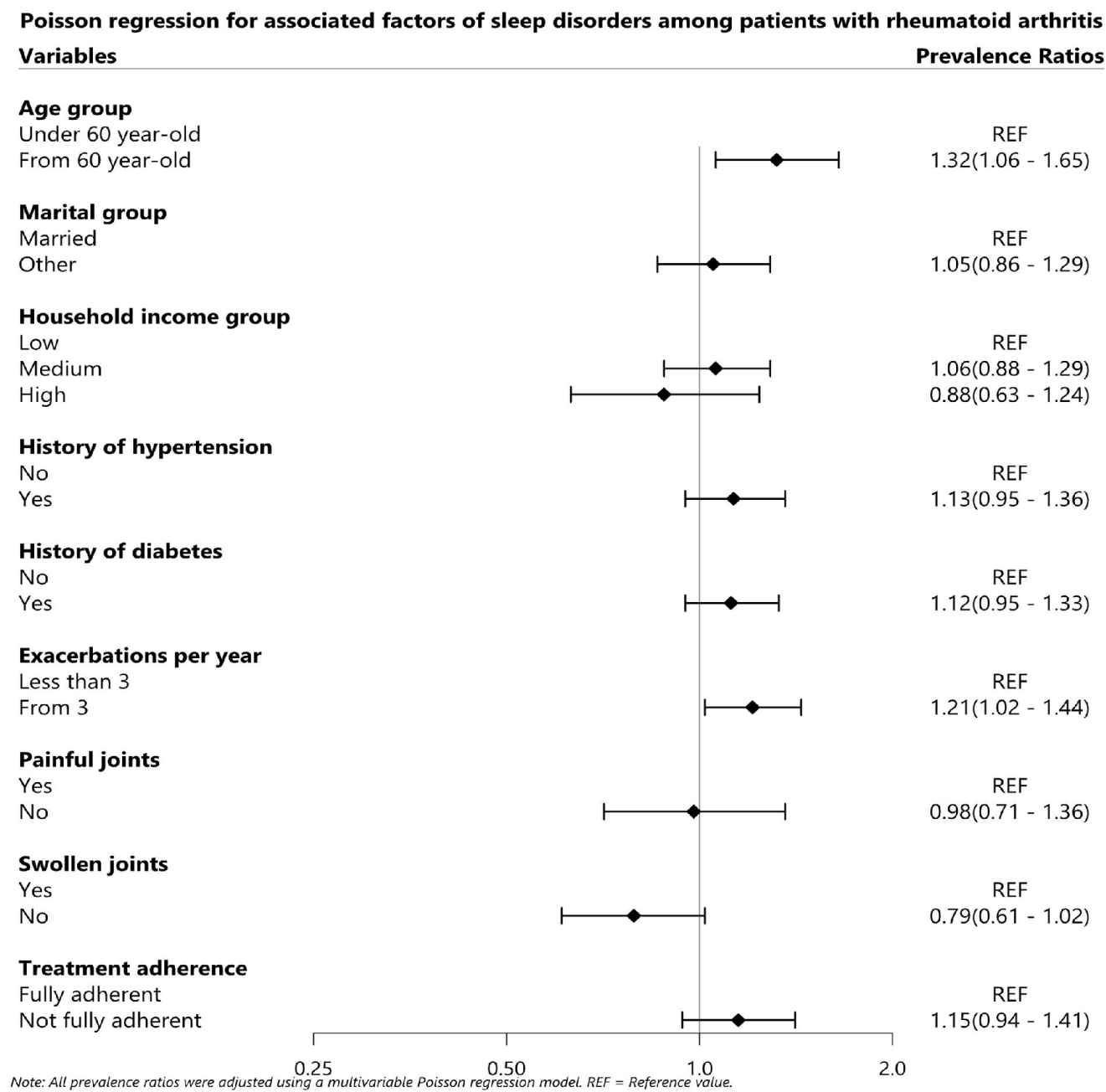


Figure 1. Poisson regression for associated factors of sleep disorders among patients with rheumatoid arthritis

DISCUSSION

The present study included 202 inpatients with RA, of whom females outnumbered males by approximately 4:1. The mean age of participants was approximately 60 years. These findings are consistent with the epidemiological characteristics of RA, which predominantly affects women because of genetic, hormonal, and immunological factors (1). More than half of the participants

reported experiencing psychological stress (53.0%), suggesting that, in addition to the burden of chronic disease, many patients also faced considerable psychosocial challenges that may adversely affect their overall well-being.

The prevalence of sleep disorders screened by PSQI in this study was 68.8%, which is comparable with previous reports. Yaseen et al. conducted a cross-sectional study at the Pakistan

Institute of Medical Sciences in 2023 and reported that 75.3% of patients with RA had poor sleep quality as assessed by the PSQI (8). These findings indicate that sleep disorders are highly prevalent among patients with RA and represent an important but often underrecognized comorbidity. Previous studies have also demonstrated that appropriate recognition and management of sleep disorders may improve disease outcomes, physical functioning, and quality of life in patients with RA (17).

Sleep disorders prevalence differed significantly according to marital status and household income. Specifically, participants who were widowed, single, or divorced and those with low household incomes had higher prevalences of sleep disorders. Similar findings were reported by Juárez et al., who studied 102 patients with RA in Mexico and found that married participants were significantly less likely to have poor sleep quality (OR = 0.04, 95% CI: 0.01–0.90) (18). These findings suggest that family support and socioeconomic status may play important roles in maintaining good sleep quality. Individuals with limited social support or financial difficulties may experience greater psychological stress, reduced coping capacity, and poorer access to healthcare, all of which may contribute to sleep disturbances.

Patients with hypertension or diabetes also had higher prevalences of sleep disorders than those without these comorbidities (87.5% vs. 60.1% and 92.5% vs. 60.4%, respectively). These findings are consistent with previous evidence showing that metabolic disorders contribute to impaired sleep through chronic inflammation, autonomic

dysfunction, vascular abnormalities, and disruption of normal sleep–wake regulation (19). In patients with RA, these mechanisms may further interact with systemic autoimmune inflammation, increasing the risk of poor sleep quality.

Multivariable Poisson regression demonstrated that older age (PR = 1.32, 95% CI: 1.06–1.65) and experiencing at least three RA exacerbations per year (PR = 1.21, 95% CI: 1.02–1.44) were independently associated with sleep disorder. Age-related changes in sleep architecture, including reduced slow-wave sleep and increased nighttime awakenings, together with the cumulative burden of chronic inflammation, may explain the higher prevalence of sleep disorders among older patients (20). Similarly, frequent disease exacerbations are likely to worsen pain, stiffness, fatigue, and psychological distress, thereby impairing sleep quality (6). Although swollen joints, painful joints, and treatment adherence were not independently associated with sleep disorders after multivariable adjustment, higher prevalences of sleep disorders were still observed among patients with swollen joints, painful joints, and poor treatment adherence. These findings suggest that inadequate disease control may contribute to sleep disturbances. Consistent with our findings, Westhovens et al. reported a significant positive correlation between disease activity measured by DAS28-CRP and poor sleep quality measured by the PSQI ($r = 0.241$, 95% CI: 0.127–0.349), indicating that effective control of RA disease activity may improve sleep quality (5). The loss

of statistical significance after multivariable adjustment suggests that the associations observed in the bivariate analyses were likely influenced by confounding. Older age and more frequent RA exacerbations remained independently associated with sleep disorders and may represent stronger determinants of sleep disturbance, thereby attenuating the apparent effects of hypertension, diabetes, swollen joints, painful joints, and treatment adherence after adjustment.

Despite these findings, the present study has several limitations. First, its cross-sectional design precludes the establishment of causal relationships between factors and sleep disorders. Second, information on medical history and several exposure variables was obtained through routine clinical history taking, making the results susceptible to recall bias. Another limitation is that standardized RA disease activity indices (e.g., DAS28, CDAI, and SDAI) were not available because the clinical and laboratory data required to calculate these indices were not collected consistently for all participants. Consequently, we described clinical manifestations, such as painful and swollen joints, instead. This approach may have influenced the interpretation of the association between RA disease activity and sleep disorders. Besides, due to resource constraints, the multivariable regression model included only variables selected a priori based on previous literature and clinical relevance. Consequently, other factors, such as medication use and certain health-related behaviors, were not included in the analysis. Furthermore, as this study was conducted at a single tertiary referral center, where patients

typically have more severe disease, the findings may have limited generalizability to patients with rheumatoid arthritis treated in other healthcare settings. Future longitudinal studies with larger sample sizes, conducted in different centers for rheumatology, can confirm these associations and clarify the causal relationship between RA and sleep disorder.

CONCLUSION

This study was conducted among 202 inpatients with RA treated at the Rheumatology Center, Bach Mai Hospital. Using a Poisson regression model with robust variance, we found that patients aged 60 years and older (PR = 1.32, 95% CI: 1.06–1.65) and those experiencing at least three exacerbations per year (PR = 1.21, 95% CI: 1.02–1.44) were more likely to have sleep disorders than their respective comparison groups. These findings were consistent with those reported in previous studies.

Routine screening for sleep disorders should be incorporated into the clinical management of patients with RA, particularly among older adults and those with frequent disease exacerbations, to facilitate early intervention and improve overall treatment outcomes and quality of life.

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Conflicts of Interest: The authors declare that they have no conflicts of interest.

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