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Prevalence of insomnia symptoms and mediation of the association between multimorbidity and insomnia symptoms by loneliness and multisite pain among middle-aged and older adults in Malaysia

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ABSTRACT

The aim of the study is to estimate the prevalence and associated factors of insomnia symptoms among middle-aged and older adults in Malaysia. In all, 5602 cross-sectional nationally representative data from adults (≥ 40 years) of the 2018 Malaysia Aging and Retirement Survey (MARS) was analyzed. Insomnia symptoms were assessed with three items from the Jenkins Sleep Scale (JSS-4). Unconditional multivariable logistic regression was used to identify relationships between social and health factors and insomnia symptoms. To examine the indirect effects of multimorbidity on insomnia symptoms via loneliness and multisite pain, causal mediation analyses were conducted. The prevalence of insomnia symptoms was 29.0%. In the final adjusted model, urban residence (AOR: 1.25, 95% CI: 1.10–1.43), multisite pain (AOR: 1.18, 95% CI: 1.04–1.35), loneliness (AOR: 1.11, 95% CI: 1.08–1.14), poor self-rated health (AOR: 1.16, 95% CI: 1.11–1.22), incontinence (AOR: 1.91, 95% CI: 1.56–2.33), and multimorbidity (AOR: 1.21, 95% CI: 1.05–1.39) were positively associated with insomnia symptoms, while male sex (AOR: 0.88, 95% CI: 0.77–0.99), Islamic religion (AOR: 0.75, 95% CI: 0.66–0.86), has caring friends (AOR: 0.91, 95% CI: 0.85–0.98), and higher physical activity (AOR: 0.96, 95% CI: 0.94–0.98) were negatively associated with insomnia symptoms. Furthermore, there was a significant indirect effect of loneliness (explaining 29.2%) and multisite pain (explaining 30.3%) on insomnia via multimorbidity. Almost one in three aging adults reported insomnia symptoms. Loneliness and multisite pain were found to mediate the association between multi-morbidity and insomnia problems. Reducing loneliness and multisite pain may help in reducing insomnia symptoms in aging multi-morbid patients.

KEYWORDS

Multimorbidity; loneliness; multisite pain; insomnia symptoms; Malaysia

Introduction

Globally, the prevalence of diagnosed insomnia disorder among older adults was 19.6% (Endomba et al., 2023), and in the general adult population 30%–36% have insomnia symptoms (Morin & Jarrin, 2022). In older adults in South Korea, the prevalence of insomnia (any of the four subtypes, ≥ 3 times/week) was 29.2% (Kim et al., 2013). In older adults (≥ 60 years) in Brazil, the prevalence of insomnia was 58.6% (Canevar et al., 2023). Using the Jenkins Sleep Scale, the prevalence of insomnia in India was 12.7% (Pengpid & Peltzer, 2021). In a study among 30–70-year-olds in four Malaysian states in 2004 found that the prevalence of insomnia symptoms was 33.8% (Zailinawati et al., 2008). However, there is scarce more recent, national information on insomnia symptoms in the aging population in Malaysia, which led to this study. The quality of life, physical and mental morbidity, and mortality are all adversely affected by insomnia (Cappuccio et al., 2010; Jaussent et al., 2011; Luyster et al., 2012). The general health of aging populations can be enhanced by focusing interventions on specific factors that raise the risk of insomnia (Smagula et al., 2016). Malaysia is undergoing rapid population aging, increasing the public health importance of sleep problems among middle-aged and older adults. Aging is associated with physiological

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changes in sleep patterns and with a higher burden of multimorbidity, pain, and psychosocial problems, all of which may increase vulnerability to insomnia symptoms (Crowley, 2011; Smagula et al., 2016). Despite this, nationally representative and recent data on insomnia symptoms in older Malaysians remain scarce, with the most recent study based on adults from four states conducted more than two decades ago (Zailinawati et al., 2008). Updated evidence is therefore needed to inform prevention and intervention strategies.

Factors associated with insomnia symptoms in older adults, include sociodemographic factors, stressor and support factors, health status and health risk behavior (Pengpid & Peltzer, 2021). Sociodemographic factors associated with insomnia symptoms include increasing age (Morin & Jarrin, 2022), female sex (Endomba et al., 2023; Morin & Jarrin, 2022), lower socioeconomic status (Morin & Jarrin, 2022; Pengpid & Peltzer, 2021), lower or no education (Kim et al., 2013; Morin & Jarrin, 2022), and urban residence (Itani et al., 2016). Stressors associated with insomnia symptoms among older adults include stressors (Smagula et al., 2016), living alone, widowhood, mental distress (Morin & Jarrin, 2022), loneliness (Griffin et al., 2020; Pengpid & Peltzer, 2021; Qi et al., 2023), depression, and anxiety (Endomba et al., 2023). Support factors associated with insomnia symptoms include lack of social support, low social network (Pengpid & Peltzer, 2021; Seo & Mattos, 2024) and lack of social cohesion (Peltzer, 2012).

Health status variables associated with insomnia symptoms among older adults include poor self-rated physical health (Canever et al., 2023; Morin & Jarrin, 2022; Smagula et al., 2016), functional disability (Gulia & Kumar, 2018; Peltzer & Pengpid, 2019), body pain (Mookerjee et al., 2023; Pengpid & Peltzer, 2021; Santos et al., 2023), and multimorbidity (Canever et al., 2023; Chen et al., 2022; Koyanagi et al., 2014). Health risk behaviors associated with insomnia symptoms among older adults include physical inactivity (De Nys et al., 2022), smoking (Hu et al., 2021), unhealthy diet (Canever et al., 2023; Peltzer & Pengpid, 2019), and alcohol use disorder (Stein & Friedmann, 2005). Furthermore, body pain and poor mental health may play a mediating role on insomnia symptoms. Some studies showed that body pain and depression mediated the association between multi-morbidity with insomnia symptoms (Muhammad et al., 2023).

Multimorbidity may increase the risk of insomnia symptoms through both social and physical pathways. Individuals with multiple chronic conditions often experience functional limitations, disability, and reduced social participation, which can increase feelings of loneliness and social isolation. According to the stress process model, chronic health conditions act as stressors that diminish social resources and contribute to loneliness (Pearlin et al., 1981). In addition, multimorbidity is frequently accompanied by pain arising from several coexisting diseases, resulting in multisite pain. Loneliness may contribute to insomnia symptoms by increasing psychological distress and physiological hyperarousal, as proposed by the evolutionary theory of loneliness (Cacioppo & Hawkey, 2009), while multisite pain can impair sleep initiation and maintenance through discomfort and nocturnal awakenings (Finan et al., 2013). These findings support a biopsychosocial framework in which loneliness and multisite pain mediate the relationship between multimorbidity and insomnia symptoms among middle-aged and older adults in Malaysia. This study sought to determine the prevalence and correlates of insomnia symptoms as well as the mediating role of body pain and loneliness on insomnia symptoms in aging adults in Malaysia in 2018 as part of a national population survey.

Methods

Sample and procedure

Data from the 2018 Malaysia Aging and Retirement Survey (MARS) were used in this study. The first nationwide, extensive study of middle-aged and older people living in Peninsular and East Malaysia is called MARS. With an 84% response rate, the data includes people 40 years of age and above who live in all of Malaysia's states. Starting with the selection of enumeration blocks in each stratum, a selection of living quarters or households, and finally a selection of household members as possible respondents based on age eligibility criteria, a multistage sampling technique was used. Any member 40 years of age or older who had spent the most of their time in the household was eligible for inclusion. A maximum of three eligible members would be chosen as potential responders if there were several eligible members. Trained field enumerators used the computer-assisted personal interview (CAPI) to conduct the in-person interview. 150

trained enumerators participated in the data gathering from August 2018 to May 2019. The research team often uses para-data to track interviewers' progress in the field to make sure high-quality data is being gathered. The duration of the interview, the number of questions posed, and the quantity of negative or unsure answers were all noted as indicators of interviewer behavior. Additionally, callbacks were used to confirm 10% of completed interviews.

(Mansor et al., 2021; Social Wellbeing Research Centre [SWRC], 2021). The University of Malaya's Institutional Review Board gave MARS its approval (# UM.TNC2/UMREC-341). Participants provided written informed consent before participating in the study.

Measures

Outcome measure

Insomnia symptoms were assessed with three items of the Jenkins Sleep Scale (JSS-4) (Jenkins et al., 1988), including the following questions: 1) "How often do you have trouble falling asleep? Would you say most of the time, sometimes, or rarely or never?"; 2) "How often do you have trouble with waking up too early and not being able to fall asleep again? Would you say most of the time, sometimes, or rarely or never?"; 3) "How often do you feel rested when you wake up in the morning? Would you say most of the time, sometimes, or rarely or never?" Response options were "Most of the time," "Sometimes," "Rarely" or "Never." Insomnia problems were "coded as "most of the time" for any of the first two symptoms and "rarely or never" for the third symptom as 1 and 0 for other responses. Participants who scored 1 on any of the three symptoms were considered to have insomnia symptoms. Cronbach alpha of the JSS-3 was 0.62 in this sample.

Sociodemographic variables

The age ranges (40–49, 50–59, 60–69, 70–79, and 80 years or older), gender (male, female), education (>primary and primary or less), marital status (not married and married), residence status (urban-rural), religious affiliation (Islam and others) and, financial independence (1 = strongly disagree to 5 = strongly agree) were among the sociodemographic variables.

Stressor and support variables

Living alone was defined as individuals who reported having only one member in a single household rather than living with one or more other persons in a household.

Body pain was assessed with the question, "Did you experience any pain or ache in the following body parts in the last 30 days that limit your daily activities?" Response options were, "None, Head, Neck, Shoulder, Arms, Wrist, Fingers, Chest, Stomach, Back, Hips, Legs, Knees, Ankles, Toes." Multisite pain was defined as having pain or ache in two or more body sites in the past month limiting daily activities.

Loneliness was assessed with the three-item modified subscale from the revised UCLA loneliness scale (Russell, 1996). The three items included 1) "How often did you experience lack of companionship?" 2) "How often did you experience loneliness?" 3) "How often did you experience isolated or sidelined from others?" Response options were 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often and 5 = Always, with an overall score ranging from 3 to 15. Cronbach's alpha was 0.64 in this sample.

Social participation was estimated with the questions, 1) "How often do you do volunteer/charity work?" 2) "How often do you go to a sport, social or other clubs?" 3) "How often do you attend non-religious organizations?" 4) "How often do you exercise/involved in group exercise?" 5) "How often do you go out for social outings?" 6) "How often do you participate in sports activities?" 7) "How often do you attend religious sermons/religious classes/talks?" (Response options ranged from 1 = Never to 5 = Always) (Sutin et al., 2024). Total scores ranged from 7–35, with higher scores indicating higher social participation. Cronbach's alpha was 0.72 in this sample.

Has caring friends was sourced from the item, "I continue to have friends who care for me." (response options ranged from 1 (strongly disagree) to 5 (strongly agree)).

Purpose in life was measured with the item, “I am leading a meaningful purpose in life” on a scale from 1 (strongly disagree) to 5 (strongly agree).

Personal mastery was assessed with four items (e.g., “I can do just about anything I really set my mind to.”) of the sense of control scale (Lachman & Weaver, 1998). Response options ranged from 1 = strongly disagree to 5 = strongly agree. Total scores ranged from 4–20, with higher scores indicating higher personal mastery. Cronbach’s alpha was 0.75 in this sample.

Health status

Self-rated health status was assessed with two questions, 1) “Which of the following best describes your current health status?” (“1 = Very good, 2 = Good, 3 = Moderate, 4 = Poor, and 5 = Very poor.”), and 2) “Compare your current health to your health for the last 12 months, would you say your health now is much better, better, about the same, worse or much worse?” (“1 = Much better, 2 = Better, 3 = Similar, 4 = Worse, and 5 = Much worse.”) Scores were summed (2–10), with higher scores indicating poorer self-rated health status.

Incontinence was sourced from the item, “During the last 12 months, have you lost any amount of urine beyond your control?” and incontinence was defined as any day in a month.

A person is said to have difficulty with activities of daily living (ADL) if they are unable to perform at least one of the following tasks independently: eating, dressing, taking care of their mouth, getting into bed or a chair, toileting, grooming, climbing stairs, and walking around the house. In this sample, the Cronbach alpha was 0.84.

Multimorbidity (two or more chronic conditions) included a doctor diagnosed high blood pressure, diabetes, chronic lung conditions (emphysema, chronic bronchitis, etc.), heart conditions (angina, heart failure, myocardial infarction, heart valve disease, etc.), cancer or other malignant tumors (such as leukemia lymphoma), stroke, asthma, high cholesterol, or joint disorder (arthritis, rheumatism).

Health risk behaviour

Physical activity (2–10) was measured as the sum of two items on moderate (“How often do you take part in sports/activities that are moderately vigorous (e.g. gardening, cleaning the car, walking at a moderate pace or dancing, etc.)?”) and vigorous (“How often do you take part in sports/activities that are vigorous (e.g. running, swimming, cycling, aerobics, tennis, or digging with a hoe or shovel, etc.)?”) physical activity rated on a scale from 1 (everyday) to 5 (rarely/never) and reverse scored in the direction of more frequent engagement in moderate-to-vigorous physical activity (Sutin et al., 2024).

Smoking was scored as current smokers (=1) compared to non-current smokers (=0).

Current alcohol use was assessed with the item, “Do you currently drink alcohol?” (Yes/No).

History of falls was assessed with the questions, “In the last 24 months, were you involved in any accident that affects your physical health?” (Fall down) (Yes/No)

Statistical analysis

The sample and insomnia symptoms categories were described using descriptive statistics. To check any variations in proportions, chi-square statistics were employed. Unconditional multivariable logistic regression was used to identify relationships between social and health factors and insomnia symptoms. Based on an earlier review of the literature, covariates were added. The multivariable model then contained the variables that the univariable analysis determined to be significant ($p < .05$). To examine the indirect effects of multimorbidity on insomnia symptoms via loneliness and multisite pain, causal mediation analyses were conducted. Each mediation model was adjusted for sociodemographic, stressor and support variables, health status and health risk behavior and survey weight. The mediate command of the Stata program was used to estimate the total, direct, and indirect effects (Causal mediation analysis, 2024). There was no evidence of collinearity in the Variance Inflation Factor (VIF). All tests

Table 1. Sample characteristics and insomnia symptoms prevalence, Malaysia, 2018–2019.

Variable	Sub-category	Sample	No insomnia	Insomnia	<i>p</i> -value ^a
		N (%) or M (SD)	N (%) or M (SD)	N (%) or M (SD)	
All		5602	3978 (71.0)	1624 (29.0)	
Sociodemographic factors					
Age (in years)	40–49	1495 (26.7)	1126 (75.3)	369 (24.7)	<0.001
	50–59	1827 (32.6)	1294 (70.8)	533 (29.2)	
	60–69	1474 (26.3)	1024 (69.5)	450 (30.5)	
	70–79	634 (11.3)	422 (66.6)	212 (33.4)	
	80 or more	172 (3.1)	112 (65.1)	60 (34.9)	
Sex	Female	3112 (55.6)	2147 (69.0)	965 (31.0)	<0.001
	Male	2490 (44.4)	1831 (73.5)	659 (26.5)	
Financially independent	1–5	3.7 (1.0)	3.7 (1.0)	3.6 (1.1)	<0.001
Education	Primary or less	2489 (44.4)	1678 (67.4)	811 (32.6)	<0.001
	>Primary	3113 (55.6)	2300 (73.9)	813 (26.1)	
Urban residence	Rural	2154 (38.5)	1594 (74.0)	560 (26.0)	<0.001
	Urban	3448 (61.5)	2384 (69.1)	1064 (30.9)	
Marital status	Married	4347 (77.6)	3137 (72.1)	1421 (27.9)	<0.001
	Not married	1255 (22.4)	301 (59.7)	203 (40.3)	
Religion	Other	1653 (29.5)	1084 (65.6)	569 (34.4)	<0.001
	Islam	3949 (70.5)	2894 (73.3)	1055 (26.7)	
Stressor and support variables					
Living alone	No	5365 (95.8)	3818 (71.2)	1547 (28.8)	0.225
	Yes	237 (4.2)	160 (67.5)	77 (32.5)	
Multisite pain	2 or more	3838 (68.5)	2831 (73.8)	1007 (26.2)	<0.001
		1764 (31.5)	1147 (65.0)	617 (35.0)	
Loneliness	3–9	5.5 (2.3)	5.3 (2.1)	6.1 (2.6)	<0.001
Has caring friends	1–5	3.9 (0.9)	3.9 (0.8)	3.8 (1.0)	<0.001
Social participation	7–35	14.9 (4.9)	15.1 (4.9)	14.4 (5.0)	<0.001
Personal mastery	4–20	15.2 (2.5)	15.3 (2.4)	15.0 (2.7)	<0.001
Purpose in life	1–5	4.1 (0.7)	4.1 (0.6)	4.0 (0.8)	<0.001
Health status					
Poor self-rated health	2–10	5.6 (1.3)	5.4 (1.2)	5.9 (1.5)	<0.001
Incontinence	No	5105 (91.1)	3724 (72.9)	1381 (27.1)	<0.001
	Yes	497 (8.9)	254 (51.1)	243 (48.9)	
ADL limitations	No	5088 (91.0)	3667 (72.1)	1421 (27.9)	<0.001
	Yes	504 (9.0)	301 (59.7)	203 (40.3)	
Multimorbidity	No	3838 (73.1)	2831 (73.8)	1007 (26.2)	<0.001
	Yes	1764 (26.9)	1147 (65.0)	617 (35.0)	
Health risk behaviour					
Physically active	2–10	4.6 (2.6)	4.7 (2.6)	4.2 (2.6)	<0.001
Current smoking	No	4556 (81.3)	3219 (70.7)	1337 (29.3)	0.227
	Yes	1045 (18.7)	758 (72.5)	287 (27.5)	
Current alcohol use	No	5289 (94.4)	3749 (70.9)	1540 (29.1)	0.407
	Yes	312 (5.6)	228 (73.1)	84 (26.9)	
Falls (past 2 years)	No	5241 (93.6)	3761 (71.8)	1480 (28.2)	<0.001
	Yes	361 (6.4)	217 (60.1)	144 (39.9)	

ADL = Activities of Daily Living; abased on Chi-square tests or Analysis of Variance (ANOVA).

were considered statistically significant at $p < .05$. For all statistical techniques, STATA software (Stata Corporation, College Station, TX, USA) version 18.0 was utilized.

Results

The sample included 5602 participants (median age 57 years, IQR = 16, range 40–95 years) with complete insomnia symptoms assessments, including 44.4% men. The prevalence of insomnia symptoms was 29.0%, which differed by age group, sex, financial independence, education, residence status, religion, marital status, multisite pain, loneliness, having caring friends, social participation, personal mastery, purpose in life, self-rated health status, incontinence, ADL limitations, multimorbidity, physical activity, and history of falls (see Table 1).

Associations with insomnia symptoms

In the final adjusted model, urban residence (AOR: 1.25, 95% CI: 1.10–1.43), multisite pain (AOR: 1.18, 95% CI: 1.04–1.35), loneliness (AOR: 1.11, 95% CI: 1.08–1.14), poor self-rated health (AOR: 1.16, 95% CI: 1.11–1.22), incontinence (AOR: 1.91, 95% CI: 1.56–2.33), and multimorbidity (AOR: 1.21, 95% CI: 1.05–1.39)

Table 2. Associations with insomnia symptoms prevalence.

Variable	Sub-category	COR (95% CI)	p-value	AOR (95% CI) ^a	p-value
Sociodemographic factors					
Age (in years)		1 (Reference)	<.001	1 (Reference)	.824
		1.01 (1.009 to 1.02)		1.00 (0.99 to 1.01)	
Sex	Female	1 (Reference)	<.001	1 (Reference)	.046
	Male	0.80 (0.71 to 0.90)		0.88 (0.77 to 0.99)	
Financially independent	1–5	1 (Reference)	<.001	1 (Reference)	.615
		0.91 (0.86 to 0.96)		1.02 (0.96 to 1.08)	
Education	Primary or less	1 (Reference)	<.001	1 (Reference)	.080
	>Primary	0.73 (0.65 to 0.82)		0.88 (0.77 to 1.02)	
Urban residence	Rural	1 (Reference)	<.001	1 (Reference)	<.001
	Urban	1.27 (1.13 to 1.43)		1.25 (1.10 to 1.43)	
Marital status	Married	1 (Reference)	<.001	1 (Reference)	.708
	Not married	1.28 (1.12 to 1.46)		0.97 (0.83 to 1.13)	
Religion	Other	1 (Reference)	<.001	1 (Reference)	<.001
	Islam	0.69 (0.61 to 0.79)		0.75 (0.66 to 0.86)	
Stressor and support variables					
Living alone	No	1 (Reference)	.225	—	
	Yes	1.19 (0.90 to 1.57)			
Multisite pain	2 or more	1 (Reference)	<.001	1 (Reference)	.013
		1.51 (1.34 to 1.71)		1.18 (1.04 to 1.35)	
Loneliness	3–9	1 (Reference)	<.001	1 (Reference)	<.001
		1.16 (1.13 to 1.19)		1.11 (1.08 to 1.14)	
Has caring friends	1–5	1 (Reference)	<.001	1 (Reference)	.013
		0.83 (0.78 to 0.88)		0.91 (0.85 to 0.98)	
Social participation	7–35	1 (Reference)	<.001	1 (Reference)	.112
		0.97 (0.96 to 0.99)		1.01 (0.99 to 1.03)	
Personal mastery	4–20	1 (Reference)	<.001	1 (Reference)	.409
		0.95 (0.93 to 0.97)		0.99 (0.96 to 1.02)	
Purpose in life	1–5	1 (Reference)	<.001	1 (Reference)	.794
		0.81 (0.74 to 0.88)		1.01 (0.91 to 1.13)	
Health status					
Poor self-rated health	2–10	1 (Reference)	<.001	1 (Reference)	<.001
		1.28 (1.23 to 1.34)		1.16 (1.11 to 1.22)	
Incontinence	No	1 (Reference)	<.001	1 (Reference)	<.001
	Yes	2.58 (2.14 to 3.11)		1.91 (1.56 to 2.33)	
ADL limitations	No	1 (Reference)	<.001	1 (Reference)	.761
	Yes	1.74 (1.44 to 2.10)		1.03 (0.83 to 1.28)	
Multimorbidity	2 or more	1 (Reference)	<.001	1 (Reference)	.007
		1.58 (1.40 to 1.80)		1.21 (1.05 to 1.39)	
Health risk behaviour					
Physically active	2–10	1 (Reference)	<.001	1 (Reference)	.004
		0.93 (0.91 to 0.95)		0.96 (0.94 to 0.98)	
Current smoking	No	1 (Reference)	.227	—	
	Yes	0.91 (0.79 to 1.06)			
Current alcohol use	No	1 (Reference)	.407	—	
	Yes	0.90 (0.69 to 1.16)			
Falls (past 2 years)	No	1 (Reference)	<.001	1 (Reference)	.097
	Yes	1.69 (1.36 to 2.10)		1.22 (0.96 to 1.54)	

COR = Crude Odds Ratio; AOR = Adjusted Odds Ratio; CI = Confidence interval; ADL = Activities of Daily Living; ^aAdjusted for all variables in the table.

were positively associated with insomnia symptoms, while male sex (AOR: 0.88, 95% CI: 0.77–0.99), Islamic religion (AOR: 0.75, 95% CI: 0.66–0.86), has caring friends (AOR: 0.91, 95% CI: 0.85–0.98), and higher physical activity

(AOR: 0.96, 95% CI: 0.94–0.98) were negatively associated with insomnia symptoms (see Table 2).

Mediation analysis

The total, direct, and indirect effects of the association of multimorbidity with insomnia symptoms are shown in Table 3. Results show that there was a significant indirect effect of loneliness (explaining 29.2%) and multisite pain (explaining 30.3%) on insomnia symptoms via multimorbidity

Table 3. Odds ratios of the total, direct, and indirect effects of multimorbidity on insomnia mediated by loneliness and multisite pain.

Effect	Loneliness		Multisite pain	
	AOR (95% CI) ^a	p-value	AOR (95% CI) ^a	p-value
Indirect	1.09 (1.05 to 1.12)	<0.001	1.07 (1.03 to 1.11)	<0.001
Direct	1.21 (1.07 to 1.38)	0.003	1.17 (1.02 to 1.34)	0.027
Total	1.31 (1.15 to 1.50)	<0.001	1.25 (1.09 to 1.43)	<0.001
Proportion mediated	29.17 (13.38 to 44.95)	<0.001	30.25 (6.14 to 54.35)	0.014

AOR = Adjusted Odds Ratio; CI = Confidence Interval; ^aAdjusted for sociodemographic, stressor and support variables, health status and health risk behavior.

Discussion

According to the study, 29.0% of persons 40 years and older in Malaysia in a large national sample reported having insomnia symptoms in 2018, which was lower than among 30–70-year-old Malaysians in 2004 (33.8%) (Zailinawati et al., 2008), the general adult population (30%–36%) globally (Morin & Jarrin, 2022), and lower than in Brazil (58.6%) (Canever et al., 2023), and similar to South Korea (29.2%) (Kim et al., 2013) and higher than in India (12.7%) (Pengpid & Peltzer, 2021). The found high prevalence of insomnia symptoms among aging adults in Malaysia calls for intensified interventions.

The study found that urban residence, multisite pain, loneliness, poor self-rated health, incontinence, and multimorbidity were positively associated with insomnia symptoms, while male sex, Islamic religion, has caring friends, and higher physical activity were negatively associated with insomnia symptoms. Moreover, loneliness and multisite pain explained 29.2% and 30.3% of the association between multimorbidity, respectively, with insomnia symptoms.

Consistent with previous research (Morin & Jarrin, 2022), the insomnia symptoms prevalence increased with age in unadjusted analysis, but became non-significant in adjusted analysis. In line with several previous studies (Endomba et al., 2023; Morin & Jarrin, 2022), we found a female preponderance of insomnia symptoms. Various studies (Morin & Jarrin, 2022; Pengpid & Peltzer, 2021) found an association between lower socioeconomic status and insomnia symptoms, while we only found this association in univariable analysis. In agreement with a study among adults in Indonesia (Peltzer & Pengpid, 2019), we found that urban residence increased the odds of insomnia symptoms.

While some studies (Morin & Jarrin, 2022) found an association living alone and insomnia symptoms, we did not find a significant association. This study found only in unadjusted analysis correlations between not married or widowhood, and insomnia symptoms, which is in line with certain other studies (Morin & Jarrin, 2022). Consistent with many studies (Griffin et al., 2020; Gulia & Kumar, 2018; Mookerjee et al., 2023), comorbid conditions, including loneliness, significantly increased the odds of insomnia symptoms. The mechanisms of how loneliness affects insomnia symptoms are unclear (Deng et al., 2023). It's feasible that recurring intrusive thoughts about how to fall short of one's own demands in social situations could be interfering with sleep patterns (Aanes et al., 2011).

Various studies (Peltzer, 2012; Pengpid & Peltzer, 2021; Seo & Mattos, 2024) showed that social support can be protective against insomnia symptoms, while in this study this was confirmed in terms of "having caring friends" and in terms of social participation, including religious involvement, in univariable analysis. A recent review (de Diego-Cordero et al., 2022) acknowledged the potential favorable effects of spiritual and/or religious interventions, including praying/meditation and daily spiritual experiences, on insomnia symptoms directly and indirectly.

In line with previous studies (Canever et al., 2023; Chen et al., 2022; Koyanagi et al., 2014; Morin & Jarrin, 2022; Smagula et al., 2016), this study showed a positive association between poor self-rated physical health, multimorbidity and insomnia symptoms, showing the possible overall negative impact of poor physical health on insomnia symptoms, possibly through stress and anxiety (Canever et al., 2023). In addition, multimorbidity in the form of chronic non-communicable disorders have been shown to increase baseline levels of fibrinogen, interleukin 6, C-reactive protein, and biomarkers that control the inflammatory cascade linked to insomnia symptoms (Dzierzewski et al., 2020).

Several studies (Gulia & Kumar, 2018; Peltzer & Pengpid, 2019) found an association between functional disability and insomnia symptoms, which in this study was only found in univariable analysis. The found

positive association between incontinence and insomnia symptoms is probably bidirectional, also insomnia symptoms being associated with urinary incontinence (Leng et al., 2023; Przydacz et al., 2021). Consistent with previous studies (Mookerjee et al., 2023; Pengpid & Peltzer, 2021; Santos et al., 2023), we found a positive relationship between body pain, and insomnia symptoms. Inflammatory makers from various chronic conditions and their medication use may lead to increased insomnia symptoms (Canever et al., 2023; Cho & Chen, 2020).

Consistent with a previous review (De Nys et al., 2022), this study showed that physical activity was protective against insomnia symptoms. However, unlike previous research (Hu et al., 2021; Stein & Friedmann, 2005), we did not find a significant association between current smoking, alcohol use and insomnia symptoms. The latter finding may be explained by the overall low frequency of alcohol use (5.6%). Consistent with a study among older adults in India (Muhammad et al., 2023), we found that multisite pain mediated the association between multi-morbidity with insomnia symptoms. This supports earlier research (Onen & Onen, 2018) that shown the influence of loneliness and chronic disease-related discomfort on sleep. Given that pain is a symptom of many of the chronic illnesses evaluated, including cancer, joint disorders, and chronic lung disease, multisite pain may have a mediation effect on the association between multi-morbidity and insomnia symptoms (Muhammad et al., 2023). Furthermore, we found that loneliness mediated the association between multi-morbidity with insomnia symptoms. In a multi-country study in a dose-response fashion an increasing number of physical diseases increased loneliness (Stickley & Koyanagi, 2018). The exact way in which physical disease and loneliness are linked is uncertain, but possible pathways point to mental illness, including depression, as an important mediator in the association (Stickley & Koyanagi, 2018).

Study strengths and limitations

The study's strength was the use of standardized measures modified from the Health and Retirement Study, along with a nationally representative sample of aging adults in Malaysia. The majority of data may have limitations due to self-reporting. Furthermore, since the study's data were cross-sectional, we are unable to establish a causal relationship between any of the related factors. Future research should take into account the family history of sleep disorders and dietary habits, which were not evaluated in this survey. The most recent diagnostic criteria for insomnia symptoms were not used, nor were other sleep disorders like obstructive sleep apnea evaluated. Furthermore, the three items of the Jenkins Sleep Scale (JSS-3) had a moderate Cronbach alpha (0.62) constituting a measurement limitation.

Conclusion

Almost one in three aging adults reported insomnia symptoms. Loneliness and multisite pain were found to mediate the association between multi-morbidity and insomnia problems. Reducing loneliness and multisite pain may help in reducing insomnia symptoms in aging multi-morbid patients. Results may provide insights for informing targeted interventions, resources allocation, policy development and sleep health promotion in this population. Future long-term research is needed to support or invalidate these findings.

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Authors' contributions

All authors fulfill the criteria for authorship. SP and KP conceived and designed the research, performed statistical analysis, drafted the manuscript, and made critical revisions of the manuscript for key intellectual content. All authors

read and approved the final version of the manuscript and have agreed to the authorship and order of authorship for this manuscript.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Data availability statement

Data are available from the Social Wellbeing Research Center (SWRC) at <https://swrc.um.edu.my/mars-data>.

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