

Insomnia Related with Intellectual Function in the Elderly

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ABSTRACT

Background: Insomnia is a common sleep disorder among older adults that can negatively affect quality of life and intellectual function. Impaired intellectual function may reduce independence, limit daily activities, and hinder social interactions.

Purpose: This study aimed to determine the relationship between insomnia and intellectual function among older adults attending the Elderly School in Bandongregosari, Malang City.

Methods: This quantitative correlational study involved 30 older adults selected through simple random sampling. Insomnia was assessed using the KSBPJ-IRS questionnaire, while intellectual function was measured using the Short Portable Mental Status Questionnaire (SPMSQ). Data were analyzed using a correlation test to examine the relationship between insomnia and intellectual function.

Results: A significant relationship was found between insomnia and intellectual function ($p = 0.002$). Higher levels of insomnia were associated with lower intellectual function, indicating that sleep disturbances may contribute to cognitive decline in older adults.

Conclusion: Insomnia was significantly associated with intellectual function among older adults at the Elderly School in Bandongregosari, Malang City. Improving sleep quality may help preserve intellectual function and enhance the quality of life of older adults.

Keywords: Cognitive Function, Elderly, Insomnia, Intellectual Function, SPMSQ

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BACKGROUND

The aging process is accompanied by progressive biological, psychological, and cognitive changes that increase vulnerability to various health problems, including sleep disturbances. Insomnia is one of the most common sleep disorders among older adults, characterized by difficulty initiating sleep, maintaining sleep, or waking too early, resulting in poor sleep quality and impaired daytime functioning (Crowley, 2017). Globally, approximately 30–48% of older adults experience insomnia symptoms, while 12–20% meet the clinical diagnostic criteria for insomnia disorder (WHO, 2017).

Adequate sleep is essential for maintaining brain function, particularly memory consolidation, attention, learning, and executive function. Chronic sleep disturbances may disrupt neuronal recovery processes and accelerate cognitive decline. Previous studies have consistently reported that insomnia is associated with reduced memory, slower information processing, and impaired abstract thinking in older adults (Krause et al., 2017; Sabia et al., 2021). Intellectual function, as a key component of cognitive function, encompasses the ability to reason, understand, solve problems, and make decisions. Declining intellectual function can reduce independence, impair activities of daily living, and diminish quality of life. Furthermore, longitudinal evidence indicates that persistent insomnia is associated with an increased risk of mild cognitive impairment and dementia (Carvalho et al., 2023). In 2021, an estimated 57 million people worldwide were living with dementia, with nearly 10 million new cases reported annually, highlighting the growing burden of cognitive disorders among the aging population (WHO, 2017).

Recent observational studies have further demonstrated that poor sleep quality is independently associated with lower cognitive performance, even after adjusting for age, educational level, and chronic diseases (Zhang et al., 2024). These findings suggest that insomnia should not be considered a normal consequence of aging but rather a modifiable risk factor for cognitive decline. Despite the growing body of evidence, several important gaps remain. First, previous studies have primarily examined global cognitive function or dementia risk, whereas fewer have specifically investigated intellectual function, which directly reflects the reasoning, decision-making, and problem-solving abilities required for independent living. Second, existing findings remain inconsistent because of differences in study design, participant characteristics, cultural backgrounds, and assessment instruments. Third, evidence from low- and middle-income countries, particularly Indonesia, is still limited, despite differences in social, environmental, and healthcare contexts that may influence both sleep quality and cognitive health. Moreover, community-based older adults participating in health promotion programs, such as the Elderly School, have rarely been investigated, although they represent an important target population for early preventive interventions.

Therefore, this study aimed to examine the relationship between insomnia and intellectual function among older adults attending the Elderly School in Bandungregosari, Malang City. By focusing on a community-based Indonesian older adult population and using validated instruments to assess both insomnia and intellectual function, this study provides context-specific evidence that may help clarify the relationship between sleep disturbances and intellectual decline. The findings are expected to support the development of early screening strategies and community-based interventions to improve sleep quality, preserve intellectual function, and promote healthy aging.

OBJECTIVE

The study aimed to determine the relationship between insomnia and intellectual function in older adults at the Bandungregosari Elderly School, Malang City.

METHODS

This study employed a quantitative correlational design with a cross-sectional approach to examine the relationship between insomnia and intellectual function among older adults. The study was conducted at the Elderly School in Bandungregosari, Malang City, from October 16 to October 30, 2025. The study population comprised older adults enrolled in the Elderly School. A total of 30 participants were selected using simple random sampling. The inclusion criteria were: (1) aged ≥ 60 years, (2) registered as active participants in the Elderly School, (3) able to communicate effectively, and (4) willing to participate by providing written informed consent. Older adults with severe hearing or visual impairment, diagnosed dementia, severe psychiatric disorders, or incomplete questionnaire responses were excluded from the study.

Insomnia was assessed using the Jakarta Biological Psychiatry Study Group–Insomnia Rating Scale (KSBPJ-IRS), a validated instrument widely used in Indonesia to evaluate insomnia severity based on difficulties initiating sleep, maintaining sleep, early morning awakening, and daytime impairment. The instrument demonstrated good validity and reliability in previous studies. Intellectual function was measured using the Short Portable Mental Status Questionnaire (SPMSQ), which consists of 10 items assessing orientation, memory, attention, and basic cognitive abilities. The SPMSQ has been widely validated for cognitive screening in older adults and demonstrated acceptable reliability.

Data were collected through face-to-face interviews conducted by trained researchers using structured questionnaires to ensure consistency in data collection. All completed questionnaires were checked for completeness, coded, and entered into the database before analysis. Descriptive statistics were used to summarize participants' characteristics and study variables. The relationship between insomnia and intellectual function was analyzed using Spearman's rank correlation test, as the data were not normally distributed. Statistical analyses were performed using IBM SPSS Statistics version 16.0, with a significance level set at $p < 0.05$. Written informed consent was obtained from all participants before data collection, and confidentiality and anonymity were maintained throughout the study.

RESULTS

Table 1. Characteristics Respondents

No	Characteristics	f	%
1	Gender		
	Man	4	13.3
	Woman	26	86.7
	Total	30	100
2	Age		
	60-64	3	10.0
	65-69	19	63.3
	70-74	8	26.7
	Total	30	100
3	Education		
	JUNIOR HIGH SCHOOL	3	10.0

SENIOR HIGH SCHOOL	20	66.7
D4/S1	7	23.3
Total	30	100
4 Work		
Doesn't work	13	43.3
Private	3	10.0
Self-employed	9	30.0
Retired civil servants	5	16.7
Total	30	100

Based on Table 1 it is known that that almost all of it various sex women (86.7%); Most of them respondents own aged 65-69 years (63.3%); most big education high school respondents (66.7%); and the majority respondents No working (43.3%)

Table 2. Cross Tabulation of Variables

Variables <i>Insomnia</i>	<i>Intellectual function</i>						P-value
	moderate intellectual impairment		severe intellectual impairment		Total		
	f	%	F	%	f	%	
Light	4	13.3	2	6.7	6	20.0	0.002
Currently	6	20.0	5	16.7	11	36.7	
Heavy	3	10.0	10	33.3	13	43.3	

Based on Table 2 it is known that that the data analysis test used is the Spearman rank obtained p value 0.002, this data show There is connection between *Insomnia* with *Intellectual functions* in the Elderly in Malang City.

DISCUSSION

Insomnia in the Elderly

The present study found that insomnia was common among older adults attending the Elderly School in Bandongrejosari, Malang City. Most participants reported difficulty initiating sleep, frequent nocturnal awakenings, and waking up feeling unrefreshed. These findings are consistent with previous studies indicating that insomnia affects approximately 30–50% of older adults worldwide and becomes more prevalent with advancing age (Miner & Kryger, 2017).

The high prevalence of insomnia observed in this study may be explained by age-related physiological changes. Reduced melatonin secretion and alterations in circadian rhythm contribute to fragmented sleep patterns, making older adults more susceptible to frequent nighttime awakenings and lighter sleep (Ju et al., 2017; Zhang et al., 2024). Furthermore, aging is associated with a decline in non-rapid eye movement (non-REM) sleep, an essential stage for physical restoration and memory consolidation. Consequently, persistent sleep disturbances may adversely affect overall health and quality of life (Lim & Dinges, 2016).

In addition to biological changes, psychosocial and environmental factors may contribute to insomnia among older adults. Individuals living in urban communities, such as Bandungrejosari, may be exposed to environmental stressors including noise, artificial light at night, and social demands that disrupt normal sleep patterns (Fu & Li, 2025). Previous studies have also shown that social isolation, financial stress, and loneliness are associated with an increased risk of insomnia in later life (Patel et al., 2018). Moreover, insomnia frequently coexists with depression and anxiety, creating a bidirectional relationship in which poor sleep worsens psychological distress, while psychological distress further impairs sleep quality (Sakal et al., 2023).

Overall, the findings suggest that insomnia among older adults is influenced by a complex interaction of biological, psychological, and environmental factors. These results underscore the importance of early identification and comprehensive management of insomnia in community settings. Improving sleep quality through appropriate interventions may not only enhance overall well-being but also help preserve cognitive function and reduce the long-term risk of functional decline among older adults (Livingston et al., 2020).

Intellectual Function in the Elderly

The assessment of intellectual function using the Short Portable Mental Status Questionnaire (SPMSQ) revealed varying levels of intellectual impairment among older adults in Bandungrejosari, ranging from mild to severe impairment. The findings suggest that deficits were primarily observed in domains related to memory, orientation, attention, and executive function, all of which are essential for decision-making, planning, and independent daily living (Ju et al., 2017; Glueck et al., 2025). These results indicate that cognitive decline remains a significant health concern among community-dwelling older adults.

Age-related neurobiological changes may explain the observed decline in intellectual function. Previous studies have demonstrated that cerebral aging, reduced cerebral blood flow, and the accumulation of neurotoxic proteins contribute to neuronal dysfunction and progressive cognitive decline (Bubu et al., 2017). Consequently, older adults with impaired intellectual function often experience difficulties in managing medications, maintaining personal hygiene, performing activities of daily living, and engaging in social interactions, ultimately reducing their quality of life (Sakal et al., 2023).

In addition to biological aging, intellectual function is influenced by several demographic and health-related factors. Lower educational attainment, chronic diseases such as hypertension, diabetes mellitus, and cardiovascular disease, as well as unhealthy lifestyles have been associated with poorer cognitive performance among older adults (Lim & Dinges, 2016; Fu & Li, 2025). Furthermore, psychosocial factors, including stress, anxiety, and social isolation, may accelerate cognitive decline by reducing cognitive stimulation and emotional well-being (Patel et al., 2018). Although these factors were not specifically examined in the present study, they may have contributed to the variability in intellectual function observed among participants. Therefore, routine cognitive screening and early intervention at the community level are essential to identify older adults at risk and to preserve their functional independence.

The Relationship Between Insomnia and Intellectual Function in the Elderly

The principal finding of this study was the significant association between insomnia and intellectual function among older adults ($p = 0.002$). Participants with moderate to severe insomnia were more likely to exhibit severe intellectual impairment than those with mild insomnia, indicating that worsening sleep disturbances were associated with poorer cognitive performance. This finding is consistent with previous studies reporting that chronic insomnia

is associated with deficits in memory, attention, executive function, and information processing speed (Krause et al., 2017; Sabia et al., 2021; Carvalho et al., 2023).

Several biological mechanisms may explain this relationship. Sleep plays a critical role in memory consolidation, synaptic plasticity, and the clearance of neurotoxic metabolites through the brain's glymphatic system. Chronic insomnia disrupts these processes, leading to impaired hippocampal function, reduced synaptic efficiency, and the accumulation of β -amyloid, which has been implicated in neurodegeneration and cognitive decline (Bubu et al., 2017; Ju et al., 2017). In addition, prolonged sleep deprivation increases cortisol secretion and neuroinflammatory responses, both of which may further impair learning, memory, and executive function (Patel et al., 2018).

Psychological factors may also contribute to the observed association. Older adults with persistent insomnia are more likely to experience depression, anxiety, fatigue, and reduced daytime functioning, all of which negatively affect attention, concentration, and decision-making abilities (Sakal et al., 2023; Fu & Li, 2025). Moreover, insomnia and psychological distress often interact in a bidirectional manner, whereby poor sleep exacerbates emotional problems, and emotional distress further disrupts sleep quality (Lim & Dinges, 2016).

The present findings also suggest a progressive trend, in which the proportion of severe intellectual impairment increased with greater insomnia severity. Although the cross-sectional design precludes causal inference, this pattern supports previous evidence suggesting a dose-response relationship between sleep disturbance and cognitive decline (Zhang et al., 2024). Therefore, early identification and management of insomnia may represent an important strategy for maintaining intellectual function in older adults.

From a clinical and public health perspective, the findings highlight the importance of integrating sleep assessment into routine geriatric care. Non-pharmacological interventions, including sleep hygiene education, regular physical activity, cognitive stimulation, relaxation techniques, and enhanced social support, have been shown to improve sleep quality and may help preserve cognitive function among older adults (Livingston et al., 2020; Sakal et al., 2023). Implementing these interventions within community-based programs, such as the Elderly School, may contribute to healthier aging and improved quality of life.

Despite these findings, several limitations should be considered. The cross-sectional design limits the ability to establish causal relationships between insomnia and intellectual function. The relatively small sample size and recruitment from a single community setting may also limit the generalizability of the findings. Furthermore, potential confounding factors, including depression, medication use, chronic comorbidities, physical activity, and socioeconomic status, were not controlled in the analysis. Future longitudinal studies with larger and more diverse populations are needed to confirm these findings and clarify the causal mechanisms linking insomnia to cognitive decline in older adults.

CONCLUSION

This study demonstrated a statistically significant association between insomnia and intellectual function among older adults attending the Elderly School in Bandongrejosari, Malang City. Older adults with more severe insomnia were more likely to experience greater intellectual impairment, suggesting that sleep disturbances may contribute to cognitive decline in later life. These findings highlight the importance of routine screening and early detection of insomnia as part of comprehensive geriatric care. Interventions aimed at improving sleep quality, including sleep hygiene education, lifestyle modification, cognitive stimulation, and psychosocial support, may help preserve intellectual function, maintain functional independence, and enhance the overall quality of life of older adults. Future longitudinal studies with larger and more diverse populations are recommended to clarify the causal relationship

between insomnia and intellectual decline and to evaluate the effectiveness of sleep-based interventions in promoting healthy aging.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest. This study is free from plagiarism and has not been previously published elsewhere

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