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Original Research

Emotional Loneliness in Elderly: Association with Cognitive Performance and Sleep Quality in One of Indonesia's Rural Areas

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Abstracts

Introduction: A growing body of studies focuses on the association between loneliness defined as social isolation with sleep quality and cognitive performance, whereas emotional loneliness has not received much attention. Determine the association between emotional loneliness, cognitive performance, and sleep quality in one of Indonesia's rural areas. **Method:** The sample comprised 30 Indonesian individuals > 60 years old living in rural areas. Cognitive performance was evaluated using the Mini-Mental State Examination (MMSE). The quality of sleep was measured using the Pittsburgh Sleep Quality Index. Meanwhile, emotional loneliness was conducted using the UCLA Loneliness Scare. Using Pearson correlation, bivariate analysis was performed between physical health, sociodemographic factors, cognitive function, and sleep quality with loneliness. **Results:** There is a significant moderate correlation between loneliness and diabetes (p-value = 0.001, r = 0.573). There is a significant low correlation between loneliness and MMSE score (p-value = 0.03, r = 0.397). And there is a significant high correlation between loneliness and PSQI score (p-value = 0.000, r = 0.886). Two components of sleep quality that show a statistically significant correlation with loneliness are subjective sleep quality (p-value = 0.000, r = 0.6) and sleep duration (p-value = 0.023, r = 0.414). **Conclusion:** This is the first study to examine the association between emotional loneliness with sleep quality and cognitive function in one of Indonesia's rural areas.

Keywords: Loneliness, Sleep quality, Cognitive performance, Elderly

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INTRODUCTION

Life conditions, life expectancy, and longevity keep improving making aging a dominant phenomenon in communities. This condition is leading to a higher number of elderly population. The number of population above the age of 60 is predicted to double globally in the next 40 years. It is also estimated that the proportion of elderly in developing countries will reach 80%. The nature of aging creates circumstances for loneliness, it places people in situations that make them feel lonelier. One-third of the elderly are estimated to experience some degree of loneliness with an elevated risk of loneliness as they age [1]. Loneliness is now understood to represent a "hidden killer" cause of its significant negative impact on both physical (chronic disease: cardiovascular disease, stroke, diabetes, etc) and mental health (depression, anxiety, etc) [2]. It's also correlated with high morbidity and mortality [3].

Loneliness, despite its growing studies, still faces conceptual issues. It has been variously defined and understood by different authors. It is a necessity to reach a consensus definition of loneliness. When trying to understand loneliness and its varied definitions, it can be concluded that multiple concepts depend on their focus, identifying different theoretical perspectives. These included the social need approach, cognitive discrepancy approach, interactionist approach, deficits in social relationships, and consequences of the universal human need to belong [4]. It is crucial to distinguish between loneliness and social isolation, and further with solitude. Loneliness is a negative, subjective, and qualitative experience of dissatisfaction with one's relationship or perceived social acceptance. In contrast, solitude is a positive experience where a person chooses to be alone. Social isolation is a harmful physical and objective state in which a person lacks social contact [5].

Loneliness is a multidimensional construct associated with multiple variables. This multidimensional construct becomes more distinct in the elderly due to their characteristic difference in many aspects such as physical health, sleeping patterns, and cognitive performance. Studies on its association with physical health showed that it is mainly associated with pathologies related to the hypothalamic-pituitary-adrenal axis, hyperstimulation, cardiovascular risk, high blood pressure, high cholesterol, sleep disorders, migraine, immune function, etc [6]. Sleep disorders are one of the common health issues among older adults. The prevalence of sleep disorders in the elderly varied from 10.4% to 62.1% [7, 8]. Only a small proportion of research shows the relationship between loneliness and sleep quality [9]. Some researchers suggest that living with another person improves sleep quality which demonstrates the association of social isolation with sleep quality instead of loneliness [10]. Meanwhile, several longitudinal studies in aging have shown that loneliness is associated with impairment in cognitive functioning, but none yet show the association between loneliness and each subfunction of cognitive performance [11]. The growing body of literature has been focusing so much on the relationship between loneliness and social isolation, instead of emotional loneliness, with multiple distinctive variables in the elderly. This study aims to analyze the association between emotional loneliness, physical health conditions, sleep quality, and cognitive performance. Further, this study also analyzes loneliness with each subscale of sleep quality and cognitive performance. The previous studies on loneliness also focus more on high-income developed countries, therefore this study will give attention to a rural area in low-income developing countries [12].

METHODS

A cross-sectional study using an in-person structured interview was conducted in Puskesmas Trawas, Mojokerto, East Java, Indonesia. This interview comprised questionnaire surveys and a cognitive function test

conducted by well-trained staff. The inclusion criteria were as follows: age 60 years and older, currently living in the Trawas area, able to write as well as draw, and able to recall events that occurred within one month. The exclusion criteria were as follows: communication impairment. All the participants provided written informed consent.

Sociodemographic factors and physical health conditions were collected from the questionnaire. The sociodemographic factors included age (years), sex (male or female), occupation (retired, housewife, farmer, entrepreneur), marital status (married or divorced), education (elementary or lower, junior high school, senior high school, and college or higher), Smoking (yes or no), and coffee consumption (yes or no). The physical health conditions included body mass index (BMI) (normal, overweight, and obesity), blood pressure, and health issues (diabetes and/ or hypertension).

Cognitive function was assessed according to The Mini-Mental State Examination (MMSE) which consists of the following sub-functions: orientation, registration, attention and calculation, repetition/recall, and language MMSE scores range from 0 to 30. The higher the score shows the better the cognitive functioning. An MMSE score < 24 indicates cognitive deficits. This study used the Indonesian language version of MMSE with 88% sensitivity and 96% specificity [13].

Sleep quality was assessed according to the Pittsburgh Sleep Quality Index (PSQI) which consists of the following components: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction. This assessment was carried out based on the determination of the overall sleep quality of the elderly during the last month. The total scores of the seven components were then summed and interpreted into two categories with a cut-off of 5, higher than that means poor sleep quality. This study used the Indonesian language version of PSQI with Cronbach alpha 0.776, sensitivity 1, and specificity 0.81 [14].

Emotional loneliness was assessed according to the UCLA Loneliness Scale version 3 which consists of 20 items with 4 points Likert scale. The response to the 20 items is summed. The total score can range from 20-80, with higher scores indicating greater feelings of loneliness. Scores of 20-40 are considered low to moderate, scores of 40-60 are considered moderate to high, and scores above 60 are considered high in terms of loneliness. This study used the Indonesian language version of UCLA. The UCLA Loneliness Scale version 3 has Cronbach alpha 0.89-0.94 and r=0.73 [15].

Our study was approved by the Ethics Committee at STIKes Majapahit, Mojokerto (110/KEPK-SM/2023).

RESULTS

The socio-demographic and physical health of the participants (n=30) are shown in Table 1. The mean age of the participants was 67.7 and 80% were female. 53% of the participants were housewives. The majority of the participants were still married (73.3%). 56.7% of participants' level of education was elementary school or lower. The mean body mass index, body weight, and height were 23.15, 54.81, and 153.65 respectively. 93.3% of the participants didn't smoke or consume coffee. 23.3% of participants had diabetes and 40% of participants had hypertension.

Table 1. Socio-demographic and physical health condition of participants

Variable	n	%	Range (Mean ± SD)
Gender			
Male	6	20	
Female	24	80	
Age			61-82 (67.7 ± 4.54)
Occupation			
Retired	6	20	
Housewife	16	53.3	
Farmer	2	6.7	
Entrepreneur	6	20	
Marital status			
Married	22	73.3	
Divorced	8	26.7	
Level of Education			
Elementary school or lower	17	56.7	
Junior high school	5	16.7	
Senior high school	4	13.3	
College or higher	4	13.3	

Variable	n	%	Range (Mean ± SD)
BMI			18.23-29.74(23.15±2.56)
Body weight (kg)			42-69 (54.81±8.22)
Height (cm)			142-168(153.65±7.52)
Normal (18.5-22.9)	16	53.3	
Overweight (23-24.9)	6	20	
Obesity I (25-29.9)	8	26.7	
Blood pressure			
Sistolic			100-160 (127±16.43)
Diastolic			60-100 (77.67±11.35)
Coffee consumption			
Yes	2	6.7	
No	28	93.3	
Smoking			
Yes	2	6.7	
No	28	93.3	
Health issue			
-Diabetes			
Yes	7	23.3	
No	23	76.7	
-Hypertension			
Yes	12	40	
No	18	60	
Other			

Table 2 shows that the majority of participants had normal cognitive function (86.7%). The participants were divided evenly in terms of sleep quality. Most of the participants had moderate to high levels in terms of loneliness (73.3%).

Table 2. Cognitive, sleep quality, and loneliness scores of the participant

Variable	n	%	Range (Mean ± SD)
MMSE			21-30 (26.6±2.88)
● Normal >24	26	86.7	
● Mild cognitive impairment 20-24	4	13.3	
PSQI			2-12 (5.77±2.89)
● Good quality >5	15	50	
● Poor quality </=5	15	50	
UCLA loneliness score			20-60 (43.37±12.98)
● Low-moderate 20-40	7	23.3	
● Moderate-high 40-60	22	73.3	
● High >60	1	3.3	

Table 3 shows a bivariate analysis between physical health, sociodemographic factors, cognitive function, and sleep quality with loneliness using Pearson correlation. There is a significant moderate correlation between loneliness and diabetes (p-value = 0.001, r = 0.573), a considerably low correlation between loneliness and MMSE score (p-value = 0.03, r = 0.397), and a significant high correlation between loneliness and PSQI score (p-value = 0.000, r = 0.886). Two components of sleep quality that show a significant correlation with loneliness are the following: subjective sleep quality (p-value = 0.000, r = 0.6) and sleep duration (p-value = 0.023, r = 0.414).

Table 3. Bivariate analysis between physical health, sociodemographic factors, cognitive function, and sleep quality with loneliness

Variable	P value	R (Pearson coefficient correlation)
Gender	0.974	0.006
Age	0.854	0.035
Occupation	0.093	0.313
Marital status	0.618	0.095
Level of studies	0.738	0.064
BMI	0.489	0.131
Coffee consumption	0.071	0.334
Smoking	0.071	0.334
Diabetes	0.001*	0.573
Hypertension	0.289	0.2
MMSE total score (numeric)	0.03*	0.397
-Orientation	0.091	0.314
-Registration	0.282	0.203
-Attention & calculation	0.107	0.3
-Recall	0.584	0.104
-Language	0.526	0.120
-Copying	0.872	0.031
PSQI total score (numeric)	0.000*	0.886
-Subjective sleep quality	0.000*	0.6
-Sleep duration	0.023*	0.414
-Sleep latency	0.145	0.273
-Sleep efficiency	0.162	0.262
-Sleep disturbance	0.222	0.230
-Use of sleep pills	N/A	N/A
-Daytime dysfunction	0.151	0.268

*significant p-value <0.05

DISCUSSION

This study has presented a cross-sectional epidemiological study analyzing factors related to physical health, sleep disorder, and cognitive function, that could be associated with emotional loneliness.

Loneliness and Physical Health

Various researchers have observed and developed a conceptual model through structural equations observing how physical health and loneliness are mutually determined. Age and social support predict loneliness and poor physical health [16]. This study shows no significant correlation between sociodemographic factors and loneliness, this may be due to the small and homogenous epidemiology characteristic of the population in this study. This study found a significant correlation between physical health loneliness and diabetes. This finding is consistent with

a survey of 8593 elderly and a review that reported an association between loneliness and diseases such as cardiovascular disease, high cholesterol, diabetes, asthma, multimorbidity, and chronic disease [6]. A 20-year follow-up study on loneliness and diabetes also presented evidence that individuals who felt most lonely had a twofold higher risk of developing diabetes [17]. Another study said that the disease associated with loneliness is especially among those with difficulties in seeing and hearing leading to feelings of loneliness since they have a hard time feeling involved and integrating into the environment This can explain why diabetes is significantly associated with loneliness due to its complication that can affect vision and hearing which is more common in the elderly.

Loneliness And Cognitive Function

Consensus in the literature on aging that loneliness correlates with poorer cognitive performance has been apparent. Yet, there is still difficulty in differentiating between objective loneliness or social isolation and subjective or emotional loneliness's impact on cognitive function. Recent research has suggested that although both social isolation and loneliness correlate with cognitive performance, some findings show that social isolation may have a more significant impact than loneliness on cognitive decline. Social isolation is more associated with objective cognitive impairment while loneliness is more associated with a subjective dimension of cognitive function [18]. This is consistent with this study that reported a significant but low correlation between loneliness and the objective dimension of cognitive performance measured by MMSE. This finding is supported by evidence in a systematic review that points out that loneliness correlated with diminished cognitive functioning and a more rapid decrease over time [11].

The empirical literature understanding of the underlying mechanism involved in loneliness is not fully consistent [19]. A recent review showed that loneliness impairs the immune system leading to poorer resistance to disease and infection [20]. A systematic review has also provided abnormal brain structure and/or activity in the prefrontal cortex, insula, amygdala, hippocampus, and posterior superior temporal cortex associated with loneliness. It is also related to biological markers associated with the pathology of Alzheimer's disease [21]. This study tries to understand which sub-function of cognitive performance correlates with loneliness to initiate research contributing toward the mechanisms involved. The result shows that the correlation is significant only in global cognitive function. This finding is supported by a review study that shows a correlation between emotional loneliness with global cognitive function although social isolation still showed a stronger correlation with global cognitive function [22]. Further research, with a bigger population, needs to be conducted to understand each sub-function of cognitive performance.

Loneliness And Sleep Quality

Loneliness has been identified as one of the factors associated with increased risk for sleep problems [23]. This study reported a significantly high correlation between loneliness and sleep quality. This finding is consistent with a study in a group of individuals aged 18-76 years old that showed a negative correlation between loneliness and sleep quality [24]. Another study in a similar population, which is an older population in China, also supported the finding of this study with a very strong correlation between loneliness and sleep quality.

This study also analyzes components of sleep quality in PSQI including subjective sleep quality, sleep duration, sleep latency, sleep efficiency, sleep disturbance, use of sleep pills, and daytime dysfunction. This study shows a significant correlation between loneliness and two components of sleep quality which are subjective sleep quality and sleep duration. Some previous

studies reported a correlation between loneliness and subjective sleep quality and daytime dysfunction in young adults. Another study of 95 young people showed an association between loneliness and only subjective sleep quality [25]. These consistent findings can conclude that loneliness is associated with subjective sleep quality. This finding is interesting because the growing body of literature tends to report just the total score. A study on PSQI's components showed that sleep disturbance, sleep efficiency, and daytime dysfunction were representative of objective findings [26]. That means emotional loneliness has a more significant impact on the subjective dimension of sleep quality.

Researchers have argued that the mechanism of why loneliness is associated with poor sleep is due to a hypervigilance state to social threats. This hypervigilance resulted in poor sleep quality and restlessness because the brain remains vigilant even when the individual is asleep [23]. This triggered an increased secretion of cortisol, a common substance secreted when an individual is awake, negatively impacting sleep quality. Some researchers also suggested that emotional loneliness in the older population may lead to an increase in perceived stress leading to poor sleep quality [25].

Limitation of Study

This study has some limitations that must be considered. The variables were measured in a cross-sectional manner, therefore no conclusions can be drawn regarding the directionality of the association. The follow-up studies should be working in the future to understand the directional and causal association between variables. The assessment of sleep quality, cognitive performance, and loneliness was based on self-reported measures that leave room for reporting bias. Some confounding factors, like the weakening of the social communication ability of the elderly, which is significant to their emotional loneliness, were not included in the design, which may have led to some deviation in the results. The number of subjects was also small, therefore this study cannot be generalized.

CONCLUSION

This is the first study to examine the association between emotional loneliness and sleep quality in one of Indonesia's rural areas. This study reported a significant moderate correlation between loneliness and diabetes, a significant low correlation between loneliness and global cognitive function, and a significant high correlation between loneliness and sleep quality. Two components of sleep quality that show a statistically significant correlation with loneliness are subjective sleep quality and sleep duration. Further study on underlying mechanisms related to the association of loneliness to sleep quality components and cognitive performance sub-functions should be conducted to find effective interventions for the elderly well-being.

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CONFLICT OF INTEREST

The author(s) of this article declare no conflict of interest.

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