

# **The Relationship Between Sleep Quality and Cognitive Function in The Elderly at The Tresna Werdha Social Institution**

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## **Abstract**

Background: Cognitive changes in the elderly are a natural consequence of the degenerative process. In this process, sleep quality becomes an important factor affecting cognitive function. While it is known that prolonged sleep disturbances can increase the risk of cognitive impairment in the elderly, few studies have specifically explored the relationship between sleep quality and cognitive function in the context of the elderly in elderly residents. Aim: To determine the relationship between sleep quality and cognitive function in elderly residents. Methods: This study used a quantitative method with a descriptive-analytic design and a cross-sectional approach. The research population comprised all elderly residents of Tresna Werdha Social Institution Budi Mulia 3 in Jakarta, totaling 282 individuals, with a sample size of 80 elderly individuals selected using simple random sampling. Data collection was conducted using questionnaires, and data analysis was performed using the Chi-square test. Results: The results showed that the majority had good sleep quality (55%) and normal cognitive function (51.2%). There is a significant relationship between sleep quality and cognitive function ( $p=0.000$ ) with an OR value of 19.444. Conclusion: There is a significant relationship between sleep quality and cognitive function in the elderly. Recommendations: Based on the results of this study, it is recommended that nurses carry out community-based interventions, such as sleep health education activities and stress management, to support comprehensive elderly health. Further research is recommended to develop and test the effectiveness of non-pharmacological-based interventions, such as cognitive behavioural therapy and meditation techniques, in improving the quality of elderly sleep.

**Keywords:** cognitive function; elderly; sleep quality.

## **Introduction**

The percentage of the elderly population according to the Central Statistics Agency has almost doubled to 11.75%, with the number of elderly women more than the elderly men (55.28% compared to 47.72%). According to Central Bureau of Statistics (Badan Pusat Statistik, 2023) from its distribution analysis, more than two-thirds of the elderly are in the East Jakarta, South Jakarta and West Jakarta areas. The highest percentage of the elderly in Jakarta was recorded in Central Jakarta, reaching 11.87%. Furthermore, the second highest percentage rate is found in South Jakarta, which is 10.46% (Badan Pusat Statistik [Central Bureau of Statistics], 2023). As the number of elderly people in Indonesia increases, it is important to pay attention to problems that may arise such as physical, functional, psychological, and cognitive changes. The National Institute on Aging (NIA) said that one of the changes that many occur in the elderly is a decline in cognitive function (Kusuma et al., 2023). Data shows that cognitive decline in the elderly in Indonesia has experienced a significant increase, based on information from the Ministry of Health, the prevalence of cognitive decline in Indonesia is estimated to reach 1.2 million people in 2016. This figure is projected to increase to 2 million people in 2030, and continue to increase until it reaches 4 million people in 2050 (Alzheimer's Indonesia, 2019).

Older people who experience cognitive impairment at first often show symptoms of forgetfulness, which results in difficulty in proclaiming words correctly. This symptom then develops into difficulty recognizing objects, difficulty in learning new things, or making decisions. In addition, there is a setback in orientation towards time, space, and place, which affects their daily lives (Alfarisi et al., 2022).

Sleep quality factors are one of the factors that affect cognitive function in the elderly (Dominguez et al., 2021). According to the National Sleep Foundation (NSF), 67% of 1,508 seniors in America experience poor sleep quality, and 7.3% of them report complaining of difficulty initiating and maintaining sleep (Iriyani et al., 2023). The

prevalence of poor sleep quality in the elderly in Indonesia is quite high. Based on data from Riskesdas 2018, around 67% of the elderly experience poor sleep quality.

Potter and Perry are quoted in (Simanjuntak & Satyavati, 2023) that a decrease in sleep quality in the elderly can have a detrimental impact on their health. This can increase susceptibility to disease, increase stress levels, cause confusion, disorientation, and mood disorders, decrease the ability to concentrate, and affect decision-making skills. Sleep deprivation causes a buildup of amyloid in the brain, linked to the glymphatic system that cleanses the brain during deep sleep. Lack of good sleep reduces the brain's ability to remove amyloid, increasing the risk of dementia (Ebersole & Hess, 2019).

Research conducted Panjwani, Dudani, and Wadhwa (2021), shows that there is a correlation between sleep quality and cognitive function in the elderly. This relationship can be explained by the fact that the older a person gets, the more difficult it is for a person to achieve a good sleep pattern. The aging process causes a decline in physical and health in the elderly, and poor sleep quality can result in irregular sleep patterns.

Based on the above phenomenon, the decline in sleep quality has a detrimental impact on the elderly, one of which is a decrease in the ability to concentrate, which affects their cognitive function. Although various studies have explored factors that influence cognitive function in the elderly, there are limited studies that specifically highlight the relationship between sleep quality and cognitive function in elderly residents, such as Tresna Elderly Social Institution. Institutional living conditions with different activity patterns and environments may uniquely impact the sleep quality and cognitive health of older adults. So researchers are interested in researching the Relationship between Sleep Quality and Cognitive Function in the Elderly.

## **Research Methods**

The design of this study is descriptive analytical with a cross-sectional approach. The sampling technique used with simple

random sampling while still paying attention to the inclusion and exclusion criteria of 80 elderly people. The population in this study is the elderly at the Tresna Werdha Social Institution Budi Mulia 3 Jakarta. The instruments used in this study are in the form of respondent characteristics questionnaires, PSQI (Pittsburgh Quality Index Sleep) questionnaires and MoCA-InA (Montreal Cognitive Assessment) questionnaires. The validity and reliability test of the questionnaire was carried out at the Tresna Werdha Social Institution Budi Mulia 1 East Jakarta with 30 respondents. In the PSQI questionnaire, Cronbach's alpha score was 0.959 and the MoCA-InA questionnaire was obtained Cronbach's alpha value of 0.759. The study used univariate and bivariate data analysis. Univariate analysis was carried out

using frequency distribution, while bivariate analysis used a chi-square test with an SPSS application. This study has been carried out in accordance with applicable standards, with due regard to the principles of research ethics. All respondents were given an explanation regarding the purpose, benefits, and risks of the study and the right to withdraw at any time without consequences. Informed consent was obtained prior to participation, ensuring confidentiality and anonymity of the data collected.

## Results

The results of this study are presented in several tables below of elderly at the Tresna Werdha Social Institution Budi Mulia 3 Jakarta, totalling 80 respondents.

**Table 1. Frequency Distribution of Characteristics of the Elderly at the Tresna Werdha Social Institution Budi Mulia 3 Jakarta (n=80)**

| Variable               | f  | %    |
|------------------------|----|------|
| <b>Age</b>             |    |      |
| 60-69 Years            | 37 | 46.2 |
| ≥ 70 Year              | 43 | 53.8 |
| <b>Gender</b>          |    |      |
| Male                   | 41 | 51.2 |
| Female                 | 39 | 48.8 |
| <b>Education Level</b> |    |      |
| No School              | 10 | 12.5 |
| Elementary school      | 23 | 28.8 |
| Junior high school     | 18 | 22.5 |
| Senior high school     | 22 | 27.5 |
| College                | 7  | 8.7  |

Based on table 1, it can be seen that the respondents with the highest age range are the elderly (>70 years old), namely 43 respondents (53.8%), male as many as 41 respondents (51.2%), low education level (not in junior high school) has the highest frequency, namely 51 respondents (63.8%).

**Tabel 2. Frequency distribution of sleep quality and cognitive function of the elderly at the Tresna Werdha Social Institution Budi Mulia 3 Jakarta (n=80)**

| Variable                  | f  | %    |
|---------------------------|----|------|
| <b>Sleep Quality</b>      |    |      |
| Good Sleep Quality        | 44 | 55   |
| Poor Sleep Quality        | 36 | 45   |
| <b>Cognitive Function</b> |    |      |
| Normal Cognitive Function | 41 | 51.2 |

**Abnormal Cognitive Function****39****48.8**

Based on table 2, it can be seen that respondents with good sleep quality were 44 respondents (55%) with normal cognitive function as many as 41 respondents (51.2%)

The results of the bivariate analysis test showed the relationship between each variable, namely the characteristics of the respondents (age, gender, education) and sleep quality with cognitive function.

**Tabel 3. Relationship between characteristic and cognitive function of the elderly at the Tresna Werdha Social Institution Budi Mulia 3 Jakarta (n=80)**

| Characteristics of Respondents |                 | Cognitive Function |               |       |         |
|--------------------------------|-----------------|--------------------|---------------|-------|---------|
|                                |                 | Normal             | Abnormal      | Total | P value |
| Gender                         | Male            | 31<br>(75.6%)      | 10<br>(24.4%) | 41    | 0.000   |
|                                | Female          | 10<br>(25.6%)      | 29<br>(74.4%) | 39    |         |
| Age                            | 60-69           | 26<br>(70.3%)      | 11<br>(29.7%) | 36    | 0.003   |
|                                | >70             | 15<br>(34.9%)      | 28<br>(65.1%) | 44    |         |
| Education Level                | Highly educated | 25<br>(86.2%)      | 4<br>(13.8%)  | 29    | 0.000   |
|                                | Poorly Educated | 16<br>(31.4%)      | 35<br>(68.6%) | 51    |         |

**Table 4. Relationship between Sleep Quality and Cognitive Function at at the Tresna Werdha Social Institution Budi Mulia 3 Jakarta (n=80)**

| Sleep Quality | Cognitive Function |               | Total        | P Value | OR     |
|---------------|--------------------|---------------|--------------|---------|--------|
|               | Normal             | Abnormal      |              |         |        |
| Good          | 35<br>(79.5%)      | 9<br>(20.5%)  | 44<br>(100%) | 0.000   | 19.444 |
| Bad           | 6<br>(16.7%)       | 30<br>(83.3%) | 36<br>(100%) |         |        |

The results of the analysis of the relationship between sleep quality and cognitive function obtained a p value: 0.000 (p value < 0.05) which means that there is a significant relationship between sleep quality and cognitive function and the Odd Ratio (OR) result of 19.444 which means that the elderly with poor sleep quality are 19.4 times at risk of having abnormal cognitive function.

### Discussion

The results of the analysis of the relationship between age and cognitive function obtained a p value 0.003 (p value < 0.05) which means that there is a significant relationship from age to cognitive function. The results of this study are in accordance with the theory Durso and Bowker (2010) that the older a person gets, the process of apoptosis in neurons occurs, causing atrophy in the brain. This process begins with cortical atrophy, then spreads to the central part of the brain, accompanied

by hyperintensity in the substantia alba and paraventricular bodies. As a result, there is a decline in cognitive function. Damage to these neuronal cells is caused by factors such as free radicals, decreased energy distribution, and brain nutrition. Research by Lo et al. (2023) also showed a relationship between sleep quality and cognitive performance influenced by age. Individuals in the middle-aged to early elderly age range may be most susceptible to the adverse effects of poor sleep quality on cognitive function.

The results of the analysis of the

relationship between sex and cognitive function were obtained with a p value 0.000 (p value < 0.05) which means that there is a significant relationship of gender to cognitive function. This is in line with Myers' (2008) theory in Ratumanan, Huwae, & Sanaky (2019), women have a higher risk of experiencing cognitive impairment when compared to men. This is due to the influence of endogenous sex hormones, namely estradiol, on cognitive function. Women who have entered old age generally experience a decrease or even loss of estradiol sex hormones. This hormone has an important role as a neuroprotective agent that protects nerve cells. Estradiol has receptors in brain regions that are responsible for regulating learning and memory functions. The research of Song et al. (2024) found that inadequate sleep quality was associated with an increased risk of mild cognitive impairment and dementia, including Alzheimer's disease, with variations in associations by gender.

The results of the analysis of the relationship between education and cognitive function obtained a p value: 0.000 (p value < 0.05) which means that there is a significant relationship between education and cognitive function. This is in line with the theory (Tiara & Prawiroharjo, 2017) that higher education will result in the formation of more synapses in the brain compared to the elderly who have a low level of education. This is also supported by research conducted by (Sembiring et al., 2023) stating that higher levels of education are often associated with involvement in diverse and challenging activities. This activity stimulates the formation of new synapses and strengthens existing ones. For example, learning new things, exercising, and engaging in creative activities can increase neuroplasticity.

The results of the analysis of the relationship between sleep quality and cognitive function obtained a p value: 0.000 (p value < 0.05) which means that there is a significant relationship between sleep quality and cognitive function and the Odd Ratio (OR) result of 19.444 which means that the elderly with poor sleep quality are 19.4 times at risk of having abnormal cognitive function. Li et al. (2022) found that sleep quality and duration in older people were positively

correlated with their cognitive function. The worse the sleep quality, the lower the mental function, as well as increased symptoms of anxiety and depression.

This study is also in line with the results of Zhang's research (2023), which shows that physical fragility in the elderly directly predicts cognitive function, which is mediated by the role of sleep quality. Sleep quality partially mediates the relationship between cognitive dysfunction and physical vulnerability, providing new insights into the study of cognition and physical fragility in the elderly.

Sleep quality is the level of satisfaction that a person feels with their sleep, so there are no signs of sleep deprivation and there are no problems in the sleep process. According to Potter and Perry in Simanjuntak & Satyavati (2023), the decline in sleep quality in the elderly will have a bad impact on health, because it can cause susceptibility to disease, stress, confusion, disorientation, mood disorders, feeling less refreshed, and a decrease in the ability to concentrate.

This is also in line with the theory Amir (2022), sleep is also very important for the proper functioning of the brain, processing genes, synthesizing proteins, and forming myelin fibers. Myelin is indispensable for the transmission of nerve impulses to distant places. In addition, sleep plays a role in the growth of new neurons, especially in the hippocampus, which is the part of the brain that regulates long-term memory.

This is also in line with the theory Ministry of Health of the Republic of Indonesia (2018) and Ariarini and Prawiroharjo (2017) that sleep has benefits for maintaining the regularity of biological processes, saving energy, and restoring cognitive function. In the third and fourth stages of sleep, as well as during REM sleep, there are changes in cerebral blood flow, increased cortical activity, increased oxygen consumption, and adrenaline production. However, all of this is reduced in the elderly. Lack of REM sleep can lead to feelings of uncertainty and disbelief. If sleep deprivation persists, some physical processes such as motor performance, memory, and balance can be disrupted.



## Conclusion

The sleep quality and cognitive function of the elderly mostly have good sleep quality and have good cognitive function. Thus, it is important to maintain sleep quality as one factor affecting the cognitive function of the elderly. There was a significant relationship between age, gender, and education level with cognitive function in the elderly and between sleep quality and cognitive function in the elderly. Demographic characteristics play an important role in determining the cognitive condition of the elderly. In addition, the significant relationship between sleep quality and cognitive function confirms that quality sleep can be a protective factor against cognitive function decline in the elderly. Based on the results of this study, it is recommended that nurses in charge of geriatric services pay more attention to the quality of elderly sleep as one of the strategies to maintain their cognitive function. Education on the importance of healthy sleep patterns, management of the sleep environment, and relaxation techniques can be part of nursing interventions. In addition, routine screening programs for cognitive function need to be carried out to detect early cognitive decline, especially in the elderly with poor sleep quality. Implementing community-based interventions, such as sleep health education activities and stress management, can also support the comprehensive health of the elderly. Further research is recommended to develop and test the effectiveness of non-pharmacological-based interventions, such as cognitive behavioural therapy and meditation techniques, in improving elderly sleep quality. In addition, exploring psychosocial factors such as physical activity, social support, and mental state can provide a more comprehensive picture of the factors that influence the quality of life of the elderly.

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