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The Influence of Sleep Hygiene on the Sleep Disorders of Elderly at Integrated Long Term Care

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ABSTRACT

Background: Sleep hygiene is the most effective non-pharmacological therapy as a simple behavior of several individual environmental factors and as a healthy sleep aid. Sleep hygiene is a very easy, inexpensive, and comprehensive therapy that can be used to improve sleep disorders in the elderly. **Methods:** The design of this study used a quantitative method. Quasi Experiment: Pre-test and Post-test with a control group. **Results**: Showed that the average value of the control group before was 3.42 and the average value afterward was 3.76, which means there's no significant relationship between sleep hygiene and sleep disorders, but in the intervention group, the average value before the sleep hygiene intervention was carried out was 3.88 and the average value after the sleep hygiene intervention was carried out was 8.48, which means that there was an increase in the average value before and after the sleep hygiene intervention was given. Based on statistical calculations using the Wilcoxon test, a *P*-value of 0.000 <0.05 was obtained, so there was a relationship between sleep hygiene and sleep disorders. **Conclusion:** Regular application of sleep hygiene is effective in promoting good sleep and can overcome sleep disturbances in various populations of the elderly age group.

Keywords: Elderly; Sleep Disorders; Sleep Hygiene

INTRODUCTION

The aging process is changing the age structure of the world's population, leading to a dramatic increase in the number of older people in the coming decades. According to the World Health Organization (2022), the number of seniors aged 60 years and older is projected to grow from 1 billion in 2020 to 1.4 billion by 2030 and 2.1 billion by 2050. The global population is aging rapidly. According to projections by the World Health Organization (2022), the number of seniors (aged 65 and over) worldwide will increase substantially from 464 million in 2015 to 727 million by 2020. Furthermore, projections indicate that the elderly proportion of the global population will increase from 9.3% in 2020 to 16.0% in 2050. This demographic shift towards an older population presents societal challenges that must be addressed. This global trend of population aging is happening in Indonesia as well. The Indonesian Central Bureau of Statistics (BPS) reported that Indonesia is entering a phase of aging population structure, indicated by the increasing proportion of elderly citizens (Central Bureau of Statistics, 2022). In 2021, the elderly population in Indonesia reached 10.31% (33.78 million people), outperforming other Southeast Asian countries in the same period such as Thailand (11%),

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Singapore (18.79%), and Malaysia (7%) (Ministry of Health RI, 2022). The province with the highest proportion of elderly people is West Java, which reached 10.18% in 2021 (West Java Health Department, 2022). The country's declining fertility rates and increased life expectancy over decades have contributed to this. The most commonly considered components of sleep hygiene were caffeine (in 51 % of studies), alcohol (46%), exercise (46%), sleep timing (45%), light (42%), napping (39%), smoking (38%), noise (37%), temperature (34%), wind-down routine (33%), stress (32%), and stimulus control (32%), although the specific details of each component varied (De Pasquale, *et al*., 2024).

The elderly, as a vulnerable group, often face various physical and psychological problems that can affect their quality of life. Studies show that around 80% of older adults have at least one chronic condition, while 50% have two or more comorbid conditions (Cho *et al*., 2022). Common physical health issues found in the elderly include frailty, sensory impairment (hearing, vision), limited mobility, chronic respiratory conditions, cardiovascular diseases, musculoskeletal disorders, and neurological disorders (Ownby *et al*., 2024). In addition, the elderly experience age-related decline in organ function and muscle mass, leading to decreased physiological reserves and vulnerability to stressors (Bentham & Eaves, 2022). These physical health challenges contribute to functional limitations, falls, hospitalization, disability, loss of independence, and mortality among the elderly.

Psychologically, the elderly are also at increased risk for problems like cognitive decline, mood disorders, and sleep problems, which worsen with age (Andas *et al*., 2022). Sleep quality and quantity change with increasing age, including advanced sleep timing, frequent nighttime awakenings, and daytime napping (Parveen, Geaorge, & Chand, 2021). Sleep disturbances among elderly such as insomnia, circadian rhythm disorders, and sleep-disordered breathing, can lead to deleterious health outcomes. Impaired sleep in the elderly is associated with an increased risk of falls, depression, anxiety, delirium, cognitive impairment, restlessness, fatigue, and daytime sleepiness (Toapanta *et al*., 2023). Poor sleep also worsens many age-related chronic diseases. Therefore, optimizing sleep health should be an important component of healthy aging (Zhang *et al*., 2022).

Adequate sleep is essential for preserving health and wellbeing in older adults. Quality sleep sustains physical and mental equilibrium, bolsters the immune system, promotes tissue repair, regulates metabolism, consolidates memory, and maintains cognitive function in the elderly (Casagrande *et al.*, 2022). Getting sufficient deep sleep is important for neural connectivity and brain health as we age (Fang, Sheng, & Shao, 2022). Conversely, studies have linked poor sleep quality and sleep disorders in older adults to detrimental health outcomes. Research shows that poor sleep in the elderly can increase the risk of obesity, diabetes, hypertension, heart disease, stroke, and mood disorders (Irwin & Vitiello, 2019). Sleep deprivation in seniors also impairs glucose metabolism and endocrine function (Ferini-Strambi, 2022). Furthermore, studies have demonstrated associations between various sleep disturbances (short sleep, fragmented sleep, hypersomnia, insomnia etc.) and accelerated cognitive decline in the elderly (Campbell *et al*., 2022).

Given the prevalence of sleep disorders among older adults, developing non-invasive techniques that are both efficacious and easily implemented is imperative (Yang, Wang & Cheng, 2022). Sleep hygiene has emerged as one such promising approach, offering a cost-effective means of managing sleep disturbances in the elderly (Zisapel, 2018). As the utility of non-pharmacologic interventions like sleep hygiene becomes increasingly evident, they may provide safe and effective solutions without adverse side effects to address sleep disorders in this population (Ferini-Strambi, 2022).

Considering the growing elderly population, investigating the effects of sleep hygiene interventions among older adults in integrated long-term care facilities in West Java is imperative (Fang, Sheng & Shao, 2019). By elucidating the favorable impacts and advantages of sleep hygiene compared to other approaches, this study may provide a robust foundation for enhancing quality of life and well-being in this demographic. We conducted this study to determine the urgent need for implementing sleep hygiene interventions among the elderly in these integrated facilities. Given that adequate sleep critically maintains physical and mental health, comprehensively understanding the effects of sleep hygiene can facilitate developing more effective, personalized care programs to improve elderly quality of life (Ferini-Strambi, 2022).

METHODOLOGY

Research Methods

This study used a quantitative research approach and employed a Quasi-Experimental Pretest-Posttest with a control control group design. This research design aims to investigate causal relationships and involves two different groups of subjects: an intervention group and a control group. Both groups underwent observation before and after the intervention to assess the impact of this study. In 2022, we conducted this research at the Treshna Werdha home in Bekasi City, Indonesia.

Sample

The determination of the sample in this research followed the Quasi-Experimental pretest-posttest with a control group design. The study involved two groups: the intervention group and the control group, each consisting of 66 and 33 participants, respectively. The sampling method utilized was purposive sampling, where participants were selected based on specific criteria to ensure relevance to the research objectives. In the intervention group, individuals who met the inclusion criteria, such as age between 55 and 65 years, good hearing and vision, clear communication skills, and the ability to comprehend the questions, were included. On the other hand, the control group's participants also met the same criteria, but they did not receive the intervention. This method aimed to enhance the internal validity of the study and enable a more accurate assessment of the intervention's impact on the observed variables.

Instrument

Participants were informed of the study objectives, methodology, risks, and benefits. Subjects who agreed to complete the questionnaire implied that they would participate in the study. Participants' confidentiality was maintained, and the data will not be used for any other purpose beyond this study. This instrument is used to measure sleep disturbances using the Sleep Quality Scale Single Item (SQS), which is a measure of sleep disturbances that could be developed to provide a more pragmatic approach to the assessment of sleep quality in clinical settings compared to the commonly used sleep quality evaluation standard, the Sleep Quality Scale (SQS), namely a self-assessed global sleep quality assessment tool that could be developed based on a review of the literature on key aspects of sleep quality. The scale uses a horizontal line consisting of a choice of numbers, including: 0 = very bad, 1–3 = bad, 4–6 = enough, 7–9 = good, and 10 = very good. Respondents marked a checklist on one of the answers (0–10) with the conditions experienced by the respondent. Score levels range from 0 to 10, with lower scores indicating lower sleep quality.

Intervention

This intervention was conducted from July 22 to August 22, 2022. During the evening meetings each day, patients in the units who did not meet exclusion criteria were identified. Education about sleep hygiene, such as dimming lights, tidying beds, and ensuring the cleanliness of the room environment, was delivered by enumerators to identified patients. Each evening, the elderly performed breathing exercises and dimmed the room lights in preparation for this sleep hygiene protocol. Signs promoting the importance of nighttime tranquility and the sleep project were placed around the units. The next morning, using the SQS Single Item instrument, research staff conducted a survey of available patients who had received sleep education. The sleep hygiene intervention was conducted three times a week for one month.

Ethical Consideration

This study obtained ethical approval from the Ethics Committee of Bani Saleh College, Indonesia of Health Sciences with number EC.135/KEPK/STKBS/VII/2022 on 20th July, 2022.

RESULTS

The researcher conducted an analysis to examine the impact of sleep hygiene on the sleep disorders of elderly individuals at two facilities: the Pangudi Luhur Integrated Center and the Compassionate Home, both located in the city of Bekasi, Indonesia. Initially, the researcher included 76 individuals who met the inclusion criteria but excluded 9 others due to their inability to communicate or mental disorders. Additionally, one person declined to participate. Consequently, the final number of participants in the study amounted to 66, evenly distributed between the control and intervention groups. Both univariate and bivariate analyses present the findings.

Table 1 : Distribution of Frequency Characteristics of Respondents in the Elderly Intervention and Control Group

Demographic Characteristics	Treatment		Control	
	F	%	F	%
Age Category Respondents				
Elderly (55-65 years)	12	36.4	16	48.5
Young Elderly (65 – 74 years)	7	21.2	8	24.2
Old Elderly (75-90 Years)	14	42.4	9	27.3
Total	33	100.0	33	100.0
Gender				
Man	14	42.4	24	72.7
Woman	19	57.6	9	27.3
Total	33	100.0	33	100.0
Education				
No school	12	36.4	15	45.5
Primary school	6	18.2	5	15.2
Junior high school	4	12.1	3	9.1
Senior high school	7	21.2	7	21.2
College	4	12.1	3	9.1
Total	33	100.0	33	100.0
Disease History				
There is	25	75.8	23	69.7
There isn't any	8	24.2	10	30.3
Total	33	100.0	33	100.0
Smoking History				
Smoking ≥ 1 Month	7	21.2	6	18.2
Do not smoke	26	78.8	27	81.8
Total	33	100.0	33	100.0
Coffee Consumption				
Yes	16	48.5	7	21.2
Not	17	51.5	26	78.8
Total	33	100.0	33	100.0
Consumption of Sleeping Pills				
Yes	0	0	0	0
Not	33	100	33	100
Total	33	100	33	100

Table 1 presents the distribution of demographic characteristics among elderly participants in institutions for the year 2022, with a total sample size of 66 individuals divided into treatment and control groups. Regarding the age category, the majority of respondents in the treatment group fell into the "Elderly (55-65 years)" category, constituting 36.4% of the group, while the control group had the highest percentage in the "Elderly (55-65 years)" category at 48.5%. The "Young Elderly (65-74 years)" category accounted for 21.2% in the treatment group and 24.2% in the control group, while the "Old Elderly (75-90 years)" category comprised 42.4% and 27.3%, respectively. In terms of gender, the majority of participants in both the treatment and control groups were women, with percentages of 57.6% and 72.7%, respectively, in the treatment group and 27.3% and 72.7% in the control group. Regarding education levels, the distribution varied among the treatment and control groups. In both groups, individuals with no school education had the highest percentage (36.4% in the treatment group and 45.5% in the control group). The percentages for other education levels were distributed differently between the groups.

Participants' disease histories showed that the majority in both groups had a history of disease, with percentages of 75.8% in the treatment group and 69.7% in the control group. In terms of smoking history, the

majority of participants in both groups did not smoke, with 78.8% in the treatment group and 81.8% in the control group. Concerning coffee consumption, a higher percentage of participants in the treatment group consumed coffee (48.5%) compared to the control group (21.2%). None of the participants in either the treatment or control group reported a history of sleeping pill consumption.

Table 2: Data Normality Test Results for Intervention Group and Control Group Before and After (n=66)

	Variable	Statistics	*P* Value
Intervention Group	Before	0.826	0.000
	After	0.780	0.000
Control Group	Before	0.809	0.000
	After	0.837	0.000

Table 2 shows the results of the data normality test by conducting the Shapiro-Wilk test. *The Shapiro-Wilk test* was used because the number of samples in this study was <40. The results showed that the *p*-value in the intervention group before and after that was *p*-value = 0.001, so *p* value <0.05, which means that the data in the intervention group were not normally distributed, as well as the control group, which had the same *p*-value, so that statistical tests could be used to determine the effect of sleep hygiene on elderly sleep disorders is the non-parametric Wilcoxon sign rank test. Furthermore, conclusions are drawn, and the results of the analysis that has been carried out through the test are as follows:

Table 3: Effect of Sleep Hygiene on Elderly Sleep Disorders in Institutions in 2022

Group		Means	Min-Max	*Z* Wilcoxon	*P* Value
Intervention	Before	3.88	(1-9)	-4.963	0.000
	After	8.48	(6-10)		
Control	Before	3.42	(1-6)	-1.050	0.294
	After	3.76	(1-6)		

Based on Table 3, in the study on the effect of sleep hygiene on elderly sleep disorders in institutions in 2022, the analysis reveals significant outcomes. In the intervention group, prior to the implementation of the intervention, the mean score of elderly sleep disorders was 3.88, with a range of 1-9. Following the sleep hygiene intervention, a significant increase is observed, indicated by the elevated mean score of 8.48, with a range of 6-10. The Wilcoxon sign rank test was statistically used because the results of the data normality test show that it is not normally distributed, and the results indicate a low *Z* value (-4.963) and a very small *P* value (0.000), rejecting the null hypothesis and confirming a significant difference between the scores of sleep disorders before and after the intervention in this group. Meanwhile, in the control group, prior to a specific time period, the mean score of elderly sleep disorders was 3.42, with a range of 1-6. Following this time period, there was a slight increase, with the mean score rising to 3.76. However, the statistical results of the Wilcoxon sign rank test show a lower *Z* value (-1.050) and a *P* value of 0.294, indicating no significant difference between the scores of sleep disorders before and after the specified time period in the control group.

Thus, it can be concluded that the sleep hygiene intervention significantly impacts the reduction of elderly sleep disorders in institutions, while in the control group, the changes are not remarkably evident. These findings provide support for the effectiveness of the sleep hygiene intervention in enhancing the quality of sleep among the elderly in institutional settings.

Table 4: Normality Test Results Comparison of Difference in Value (Δ mean) of Sleep Disorders in Elderly Institutions in 2022 between the Intervention and Control Groups

	Variable	Statistics	*P* Value
Difference in Sleep Disturbances***(Δmean)***	Intervention	0.934	0.047
	Control	0.880	0.002

Table 4 shows the results of the data normality test by conducting the test. Shapiro-wilk The results showed that the *p*-value in the intervention group was *p*-value = 0.047, so *p*<0.05, which means that the data in the intervention group were not normally distributed, as well as the control group, which had a *p*-value of 0.002

<0.05, so that the statistical test used to determine the difference in effectiveness or decrease in sleep disturbances is the Mann Whitney non-parametric test.

Table 5: Comparison of Differences in Sleep Disturbances in Elderly Sleep Disorders in Nursing Homes in 2022 between the Intervention and Control Groups

	Group	*n*	*Mean*	*P*-value
Difference in sleep disturbances	Intervention	33	4.61	0.000
	control	33	0.33	

Based on table 5, it can be seen that the average posttest minus pretest score difference (posttest-pretest) is expressed as mean in the intervention group of 4.61 and in the control group of 0.33. Statistically, there are differences in sleep disturbances in the elderly at the 2022 Institution between the Intervention and Control groups with a *p*-value of 0.000 ($p<0.05$).

DISCUSSION

The study was conducted at two sites in Bekasi City, Indonesia: the Pangudi Luhur Integrated Center and the Bekasi City Compassionate Home. The participants comprised elderly individuals residing in both facilities. Questionnaires were utilized to collect data, specifically the SQS Single Item. The sample size was 66 respondents. Among the 66 male respondents, 39 (59.1%) were men. Previous research found that women are more prone to sleep disorders compared to men. Elderly males produce less testosterone at night versus young adult males due to age-related declines in testosterone production (up to a 75% reduction). A prior study revealed that among elderly females, 64.36% of sleep disturbances were attributable to smoking habits, 57.1% to moderate anxiety, 78.6% to discomfort with environmental conditions, and 78.6% to impaired health status. Of the sample, 27 (40.9%) exhibited relatively poor sleep quality. Sleep disorders in elderly women can stem from reproductive cycles and menopause.

Research shows women undergoing menopause experience decreased estrogen production, influencing mental state and mood lability (Fang, Sheng & Shao, 2019). Prior studies indicate sleep disorders relate to depressive factors; more severe depression is associated with greater sleep disturbances in elderly men due to age-related testosterone changes (Sprajcer *et al*., 2021). Environmental discomforts like noise, overly bright or dim lights, and extreme temperatures can also contribute to poor sleep in the elderly (Zisapel, 2018).

Analysis of the 66 respondents revealed 25 (54.2%) had a high school education. While this study did not assess associations between education level and knowledge of sleep disorders, prior research indicates a correlation between education and intelligence, including emotional intelligence (Fang, Sheng & Shao,2019). As a result, the researchers concluded that those with less education may experience greater disturbances due to poorer self-monitoring and comprehension of emotions, motivations, desires, and appropriate responses to sleep disorder causes. The results for the 66 respondents with medical histories revealed that 25 respondents (37.9%) had a history of hypertension. This aligns with prior research indicating physical discomfort from illness can disrupt sleep and cause sleep disturbances, rendering the elderly more susceptible to disease (Irwin & Vitiello, 2019). Hence, the researchers concluded that those with a history of this condition often awoke at night due to discomfort during sleep, leading to persistent sleep disruptions. This deteriorates sleep quality and health in the elderly (Fang, Sheng & Shao, 2019).

Regarding age, analysis of the 66 respondents revealed 27 aged 55–65 years exhibited sleep disturbances. A previous study found poorer sleep quality in those aged 50–75 years versus 80–90 years living in long-term care facilities, attributed to declining adaptability to environmental stressors with age (Fang, Sheng & Shao,2019). Moreover, research indicates most adults aged 60–74 years and older have entered a degenerative stage with reduced functional abilities (Irwin & Vitiello, 2019).

Sleep Disorders before and after the Intervention Group

Based on the data in table 4.2, if you look at the characteristics of the group before being given the Sleep Hygiene intervention, 22 people (66.7%) experienced poor sleep disturbances and experienced an increase

after being given the Sleep Hygiene intervention; 15 people experienced good sleep disturbances (45.5%). Two separate studies found that 20 people (71.4%) of the sample did not meet the criteria for elderly people with sleep disorders. 70.1% of the study's participants reported having poor sleep disorders. In addition to this, 68 respondents, or 70% of the group, reported other symptoms, such as waking up during the night and feeling hot. These symptoms are common among people with sleep disorders in general. A lack of optimal organ function is common at any age. Ensuring good sleep hygiene in nursing homes can reduce the use of medications that have an impact on aging.

Sleep Disorders before and after Intervention in the Control Group

According to the researchers' theory and research, sleep disorders in the elderly typically worsen before receiving sleep hygiene controls, and most people's overall sleep disturbances do not improve after receiving these controls. This condition is influenced by increasing age and changes in the pattern and quality of life among the elderly.

The Effect of Sleep Hygiene on Sleep Disorders in the Elderly Intervention Group

Statistical analysis using the Wilcoxon test yielded a *p*-value of 0.000 <0.05. This aligns with prior research by Irwin and Vitiello (2019) demonstrating an association between sleep hygiene and sleep disorders via the paired *T*-test, which also showed a *p*-value of 0.000 ($p<0.005$). These results indicate that lower sleep hygiene correlates with worse sleep disturbances in the elderly, likely due to aging processes that alter sleep patterns.

Effect of Sleep Hygiene on Sleep Disorders in the Elderly Control Group

The statistical calculations using the Wilcoxon test yielded a *P*-value of 0.217, surpassing the conventional significance level of 0.05. This outcome implies the absence of a discernible impact of pre- and post-sleep Sleep Hygiene control on sleep disturbances among the elderly residing in nursing homes. This finding is consistent with previous research, which similarly demonstrated no association between sleep hygiene and sleep disturbances using the Paired *T*-test, reporting statistical data with a *p*-value of 0.201 (*p*-value > 0.005), signifying no significant difference before and after the control group intervention, indicating a lack of alteration in sleep disturbance levels (Andas *et al.*, 2023).

Initially, the data analysis employed the Pearson chi-square statistical test, but 7 cells (77.8%) exhibited an expected count of less than 5, prompting the use of the Kolmogorov-Smirnov alternative test. The results of the Kolmogorov-Smirnov test yielded a *p*-value of 0.132 with an alpha level of 0.05. The *p*-value exceeding alpha indicates the absence of a correlation between sleep hygiene behavior and sleep quality in the elderly at the Tresna Werdha Panti. The collected data highlight the fact that the standard care did not result in any changes in sleep disorders among the elderly in the control group. Additionally, it is essential to emphasize that the control group did not receive any form of intervention.

CONCLUSION

In conclusion, it can be said that implementing sleep hygiene regularly is effective in promoting good sleep and can overcome sleep disturbances in various populations of the elderly age group. Therefore, it can be considered a source of therapeutic, easy-to-apply, and safe non-pharmacological treatments to promote better sleep.

Conflict of Interest

The authors declare that they have no conflict of interests.

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