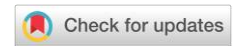


Effect of White Noise on Sleep Quality Patient with Acute Myocardial Infarction

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ABSTRACT

Background: Symptoms of acute myocardial infarction include chest pain radiating to the neck, jaw, shoulders and arms, as well as shortness of breath and stress, which can cause decreased sleep quality. Therapy given to overcome sleep quality disorders includes pharmacological and non-pharmacological therapy, including the use of complementary methods in the form of white noise therapy. This study aimed to determine whether there is an effect of white noise therapy on sleep quality in patients with acute myocardial infarction.

Methods: This type of research is quantitative research with a non-equivalent control group design method or untreated control group design with pretest and posttest. The population of this study was 24 respondents, with sampling using non-probability sampling.

Results: Based on the results of the study The average age of respondents was in the age range of 54.0 years and Pvalue of $< .001 < 0.05$ with an effect size of 2.30 with an average value before white noise therapy was given as much as 33.3% and after white noise therapy was given to 100%.

Conclusion: There is an effect of changes in sleep quality in patients with acute myocardial infarction at Amira Hospital in 2024 after being given white noise therapy.

INTRODUCTION

Acute myocardial infarction (AMI) is one of the leading causes of death in developed countries (Mechanic et al., 2023). According to the results of the 2018 Sample Registration System (SRS) survey, Acute Myocardial Infarction (AMI) ranks second as one of the causes of death after stroke (Sumeke. pk, 2023).

Signs and symptoms of acute myocardial infarction include typical chest pain, pain lasting >30 minutes, the quality of pain is often felt as if it is being pressed, squeezed, choked and heavy, can be accompanied by nausea, vomiting, weakness, dizziness, palpitations and cold sweats (Widaryati & Andriyani, 2023). The prevalence of Acute Myocardial Infarction (AMI) tends to increase every year, this not only affects developed countries but also developing countries (Amrullah et al., 2022).

The prevalence according to the World Health Organization (WHO) in 2021 was 17.6 million patients with heart failure. Mozaffarian et al., in 2016 said that acute myocardial infarction was 2.8% of the total population in the United States and was higher in men than women, while in Asia there were 3.3% of the population over 18 years of age suffering from myocardial infarction heart disease (Spencer & Talbert, 2016).

Research conducted by Farokhnezhad Afshar et al., 2016 on the use of white noise is recommended as a method to cover environmental noise and improve sleep quality by comparing the average sleep quality score. before and after the study ($P = 0.008$), further research conducted by Cao., 2022 white Noise is a non-pharmacological way to improve sleep quality and has a significant positive effect on sleep quality, both from questionnaire scores or EEG. This is proven by the results of data selection and statistical

analysis using The t-test for comparison between groups was ($P < 0.05$) more than 90% of experiments using sleep scale scores (RCSQ or PSQI) with the results of the experimental group being better than the control group.

White noise therapy on sleep quality disorders in acute myocardial infarction patients and the provision of complementary therapy in the form of white noise can be carried out and applied in hospitals, so that it can be developed into an SOP (Standard Operating Procedure).

METHODS

Study design

This research design uses quantitative research with a Quasy experiment pretest - posttest experimental control group design approach and a non-equivalent control group design (Abraham & Supriyati, 2022). The sample size of this study was 24 respondents, with a minimum sample calculation using G Power software (version 3.1.9.4). The researcher entered the data into G Power using the following parameters: type of analysis to be used, significance score (α), statistical power, sample size calculation, effect size and tail (s) direction of the hypothesis to be used. Input parameters have been set for analysis t test-means: difference between two independent means (two groups), significance score / α (α err prob) 0.05, statistical power ($1-\beta$ err prob) for calculating sample size is 90% (0.90), clinical effect size 1.4 1 and the direction of the two tails hypothesis (Akhtar, 2020).

Sample/Participant

This study lasted for 2 months, starting in May 2024 to June 2024. The variables in this study were respondent characteristic data consisting of age, gender, family history, education, occupation and type of acute myocardial infarction, white noise therapy as an independent variable and sleep quality as a dependent variable. The population in this study were all acute myocardial infarction patients who were being treated at Amira Hospital. The sample used in this study was acute myocardial infarction patients who experienced sleep quality disorders. The sampling technique in this study was purposive sampling which was adjusted to the inclusion criteria, namely patients with acute myocardial infarction who experienced sleep disorders, PSQI pre-test questionnaire results > 5 , Nstemi ECG results, compos mentis awareness, willing to be respondents and able to communicate verbally and in writing. While the exclusion criteria in this study were patients who experienced decreased consciousness, in a critical phase and patients who were referred to a Type B Hospital for Coronary Artery Bypass Graft (CABG). The number of samples in this study was 24 respondents.

Intervention

Based on the research design conducted by the researchers, they divided this research into two stages. The first stage uses sleep quality screening, namely the Pittsburgh Sleep Quality Index (PSQI). Then in the second stage consists of implementing interventions and collecting data. Researchers do intervention as well as conduct observations and record intervention results based on instruments Which has set. This study used two groups, namely the control group and the intervention group, with pre- and post-test questionnaires. The control group was given pharmacological therapy, while the intervention group was given pharmacological and non-pharmacological therapy in the form of white noise. White noise therapy was given when the patient was going to sleep and was carried out for three days. This study was conducted for two months to fulfill all sessions for each respondent.

Instrument

The instrument used in this study was the Pittsburgh Sleep Quality Index (PSQI) with a sensitivity value of 89.6% and a specificity of 86.5% (Beswick et al., 2023). Assessment using the Pittsburgh Sleep Quality Index (PSQI) sleep quality scale consists of: subjective sleep quality, sleep latency and sleep latency score, sleep duration, sleep efficiency, sleep disturbances, medication use and daytime dysfunction, with a score of 0 (very good), score 1 (fairly good), score 2 (rather bad) and score 3 (very bad) then add up all the scores from component one to component seven. To determine the final score that concludes the overall sleep quality, namely for good sleep quality ≤ 5 and poor sleep quality > 5 .

Data Analysis

Data analysis in this study uses univariate and bivariate analysis. The statistical analysis application used in this study is the JAMOWI 2.2.5 application, an open source application that can be downloaded for free through the official website. For univariate analysis using descriptive analysis, while bivariate analysis using the T-dependent test to see the difference in the average before and after therapy was given to the intervention group.

Ethical Considerations

This research has passed the research ethics protocol test conducted by the Research Ethics Commission of the University of Indonesia Maju with the number : No. 8766/Sket/Ka-Dept/RE/UIMA/V/2024

RESULTS

The results of the research conducted are presented in the form of a table consisting of respondent characteristics. Which covers age, gender, education, occupation and family history. Bivariate analysis was used to see the effect of *white noise therapy* on sleep quality disorders.

Table 1 : Characteristics Respondents based on age, gender, education, occupation and family history (n= 24)

Characteristics	Category	(n)/ mean	(%)/ SD
Age (mean, SD)	Numeric	54.0	4.98
Gender (n, %)	Man	12	50.0%
	Woman	12	50.0%
Education (n, %)	SENIOR HIGH SCHOOL	10	41.7%
	SD	5	20.8%
	Bachelor	6	25%
	JUNIOR HIGH SCHOOL	3	12.5%
Jobs (n, %)	Self-employed	8	33.3%
	Doesn't work	12	50%
	Government employees	4	16.7%
Family history (n, %)	Heart	17	70.8%
	Diabetes	2	8.3%
	Hypertension	5	20.8%

Based on table 1 shows the results that the average age of respondents is 54.0 years. At the high school education level, the results are more dominant, as many as 10 respondents (41.7%). In terms of employment, more respondents are unemployed than respondents who have jobs, namely 12 respondents (50.0%). In terms of family history frequency, heart disease is more dominant than other diseases with a total of 17 respondents (70.8%).

Table 2: Description of sleep quality before white noise therapy was given to patients with acute myocardial infarction.

Characteristics	Information	n	% of Total
Sleep quality before	Good	16	66.7%
	Bad	8	33.3%

Based on table 2, the results show the difference in sleep quality before being given *white noise therapy*, namely 16 respondents (66.7%) with good sleep quality and 8 respondents (33.3%) with poor sleep quality.

Table 3: Description of the difference in sleep quality after *white noise* therapy in patients with acute myocardial infarction

Characteristics	Information	n	% of total
Sleep quality after	Good	24	100%

white noise therapy, namely 24 respondents (100%) with good sleep quality.

Table 4. Characteristics of pre and post sleep quality in the intervention group and control group.

Category	Mean	SD	P	Effect size
Pre-test intervention	5.67	0.651	0.001	3.00
Post test intervention	4.50	0.522		
Pre test control	5.33	0.985	0.002	3.32
Post test control	3.33	0.492		

Based on table 4, the results of the analysis test using *Wilcoxon - W* in the intervention group test obtained the results of $p (0.001) < 0.05$, meaning that the data was not normally distributed, H_0 was rejected and H_a was accepted, meaning that there was an effect before and after being given *white noise therapy* in the intervention group with an *effect size* of 3.00, meaning that it had a strong effect. While the results of the analysis test in the control group had a value of $p (0.002) < 0.05$, meaning that H_0 was rejected and H_a was accepted, meaning that there was an effect of changes in sleep quality in the control group with an *effect size* of 3.32.

Table 5: Effect of *white noise therapy* on sleep quality in acute myocardial infarction patients

Intervention	Sleep quality	Mean (SD)	p	Effect size
<i>White noise</i>	Before	4.50 (0.522)	<,001	2.30
	After	3.33 (0.492)		

Based on table 5, the results of the test on the effect of sleep quality on patients with acute myocardial infarction obtained a p value ($<, 001$) < 0.05 , meaning that there was an effect of sleep quality before and after being given *white noise therapy* with an *effect size* of 2.30 (large effect) with a comparison of the average value before the intervention of 4.50 with a standard deviation of 0.522 and after the intervention of 3.33 with a standard deviation of 0.492.

DISCUSSION

Description of the characteristics of research respondents based on age, education, occupation, family history.

Based on the results of research on acute myocardial infarction patients at Amira General Hospital, it shows that the average age of respondents in both men and women is 54.0 years, this study is in line with research conducted by Merta in 2010, which showed that most patients suffering from acute myocardial infarction are over 50 years old. This is also in line with research according to Dwi Sulistyowati with the title The Effect of Sleeping Position Angle on Sleep Quality and Cardiovascular Status in Acute Myocardial Infarction (AMI) Patients in the ICVCU Room of Dr. Moewardi Surakarta Hospital which shows that respondents are dominated by the older adult age group with an age range of 41-65 years. This is reinforced by the theory of Acute Myocardial Infarction which has a higher risk at the age of over 40 years according to (Sumeke. pk, 2023).

Acute myocardial infarction causes impaired blood flow to the heart or a condition where the heart muscle does not get enough blood and oxygen due to atherosclerosis of the heart's blood vessels. According to Muttaqin, 45% of acute myocardial infarction occurs at the age of 45 years and over and less than 10% occurs at the age of less than 40 years. Meanwhile, according to Morton, this disease occurs more often in people over 50 years of age, due to the influence of an unhealthy lifestyle such as stress, obesity, smoking and lack of physical activity (Nurmala & Kamil, 2019). Based on previous

research and research conducted by researchers, that the age over 45 years is an age that is susceptible to heart disease.

The results of the study on the level of education were mostly high school education with 10 respondents (41.7%). In the results of the study (Nurmala & Kamil, 2019) the highest respondents were seen from the level of education and the most respondents with high school education were 16 respondents (35.6%). From the results of Any Masfuati's study in 2015 entitled *The Relationship between Stress Levels and Sleep Quality of the Elderly at the Tresna Wredha Social Home, Budi Luhur Unit, Yogyakarta*, that the majority of elderly people who experience good sleep quality are elderly with high school education with 13 respondents. The higher the level of education, the easier it will be to overcome various problems. This is supported by Luo et al who stated that a low level of education can affect sleep quality to be poor related to lack of social needs (Nurmala & Kamil, 2019). The results of the researcher's study, with previous studies, have differences, because according to the researcher, the higher the level of education, the more work, so that sleep quality becomes poor.

From the research results, the average number of respondents who do not work is 12 respondents (50%) compared to those who have jobs, this is in line with research conducted by Icha Fahrurisa in 2015 which found that the majority of respondents do not work, namely 19 respondents (59.4%). The results of the study show that work has a very important role in meeting human life needs, especially social and psychological life needs (Triyanta & Haryati, 2013). According to researchers, the smaller the income will affect the quality of sleep because the more the patient will think about it. Other factors that interfere with the quality of sleep in patients are activities in the hospital such as giving medication, lighting, monitor noise, staff conversations, telephone rings, and other medical equipment.

The effect of white noise therapy on sleep quality in the intervention group and control group

The results of the study showed that before complementary therapy in the form of white noise therapy was given to patients with acute myocardial infarction, some respondents in the intervention group experienced sleep quality disorders or poor sleep quality, including respondents feeling pain during activity and rest, shortness of breath, often waking up in the middle of the night or early morning, anxiety, stress and some respondents took sleeping pills. After white noise therapy was given to the intervention group, it showed an increase in poor sleep quality to good sleep quality. From the results of the study that has been carried out, it was found that there was an effect before and after white noise therapy was given to the intervention group.

intervention, widely discussed and practical, as it is a reliable alternative to drugs. People define sound with a uniform loudness distribution within the hearing range of the human ear (20hz - 20000hz) as "white noise". When we use white noise for medical purposes, the loudness usually does not exceed 10,000 hertz. At the same time, the upper limit of white noise loudness selected for this study was about 60 db in the range of loudness levels that affect hearing (Cao, 2022).

white noise therapy can affect sleep quality according to (Riedy et al., 2021). The effect of music intervention on sleep quality can be concluded that music is usually applied to emotional regulation, reducing depression and insomnia associated with emotional disorders. The mechanism comes from the brain's nervous system, such as the limbic system. The ability of music to regulate emotional states can help improve participants' sleep quality. In addition, music is closely related to physiological and psychological responses and has an effect on the activity of the endocrine and autonomic nervous systems, increasing parasympathetic activity by reducing plasma cytokine and catecholamine levels and reducing cortisol levels as well as heart rate and respiratory rate. This is conducive to keeping patients calm and helping them sleep (C. Wang et al., 2021).

Researchers assume that when we listen to music or when doing music therapy the body and brain are in a relaxed state, this is what causes a decrease in sleep quality because our minds are diverted to something else in this case to music therapy so that patients can sleep comfortably. This is proven by the results of the selection and statistical analysis of data using the t-test for comparison between groups, namely ($P < 0.05$) more than 90% of experiments using sleep scale scores (RCSQ or PSQI) with the results of the experimental group being better than the control group (Cao, 2022).

The findings of this study indicate that acute myocardial infarction patients who have poor sleep quality can be given complementary therapy in the form of white noise to improve the quality of sleep of patients. The limitations of this study are that the study was only applied to acute myocardial infarction patients. In addition, the readiness of the research location such as the room is inadequate to conduct white noise therapy sessions which should have a greater impact if at the time of white noise therapy the

patient is given a special room or a patient room consisting of two people in the same room. Researchers are also still lacking in finding variables that can affect sleep quality disorders in patients, so researchers assume that there are still many factors that need to be studied further regarding the research that has been done. This study can be a reference and used by the public to consider white noise therapy interventions as interventions that are beneficial for the recovery of heart patients

CONCLUSION

Giving white noise therapy can improve sleep quality especially in patients with acute myocardial infarction. This study can be a reference especially in complementary care in the form of white noise therapy and become a nursing intervention that can be done on patients. In further research it is recommended to look for more variables that can affect sleep quality to minimize bias and maximize the research that has been done.

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CONFLICTS OF INTEREST

The authors declare that this study is free from any conflicts of interest

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