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ENVIRONMENTAL FACTORS AS SLEEP DISTURBANCE ON CRITICALLY ILL PATIENTS IN INTENSIVE CARE UNITS (ICU): A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Sleep disturbance is a major problem among critically ill patients in the Intensive care unit (ICU) and often leads to negative experiences during their treatment. Previous studies found that environmental factors including noises and lighting mainly associated with the patient's sleep disturbance. Objectives: This study purposed to explore the relationship between environmental noise and lighting with the experience of sleep disturbance among critically ill patients in ICU. Methods: Analytical descriptive with a cross-sectional study approach was used in this study in the population of critically ill patients who were treated in the ICU. Setting of the study was conducted at a public hospital in West Sumatra, Indonesia from June to August 2021. The sample size was calculated by using power analysis from a previous study which obtained 80 participants. A purposive sampling technique was used based on the inclusion criteria. Data was analysed by using percentages for the descriptive statistic and the Spearmen rank test for the inferential statistic. Results: Results of the study showed that 37.5% of the participants had sleep disturbance from environmental noise and 31 participants 38.75% of participants had sleep disturbance from lighting. Moreover, there was a significant relationship between environmental factors with sleep disorders in critically ill patients. Conclusion: Environmental factors of noises and lighting associated with the experience of disturbance among critically ill patients in ICU. It should be expected that hospitals could provide health education for patients and families suffering from sleep disturbance to maintain a calm environment noise and good lighting .

Keywords:
critically ill patient, environmental noise, lighting, sleep disturbance

BACKGROUND

Sleep quality can improve psychological well-being and it is important for the recovery of critically ill patients (Elliott, Rai and McKinley, 2014). Nevertheless, most critically ill patients reported sleep disturbance during their treatment. Sleep disturbance among critically ill patients may result in physical and psychological discomfort such as anxiety (Hofhuis et al., 2008). Symptoms of sleep disturbance usually a person will have more difficulty starting sleep, often wake up early and find it difficult to go back to sleep (Delaney, Van Haren and Lopez, 2015). A study by Pisani (2015) found sleep disturbances in critically ill patients may result in impaired immune function, decreased ability of respiratory inspiratory muscles, disruption of the metabolic system, disruption of central nervous system regulation and the patient's psychological condition which has an impact on prolonged treatment time (Pisani et al., 2015). Other effects of sleep disorders include excessive daytime sleepiness, impaired attention and memory, depressed mood, inappropriate use of hypnotics, discomfort during treatment and decreased quality of life (Robertson and Al-Haddad, 2013; Rustam, Kongsuwan and Kitrungrote, 2021) .

Sleep disturbances in critically ill patients may affect cardiovascular disorders, respiratory disorders that can lead to hypercapnia to hypoventilation, and metabolic disorders that occur in glucose tolerance, insulin release, growth hormone and cortisol secretion, appetite regulation by leptin and garlic and affect sleep quality (Romero-Bermejo, 2014). Elliott et al (2013) found several factors associated with sleep disturbances among critically ill patients in ICU were noise, lighting, interventions provided by nurses, treatment and patient illnesses (Elliott et al., 2013). Environmental noise in the ICU may result in psychological disorders such as agitation, confusion and delirium and physiological such as cardiovascular disorders and suppression of the immune response to infection or delayed healing as well as an increased need for drugs (Suparti and Suroso, 2020).

Boyko et al (2012) stated that ICU noises are a major problem for critically ill patients due to medical measures such as the sound of monitors, voices of visitors, conversations between nurses which often cause sleep disturbances and lighting that is too bright so patients are easy to wake up (Boyko, Ørding and Jennum, 2012). The permissible noise level for health services such as hospitals ranges from 35 dB to 45 dB and noise for treatment rooms of <45 dB (Elbaz et al., 2017).

Sleep disturbance in critically ill patients can be treated pharmacologically with the use of drugs such as benzodiazepines, non-benzodiazepines, ramelteon, low-dose sinequan, and suvorexant. In general, benzodiazepines are used in the ICU, including lorazepam, midazolam, and diazepam (Oldham and Pisani, 2015). Pharmacotherapy has a general hypnotic effect with a tendency to increase total sleep time but could have side effects including drug dependence, agitation, difficulty concentrating, confusion, and hallucinations (Mehta et al., 2012).

Sleep disorders in ICU patients can be handled by adjusting the lighting level to help patients feel calm and comfortable (Engwall et al., 2015). Another study by Suparti (2020) found that sleep quality can be improved by managing the ICU's environment, such as lowering the voice of staff conversations, lowering lighting, and arranging routine maintenance activities at night (Suparti and Suroso, 2020). Furthermore, Hu (2010) found that sleep disturbances in critically ill patients can be overcome by using ear plugs and eye masks not only to improve sleep quality but also to increase melatonin production .

METHODS

A cross-sectional was conducted on admitted critically ill patients in the ICU of a public hospital in West Sumatra Indonesia. The sample size was calculated by using power analysis from a previous study. Eighty participants were recruited in this study from June to August 2022 by using a purposive random sampling technique based on the inclusion criteria including; 1) age more than 18 years old, 2) spent at least more than 24 hours in ICU, and 3) being conscious and cooperative. The instrument of this study is a modified questionnaire from the Factors Interfering Sleep Quality Questionnaire (FISQ) to measure environmental factors of sleep disturbance specifically noise and lighting, and the Pittsburgh Sleep Quality Index (PSQI) to assess sleep disorder of the participants

RESULTS

Characteristics of the participants are shown in Table 1, half of the participants in the study were female (55%), with an average age of 52.1 years old (SD=13.8), and the average length of stay in the ICU for two days (SD=.66).

Based on environmental factors in the ICU, 23.4% of participants had sleep disturbance. More-

Table 1. Characteristics of the participants

Characteristic	F	%
Age	(m=52.1)	(SD=.66)
Gender		
Male	44	55
Female	36	45
Length of stay in ICU	(m=1.87)	(SD=.66)

Table 2. Sleep disturbance from the environmental factors

Variable	F	%
Environmental factors (noise, lighting)		
No disturbance	46	76,6
Disturbance	34	23,4
Environmental noise		
No disturbance	42	62,5
Disturbance	38	47,5
Environmental light		
No disturbance	50	61,25
Disturbance	30	38,75

Table 3. The prevalence of sleep disorder of the participants

Variable	f	%
Sleep disorder		
Mild	26	32,5
Moderate	31	38,75
Severe	23	28,75

Table 4. Environmental factors and sleep disorder of the participants

		Sleep Disorder						*R*	*p*
		Mild		Moderate		Severe			
		f	%	f	%	f	%		
Environmental factors (noise, lighting)	No disturbance	22	84,6	15	61,3	9	39,1	.367	.001
	Disturbance	4	15,4	16	38,7	14	60,9		

over, 47.5% of participants had sleep disturbance from environmental noise and 38.75% of the participants had sleep disturbance from lighting as shown in Table 2.

The prevalence of sleep disorders among 80 participants (Table 3) showed that 26 participants (28.4%) had severe sleep disorders, 31 people (38.75%) had moderate sleep disorders and 9 re (39.1%) had mild sleep disorders with a total of 50 people (62.5%) and most of them did not experience sleep disturbances as many as 30 people (37.5%).

The results of the bivariate analysis with the Spearmen Rho test showed a significant relationship between environmental factors and sleep disorders

in respondents with a correlation value of rho = 0.367 as shown in Table 4. It can be interpreted that there is a strong relationship between environmental factors and sleep disorders in respondents with a positive correlation. Therefore, the higher the noise factor level, the higher the level of sleep disturbance.

DISCUSSION

Respondent characteristics regarding gender in this study found that 55.0% were female. A previous study stated that sleep disturbances can occur to anyone, both male and female. However, the causes of sleep disturbances in men and women are slightly different. In men, it is generally caused by work activities and daily routines, while in women, apart from work activities and age, hormonal factors are also very influential. The difference in hormonal factors makes women have sleep problems (Bihari et al., 2012). Generally, the hormones progesterone and estrogen affect a woman's sleep pattern. This is caused by the hormone progesterone and estrogen receptors located in the hypothalamus. The position of these two hormones is thought to directly affect circadian rhythms and sleep patterns. It is known that the hormone progesterone can shorten REM latency (Mallampalli and Carter, 2014). Gender is a factor that shows differences in physical, biological, and individual characteristics. A study by Bhaskar (2016) found that 50% of female participants experienced complaints of sleep disturbances caused by anxiety factors. Following the above theory, it can be assumed that gender can affect the occurrence of sleep disorders (Bhaskar, Hemavathy and Prasad, 2016).

The average age of the participants in this study was 52 years old. Bhaskar (2016), states that age is a risk factor for sleep disorders, the higher the age, the higher the risk of sleep disorders. Environmental factors in the ICU are one of the factors that affect the sleep quality of critically ill patients. Similarly, Rustam (2018) also mentioned that sleep disorders can also be said if a person's condition is unconscious, but can be awakened by a stimulus or sensory appropriate to minimal physical activity, the level of consciousness varies, changes in physiological processes occur and a decrease in response to external stimuli and can attack all age groups (Superman Rustam, Kongsuwan and Kitrungrote, 2018). However, much literature states that the incidence of sleep disorders will increase with age. In other words, symptoms of sleep disorders often occur in the elderly almost half of the elderly reported having difficulty initiating sleep and maintaining sleep (Pisani et al., 2015).

Based on the results of the study on environmental factors as sleep disturbance of critically ill patients, it was found that 47,5% of critically ill patients in this study experienced sleep disturbances caused by noise. According Suparti (2020) described that noise may cause psychological and physiological disturbances in an environment. Negative psychological states are risk variables including agitation, confusion and delirium. Physiological disorders can affect cardiovascular and immune response suppression to infection or delayed healing and increased need for drugs (Suparti and Suroso, 2020). Potter & Perry (2010) stated that noise is a major problem for patients in the ICU because of medical actions such as the sound of monitors, visitors' voices, conversations between nurses which often cause sleep disturbances and lighting that is too bright so patients are easy to wake up. The permissible noise level for health services such as hospitals ranges from 35 dB to 45 dB and noise for treatment rooms of <45 dB (Demoule et al., 2017).

Furthermore, environmental light is also an important point that causes patients to experience sleep disorders, it is related to the loss of melatonin secretion patterns at night. Melatonin is a response to darkness and has an influence in promoting sleep and development through the stages of sleep, inhibition of melatonin production in response to bright light can cause alertness and awakening with an average light intensity of 300 lux, a maximum glare index of 19 and uniformity of 0.6 (Hanang, 2014). According to the above theory, lighting can affect the occurrence of sleep disturbances. When the researchers conducted research with questionnaires and interviews, it was found that most of the participants experienced sleep disturbances due to lighting (Parthasarathy and Tobin, 2004).

Moreover, finding of this study also found all of the respondents reported sleep disorders during their treatment. Whereas, 19 respondents experienced severe sleep disturbances from environmental noise and light. Statistically, it was found there is a significant strong relationship between environmental factors and sleep disorders in critically ill patients in ICU. Kwak & Young K, (2016) revealed environmental noise in ICU may increase the frequency of awakening during sleep and decrease the slow-wave phase of sleep (which can also be called deep sleep). This condition causes a decrease in sleep quality. According to Bihari (2012), noise is heard as a stimulus to cells auditory nerve in the ear by longitudinal waves caused by vibrations from the source of sound or sound and these waves propagate through air or other

conductors, and when the sound or sound is unwanted because it disturbs or arises against the will of the person concerned, the sounds or such sound is expressed as noise (Kamdar, Needham and Collop, 2012). Moreover, according to Kenneth W & Monique K, (2016) mentioned that light in the room may suppress the hormone melatonin. Naturally, melatonin will be produced at night before bedtime, however, exposure to room light at the beginning of the night prevents the secretion of the hormone melatonin. Melatonin plays a role in physiological processes, such as homeostasis glucose, thermoregulation, and blood pressure, and supports sleep. Chronic suppression of melatonin has negative health consequences (Pulak and Jensen, 2014) .

CONCLUSION

The findings of the study revealed that most of the participants had a decreasing quality of sleep. The correlation that exists between environmental noise and light with the incidents of sleep disorder among critically ill patients showed that patients were more disturbed to sleep by the environmental noise rather than the light of the ICU. The noise at the ICU should be reduced appropriately. Furthermore, effective interventions such as earplugs or eye masks can be implemented to increase the sleep quality of critically ill patients while caring in the ICU. Further study also may identify another factor that could impact sleep disorders.

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REFERENCES

Bhaskar, S., Hemavathy, D. & Prasad, S. 2016. 'Prevalence of chronic insomnia in adult patients and its correlation with medical comorbidities', Journal of Family Medicine and Primary Care, 5(4), p. 780. doi: 10.4103/2249-4863.201153.

Bihari, S. et al. 2012. 'Factors Affecting Sleep Quality of Patients in Intensive Care Unit', Journal of Clinical Sleep Medicine, 8(3), pp. 301-307. doi: 10.5664/JCSM.1920.

Boyko, Y., Ørding, H. & Jennum, P. 2012. 'Sleep disturbances in critically ill patients in ICU: how much do we know?', Acta Anaesthesiologica Scandinavica, 56(8), pp. 950-958. doi: 10.1111/J.1399-6576.2012.02672.X.

Delaney, L. J., Van Haren, F. & Lopez, V. 2015. 'Sleeping on a problem: the impact of sleep disturbance on intensive care patients - a clinical review', Annals of Intensive Care, 5(1), pp. 1-10. doi: 10.1186/S13613-015-0043-2/TABLES/3.

Demoule, A. et al. 2017. 'Impact of earplugs and eye mask on sleep in critically ill patients: A prospective randomized study', Critical Care, 21(1), pp. 1-9. doi: 10.1186/S13054-017-1865-0/TABLES/3.

Elbaz, M. et al. 2017. 'Sound level intensity severely disrupts sleep in ventilated ICU patients throughout a 24-h period: a preliminary 24-h study of sleep stages and associated sound levels', Annals of Intensive Care, 7(1), pp. 1-9. doi: 10.1186/S13613-017-0248-7/TABLES/6.

Elliott, R. et al. 2013. 'Characterisation of sleep in intensive care using 24-hour polysomnography: an observational study', Critical care (London, England), 17(2). doi: 10.1186/CC12565.

Elliott, R., Rai, T. & McKinley, S. 2014. 'Factors affecting sleep in the critically ill: An observational study', Journal of Critical Care, 29(5), pp. 859-863. doi: 10.1016/J.JCRC.2014.05.015.

Engwall, M. et al. 2015. 'Lighting, sleep and circadian rhythm: An intervention study in the intensive care unit', Intensive & critical care nursing, 31(6), pp. 325-335. doi: 10.1016/J.ICCN.2015.07.001.

Hofhuis, J. G. M. et al. 2008. 'Experiences of critically ill patients in the ICU', Intensive and Critical Care Nursing, 24(5), pp. 300-313. doi: 10.1016/j.iccn.2008.03.004.

Kamdar, B. B., Needham, D. M. & Collop, N. A. (2012) 'Sleep deprivation in critical illness: Its role in physical and psychological recovery', Journal of Intensive Care Medicine, 27(2), pp. 97-111. doi: 10.1177/0885066610394322.

Mallampalli, M. P. & Carter, C. L. 2014. 'Exploring Sex and Gender Differences in Sleep Health: A Society for Women's Health Research Report', https://home.liebertpub.com/jwh, 23(7), pp. 553-562. doi: 10.1089/JWH.2014.4816.

Mehta, S. et al. 2012. 'Daily sedation interruption in mechanically ventilated critically ill patients cared for with a sedation protocol: A randomized controlled trial', JAMA - Journal of the American Medical Association, 308(19), pp.

1985-1992. doi: 10.1001/jama.2012.13872.

Oldham, M. & Pisani, M. A. 2015. 'Sedation in critically ill patients', Critical care clinics, 31(3), pp. 563-587. doi: 10.1016/J.CCC.2015.03.010.

Parthasarathy, S. & Tobin, M. J. 2004. 'Sleep in the intensive care unit', Intensive Care Medicine, 30(2), pp. 197-206. doi: 10.1007/S00134-003-2030-6.

Pisani, M. A. et al. 2015. 'Sleep in the intensive care unit', American Journal of Respiratory and Critical Care Medicine, 191(7), pp. 731-738. doi: 10.1164/RCCM.201411-2099CI/SUPPL_FILE/DISCLOSURES.PDF.

Pulak, L. M. & Jensen, L. 2014. 'Sleep in the Intensive Care Unit', http://dx.doi.org/10.1177/0885066614538749, 31(1), pp. 14-23. doi: 10.1177/0885066614538749.

Robertson, L. C. & Al-Haddad, M. 2013. 'Recognizing the critically ill patient', Anaesthesia & Intensive Care Medicine, 14(1), pp. 11-14. doi: 10.1016/J.MPAIC.2012.11.010.

Romero-Bermejo, F. J. 2014. 'Sleep quality in intensive care unit: Are we doing our best for our patients?', Indian Journal of Critical Care Medicine, 18(4), pp. 191-192. doi: 10.4103/0972-5229.130567.

Rustam, J. S., Kongsuwan, W. & Kitrungrote, L. 2021. 'Effects of nursing comfort care integrating with the daily Islamic rituals on comfort among mechanically ventilated Muslim patients: A randomized clinical trial', Nursing Practice Today, 8(4), pp. 322-332. doi: 10.18502/NPT.V8I4.6708.

Suparman Rustam, J., Kongsuwan, W. & Kitrungrote, L. 2018. 'Comfort in Patients Receiving Mechanical Ventilation: A Literature Review', Critical Care Nursing, 11(2). doi: 10.5812/ccn.64159.

Suparti, S. and Suroso, J. 2020. 'The Correlation Between Humidity, Temperature, and Noise With Sleep Quality at Intensive Care Unit (ICU)', Indonesian Nursing Journal of Education and Clinic (Injec), 5(1), p. 60. doi: 10.24990/injec.v5i1.269.