Pharmacophore

ISSN-2229-5402

Journal home page: http://www.pharmacophorejournal.com

Pharmacophore
an International Journal
ISSN 2229-5402

THE EFFECT OF USING EARPLUG ON NOCTURNAL SLEEP OF THE PATIENTS HOSPITALIZED IN CARDIAC INTENSIVE CARE UNITS

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ARTICLE INFO

Received:
03th Jun 2017
Accepted:
29th Nov 2017
Available online:
14th Dec 2017

Keywords: *Sleep, Cardiac intensive care unit, Earplug*

ABSTRACT

Background and Objectives: Noise is one of the main problems of intensive care units. Most often, noise from equipment, alarms, conversations between the personnel, and ringing of the phone disturbs the patients' sleep. Thus, the present study aimed to assess the effect of using earplug on the nocturnal sleep of the patients hospitalized in cardiac intensive care units.
Materials and Methods: In this experimental study, 40 qualified patients were randomly divided into a control and an earplug group. The data were collected using demographic information questionnaire, Pittsburgh Sleep Quality Index (PSQI), numeric pain scale, and Leeds Sleep Evaluation Questionnaire (LSEQ). Then, the data were entered into the SPSS statistical software (v. 16) and analyzed using T-test and chi-square test.
Results: The results showed that after the intervention, the mean score of overall sleep was 4.8±0.5 in the control group and 5.6±1.1 in the earplug group and the difference was statistically significant (P=0.003).
Conclusion: According to the study results, using earplug improved the sleep quality of the patients hospitalized in cardiac intensive care units.

To Cite This Article: Alireza Rostamzadeh, Rahim Baghaei*, Chiman Ghaderi, (2017), "The effect of using earplug on nocturnal sleep of the patients hospitalized in cardiac intensive care units", ***Pharmacophore, 8(6S),*** *01-08.*

Introduction

Sleep deprivation is one of the major problems of the patients in Intensive Care Units (ICUs). More than 56% of patients experience sleeping disorders just after a day of hospitalization (1). Sleeping disorders in ICUs are multifactorial and are affected by environmental factors (light, noise, and temperature), nursing interventions, pain and nature of the disease, mechanical ventilation modes, and medications (2, 3). ICU environment has been identified as one of the main factors in the patients' sleep disorders (4). Besides, noise is one of the main problems of intensive care units. Most often, noise from equipment, alarms, conversations between the personnel, and ringing of the phone disturbs the patients' sleep (5). Noise has various negative physiological and psychological effects, such as increase in stress responses and decrease in patient satisfaction (6, 7). Considering the negative effects of noise on the patients' sleep, researchers have suggested noise control as one of the main priorities of ICUs. Hence, the effects of measures, such as limiting the care activities and visits while patients are sleeping and creation of sleeping time protocol, have been investigated on the patients' sleep. According to the studies, using sleeping time protocol improved the patients' sleeping time and increased their satisfaction (8, 9).

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Nonetheless, the nature of ICU and the necessity to immediately perform the interventions and respond to acute problems are the barriers to successful execution of this protocol. Thus, other methods should be considered in order to reduce the noise in ICUs (10).

Sleep plays a critical role in cardiovascular function and sleep deprivation intensifies anxiety, irritability, increase in heartbeat, and increase in myocardial oxygen demand (11). Moreover, cardiovascular diseases are among the main factors of reduction of sleep and increase in nocturnal wakefulness. In fact, anxiety, depression, and fear from death due to heart attack lead to lack of sleep or sleeplessness and increase the incidence of reinfarction and arrhythmia. Therefore, elimination of sleep disorders is of utmost importance in the patients suffering from cardiovascular diseases (12).

Considering the importance of sleeping for the patients, especially those who are hospitalized in Cardiac Intensive Care Units (CICUs), and the negative effects of sleep deprivation and due to the fact that sufficient sleep leads to improvement of the patients' general status and timely discharge, simple, inexpensive, and practical strategies are necessary to improve the patients' sleep (7). Thus, the present study aims to determine the effect of using earplug on the nocturnal sleep of the patients hospitalized in CICUs.

Despite numerous studies in the area of medical sciences in clinical (13, 14, 15), educational (16, 17, 18,19) and service fields (20,21,22,23) very little researches have been done in this area.

Materials And Methods

The present experimental study was conducted on the patients suffering from acute coronary syndrome with almost similar symptoms and treatment methods who were hospitalized in CICUs. The inclusion criteria of the study were being between 35 and 85 years old, being willing to participate in the study, being aware of time and place, and not suffering from visual or auditory problems. On the other hand, the patients with a history of sleep disorder (above 7 scores in Pittsburgh Sleep Quality Index (PSQI)), with average or severe pain (above 3 scores in numeric pain scale), and on mechanical ventilation were excluded from the study. After all, among the patients hospitalized in Seyed-al-Shohada hospital, Urmia, Iran, 40 qualified patients were consecutively entered into the study and divided into a control and an earplug group (each containing 20 subjects) through simple random sampling.

At first, the study methods and objectives were explained to all the participants and written informed consents for taking part in the study were obtained. Then, the questionnaires were completed and coded. It should be mentioned that performance of the study had no interference with the patients' treatment processes.

The first night of hospitalization was considered for getting familiar with the environment. In addition, the second night was considered to be compared to the third night. At the third night, the experimental group participants used earplugs, while those of the control group underwent no interventions. Then, the patients' sleep at the third night was compared to the second night using Leeds Sleep Evaluation Questionnaire (LSEQ).

In this study, the data were collected using PSQI, numeric pain scale, and LSEQ. PSQI was employed in order to assess sleep disorders before hospitalization. This questionnaire consists of 19 items classified into 7 categories of mental quality of sleep, delay in going to sleep, sleeping time, sleep efficiency, sleep disorders, using hypnotic drugs, and difficulty in doing daily activities. In this scale, a score of 0-3 is assigned to each item and the maximum score of each category is equal to 3. Besides, the total score of the scale is computed by summing up the scores of the 7 categories which may range from 0 to 21. It should be noted that higher scores represent lower sleep quality (24).

The intensity of pain was evaluated using a numeric pain scale ranging from 0 to 10, with 0 and 10 representing lack of pain and the most intense pain, respectively. This scale is a standard and reliable instrument for investigation of pain.

Finally, LSEQ was used in order to determine the impact of the interventions. This questionnaire assesses the individuals' mental sleep quality and is employed to investigate the changes in sleep after interventions. LSEQ includes 10 questions based on visual error criterion (0-10 cm). These 10 questions are classified into 4 categories of going to sleep easily (3 questions), sleep quality (2 questions), waking up easily (2 questions), and one's feeling after waking up (3 questions). Higher scores represent improvement of sleep and average scores indicate no change in the individuals' sleep (25). After all, the subjects' satisfaction with eye masks and earplugs was assessed through a closed question including 4 options, with 1 and 4 representing highly dissatisfied and highly satisfied, respectively.

The instruments' face and content validity were confirmed by the resources and the faculty members. In addition, internal consistency was used in order to determine the reliability of the two instruments. Accordingly, Cronbach's alpha of 0.83 and 0.88 were obtained for PSQI and LSEQ, respectively.

After collection and codification, the study data were entered into the SPSS statistical software (v. 16). One-way ANOVA was used in order to compare 4 groups. In case significant results were obtained, Tukey's test was used in order to determine the differences among the groups. Additionally, qualitative data were compared through chi-square test. $P<0.05$ was considered as statistically significant.

Results

The 40 study patients were randomly divided into a control and an earplug group (each containing 20 participants). The mean age of the patients was 60.20±9.9 years in the control group and 57.10±9.3 years in the experimental group. In addition, the mean score of sleep disorder was 3.4±1.7 and 4.2±1.6 in the control and experimental group, respectively. The study results revealed no significant difference between the groups regarding the underlying and confounding variables which could have effects on the findings (Table 1).

Table 1. Comparison of the demographic characteristics in the two groups

Variable		Control group (n=20) number (percent)	Earplug group (n=20) number (percent)	P-value
Sex	Female	6 (30)	6 (30)	1.0
	Male	14 (70)	14 (70)	
Marital status	Married	17 (85)	16 (80)	1.0
	Widowed	3 (15)	4 (20)	
Comorbidities	Yes	8 (40)	10 (50)	0.751
	No	12 (60)	10 (50)	
History of smoking	Yes	7 (35)	8 (40)	1.0
	No	13 (65)	12 (60)	
Consumption of sedatives	Yes	4 (20)	5 (25)	1.0
	No	16 (80)	15 (75)	
Mean age (years)		60.20±9.9	57.10±9.3	0.316
BMI		28.14±4.9	27.28±4.9	0.541
Pain score		0.7±0.9	0.9±1.1	0.117
Sleep disorder score		3.4±1.7	4.2±1.6	0.584

After the intervention, the mean score of overall sleep was 4.8±0.5 in the control group and 5.6±1.1 in the earplug group and the difference was statistically significant (P=0.003) (Table 2). Moreover, a significant difference was found between the two groups regarding going to sleep easily, sleep quality, and waking up easily, but not concerning one's feeling after waking up (Table 2). Furthermore, 15% of the experimental group subjects were highly satisfied and 35% were satisfied with the earplugs.

Table 2. Comparison of the two groups' score of overall sleep after the intervention

Group	Control Mean (SD)	Earplug Mean (SD)	P-value
Going to sleep easily	4.7 (0.9)	5.5 (1.1)	0.01
Sleep quality	4.6 (0.9)	5.9 (1.6)	0.007
Waking up easily	4.8 (0.4)	5.4 (0.5)	0.001
One's feeling after waking up	5.1 (1.1)	5.7 (1.1)	0.08
Sleep overall score	4.8 (0.5)	5.6 (1.1)	0.003

Discussion

Environmental stimuli, such as noise, are among the causes of patients' sleep disorder in ICUs (27). Up to now, a large number of studies have been conducted on the effective factors in patients' sleep disorder in ICUs. However, few studies have investigated the effects of appropriate strategies for reducing the environmental stimuli. Moreover, type, setting, sample size, instruments, and inclusion and exclusion criteria of the studies have created problems for comparison of the results.

In the present study, using earplugs facilitated going to sleep, increased the sleep quality, and facilitated waking up. However, no significant difference was observed between the two groups regarding the individuals' feeling after waking up. The average satisfaction with the earplugs might result from the subjects' ears' anatomical differences and their inability to properly apply the earplugs.

Wallace et al. (1999) conducted a study to determine the effect of using earplugs on the sleep of 6 healthy individuals in a similar setting to ICU. The results showed that being exposed to noise in that setting increased the Rapid Eye Movement (REM) sleep latency and the second stage of sleep, but decreased the sleeping time and the amount of REM sleep. On the other hand, using earplugs increased the amount but decreased the latency of REM sleep (26). Furthermore, Scotto et al. (2009) performed a study on 88 patients (49 in the intervention and 39 in the control group) who were hospitalized in ICUs

to evaluate the impact of using earplugs on their mental experiences. According to the results, the patients who had made use of earplugs went to sleep more easily, woke up in the middle of the night less, and experienced deeper and longer sleep. However, no significant difference was found regarding how long it took them to go to sleep (10).

In Iran, Niseh et al. (2011) investigated the effect of using earplugs on the sleep quality of the patients with acute coronary syndrome. In that study, 60 patients were randomly divided into a control and an earplug group. Based on PSQI, using earplugs increased the quality of the overall sleep and all its dimensions, except for sleep efficiency (27).

One of the limitations of the present study was the difference in the individuals' personal and physiological conditions while answering the questions. Not using polysomnography for exact investigation of the patients' sleep was also another limitation of the study. Thus, future studies are recommended to use polysomnography for more accurate evaluation of the patients' sleep. The effects of using earplugs on physiological parameters, such as heart rate, blood pressure, and breathing, should be assessed, as well.

Conclusion

The findings of the present study showed that using earplugs improved the sleep quality of the patients hospitalized in ICUs. Improvement of sleep by non-pharmacological methods is cost-effective and, at the same time, reduces the complications of medications. It also causes the nurses to get aware of the patients' status, evaluate the patients' conditions more accurately, and quickly provide the patients with the necessary care services. Of course, using high-quality earplugs in different sizes can improve the effectiveness of these interventions.

Acknowledgements

The present article was extracted from a proposal approved by Urmia University of Medical Sciences, Urmia, Iran. Hereby, the authors would like to thank the Research Vice-chancellor of the University for financially supporting the study. They are also grateful for the patients, management and personnel of Seyed-al-Shohada hospital, and all the individuals who cooperated in the study.

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