

The Effect of Sleep Hygiene on the Incidence of Cardiac Dysrhythmia in Patients with Myocardial Infarction Hospitalized in Critical Care Units: A Randomized Controlled Trial

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Abstract

Background: Patients in cardiac care unit (CCU) have some degree of sleep disorders that may consequently increase the risk of dysrhythmia in these patients.

Objectives: This study aimed to investigate the effect of sleep hygiene on the incidence of cardiac dysrhythmia in patients with myocardial infarction (MI) hospitalized in CCUs.

Methods: In this randomized controlled trial, 62 patients with MI who lacked sleep disorders before admission were assessed using the Pittsburgh sleep quality index and a researcher-made sleep hygiene questionnaire. The patients were selected consecutively and then randomly allocated into the intervention and control groups to either receive the sleep hygiene training or routine care. All patients were under the cardiac monitoring on the second and third days of their hospitalization. Then, the number of PVCs and PACs was recorded during a 6-hour period in these two days. Data were analyzed by chi-square test, independent samples t-test, and Paired t-test.

Results: On the third day, the number of PVC (2.06 ± 0.04) and PAC (0.87 ± 0.02) was significantly less in the intervention group than the control group (4.45 ± 3.71 and 2.68 ± 2.53 , respectively) ($P < 0.01$). Unlike the control group, in the intervention group, the number of PVC (2.06 ± 0.04 vs. 4.74 ± 0.07 , $P < 0.01$) and PAC (0.87 ± 0.02 vs. 2.91 ± 0.05 , $P < 0.05$) on the third day significantly reduced compared to the second day.

Conclusions: Performing sleep hygiene principles can reduce the incidence of dysrhythmia after MI. Therefore, nurses can use sleep hygiene practices in combination with other treatments to reduce the incidence of dysrhythmia after MI.

Keywords: Sleep, Hygiene, Cardiac Dysrhythmia, Myocardial Infarction, Patients

1. Background

Patients with myocardial infarction (MI) comprise a major part of patients hospitalized in coronary care units (CCU) (1). Dysrhythmia is prevalent in these patients and explains 40% - 50% of their mortality (2), especially within the first 48 hours following MI (3). Evidence shows that sleep has a vital role in the regulation of cardiovascular function (4). It has also been shown that the lack of adequate sleep triggers the release of epinephrine and norepinephrine, which consequently would increase the heart rate, respiratory rate, blood pressure, and myocardial oxygen demand (5). These neurotransmitters would also intensify anxiety, irritability, and anger (4) and therefore,

would increase the risk of hypertension, coronary artery disease (6), heart attack (7), and dysrhythmia (8) such as premature ventricular complexes (PVCs) and premature atrial complexes (PACs) (9).

All patients who are hospitalized in CCUs have some degree of sleep disorders (10, 11). They may spend 30% - 40% of their sleep time awake and the demand for sleep would increase during the day (12). Several factors such as environmental noises, light, temperature, nursing procedures (5), phone ringing, staff and patients' speeches, being connected to the monitoring systems, inappropriate bed, and disregard of bedtime habits (13) might be involved in the prevalence of sleep impairment in CCU patients. Although

it is difficult for nurses to control some of the sources of noise and discomfort, any effort should be made to reduce the patients' discomfort and distress and improve their sleep and rest quality (14).

Researchers have examined the effects of different strategies to improve the quality of sleep in CCUs. For instance, Jones et al. and Hu et al. have reported that using eye mask and earplugs can improve the perceived sleep quality and hormone balance in critical care patients (15, 16). Neyse et al. have also shown that using earplugs can improve the sleep quality in CCU patients with acute coronary syndrome (17). However, no studies are available regarding the effect of sleep hygiene on the incidence of cardiac dysrhythmia in patients with MI. Considering the prevalence of sleep impairment among patients hospitalized in CCUs, the question still remains that "can sleep hygiene affect the incidence of cardiac dysrhythmia in patients with MI?"

2. Objectives

This study aimed to investigate the effect of sleep hygiene on the incidence of cardiac dysrhythmias in patients with MI hospitalized in CCUs.

3. Methods

3.1. Study Design and Participants

This non-blind randomized controlled trial study was conducted on 62 patients with MI in two CCUs of Ekbatan hospital in Hamadan, Iran, between July and November 2014. The inclusion criteria included suffering from acute inferior MI (upon consultation with physician), full consciousness, ability to speak, not suffering from mental diseases, lack of pain due to non-cardiac diseases, not being addicted to opium and sleep medications, not receiving medical treatment or any procedure influencing sleep, lack of previous sleep disorders, and spending the first day of hospitalization. The exclusion criteria were: having pain or consumption of narcotics during the night, occurring a long-term PVC or PAC that needed medical treatment, being discharged before the third day, death of the patient, cardiac arrest, loss of consciousness or unwillingness to take part in the research.

The sample size was calculated based on the results of a study conducted by Bagheri Nesami (18). Accordingly, σ_1 , σ_2 , and d (the difference of the two means) numbered 3.88, 4.82, and 4, respectively. By considering type I error probability of 0.05 and power of 0.9, the sample size was calculated to be 26 for each group. Then, Five patients were

added to each group because of the possibility of drop-out. Thus, the sample included 31 patients in each group.

The subjects admitted to one of the CCUs comprised the intervention group ($n = 31$) and patients in the other CCU were assigned as the control group ($n = 31$). A consecutive sampling method was used to recruit the patients in the study and the selected patients were randomly allocated into the two groups.

A total of 74 patients were assessed for eligibility; however, 12 patients were excluded: 9 patients for not meeting the inclusion criteria and 3 patients for unwillingness to participate in the study.

3.2. Instruments

A three-part instrument was used in this study. The first part consisted of questions on the patients' demographic information including gender, age, marriage, residence, and number of children. There were also four questions in this part for recording the number of PVCs and PACs occurred for the patient within a 6-hour period on the second and third days of the hospitalization. The second part was a researcher-made questionnaire that included 15 questions organized in three subsets of 'sleep environment', 'things to be avoided', and 'sleep habits'. The sleep environment subset consisted of 5 questions regarding bed comfort, effect of light, noise, environment temperature and the effect of being connected to the monitoring systems during sleep. The second subset (i.e. things to be avoided) comprised 6 questions about eating heavy foods, tea, coffee, and chocolate, smoking, and thinking about problems before sleep. The subset of sleep habits consisted of 4 questions regarding tooth brushing, prayers, studying book, and drinking milk.

All questions were responded on a 4-point scale that was designed proportionally to the scope of questions. The content validity of this part of the instrument was verified by a number of experts and its reliability was confirmed by Cronbach's Alpha of 0.85.

The Pittsburgh sleep quality index (PSQI) was used as the third part of the data collection instrument. The PSQI was used to investigate sleep disorders. Nasiri Ziba et al. examined the validity and reliability of the Persian version of the PSQI and the Cronbach's Alpha was reported to be 0.87 (19). The PSQI consists of 19 questions organized into 7 parts (i.e. subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and day-time dysfunction). Each subscale is scored from 0 (no problem) to 3 (very serious problem) and the overall score ranges from 0 to 21. The score 5 or higher indicates sleep disorder or bad sleep quality (20, 21). All the needed data were gathered through face to face

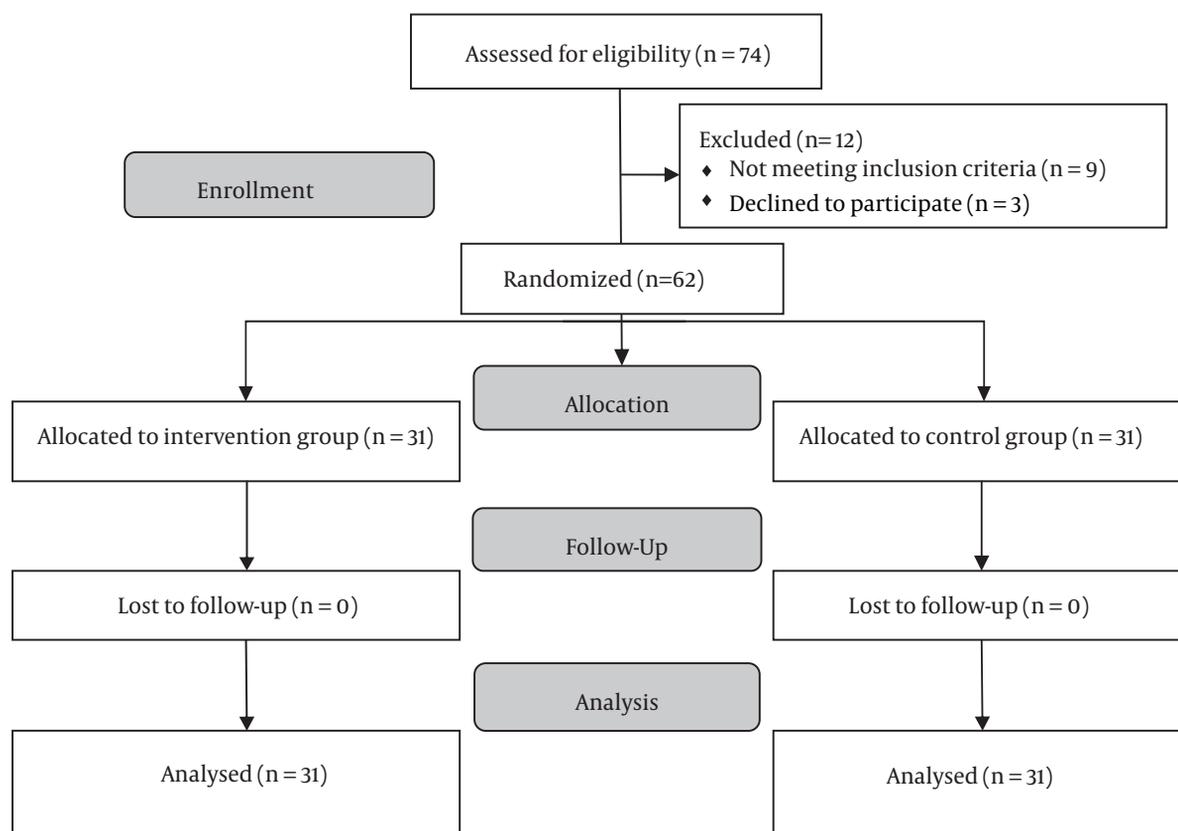


Figure 1. Consort Flow Diagram

interviews with individual patients. The first author conducted all of the interviews. The number of dysrhythmias (i.e. PVCs and PACs) occurred in each patient was also monitored using a cardiac monitoring system. For recording the PACs and PVCs, patients underwent the cardiac monitoring on the second and third days of hospitalization for six hours. Cardiac monitoring device was authenticated based on the reputation of manufacturer, standard tools, and reputable mark, and its calibration was certified by the medical equipment engineering technicians before each sample was taken.

PVC and PAC are among the prevalent dysrhythmias after MI that do not need any intervention if they are sporadic (22). However, they need to be managed if they are frequent and continuous. In the present study, we selected these two dysrhythmias because they did not improve after the incidence.

3.3. Procedures

Patients with inclusion criteria were identified through daily referring to the aforementioned CCU wards

and examining their hospitalization records alongside consulting with the treating physician.

Before the start of the study, a coin tossing method was used to randomly allocate the two CCU wards to either control or intervention groups. Then, patients in the CCU1 and CCU2 were enrolled in the intervention group and control group, respectively. Every patient completed the questionnaire at first. To this end, an individual interview was undertaken with each patient and the researcher recorded the answers on the questionnaires. All interviews were conducted while the patients were in a comfortable situation on their beds.

On the second hospitalization day, following the assessment of the sleep quality and sleep barriers, based on the barriers expressed by each patient, a combination of adjusted activities was conducted for the patients in the intervention group. To this end, nurses caring for the patients in the intervention group were asked to modify their activities and caring behaviors according to the patients sleep habits and needs (i.e. decreasing their loud speech, decreasing the environmental light and noises, and using

light blinker telephone apparatus instead of the ringing ones). Patients were also trained to avoid smoking and using cell phone and also avoid using materials such as tea, coffee, chocolate, and heavy foods 1 - 2 hours before the sleep time. They were also educated that do not think of their life problems and hassles and try some tranquil activities such as praying, reading books or newspapers, tooth brushing or having a cup of milk before the sleep time. Moreover, the beds, bed sheets and coverlets were modified according to their desire. All patients in the two groups were taught about preventing the separation of leads and keeping them at rest as much as possible. However, no intervention was carried out on patients in the control group and they only received the routine care such as decreasing their loud speech and decreasing the environmental light.

All patients in the two groups were under the cardiac monitoring on the second and third days of their hospitalization. Then, in collaboration with a cardiologist and using the apparatus memory, the number of PVCs and PACs occurred was recorded during a 6-hour period (i.e. 8:00-14:00) in these two days.

3.4. Ethical Considerations

The present study was approved by the ethics committee of Hamadan University of Medical Sciences (grant no. p.16.35.3800, ethical approval code: p.16.35.9.263). All of the patients were informed about the voluntary nature of their participation and they were requested to sign an informed consent prior to participation. All patients were also assured of their anonymity and confidentiality of the data and they were informed that they can withdraw from the study at any time. This study was registered at the Iranian Registry of Clinical Trials under the registration code 2013060113493N1.

3.5. Data Analysis

The statistical analysis was performed using SPSS 11.5. The demographic variables of the two groups were compared using Chi-Square test. Independent samples t-test was also used to compare the number of recorded dysrhythmia between the two groups on the second and third days and paired t-test was employed to compare the data between the second and third days in each group. The Kolmogorov-Smirnov test was utilized to examine the normal distribution of the main quantitative variables, which showed that the distribution was normal.

4. Results

Most of the patients in this study were above 50 years old (61.2%), married (67.7%), resided in city (54.8%), and had

less than 2 children (41.9%). The number of male patients were more than the number of women in the two groups and a significant difference was observed between the two groups in this regard ($P = 0.001$) (Table 1).

Table 1. Demographic Information of Patients in Intervention and Control Groups^a

Variable	Group		P Value ^b
	Control	Intervention	
Gender			0.001
Male	28 (90.3)	16 (51.6)	
Female	3 (9.7)	15 (48.4)	
Age, y			0.175
< 40	3 (9.6)	2 (6.4)	
40 - 50	12 (38.7)	10 (32.3)	
> 50	16 (51.7)	19 (61.3)	
Residence			0.156
Village	11 (35.5)	14 (45.2)	
City	20 (64.5)	17 (54.8)	
Marital status			0.719
Single	2 (6.5)	1 (3.2)	
Married	23 (74.1)	21 (67.7)	
Divorced	6 (19.4)	9 (29.1)	
Number of children			0.112
0 - 2	7 (22.6)	13 (41.9)	
3 - 5	18 (58.1)	10 (32.3)	
6 - 9	6 (19.3)	8 (25.8)	

^aValues are expressed as No. (%).

^bChi-Square.

There was no significant difference between the control and intervention groups on the second day of hospitalization in terms of the number of PVC ($P = 0.53$) and PAC ($P = 0.51$). However, after the intervention (i.e. on the third day), a significant difference was found between the two groups in terms of the number of PVC ($P = 0.005$) and PAC ($P = 0.007$) (Table 2).

There was a significant difference in the number of PVC ($P = 0.006$) and PAC ($P = 0.01$) (between the second and third days in the intervention group, while there was no significant difference in the number of PVC ($P = 0.08$) and PAC ($P = 0.47$) between the second and third days in the control group (Table 2).

5. Discussion

The present study showed the positive effect of sleep hygiene on decreasing the rate of dysrhythmias in patients

Table 2. Comparison of the Number of PAC and PVC Between the Two Groups on the Second and Third Days^a

Variable	Group		P Value ^b
	Control	Intervention	
PVC			
Second day	4.71 ± 3.82	4.74 ± 0.07	0.53
Third day	4.45 ± 3.71	2.06 ± 0.04	0.005
P Value ^c	0.08	0.006	
PAC			
Second day	2.93 ± 2.54	2.91 ± 0.05	0.51
Third day	2.68 ± 2.53	0.87 ± 0.02	0.007
P Value ^c	0.47	0.01	

^aValues are expressed as mean ± SD.^bT-test.^cPaired t-test.

with MI, so that the intervention group experienced less PVCs and PACs on the third day than the second day of hospitalization. In agreement with the present study, Jones et al. (15) and Babaei et al. (23) have reported that decreasing the environmental light and noises along with using earplug and eye mask could improve the sleep quality in critical care patients. Arab et al. have also compared the effects of earplug and eye mask on sleep quality and reported that earplug was more effective than eye mask (24). In a recent study, Hazeri et al. investigated the effect of sleep hygiene training on nurses' sleep quality and stated that the intervention was not effective (25). It seems that education interventions might not be much effective solely. However, such trainings might be more effective if accompanied by some environmental modifications such as those implemented in the present study.

Although no previous study is available regarding the effect of sleep hygiene on the incidence of dysrhythmias, a number of earlier studies have examined the effects of various non-pharmacological interventions such as therapeutic touch (26), scheduled visits (27), and relaxation methods (28) and indicated that they can reduce the incidence of PVCs and PACs and ventricular dysrhythmias in patients with MI. The positive effects of these interventions might be attributed to the increased serenity and comfort (26), decreased anxiety (29), and reduced levels of catecholamines (5) induced by these methods.

The finding of the present study should be interpreted by considering some limitations such as the small sample size, short-term intervention and implementing the study in only two CCUs. One also might criticize the methodology because of the possible differences in the two study settings; however, the routines and methods of caring and

treatment were similar in the two wards and no significant difference was observed between the two groups in terms of the patients' characteristics.

In conclusion, the present study showed the positive effect of sleep hygiene on the incidence of PVCs and PACs in patients with MI. Considering the effectiveness of the intervention, it is suggested for nurses working in CCUs to be re-trained about the positive effects of sleep hygiene on cardiac patients. CCU nurses are also recommended to use similar intervention to improve the sleep quality in CCU patients especially those admitted with MI. However, further studies with larger sample sizes and longer duration of intervention are suggested.

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Footnotes

Authors' Contribution: Study design: Mohsen Salavati, Seyed Reza Borzou and Maryam Malmir; data collection and analysis: Mohsen Salavati, Saeed Musavi, Seyed Reza Borzou; manuscript drafting: Mohsen Salavati, Zahra Khalili, Seyed Reza Borzou, Maryam Malmir, Shahram Homayonfar.

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