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Effect of Eye Mask on Sleep Quality in Patients with Acute Coronary Syndrome

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ABSTRACT

Introduction: Sleep is one of the basic human needs and sleep deprivation causes numerous adverse effects on the human body and mind. Due to reduced sleep quality in patients with acute coronary syndrome, this study was carried out to determine the effect of eye mask on sleep quality in patients with acute coronary syndrome. ***Methods:*** In this two-group controlled clinical trial, sixty patients with acute coronary syndrome in the coronary care units of Baqiyatallah Hospital in Tehran in 2010 were selected by purposeful sampling method and randomly allocated to two groups of case and control. In the case group, in the second night stay, the intervention of eye mask was done per night and by using the Petersburg's sleep quality index; sleep quality was evaluated during and at the end of hospitalization. Then data were analyzed by paired t-test, independent t-test, Spearman and Pearson's correlation coefficient and SPSS software version 19. ***Results:*** Total sleep quality score of the case group was significantly decreased after intervention (4.86 ± 1.88) from before intervention (10.46 ± 4.09) ($p < 0.000$). In addition, total score of sleep quality after intervention in the case group (4.86 ± 1.88) was significant different from the control group (8.43 ± 1.97) ($p < 0.005$). ***Conclusion:*** Using eye mask, as an economical and uncomplicated method, can improve sleep quality in patients with acute coronary syndrome in the coronary care units and can be used as an alternative method of treatment instead of drug therapy.

Introduction

Sleep is one of the basic human needs required for health and energy conservation, appearance and physical well-being. At the time of sleeping, certain hormones such as serotonin and the growth hormone are released and chemical changes and increased cellular nutrition take place so as to make the body ready for the activities of the next day. In addition, repair, re-organization, memory enhancement, and learning occur in the nervous system. Furthermore, sleep causes reduction in stress, anxiety and neurological pressures and helps the individual in recovering energy for better focus, adaptability, adjustment and enjoying daily activities.[1] Accordingly, sleep disorders are also correlated with health, well-being, and mortality. Therefore, sleep not only influences the individual, but also his/her family and the whole community; hence, accurate measurement of sleep is considered to be an important part of clinical practice.[2,3] Researches have indicated that sleep deprivation can decrease the immune system activity, increase release of inflammatory substances such as interleukin-6 and CRP, increase white blood cell count, decrease hypothalamus, adrenal and pituitary functioning during the next days, decrease glucose tolerance, hypertension and increase risk of cardiovascular events independently,

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decrease the maximum ability level of individuals and also the individual's skill, talent and aerobic power changes.[1,3,4,5] On the other hand, sleep shortage is a common problem among hospitalized patients. Approximately 56% of patients suffer from this problem during the early days of admission.[6] It has been clearly identified that hospitalization significantly impairs sleep pattern. Studies have shown that in patients with insomnia, mean number of admission cases per month is double the number of admissions of those without sleep disorder.[7,8] The findings of other studies have illustrated that insomnia can have negative impacts on different aspects of life such as interaction with others, occupational domain and health status of patients and deprivation from sleep can cause depression, decreased immune system functioning of elderly patients and cardiac illnesses. Therefore, a relaxing sleep can be beneficial in maintaining cardiac function.[8,9]

Studies have shown that cardiovascular diseases are the major factor in decreased sleep amount and increased rate of night wakening so that in addition to physical fatigue it causes mental and psychological fatigue, physical tension, restlessness, aggression and consequently longer time of hospitalization and treatment of diseases.[10] Cardiovascular diseases, such as angina pectoris and myocardial infarction, can cause sleep disorder and considering that myocardial oxygen demand is high due to sleep disorder, the probable rate of cardiac risks such as recurrent myocardial infarction and arrhythmia would be higher and make it extremely necessary to resolve sleep disorders.[11] On the other hand, scientific evidence have shown that short sleep is a risk factor for heart attack.[12]

Low quality sleep is the predictor of adverse consequences in patients with coronary artery disease. Identifying and modifying risk factors for low quality sleep can perhaps reduce the complications and mortality in patients with coronary artery disease.[13]

Patients admitted to CCU have lower sleep quality than the time they are at home. Quality and quantity of poor sleep as a stressful situation will cause the secretion of epinephrine and norepinephrine which by itself can increase palpitation, breathing rate, blood pressure level and level of myocardial need to oxygen, cardiac dysrhythmia and reduction of renal perfusion. Eventually these factors can exacerbate ischemia and infarction and finally cause myocardial infarction. Patients admitted to intensive care units might not have good quality sleep at night which may be influenced by various internal factors such as pain, discomfort, drugs, anxiety, stress, aging and external factors such as monitors' noise, waking up frequently by nurses, lighting, temperature of the environment, and nursing and therapeutic care.[14-20] In general, modification of underlying diseases, reduction of environmental disturbing factors during sleeping and reduction of stress can be treated with psychiatric interventions (psychotherapeutic) and relaxation training, or by medication.[7]

Many studies have shown the impact of non-pharmacological treatments on sleep disorders. The effect rate of these therapeutic methods has been reported 70 to 80%. American Academy of Sleep Medicine by reviewing numerous research studies reported the validity of these studies on the long term effects of non-pharmacological treatment methods and many randomized double-blind studies by reviewing the effect of these methods with different types of sleeping medication.[21] A dark and quiet room and calm is almost an ideal place for anyone to sleep and relax. An unknown and unfamiliar place with different people coming and going and frequent opening of elevator doors are the main complaints of most of hospitalized patients. Although it is difficult for nurses to control some of these sources of noise and discomfort, any effort should be done in order to reduce the patients' discomfort and distress and improve and promote their sleep and resting. Several

actions are recommended to improve sleep of patients in CCUs, one of which is to limit environmental light using eye masks as a nursing intervention.[8,16] Despite much emphasis on the effect of eye mask on improvement of sleep quality of patients admitted to CCUs, few studies have been done in this regard and most of conducted studies concerning this issue have particularly emphasized the use of earplugs. The results of the study by Stanchina et al., Richardson et al., Koo and Koh, and Hu et al. showed that using eye mask can promote sleep quality of patients.[20-23] Therefore, given the impact of insomnia on admitted patients in hospitals particularly those admitted to CCUs and also the effect of insomnia on cardiovascular system functioning, health level, and improvement of patients with coronary artery disease, as well as the efficacy of using eye mask on sleep of patients and considering that no study has ever been done aiming to review the effect of eye mask on quality of sleep in patients with acute coronary syndrome in Iran, the present study aimed to determine the impact of eye mask on sleep quality of patients admitted to CCU.

Materials and methods

This was a two-group controlled clinical trial conducted in 2010 on 60 patients with acute coronary syndrome in Baqiatallah Hospital in Tehran. Using Altman's nomogram and considering the studies of Koo and Koh as samples, the sample size was 25 with power = 90%, β = 10% and a = 5% and the by calculation of 10% sample loss, we selected 30 subjects for each group and then through random allocation by ball inside a bag, the subjects were divided into two groups.[22] The inclusive criteria in this study according to the selected studies included: minimum age of 18 years, awareness of time and place, lack of implementing surgery, ejection fraction of over 40%, lack of receiving narcotics 5-6 hours before night sleep, lack of taking psychiatric drugs, lack of a clear and known sleep disorder, lack of brain disorder, lack of visual and auditory disorders, lack of dependency on narcotic drugs, no history and dependency of using eye mask, no history of underlying diseases affecting sleep, such as rheumatoid arthritis, migraine and etcetera, no dependency on any substance or procedure influencing sleep, and no use of inotropic drugs. The samples were selected according to the inclusive criteria and those without the inclusive criteria were excluded from the study. The exclusive criteria of the study were: incidence of acute problems during admission and/or prescription or consumption of narcotics during the night, which were excluded from the study. Data collection tools in this study included Petersburg's Sleep Quality Index (PSQI) and demographic characteristics inventory. PSQI is a self-report questionnaire which has been designed by Buysse et al. in 1989 in order to measure the quality of sleep and help the diagnosis of those who have good or poor sleep. This index has been widely used in clinical and non-clinical researches in order to review sleep quality during the previous month (4 weeks) and consisted of 19 questions in seven parts (subjective sleep quality *C1*, sleep latency *C2*, sleep duration *C3*, habitual sleep efficiency *C4*, sleep disturbance *C5*, use of sedative medications *C6*, and daytime dysfunction *C7*) which are briefly given in a table. Each part scores from 0-3. The scores 0, 1, 2 and 3 in each scale indicate normal, minor problem, average problem and severe problem respectively. Most of the test articles are based on multi-choice questions and short answers and are easily fathomable. In this index, high scores indicate lower sleep quality.[24-34] This index had 90% sensitivity and 87% specificity. Buysse et al. in their study also reported sensitivity and specificity of 89.6% and 86% respectively and internal consistency a = 0.83 and its validity in test re-test was r = 0.85.[24] In the study of Behrozi far et al., the reliability of Petersburg's Sleep Quality Index on 15 samples was calculated through Cronbach's alpha and was confirmed.[8] Due to the time

change of answering of the samples and changes which had to be inserted into the questionnaire (four weeks reduces to a week), the new index was designed with new changes and was given to ten professors for content validity and their comments were applied. In order to determine its reliability, we used test re-test method which was confirmed with r = 0.85. Thereafter, by obtaining permission from the university and hospital and CCU wards, and after introducing and explaining the study objectives and how to implement it to each of the subjects, and by obtaining their consent to participate in the study, Petersburg's Sleep Quality Index was given to them to complete the day after their admission and the intervention was conducted from the second night until their discharge time (for four nights).[24,25] Then, the questionnaires were re-completed by the samples on the last admission day and the obtained data were analyzed by descriptive and inferential statistics and paired t-test, independent t-test, Spearman and Pearson correlation coefficient through SPSS software version 19.

The ethical considerations of this study included obtaining permission from the Baqiatallah hospital's authorities in order to conduct the study, precise explanation of the study objective to the samples, confidentiality of information of the study subjects, providing the results of the study to Baqiatallah University, not imposing additional costs to the samples, compliance to ethics in writing and use of books, journals and internet sources (mention the sources). The problems and limitations of this study, which have been selected according to a similar study, included difficult acceptance of patients to wear eye mask, possibility of excluding the sample due to medical reasons during the study, the emergency use of narcotic drugs during the study, no control over side-effects of prescribed drugs by the physician that could have sedative effects, lack of full control of the physical conditions that may affect the patient's sleep, physiological and cultural conditions specific to each individual which could affect the results and no control over the variable of quantity of sleep in admitted patients which was out of the researcher's control.[23]

Results

The findings showed that mean age of the samples was 55.9 ± 7.55 years and 40% of them suffered from infarction without ST segment elevation and 33.35% of them had infarction with ST segment elevation and 26.65% of them suffered from angina pectoris. In addition, 29 patients (48.3%) were male and 31 patients were female (51.7%). Mean ejection fraction of the subjects was 46.36 ± 3.91. Most of the subjects were married and had 3-5 children, academic education, were employees and had an income level from 5,000,000 to 10,000,000 Iranian Rials (~USD 400 to 800 $). 45% of the patients had history of previous hospitalization, 45% with previous myocardial infarction and 96.62% history of medication consumption. 36.7% of the subjects had a history of hypertension, 43.3% had a history of diabetes and 13.3% mentioned both of them. In terms of demographic characteristics, no significant statistical difference was seen between the two groups ($p > 0.05$) (Table 1).

In the test group, the total score of sleep quality before the intervention was 10.46 ± 4.09 and after the intervention it was reduced to 4.86 ± 1.88 and paired t-test showed a significant difference in this regard ($p < 0.000$). In the control group, the total score of sleep quality before and after the intervention showed a significant statistical difference (7.4 ± 2.23 vs. 8.43 ± 1.97; respectively) ($p < 0.000$) which indicated decreased sleep quality of patients during hospitalization in the ward. Moreover, the total score of sleep quality in the test group (4.86 ± 1.88) was less than the score of the control group (8.43 ± 1.97) and this difference was significant according to the independent t-test ($p < 0.05$) (Table 2).

Table 1. Demographic characteristics of the study subjects separated by groups

Variable	Eye Mask N(%)	Control N(%)	Total N(%)	P
Sex				
Male	16 (53.3)	13 (43.3)	29 (48.3)	0.82
Female	14 (46.7)	17 (56.7)	31 (51.7)	
Marital status				
Married	25(83.3)	23 (76.7)	48 (75)	0.16
Other	5 (16.7)	7 (23.3)	12 (25)	
Number of children				
Less than 2	9 (30)	17 (56.7)	26 (44.2)	0.05
3-5	21 (70)	13 (43.3)	34 (55.8)	
Occupation				
Housekeeper	9 (30)	7 (23.3)	16 (20)	0.07
Employee	11 (36.7)	18 (60)	29 (48.3)	
Other	10 (33.3)	5 (16.7)	15 (31.7)	
Education				
High-school graduates and lower	19 (63.3)	6 (20)	25 (32.5)	0.000
University Degree	11 (36.7)	24 (80)	35 (67.5)	
Income				
Under 2,500,000 Rs	3 (10)	4 (13.3)	10 (15)	0.05
2,500,000 to 5,000,000	18 (60)	3 (10)	6 (5)	
5,000,000 to 10,000,000	3 (10)	23 (76.7)	41 (75.8)	
10 to 15 million Rials		-	3 (4.2)	
Type of MI				
MI St	9 (30)	11 (36.7)	20 (30.8)	0.98
MI non ST	12 (40)	12 (40)	24 (41.7)	
UA	9 (30)	7 (23.3)	16 (27.5)	
Frequency of MI				
No	14 (46.7)	13 (43.3)	27 (48.3)	0.88
Yes	16 (53.3)	17 (56.7)	33 (51.7)	
Frequency of admission				
No	14 (46.7)	13 (43.3)	27 (48.3)	0.88
Yes	16 (53.3)	17 (56.7)	33 (51.7)	
Disease history				
Diabetes	13 (43.3)	6 (20)	19 (31.7)	0.54
Hypertension	11 (36.7)	13 (43.3)	24 (36.7)	
Diabetes and Hypertension	4 (13.3)	6 (20)	10 (16.7)	
None	2 (6.7)	5 (16.7)	7 (15)	
History of drug consumption				
No	-	2 (6.7)	2 (5)	0.05
Yes	30 (100)	28 (93.3)	58 (95)	

In the control group, after the intervention, the difference in the obtained score was significant only in the domain of sleeping drugs ($p > 0.05$) and it was not significant in other domains ($p > 0.05$) (Table 3). However, in the test group, reduction of score in all the sleep quality domains was significant after the intervention ($p < 0.05$) (Table 4).

In comparison of the scores for all the sleep quality domains before the intervention, there was a significant difference in all the domains of both groups except sleep latency and sleep disturbance ($p < 0.05$) (Table 5). In the test group, the maximum score of the domains before and after the intervention were related to good sleep duration (1.66 ± 0.75) and subjective sleep quality respectively (0.8 ± 0.48). Furthermore, the minimum score of the domains before the intervention was related to sleep disturbance (1.33 ± 0.08) and after the intervention to use of sleeping medication (0.6 ± 0.62). Moreover, in the control group the maximum score of the domains before and after the intervention was related to daytime dysfunction (1.3 and 1.56 respectively) and the minimum score before the intervention was related to subjective sleep quality (0.83) and after the intervention was relate to subjective sleep quality and sleep duration adequacy (1.03). After the intervention except the subjective sleep quality domain, there was a significant difference in other domains of sleep quality between the two groups according to the independent t-test ($p < 0.05$) (Table 6). No significant correlation was seen between the demographic variables and score of sleep quality (Spearman and Pearson; $p > 0.05$).

Table 2. Comparison of the total score of sleep quality in the studied groups before and after the intervention

Group	Pre-intervention mean (SD)	Post-intervention mean (SD)	P*
Control	7.4 (2.23)	8.43 (1.97)	0.000
Test	10.46 (4.09)	4.86 (1.88)	0.000
P**	0.001	0.000	

*Paired t-test
** Independent t-test

Table 3. Comparison of scores in domains of sleep quality of both groups before and after the intervention

Domains	Pre-intervention mean (SD)	Post-intervention mean (SD)	P*
Subjective sleep quality	0.83 (0.59)	1.03 (0.66)	0.13
Sleep latency	1.16 (0.53)	1.2 (0.61)	0.73
Sleep duration	1.2 (0.61)	1.1 (0.4)	0.31
Habitual sleep efficiency	0.93 (0.58)	1.03 (0.55)	0.43
Sleep disturbance	1.06 (0.44)	1.3 (0.46)	0.07
Use of sleeping medications	0.86 (0.57)	1.2 (0.4)	0.01
Daytime dysfunction	1.3 (0.53)	1.56 (0.62)	0.1

*Paired t-test

Table 4. Comparison of scores of sleep quality domains in the test group before and after the intervention

Domains	Pre-intervention mean (SD)	Post-intervention mean (SD)	P*
Subjective sleep quality	1.46 (0.77)	0.8 (0.48)	0.000
Sleep latency	1.46 (0.77)	0.66 (0.6)	0.000
Sleep duration	1.66 (0.75)	0.76 (0.5)	0.000
Habitual sleep efficiency	1.53 (0.86)	0.73 (0.52)	0.000
Sleep disturbance	1.33 (0.8)	0.63 (0.49)	0.001
Use of sleeping medications	1.4 (0.8)	0.6 (0.62)	0.000
Daytime dysfunction	1.63 (0.7)	0.66 (0.47)	0.000

*Paired t-test

Table 5. Comparison of scores of sleep quality domains in the studied groups before the intervention

Domains	Test Control mean (SD)	Test mean (SD)	P*
Subjective sleep quality	0.83 (0.59)	1.46 (0.77)	0.000
Sleep latency	1.16 (0.53)	1.46 (0.77)	0.000
Sleep duration	1.2 (0.61)	1.66 (0.75)	0.000
Habitual sleep efficiency	0.93 (0.58)	1.53 (0.86)	0.000
Sleep disturbance	1.06 (0.44)	1.33 (0.8)	0.001
Use of sleeping medications	0.86 (0.57)	1.4 (0.8)	0.000
Daytime dysfunction	1.3 (0.53)	1.63 (0.71)	0.000

* Independent t-test

Table 6. Comparison of scores of sleep quality domains in the studied groups after the intervention

Domains	Test Control mean (SD)	Test mean (SD)	P*
Subjective sleep quality	1.03 (0.66)	0.8 (0.4)	0.12
Sleep latency	1.2 (0.61)	0.66 (0.6)	0.001
Sleep duration	1.1 (0.4)	0.76 (0.5)	0.006
Habitual sleep efficiency	1.03 (0.55)	0.73 (0.5)	0.035
Sleep disturbance	1.3 (0.46)	0.63 (0.49)	0.000
Use of sleeping medications	1.2 (0.4)	0.6 (0.62)	0.000
Daytime dysfunction	1.56 (0.62)	0.66 (0.47)	p = 0.000

*Independent t-test

Discussion

The obtained results before the intervention showed that 65% of the study subjects had undesirable sleep quality and mean score of their sleep quality was 8.93 ± 3.16. The results of several years of nursing showed that hospitalized patients somehow experienced a decreased sleep quality; however, the statistics of these disorders have been different in various studies. In four separate studies, such statistics were reported to be 50%, 60%, 65% and 74.6%.[35-38] In the study of Redker and Hedges during five days following open heart surgery, it was identified that although there was no obvious change in the quantity and duration of patients' sleep, and even in some cases night sleep increased from 45 to 60%, the sleep quality has been decreased due to frequent interruption of sleep rhythm during the first three days of hospitalization.[39] In the study of Erickson et al. which was done on 84 coronary patients, it was determined that 51% of the patients had difficulty in going to sleep, 44% had difficulty which led to disturbance of their sleep and 40% had difficulty in later stages of sleep and 39% of them also had the difficulty of waking up early.[40] In the study of Parker and Dunbar, it was identified that number of sleep disorders in patients with heart failure was higher than those without this illness and factors such as respiratory problems, aging, medications, anxiety and depression had a considerable role in this regard.[41]

The results of the present study showed that mean score of sleep quality in the two groups had a significant difference after the intervention so that the sleep quality of patients was promoted after wearing the eye mask; this was in accordance with the study results of Stanchina et al., Richardson et al., Koo and Koh, and Hu et al.[20-23] The results of this study showed a significant increase in sleep quality domains after using the eye mask in the test group compared with the control group; i.e. sleep quality showed a significant difference between the test and control groups after using the eye mask in all the domains expect in the domain of subjective sleep quality ($p < 0.05$). The reason for the lack of increase in the subjective sleep quality in the test group might be due to stress resulted from admission to CCU. In the test group, there was a significant difference in all the domains and total score of sleep quality before and after the intervention. In the control group, there was a significant difference only in the domain of using sleeping medication and there was no significant difference in other domains of sleep quality, which could be due to the lack of consumption of sleeping drugs during the study. In the control group, total score of sleep quality before and after the intervention showed a significant difference; i.e. the total score of sleep quality had a descending increase. This indicates decreased sleep quality of patients during hospitalization in CCU which was in accordance with the study results of Lei et al. and Schiza et al. The study results of Lei et al. showed that sleep quality of patients reduced 54-57% after admission to the hospital.[42,43]

Conclusion

Sleep is one of the important elements in human life which is associated with reconstruction of physical and emotional power. Maintaining regular sleep cycles is absolutely necessary in order to preserve fitness and health and using eye mask is a cost-effective and uncomplicated method that can improve sleep quality of patients with acute coronary syndrome in Cardiac Intensive Care Units and can be used as an alternative method to using pharmacological therapy.

Ethical issues

None to be declared.

Conflict of interest

The authors declare no conflict of interest in this study.

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