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Evaluation of the effect of jaw relaxation on sleep quality in patients with myocardial infarction

Monireh Sadat Kashi[1], Naser Sedghi Goyaghaj[2], Mohammad Ali Hoseini[3], Farahnaz Mohammadi Shahbolaghi[4], Enayatollah Bakhshi[5]

1. MSc of Nursing, University of Social Welfare & Rehabilitation Sciences, Tehran, Iran
2. MSc of Nursing, University of Social Welfare & Rehabilitation Sciences, Tehran, Iran
3. Associate Professor, Department of Rehabilitation Management, University of Social Welfare & Rehabilitation Sciences, Tehran, Iran
4. Associate Professor, Department of Nursing, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran
5. Associate Professor, Department of Biostatistics, University of Social Welfare & Rehabilitation Sciences, Tehran, Iran

***Correspondence:* Mohammad Ali Hoseini, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran.**
Email: Mahmaimy2020@gmail.com

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ABSTRACT

Background: Poor sleep quality is one of the most common problems in patients with myocardial infarction, significantly affecting their quality of life. This study aimed to evaluate the effect of jaw relaxation on sleep quality in patients with myocardial infarction.

Methods: This quasi-experimental study was conducted on patients with myocardial infarction referring to the hospitals in Saveh, Iran in 2015. In total, 68 patients were selected through purposive sampling and randomly allocated to two groups of intervention and control. In the intervention group, the samples practiced jaw relaxation techniques in the form of five 20-minute sessions a day for a month. On the other hand, samples in the control group only received routine care. Data were collected using demographic questionnaires and the Pittsburgh Sleep Quality Index (PSQI) before and one month after the intervention. Data analysis was performed in SPSS version 19 using Fisher's exact test, Chi-square, and paired and independent t-test.

Results: In this study, mean scores of sleep quality before the intervention were 14.52±1.39 and 14.32±1.29 in the intervention and control groups, respectively. After the intervention, these scores were 12.38±1.49 and 14.02±2.4, respectively (P≤0.001). According to results of independent t-test, a significant difference was observed between the groups in this regard (P≤0.001).

Conclusion: According to the results of this study, application of jaw relaxation techniques contributed to improved sleep quality in patients with myocardial infarction. Therefore, it is recommended that this method be used as a non-pharmacological approach due to its simplicity and cost-effectiveness.

1. Introduction

Prevalence of cardiovascular diseases has increased in developing countries, especially Iran. These diseases are mostly associated with considerable outcomes;[1] as such, about 700-800 daily deaths are caused by cardiovascular diseases in Iran, 166 of which occur due to heart attacks.[2] Statistics suggest that approximately 1.5 million people are diagnosed with cardiovascular diseases in America yearly, resulting in the hospitalization of the majority of these cases. Moreover, these diseases eventually lead to disabilities in the patients.[3-6] Cardiovascular diseases adversely affect the quality of life of the patients. In this regard, lack of sufficient sleep and increased insomnia have been introduced as major negative mental and physical impacts of these diseases, leading to increased symptoms of the disease and restlessness,[7] aggressive behaviors, and prolonged hospitalization.[8, 9]

Poor sleep quality and quantity could be attributed to stressful conditions and release of epinephrine and norepinephrine, resulting in increased heart rate, blood pressure, and respiratory rate.[10] These factors could contribute to elevated myocardial oxygen demand, heart dysrhythmia, reduced renal perfusion, ischemia and myocardial infarction, which require specialized nursing care.[11]

Today, both pharmacological and non-pharmacological methods are applied to improve sleep quality in patients.[12] Nevertheless, nursing researchers are attempting to find non-medicinal

treatment methods to cure sleep disorders due to the lack of long-term efficacy of pharmacological methods, as well as the side effects of sleeping pills.[13] In this regard, attention to complementary medicine to alleviate disease symptoms is of paramount importance; accordingly, one of the most common methods is relaxation.[14]

According to the literature, use of relaxation techniques diminishes anxiety or musculoskeletal pressure,[15] positively affecting painful and stressful situations as a therapeutic strategy. In addition, these techniques are regarded as one of the most commonly used methods for different patients.[16] Application of relaxation techniques is associated with reduced levels of pain and anxiety in patients through deteriorating the tissue oxygen demand, decreasing the levels of chemicals (e.g., lactic acid), relieving musculoskeletal tension and anxiety, and releasing endorphin.[17] Since relaxation techniques are regarded as an active coping strategy, they could be applied under different circumstances.[18]

There are several types of relaxation methods, including jaw relaxation. This technique is non-invasive and cost-effective with no complications and could be independently used by patients.[19] Jaw relaxation method was first introduced by Jacobson in 1938, only focusing on relaxing speech organs at the time. Nevertheless, it seems that exercises to relax the lips, throat and face could significantly alleviate anxiety levels, and this sense of looseness stimulates a full-body stretch.[20]

Several studies have been conducted to evaluate the effects of relaxation methods, such as jaw relaxation, on improved sleep quality. In a study by Sun et al. (2013), relaxation was presented as a simple and cost-effective technique, used to improve sleep quality in the elderly.[21] According to the results obtained by Sa'eedi et al. (2013), progressive muscle relaxation had a positive impact on the severity of insomnia in patients undergoing hemodialysis.[22] Moreover, Demiralp et al. (2010) indicated that application of relaxation methods led to a significant improvement in the sleep quality of patients with breast cancer.[23] Positive effects of jaw relaxation on pain and anxiety levels in patients while redressing burnt areas were also pointed out in the studies by Rafi'ee et al. (2010) and Mohamadi Fakhar et al. (2013).[24, 25]

According to the literature, application of various relaxation methods could promote nursing interventions; however, despite the importance of sleep quality in patients with cardiovascular diseases, evidence is scarce regarding the effectiveness of jaw relaxation in such patients. With this background in mind, this study was conducted to evaluate the effect of jaw relaxation on sleep quality in patients with myocardial infarction.

2. Methods

2.1. Design

This quasi-experimental study was conducted on patients with myocardial infarction, admitted at the hospitals of Saveh, Iran in the first half of 2015.

2.2. Participants and setting

In this study, Sample size was calculated based on the study by Mohamadi Fakhar et al. (2011)[26] and sample size formula (σ=11.92, $Z_{1-\alpha/2}$=1.96, $Z_{1-\beta}$=0.84, d=5.8) with 80% test power and 5% error margin. Considering the possible sample loss, the final sample population was estimated at 68 cases. Moreover, the minimization method was used to divide the samples into two groups of intervention and control. Application of this method ensures balance and homogeneity among the study groups in terms of baseline characteristics of the participants.

In this method, the first patient was randomly assigned to a group, followed by the allocation of other patients to each study group based on the studied variables in the group, which involved fewer people with those characteristics. However, random sample allocation would occur in case of having two groups with the same characteristics.[24] It is worth mentioning that two variables of age and gender were considered in the minimization method.

Inclusion criteria were as follows: 1) diagnosis of myocardial infarction (based on medical records), 2) failure to perform cardiopulmonary resuscitation on arrival to the emergency department, 3) in-hospital stay at the coronary care unit (CCU) for more than one day, 4) awareness of time, place and other people, 5) lack of mental retardation, blindness or deafness (since vision and hearing are required in this intervention method), 6) age range of 25-85 years, 7) lack of pain or discomfort during interview and completing the questionnaire (based on questions asked from patients), 8) ability to speak Persian or Turkish,[24] 9) score of <5 in Pittsburgh Sleep Quality Index (PSQI) to determine sleep disorders and 10) lack of active mental disorders (based on the diagnosis of a specialist and medical records of the patients).

Exclusion criteria were lack of patient cooperation, death of patients, need for cardiopulmonary resuscitation, use of sedatives without physician's order, experiencing cardiac dysrhythmia during the research and insufficient necessary skills in the process of jaw relaxation for any reason. In total, 112 patients were evaluated, 44 of whom were not eligible and, therefore, replaced by another participant using the same sampling method.

2.3. Instruments

In this study, the criteria to obtain skills in the process of jaw relaxation, PSQI, and demographic questionnaires (age, gender, marital status, educational level, occupational status, place of residence and type of stroke according to medical records or responses of patients) were used to evaluate the participants.

Process of jaw relaxation required the acquisition of four skills (two scores each), including the calmness of face, not frowning, not speaking, and performing calm breathing. In this regard, achieving a score of seven out of eight was interpreted as adequate skills of the participants.[17]

According to the literature, the PSQI is one of the most reliable tools used to assess the sleep quality of patients within the past month, which was first designed by Buysse et al. (1989) in the Pittsburgh Psychiatric Institute, and its reliability and validity have been confirmed.[27, 28] While PSQI is in nature a nine-item questionnaire, presence of 10 sub-items in question number five has led to a total of 19 items, which are graded based on a four-point Likert scale within a score range of 0-3.

PSQI also includes seven subscales, as follows: 1) subjective sleep quality, 2) sleep latency, 3) sleep duration, 4) habitual sleep efficiency, 5) daytime dysfunction, 6) use of sleeping pills and 7) sleep disturbances.[29] Scores three, two, one and zero in each criterion represent a natural state, and mild, moderate and severe problems, respectively. Total score of all subscales is indicative of overall sleep quality. Generally, this questionnaire is scored within a range of 0-21, and scores of <5 indicate good sleep quality, while higher PSQI scores represent poor sleep quality.[30]

Validity and reliability of this questionnaire was evaluated by Farahi Moghadam et al. (2012) and confirmed with sensitivity of 100%, specificity of 93%, and Cronbach's alpha of 0.89 for the Iranian population.[31] Evidence suggests that this questionnaire has been broadly used in domestic and foreign studies.[29, 32] In this study, the reliability of PSQI was assessed in 20 patients with heart attacks using Cronbach's alpha coefficient, which was determined at 0.82.

2.4. Data Collection

For the intervention, the patient lied flat on his back on a bed with a 30-degree head-of-bed elevation. Afterwards, training was carried out for 20 minutes, and the patient was required to practice the instructions simultaneously. However, the training course duration would be prolonged for the patients who had difficulty in applying the intervention method.

In this process, patients were trained to allow the mandible come down slowly similar to minor yawning, while the tongue smoothly and motionlessly rested on the floor of the mouth. Lips were relaxed and the patient was asked to take slow and regular breaths (inhalation, exhalation, and relaxation). In addition, the patient was required not to speak or even think about words.[17] After the completion of the training course, it was recommended that this technique be practiced by the patient five times that day in order to reach the sufficient skills in this field. At this stage, samples of the experimental group, who gained a score of 7 out of 8 in jaw relaxation method, remained in the study and those without this score were eliminated from the research.

In the next stage, the participants practiced this method at the ward under the supervision of our researcher to achieve adequate skills. Moreover, discharged patients were required to practice the jaw relaxation technique continuously for another month, which was followed-up by the researcher through phone calls. On the other hand, routine care of the ward was provided for the samples in the control group, and no non-pharmacological approaches were applied for these participants to improve their sleep quality.

After the enrollment of eligible participants in the study, their sleep quality was evaluated using the PSQI by the researcher before the intervention and again at the end of the jaw relaxation training course, which was practiced by the patients for one month.

2.5. Ethical considerations

Initially, objectives of study were explained to the participants and they were assured of confidentiality terms. In addition, the samples were free to withdraw from the research at any time during the study. However, training jaw relaxation technique only occurred when patient treatment course was completed and samples were prepared and willing to be trained.

2.6. Statistical analysis

Data analysis was performed in SPSS version 19 using descriptive statistics, Fisher's exact test (to compare the study groups in terms of gender, marital status, educational level, occupational status, and place of residence), independent T-test (for the comparison of sleep quality scores between groups), paired T-test (to compare sleep quality scores in each group before and after the intervention), and

Chi-square (for the comparison of groups regarding the type of heart attack).

3. Results

Demographic characteristics of the participants are shown in Table 2; accordingly, no significant differences were observed between the demographic variables of study groups. According to the results, some aspects of sleep quality, including subjective sleep quality (P=0.032), sleep latency (P=0.038), habitual sleep efficiency (P=0.014), sleep disturbances (P=0.002) and use of sleeping pills (P=0.045), improved in the intervention group. In addition, overall sleep quality enhanced in this group after the intervention (P<0.001).

Meanwhile, the results of independent T-test were indicative of significant differences between the intervention and control groups regarding the variables of subjective sleep quality (P=0.046), habitual sleep efficiency (P=0.029), sleep disturbances (P=0.045), use of sleeping pills (P=0.039) and total sleep quality scores (P<0.001) (Table 2).

Table 1. Demographic characteristics of participants

Variable	Group	Intervention N (%)	Control N (%)	P-value
Gender	Male	21 (61.76)	21 (61.76)	**0.999
	Female	13 (38.24)	13 (38.24)	
Marital status	Single	2 (5.88)	2 (5.88)	*0.999
	Married	22 (94.12)	22 (94.12)	
Educational level	Below diploma	25 (73.52)	28 (82.34)	**0.293
	Diploma and higher	9 (26.47)	6 (17.01)	
Occupational status	Self-employed	25 (73.52)	21 (61.76)	**0.437
	Employed	9 (26.48)	13 (38.24)	
Place of residence	Urban	23 (67.64)	27 (79.41)	**0.41
	Rural	11 (32.26)	7 (20.59)	
Type of heart attack	Extensive	9 (47.26)	10 (41.29)	**0.978
	Inferior	10 (41.29)	11 (35.32)	
	Anteroseptal	6 (64.17)	4 (76.11)	
	Lateral	2 (88.5)	2 (88.05)	
	Old MI	4 (76.11)	3 (82.8)	
	Posterior	3 (82.8)	4 (76.11)	
Age (year)	M±SD	54±11.94	54.22±12.82	***0.854

*Fisher's exact test; **Chi-square; ***Independent T-test

Table 2. Mean sleep quality scores and its components before and after intervention

Sleep quality	Group	Intervention M±SD	Control M±SD	*P-value
Subjective sleep quality	Before intervention	2.11±0.59	1.97±0.57	0.42
	After intervention	1.74±0.65	2±0.6	0.046
	**P-value	0.032	0.89	
Sleep latency	Before intervention	1.76±0.65	1.94±0.64	0.41
	After intervention	1.61±0.55	1.84±0.73	0.75
	**P-value	0.038	0.89	
Sleep duration	Before intervention	1.73±0.61	1.67±0.58	0.033
	After intervention	1.5±0.5	2±0.73	0.051
	**P-value	0.068	0.29	
Habitual sleep efficiency	Before intervention	2.32±0.58	2.52±0.61	0.55
	After intervention	1.85±0.7	2.26±0.75	0.029
	**P-value	0.014	0.39	
Sleep disturbances	Before intervention	2.35±0.73	2.45±0.6	0.63
	After intervention	1.7±0.62	2.2±0.73	0.045
	**P-value	0.002	0.37	
Use of sleeping pills	Before intervention	2.52±0.61	2.38±0.55	0.098
	After intervention	2.23±0.69	2.14±0.5	0.039
	**P-value	0.045	0.063	
Daytime dysfunction	Before intervention	1.73±0.79	1.35±0.65	0.08
	After intervention	1.7±0.75	1.67±0.76	0.25
	**P-value	0.85	0.46	
Total sleep quality	Before intervention	14.59±1.39	14.32±1.29	0.531
	After intervention	12.38±1.49	14.02±2.4	<0.001
	**P-value	<0.001	0.481	

*Independent T-test; **paired T-test

4. Discussion

According to the results of the present study, some of the aspects of patient sleep quality, such as subjective sleep quality, sleep latency, habitual sleep efficiency, sleep disturbances, use of sleeping pills and total sleep quality, improved in the experimental group after the intervention.

In this regard, Rambod et al. (2013) evaluated the effect of Benson's relaxation technique on the sleep quality of patients undergoing hemodialysis. According to the results of the aforementioned study, application of this method was associated with enhanced sleep quality of the patients; however, no significant improvement was observed in different aspects of sleep quality.[33] These results are in congruence with our findings, regardless of the differences in sample populations, study settings and type of relaxation used in the studies. This consistency could be due to the general effect of relaxation on reducing stress and anxiety levels, as well as the application of similar tools.

In a study by Sa'eedi et al. (2012), positive effects of relaxation methods on sleep quality of patients were confirmed, and it was demonstrated that use of progressive muscle relaxation techniques led to a significant improvement in the sleep quality of dialysis patients after the intervention, compared to before the study.[34] While the results of the mentioned study are consistent with our findings, the jaw relaxation method used in the current research was simpler and only focused on speech organs. In line with the results of the present study, the positive impact of muscle relaxation techniques on the sleep quality of the elderly was pointed out in a study by Sun et al. (2013). Nevertheless, causes of poor sleep quality and methods used in the present study and the mentioned research were different. Stress, anxiety, and disease complications could significantly affect the sleep quality of patients with heart attack through diverse mechanisms.[35]

Application of progressive muscle relaxation techniques was accompanied with improved sleep quality of hemodialysis patients in a study by Hadadian et al. (2015).[36] Similarly, Dayapoğlu et al. (2012) conducted a study on 32 patients with multiple sclerosis, in which the positive effects of relaxation programs on the sleep quality of patients were approved.[37]

In another research, Blanaru et al. (2012) evaluated the effects of muscle relaxation and music on the sleep quality of patients with high levels of post-traumatic stress. According to the results, a significant enhancement was observed in the sleep quality of participants after the intervention.[38] Similarly, Demiralpn et al. (2010) indicated that use of relaxation methods led to a significant improvement in sleep quality and reduced fatigue in patients with breast cancer. While this technique was introduced as a complementary method, the only improvement in the aspects of sleep quality was observed in the subjective sleep quality of the patients.[23] Results of the mentioned study are in line with our findings, and it seems that relaxation could physiologically affect endorphin release, leading to increased comfort, blood flow, and wellbeing.[24]

Inconsistent with the results of the aforementioned studies, Valiente López et al. (2015) indicated that progressive relaxation led to no statistically significant difference between the intervention and control groups. This contradiction might be due to the type of relaxation techniques, since Jacobson's relaxation technique, which is accompanied with consecutive contraction-expansion of the whole muscle groups in the body with systematic rest courses, was used in the mentioned research.[39]

In another study by Vargas et al. (2014), cognitive-behavioral therapies in South Florida were marked as a beneficial relaxation method for stress management. According to the results of the mentioned study, while the sleep quality of patients significantly improved, no statistically significant difference was observed between the intervention and control groups, which is inconsistent with the results obtained in the present study. This discrepancy might be due to differences in sample populations and type of interventions used in each research.[40]

One of the major drawbacks of this study was different attitudes of individuals toward relaxation techniques. Since the attitude of individuals is related to cultural factors and educational level, generalization of the final data to the whole community must be carried out with caution.

5. Conclusion

According to the results of this research, application of jaw relaxation technique improved sleep quality in patients with myocardial infarction. Therefore, it is recommended that this method be used as a non-invasive, simple, cost-effective approach in the form of complementary therapy (along with pharmacological approaches) in order to enhance the sleep quality of such patients. Moreover, it is suggested that the effect of jaw relaxation technique on other complications caused by myocardial infraction (e.g., anxiety and pain) be evaluated in future studies to compare its effects on the enhancement of sleep quality with other non-pharmacological methods.

Conflicts of interest

The authors declare no conflicts of interest.

Authors' contributions

Monireh Sadat Kashi: study design and implementation, drafting of the manuscript. Naser Sedghi Goyaghaj: participation in study design and drafting of manuscript. Mohammad Ali Hoseini: study design and final approval of the article. Farahnaz Mohammadi Shahbolaghi: participation in study design and scientific editing of the manuscript. Enayatollah Bakhshi: statistical analysis advisor.

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