





Comparison between the effect of aromatherapy with lavender and damask rose on sleep quality in patients undergoing coronary artery bypass graft surgery: A randomized clinical trial

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Original Article

Abstract

BACKGROUND: Numerous studies have investigated the effect of lavender and damask rose aromatherapy on sleep quality. There is, however, little research to compare the impact of them over each other. The aim of current study was to compare the effect of aromatherapy with lavender and damask rose on sleep quality in patients after coronary artery bypass graft (CABG) surgery in Guilan Province, Iran, in 2017-2018.

METHODS: In this randomized clinical trial (RCT) study, 97 patients undergoing CABG were randomly assigned to intervention or control groups. In the intervention groups, the patients were asked by the researcher to inhale the lavender or damask rose randomly every night for 5 consecutive nights at 22:00. The control group received routine nursing care in compliance with the hospital procedure. Data were obtained by demographic-clinical and Beck Depression Inventory (BDI) questionnaires. To analyze the data, chi-square test, t-test, Kruskal-Wallis test, and Wilcoxon test were used.

RESULTS: During the 5-night intervention period, despite a relative improvement of sleep quality in intervention groups compared to the control group, none of the two aromatherapies had a statistically significant effect on any of delayed sleep ($P = 0.514$), sleep duration ($P = 0.839$), sleep efficiency ($P = 0.067$), sleep disturbances ($P = 0.061$), and daily functional disorders ($P = 0.114$) except for subjective sleep quality ($P = 0.016$) and use of sleep medications ($P = 0.031$).

CONCLUSION: Using both aromatherapies with lavender and damask rose indicated positive effects on sleep quality of the CABG patients, but we could not find a superiority over each other.

Keywords: Coronary Artery Bypass; Aromatherapy; Lavandula; Rosa; Sleep Hygiene

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Introduction

Sleep as one of the basic physiological needs of humans and an effective factor for maintenance of energy, the appearance, maintaining health, and recovery from disease is essential¹⁻⁴ and deprivation of it has adverse effects on human mind and body.³ Diseases can have negative effect on sleep and reaction determined by increased plasma

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C-reactive protein (CRP) concentrations after the procedure.⁵

Among the diseases that can affect the sleep patterns of people is coronary artery disease (CAD),⁶ and today, it is the most common chronic disease and the leading cause of mortality in the world.^{7,8} Open heart surgery is one of the most commonly-used treatments for patients with coronary artery stenosis that the patients need to connect a ventilator for 6 hours after heart surgery and then they are transferred to intensive care unit (ICU). Mechanical ventilation discontinuation may make the patients agitated and anxious which can lead to increased oxygen consumption following increased plasma concentration of epinephrine and norepinephrine. As a result, changes and abnormalities in heart rate, hypertension (HTN), and sleep disorders are created after surgery.^{2,9}

Different pharmaceutical and non-pharmaceutical therapies are used to resolve sleep disorders.^{7,10} Studies have shown that according to the high cost of health care, the majority of patients have turned to complementary therapies.¹¹⁻¹³ One of the treatments that has grown significantly in most countries in recent years, compared to other complementary therapies, is aromatherapy.¹⁴ The aromatherapy is considered as a comprehensive intervention and an effective mediator for pain relief, relieving anxiety and improving the quality of sleep, and is associated with better acceptance of patients.^{15,16}

One of the most aromatic and volatile oils used in aromatherapy is the oil from the lavender plant, which belongs to the peppermint species, a herbaceous, aromatic, and always lush plant.¹⁴ This herb is anti-anxiety and sedative. The main ingredient is linalool, which affects gamma aminobutyric acid (GABA) in the central nervous system (CNS), as well as linalyl acetate which is narcotic.⁷ Lavender aromatherapy can improve the quality of sleep, and its essence reduces the time to fall asleep, increases the second stage of sleep, and reduces the stage of eye movement. Among the studies, some indicated positive effects of this inhalation on the quality of sleep in patients with chronic insomnia, hemodialysis, and acute coronary syndrome (ACS),^{2,17} improvement in heart rate and sleep quality in middle-aged women¹⁸ and increased deep sleep in young people;¹⁹ however, studies have not always been meaningful in this regard.¹⁶

Another effective plant in aromatherapy is damask rose (*Rosa damascena*), which has anti-anxiety effects with two substances of citronella and

2-phenylethyl alcohol.¹³ This fragrance with positive effects on the CNS⁷ can reduce neurological stress and tension.⁹ However, in a study conducted by Tazakori et al., there was no correlation between the inhalation of damask rose and the improvement of sleep quality and anxiety reduction.²⁰ Moreover, Atashi et al. showed that damask rose had no significant effects on the sleep quality of athletes at night before the race.²¹

Considering the complications of sleep disorders that can affect the patient's recovery process after surgery and notably improving sleep quality as one of the most significant needs of the patient in nursing care, also following the controversial results of research in order to find effective and safe non-pharmaceutical methods and reducing the cost of treatment, this study aimed to determine and compare the effect of the damask rose essence and lavender essence on the sleep quality of patients after open heart surgery. Thus, positive results of this study as alternative or complementary therapies can help the sleep quality progression in patients undergoing open heart surgery.

Materials and Methods

This study was a randomized clinical trial (RCT) designed to compare the effect of aromatherapy with lavender and damask rose on sleep quality in patients undergoing coronary artery bypass graft (CABG) surgery in Heshmat Hospital in Rasht, Iran, during March 2018 to August 2018.

Inclusion criteria were as follows: 1) age of 65 years or less [according to World Health Organization (WHO), the age of 65 or older is considered as the old age²² and therefore, this age group was used to ensure that the effect of smell reduction created by age has been removed], 2) patient's tendency to participate in the study, 3) having clear verbal ability.

All participants with the following criteria were excluded: 1) consumption of anti-depressant and narcotic drugs also sedative medications, 2) the history of known psychological disorders, 3) the history of allergic rhinitis and other respiratory and sinusitis problems, 4) the history of systemic or chronic diseases affecting the sense of smell or hearing, and 5) the history of sleep disorders.

This study was performed among three groups of patients undergoing CABG; the first group underwent aromatherapy with lavender, the second group underwent aromatherapy with damask rose, and the third group was without intervention. For patients' randomization, we randomized the rooms

based on 6 random blocks to eliminate probable confusion causing by the nature of the interventions in a shared room. The randomizations of the rooms were done at three times and the interventions were performed in eligible patients in each room. As far as possible, the same conditions for patient care, control of light, sound, and entry into the desired sections were provided.

The researcher, after obtaining a written permission from the authorities and Ethics Committee of Guilan University of Medical Sciences, Rasht, referred to Dr. Heshmat Hospital in Rasht, and after introducing herself as a researcher, explained the purpose of the study to patients and hospital managers. Then, written consent was obtained from the patients undergoing CABG who had the inclusion criteria. Before intervention, in literate individuals, the standard sleep questionnaire, i.e., Pittsburgh Sleep Quality Index (PSQI), was completed by the patient himself and was completed by the researcher in illiterate people.

PSQI includes 9 questions in 7 dimensions: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction with 4 open questions and 5 multiple-response items. The total score of the 7 dimensions of the questionnaire forms the total score of the questionnaire, which ranges from 0 to 21. In addition, each questionnaire has a score between 0 and 3. Higher score represents lower sleep quality.²³

The validity and reliability of PSQI questionnaire has been examined in the Iranian society.^{24,25} A favorable criterion and construct validity and Cronbach's alpha of 0.89 were reported for the Persian version of PSQI.

The researcher purchased the essence of lavender and damask rose from Barich Essence Company in Kashan, Iran, which is a valid company. Mixture essence of damask rose consisted of citronellol, nerol, geranolol, and phenethyl alcohol. Also, mixture essence of lavender was compounded of linalyl acetate, terpinen, lavandulol acetate, lavendulol, and alpha terpineol. Patients in the intervention groups were asked to inhale the lavender and damask rose as much as three drops on a piece of the patient's pillow, every night for 5 consecutive nights at 22:00, after consulting with an expert in traditional medicine by the researcher.⁷

The patients were monitored by the night nurse at night time. Then, the researcher completed the

sleep quality questionnaire in the morning of sixth day. In the control group, without any intervention, in the morning of the day after entering the surgery department and in the morning of the 6th day, the sleep quality questionnaire was completed.

Ethical consideration: The present study was approved by the Ethics and Research Committee of Guilan University of Medical Sciences, (IR.GUMS.REC.1396.450) and was registered at the Iranian Center for Clinical Trials with IRCT20180205038626N1 code.

Statistical analysis: The sample size was calculated based on Najafi et al. study.² An alpha level of 0.05, power of 80%, 20% of correction for missing data, and also adjustment for multiple comparisons were considered²⁶ and number of samples for each group was estimated to be 30.

Frequency and percentage and mean and standard deviation (SD) were used to describe the data for categorical and continuous variables, respectively. Based on the Kolmogorov-Smirnov test, none of the scores of PSQI dimensions had normal distribution; hence, non-parametric tests were carried out.

Patients' demographic characteristics were compared between groups using chi-square test and Kruskal-Wallis test for categorical and ordinal characteristics, respectively. Continuous variables with normal distribution were compared between groups by one-way analysis of variance (ANOVA). To examine significant changes of scores over time, Wilcoxon signed-rank test was used in each group. For the post-hoc pairwise comparisons, Bonferroni correction (with the adjusted P-value of less than 0.020) was employed. Also, in order to compare the sleep quality of three groups at the end of the intervention, adjusted to the baseline scores, the relative changes to the baseline were calculated and compared by Kruskal-Wallis test. All analyses were performed by SPSS software (version 21, IBM Corporation, Armonk, NY, USA).

Results

Of 112 patients enrolled in the trial, 5 patients did not meet inclusion criteria, 10 patients did not want to participate, and 97 patients were randomly allocated to aromatherapy. These patients were divided into three groups. Of which, 34 patients underwent the aromatherapy with lavender, 32 patients underwent the aromatherapy with damask rose, and 31 patients were examined as controls. The flowchart of the patients included in the study is shown in figure 1.

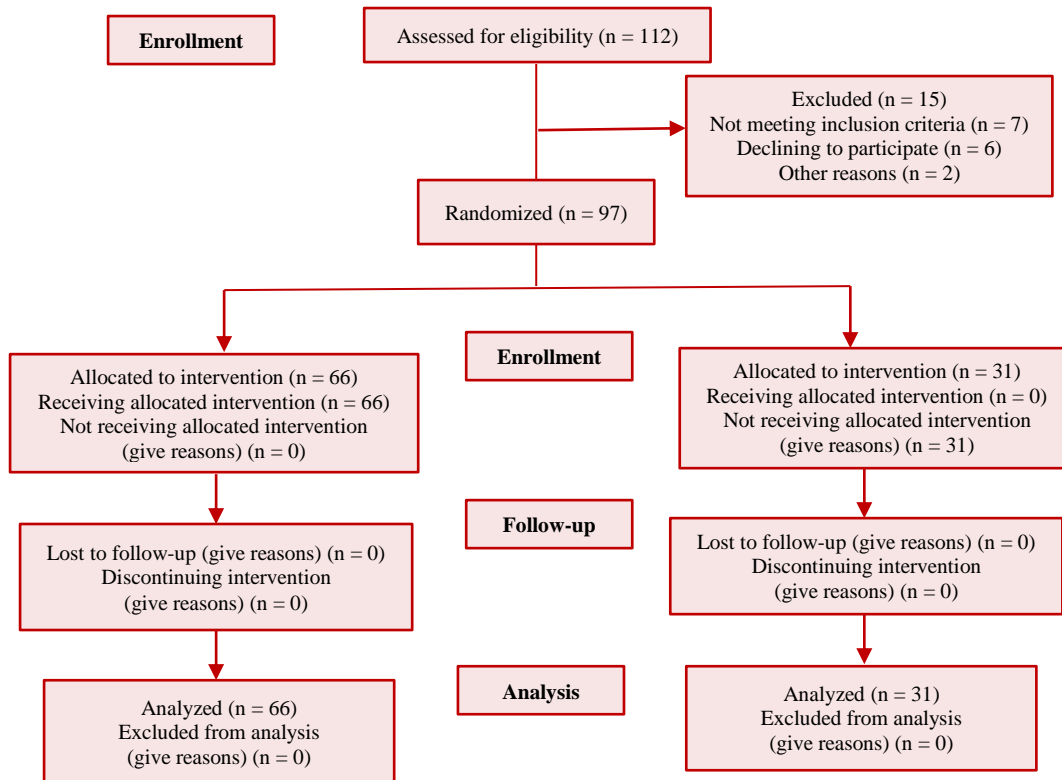


Figure 1. Consolidated Standards of Reporting Trials (CONSORT) flow diagram

Patients’ demographic characteristics are shown in table 1. About 62.0% of patients were men, with a mean age of 59.00 ± 6.98 years. Most of the patients were married (87.6%) and illiterate (46.4%)

or with education level of less than diploma (41.2%). There were no significant differences between the three groups in terms of demographic characteristics (Table 1).

Table 1. Patients’ demographic characteristics in total and by each group

Variable	Group			P
	Aromatherapy with lavender (n = 34)	Aromatherapy with damask rose (n = 32)	Control (n = 31)	
Gender				0.891**
Female [n (%)]	14 (41.2)	12 (37.5)	11 (35.5)	
Age (mean ± SD)	58.00 ± 6.76	59.00 ± 6.33	59.00 ± 5.16	0.799 [£]
Marital status [n (%)]				0.392**
Married	6 (17.6)	4 (12.5)	2 (6.5)	
Single	28 (82.4)	28 (87.5)	29 (93.5)	
Education [n (%)]				0.409 [£]
Illiterate	12 (35.3)	18 (56.3)	15 (48.4)	
High school	18 (52.9)	10 (31.3)	12 (38.7)	
Diploma	4 (11.8)	2 (6.3)	6 (9.7)	
Associate degree	0 (0)	1 (3.1)	0 (0)	
Bachelor’s degree	0 (0)	1 (3.1)	1 (3.0)	
Medical history [n (%)]				0.872**
HTN	26 (76.5)	26 (81.3)	25 (80.6)	
DM	19 (55.9)	14 (43.8)	13 (41.9)	
Hyperlipidemia	12 (35.3)	13 (40.6)	14 (45.2)	
Thyroid diseases	1 (2.9)	1 (2.9)	4 (12.9)	
Others*	1 (2.9)	5 (15.6)	0 (0)	

Frequency (percent) was reported except indicated.

* Others include: Rheumatoid arthritis (RA), gastritis, kidney stones

** Chi-square test; [£] One-way analysis of variance (ANOVA); [£] Kruskal-Wallis test

HTN: Hypertension; DM: Diabetes mellitus; SD: Standard deviation

Table 2 shows the description of the total and each dimension score of the sleep quality in studied patients. At baseline, the total score of sleep quality was not significantly different between the three groups ($P = 0.960$). However, comparison of the sleep quality dimensions between the three groups showed that the scores of sleep efficiency, sleep disturbances, and the use of sleep medications at baseline were significantly different between groups ($P < 0.050$ for all comparisons). At baseline, the patients under aromatherapy with damask rose had significantly better sleep efficiency score and worse score for use of sleep medication than the control group ($P = 0.003$ and $P = 0.007$, respectively). Also, the patients in the lavender group had less sleep disturbances than the damask rose group ($P = 0.010$). In all other dimensions, there were no significant differences between the three groups ($P > 0.050$ for all comparisons).

After the intervention period, compared to the baseline, the quality of sleep was improved in all three groups of patients ($P < 0.001$, $P = 0.001$, and $P = 0.055$ for lavender, damask rose, and control groups, respectively) (Table 2 and Figure 2). However; the improvement was more pronounced in the intervention groups rather than the control group. Analyses of scores of dimensions illustrated that in both groups of lavender and damask rose, sleep quality of patients statistically improved in more dimensions (5 dimensions of seven) (Table 2), whereas recovery in the control group was only in one dimension of sleep duration.

Following the intervention, the data showed that none of the total score of sleep quality and relative change of sleep quality scores adjusted to the baseline were statistically significant ($P = 0.104$ and $P = 0.115$ for the total score and relative change of sleep quality scores, respectively).

Furthermore, after adjusting to the baseline scores, in terms of relative change of score, none of the sleep quality dimensions were statistically different at the end of the intervention time ($P > 0.050$ for all, Table 2), except for the subjective sleep quality ($P = 0.016$) and the use of sleep medications ($P = 0.031$). After adjusting to the baseline values, the results showed that there were no significant differences between the three groups in terms of relative improvement in the score of each dimension of sleep latency ($P = 0.514$), sleep duration ($P = 0.839$), sleep efficiency ($P = 0.067$), sleep disturbances ($P = 0.061$), and daytime dysfunction ($P = 0.114$). However, relative improvement in sleep quality was only significant in

the dimensions of sleep quality ($P = 0.016$) and the use of sleep medications ($P = 0.031$) in the three groups. According to the Mann-Whitney U post-hoc test, the results revealed significant differences among both intervention groups score and control group score in improved sleep quality ($P = 0.012$ for both tests). In other words, aromatherapy with damask rose and lavender, both of them, had been effective in improving the subjective quality of sleep after intervention. However, the relative enhanced sleep quality in the two intervention groups did not differ significantly ($P = 0.494$). Also, the use of sleep medications in patients with the damask rose aromatherapy improved relative to aromatherapy with lavender, due to the correction of the significant level. This result is at the significance level of borderline and should be concluded with caution ($P = 0.031$).

Discussion

Aromatherapy is one of the complementary and integrated methods widely used in many countries and is part of comprehensive nursing care. Although several studies have shown the healing properties of the two fragrances of lavender and damask rose in different diseases, few comparison between them had been performed.^{13,27,28} For this reason, the researchers were looking for a comparison between the effect of lavender and damask rose aromatherapy on the sleep quality of patients after CABG.

At this study, before the intervention, the total score of sleep quality of the studied units was not significantly different between the three groups; however, by chance, there were some differences in scores of some dimensions such as sleep efficiency, sleep disturbances, and the use of sleep medications. Also, results of our data after the intervention indicate that despite the relative improvement in the overall sleep quality score in the two groups of lavender and damask rose compared to the control group, there was no statistically significant difference between the three groups in terms of total sleep quality score. Furthermore, despite of improvement at the end of intervention, the mean values of sleep quality of patients in intervention groups are still in an unpleasant range of higher than 5. In 2018, Ayik and Ozden²⁹ concluded that aromatherapy with lavender before colorectal surgery improved sleep quality and reduced anxiety in patients. Contrary to the results of present study, in the study of Ozlu and Bilican,¹² the sleep quality of patients in the surgical ICU (SICU) was improved.

Table 2. Sleep quality in experimental and control groups

Groups	At baseline			P [‡]	After intervention			P [‡]	P [*]
	Experimental (lavender)	Experimental (damask rose)	Control		Experimental (lavender)	Experimental (damask rose)	Control		
Subjective sleep quality	1.88 ± 0.64	1.59 ± 0.49	1.67 ± 0.65	0.175	1.32 ± 0.53	1.12 ± 0.70	1.48 ± 0.63	0.066	0.016 ^{***}
Sleep latency	1.64 ± 0.84	0.83 ± 1.40	1.58 ± 0.71	0.492	1.32 ± 0.76	1.34 ± 0.90	1.39 ± 0.67	0.898	0.514
Sleep duration	0.50 ± 0.84	0.56 ± 0.50	0.64 ± 0.70	0.794	0.20 ± 0.41	0.31 ± 0.47	0.42 ± 0.67	0.430	0.839
Habitual sleep efficiency	0.47 ± 0.61	0.28 ± 0.46	0.96 ± 1.01	0.009 ^{**}	0.14 ± 0.43	0.21 ± 0.49	1.03 ± 1.08	0.001	0.067
Sleep disturbances	1.08 ± 0.28	1.34 ± 0.48	1.22 ± 0.42	0.043 ^{**}	1.08 ± 0.28	1.09 ± 0.29	1.16 ± 0.37	0.595	0.061
Use of sleep medications	0.17 ± 0.38	0.34 ± 0.47	0.06 ± 0.24	0.020 ^{**}	0.14 ± 0.35	0.09 ± 0.29	0.03 ± 0.18	0.285	0.031
Daytime dysfunction	1.26 ± 0.66	1.37 ± 0.65	1.06 ± 0.62	0.143	1.17 ± 0.57	1.15 ± 0.57	1.13 ± 0.67	0.970	0.114 ^{***}
Total PSQI score	7.02 ± 2.27	6.90 ± 1.78	7.22 ± 0.07	0.962	5.41 ± 1.79	5.34 ± 2.05	6.65 ± 2.75	0.104	0.115

Mean ± standard deviation (SD) was reported

[‡] P-value was reported from Kruskal-Wallis test for between-groups comparison; * P-value was reported from Kruskal-Wallis test comparing post intervention scores between groups, adjusted to the baseline scores; ** The patients undergoing aromatherapy with damask rose had significantly better sleep efficiency score and worse use of sleep medication score than the control group (P = 0.003 and P = 0.007, respectively). Also, the patients in the lavender group had less sleep disorders than the damask rose group (P = 0.010); *** Adjusted to the baseline scores, both intervention groups significantly differ from control group (P = 0.012 for both tests)

Adjusted to the baseline scores, patients with the damask rose aromatherapy improved more relative to aromatherapy with lavender (P = 0.031 based on Mann-Whitney U test)

PSQI: Pittsburgh Sleep Quality Index

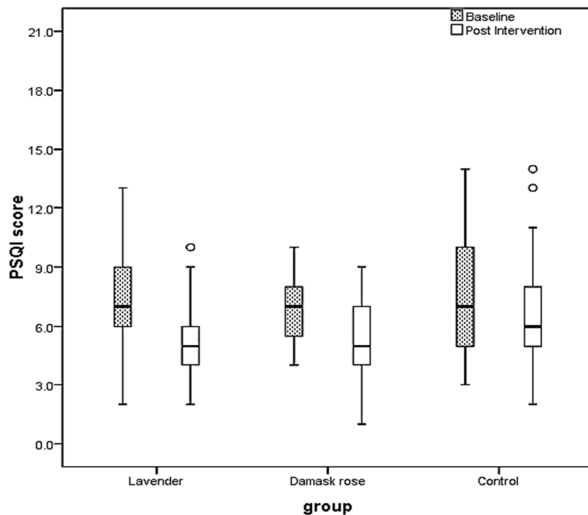


Figure 2. Pittsburgh Sleep Quality Index (PSQI) score at baseline and after intervention by groups; upper and lower horizontal lines of the boxes show 25th and 75th percentiles, line inside the boxes represents the median, and whiskers represent minimum and maximum

It seems that this difference may be related to the application of lavender in the back massage of the patients in the evening. Meanwhile, this may be due to difference in the type of tool. The sleep quality measurement tool in this study was Richards-Campbell Sleep Questionnaire (RCSQ), but in our study, aromatherapy was as an inhalable at night time, and the sleep quality measurement tool was PSQI. The Ozkaraman et al. study in 2018¹¹ indicated positive effects of lavender on the quality of sleep in patients with cancer and another study by Faydali and Cetinkaya in 2018³⁰ showed positive effects of lavender on the quality of sleep in the elderly. Moreover, Cho et al. in 2013²⁷ demonstrated a positive effect of lavender on the sleep quality of patients who were candidates for percutaneous coronary intervention (PCI), which was different from the results of the present study. It seems that the sample size of these studies was larger and the longer duration of aromatherapy use and also the difference in diseases type were not consistent with our research subjects.

According to our findings, in the two interventional groups of lavender and damask rose aromatherapy, in spite of no significant statistical difference with the control group, improvement in the dimensions of sleep quality had taken place, so that in the group of aromatherapy with lavender during one week of intervention, there was a significant improvement in the dimensions of sleep quality, sleep latency, sleep duration, and sleep efficiency, which was consistent with the results of

studies reported by Najafi et al.² and Karadag et al.³¹ In the group of aromatherapy with damask rose, during one week of intervention, there was a significant improvement in the dimensions of sleep quality, sleep duration, sleep disturbances, and the use of sleep medications. Hajibagheri et al., in a study entitled “The Effect of damask rose on the quality of sleep of cardiac patients” reported that this fragrance had a positive effect on the quality of sleep.²⁸ Atashi et al. in 2015, in a study, investigated the effect of aromatherapy with damask rose on the sleep quality of athletes and concluded that this fragrance was not effective on the dimension of daytime dysfunction of athletes' sleep at night before the competition,²¹ which was not in line with the results of the present study. This contradiction in the results seems to be due to differences in participants, type of applied procedure, type of disease, and time and place as well as duration of using the fragrance in a variety of age groups which were different from our study.

The limitations of this study that can be mentioned are the number of samples and the short duration of intervention. In this study, the intervention period was considered to be 5 nights in order to access the patient in the hospital and control the implementation of the intervention. It seems that according to the observed improvement in interventional groups, in future studies, to confirm the significance of the statistical effect of intervention, a longer period of intervention with more samples should be considered. Also, in future studies, the effect of type, concentration of consumed doses, as well as the method of implementing the aromatherapy interventions on the effectiveness of these interventions can be considered.

Conclusion

We could not find any statistically significant difference between two types of intervention and the aromatherapy with lavender and damask rose, both of them, had a positive effect on the sleep quality of the patient's undergoing CABG surgery. Hence, further studies with longer intervention period are needed.

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Conflict of Interests

Authors have no conflict of interests.

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