



Review Article

Aromatherapy in patients undergoing coronary artery bypass surgery: A systematic review of clinical trials

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ABSTRACT

In recent years, various investigations have been conducted on the aromatherapy with some essential oils as a non-invasive nursing intervention in various conditions, such as the improvement of anxiety in patients with cardiovascular diseases. The current study aims to systematically review and determine the effects of aromatherapy with various herbs in patients undergoing coronary artery bypass surgery. Five English databases, including Web of Science, Scopus, PubMed, EMBASE, and Google Scholar, were used to find all published clinical papers related to the effects of aromatherapy on the patients with coronary artery bypass surgery without time limitation. All searches were based on the 06- PRISMA guideline and registered in the CAMARADES-NC3Rs Preclinical Systematic Review and Meta-Analysis Facility (SyRF) database. Out of 1835 papers, 13 papers up to 2021, met the inclusion criteria for discussion in this systematic review with the data extracted. The most studies were carried out on effect of aromatherapy on anxiety of patients with coronary artery bypass graft (CABG) surgery (8 papers, 61.5%). The most common used essential oil was belonged to lavender essential oil (11 papers, 84.6%). The findings of the present investigation demonstrated that aromatherapy particularly with lavender is able to significantly decrease anxiety, pain, nausea and vomiting, Sleep quality, Hemodynamic Indices, blood pressure, and extubation time in patients with CABG surgery. However, more studies are required to confirm the accurate mechanisms and side effects of the alternative treatment.

Keywords: Alternative medicine, Lavender, Herbal medicine, Open-heart surgery, Anxiety

INTRODUCTION

Cardiovascular disease (CVD) is one of the most important life-threatening factors in human societies, so that it is the cause of 70% of deaths in people over 75 years and 25% of deaths in people over 30 years.^[1] In addition to drug treatments, open heart surgery is also one of the most important options in the treatment of CVD.^[2,3] Surgery as a treatment is a stressful experience. In open heart surgery, anxiety manifests itself on a larger scale. Anxiety and depression have been reported in 25-30% of patients before coronary artery bypass graft surgery (CABG).^[4] As a result, anxiety increases cortisol and adrenaline levels, which is the physiological response to stress.^[4-6] Complications of the elevated cortisol include cognitive impairment, thyroid dysfunction, blood sugar imbalance, hyperglycemia, hypertension, sleep quality, decreased immune system and inflammatory responses in the body, delayed wound healing, as well as decreased muscle mass.^[7,8]

Nowadays, complementary and alternative therapies such as massage therapy, acupuncture, and aromatherapy are widely used to reduce and manage the anxiety in the patients with CVDs.^[9,10] One of the treatments that have seen significant growth in the most countries

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compared to other complementary medicine treatments for anxiety is aromatherapy. This treatment is the second complementary medicine treatment that is most used in the clinic.^[11] Aromatherapy includes inhalation and incense use of extracts and essential oils of plants for preventive care or treatment.^[12-14]

In recent years, various investigations have been conducted on the aromatherapy with some essential oils as a non-invasive nursing intervention in various conditions, such as the improvement of anxiety in patients undergoing angiography and stenting, hemodialysis, general surgery, and reducing cardiac parameters such as blood pressure and pulse rate.^[15-17] On the other hand, several investigations have demonstrated the high potency of essential oil inhalation on reducing anxiety in patients with CVD.^[18] The current study aims to systematically review and determine the effects of aromatherapy with various herbs in patients undergoing coronary artery bypass surgery.

MATERIAL AND METHODS

Database search

Five English databases, including Web of Science, Scopus, PubMed, EMBASE, and Google Scholar, were used to find all published clinical papers related to the effects of aromatherapy on the patients with coronary artery bypass surgery without time limitation. All searches were based on the 06- PRISMA guideline and registered in the CAMARADES-NC3Rs Preclinical Systematic Review and Meta-Analysis Facility (SyRF) database;^[19] whereas the searched words and terms were: “aromatherapy,” “surgery,” “coronary artery bypass surgery,” “anxiety,” and “pain.”

Quality assessment and article selection

All searched studies were imported to the EndNote X9 software (Thomson Reuters, New York, NY, USA) and duplicate papers were deleted. Three independent authors read and evaluated the title and abstract of the studies and the related articles were included for further consideration; while corresponding author resolved any discrepancy among the authors. As inclusion criteria of this study, all clinical articles evaluating the effect of aromatherapy on patients with coronary artery bypass surgery were included in the study. On the other hand, the studies which presented insufficient data, studies with just an abstract of the article, articles in which there is no consistency between method and results, and papers with unreasonable results as well as misinterpretations were excluded from this review. The following information was extracted from each article separately: Authors, years, plant, factor, measurement scale, dosage, intervention process, results, and reference [Figure 1].

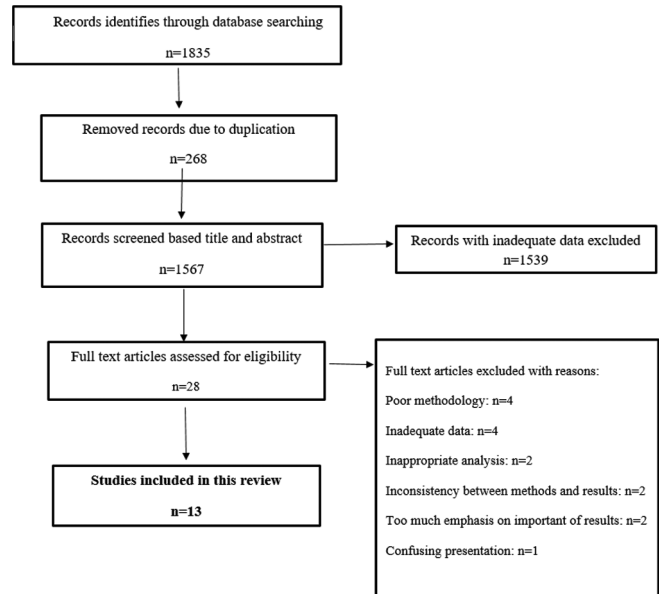


Figure 1: Flowchart describing the study design process.

RESULTS

Out of 1835 papers, 13 papers up to 2021, met the inclusion criteria for discussion in this systematic review with the data extracted IN Table 1. The most studies were carried out on effect of aromatherapy on anxiety of patients with CABG surgery (8 papers, 61.5%). The most common used essential oil was belonged to lavender essential oil (11 papers, 84.6%).

DISCUSSION

In 2015, Bikmoradi *et al.* use of lavender essential oil to evaluate the effects of aromatherapy on that aimed anxiety reduction patients after CABG. Sixty patients divided into two groups of control and aromatherapy. The aromatherapy group patients received two drops of 2% lavender essential oil for 20 min on the 2nd and 3rd days after surgery. They use the DASS-21 questionnaire before and after the intervention as measurement scale. The results showed that aromatherapy with lavender did not have much effect on reducing mental stress but can increase systolic blood pressure.^[20]

Hassanzadeh *et al.* have studied the effects of laundry essential oil on 80 patients who had a chest tube for duration of at least 24 h after CABG. They divided the patients into four groups of twenty. Group I: Applied cold with cooling gel pack. Group II: Inhaled lavender essential oil. Group III: Applied cold with cooling gel pack and inhaled lavender essential oil. Group IV: Did not receive either cold application or lavender oil inhalation. Pain intensity was measured using a vertical visual analog scale (VAS) and (SFM-MPQ) was used to evaluate pain quality during chest tube removal (CTR). In the aromatherapy group, patients were asked to hold a linen cloth

Table 1: List of studies on the effect of aromatherapy on patients with coronary artery bypass graft surgery.

Authors	Year	Plant	Factor	Measurement scale	Intervention process	Results	Ref
Bikmoradi <i>et al.</i>	2015	Lavender	Anxiety	Depression Anxiety and Stress Scale questionnaire 21	2 drops for 20 min on the 2nd and 3rd days after surgery	In this study, 60 men and women were used who were divided into two groups of control and aromatherapy. The results showed that aromatherapy with lavender did not have much effect on reducing mental stress but can increase systolic blood pressure	[20]
Hasanzadeh <i>et al.</i>	2016	Lavender	Anxiety	Modified-McGill pain questionnaire (SFM-MPQ) and the Spielberger situational anxiety level inventory (STAI)	1-2 drops for 20 min	The results showed that aromatherapy with lavender can be effective in reducing anxiety levels so that it can reduce anxiety levels by 38.2 ± 5.4 to 23.2 ± 3.8 . Lavender can also decrease pain intensity from 3.1 ± 1.3 before intervention to 1.6 ± 1.3 at 15 min after chest tube removal	[21]
Heidari <i>et al.</i>	2013	Lavender	Anxiety	Spielberger State Anxiety questionnaire	2 drops for 20 min	The data suggest that aromatherapy with lavender oil can reduce the anxiety score from 56.37 ± 5.6 to 54.73 ± 5.42 , while the level of anxiety in the control group has increased.	[22]
Hosseini <i>et al.</i>	2016	Lavender	Anxiety	Spielberger State Anxiety questionnaire	2 drops for 20 min	The results show that aromatherapy with lavender essence reduces anxiety score from 56.73 to 54.73 and can also reduce plasma cortisol levels from 16.76 to 14.88	[23]
Pourmovahed <i>et al.</i>	2016	Lavender	Anxiety	Spielberger State Anxiety questionnaire	2 drops for 20 min	In this study, 64 people were used and the outcome of the study was that aromatherapy with lavender extract can reduce the level of anxiety from 45.71 ± 14.27 to 39.53 ± 9.28 . For this reason, using lavender before surgery can be a good option to reduce anxiety.	[24]
Rajai <i>et al.</i>	2016	Lavender	Anxiety	Depression Anxiety Stress Scale questionnaire	2 drops on the morning of surgery	This study was performed on 60 people who undergoing coronary artery bypass graft surgery. The results showed that aromatherapy with lavender can reduce Anxiety from 7.23 to 6.80. It can also affect the heart rate and reduce the heart rate	[25]
Seifi <i>et al.</i>	2014	Lavender	Anxiety	Spielberger State Anxiety questionnaire	2 drops for 20 min on the 2nd and 3rd days after surgery	The results showed that inhalation aromatherapy with lavender had no significant effect on reducing anxiety in patients undergoing coronary artery bypass graft surgery	[26]
Fazlollahpour-Rokni <i>et al.</i> rose	2019	Rose	Anxiety	Spielberger State Anxiety questionnaire	3 drops for 10 min one night and 1 h before surgery	Aromatherapy with rose essential oil did not cause any significant differences in state anxiety ($P=0.41$), trait anxiety ($P=0.90$), and total anxiety ($P=0.69$)	[27]

(Contd...)

Table 1: (Continued)

Authors	Year	Plant	Factor	Measurement scale	Intervention process	Results	Ref
Heidari Gorji <i>et al.</i>	2015	Lavender	Pain perception intensity	Visual analog scale (VAS)	2 drops 15 min	The pain perception intensity in the case group was lower than that in the control group at the 30- and 60-min phases after intervention ($P < 0.0001$)	[28]
Ebrahimi Hosein Abadi	2018	Lavender	Hemodynamic Indices	Hemodynamic Indices	5 drops for 30 min after surgery	Among the hemodynamic indices tested, only the blood pressure of the patients was reduced by aromatherapy with lavender essential oil after CABG surgery; therefore, it can be used as a simple, complementary, and low-cost therapeutic intervention after CABG surgery to stabilize a patient's blood pressure	[29]
Babatabar Darzi <i>et al.</i>	2020	Lavender and rose	Extubation time, surgical site pain severity, and anxiety	The visual analog scale and Spielberger State Anxiety questionnaire	3 drops after triggering of the first inspiration	Aromatherapy can reduce extubation time, surgical site pain severity, and anxiety in patients undergoing OHS	[30]
Maghami <i>et al.</i>	2020	Peppermint	Nausea and vomiting	Four questions about the severity, frequency, and duration of nausea and the frequency of vomiting episodes	2 drops 30 min before tracheal extubation, 4 h, and 8 h after endotracheal tube removal.	Peppermint essential oil inhalation significantly reduced nausea and vomiting after open-heart surgery	[31]
Emami-Sigaroudi <i>et al.</i>	2021	Lavender and damask rose	Sleep quality	Demographic-clinical and Beck Depression Inventory (BDI) questionnaires.	2 drops every night for 5 consecutive nights at 22:00.	Although a relative improvement of sleep quality in intervention groups compared to the control group, but no significant effect was observed on any of delayed sleep, sleep duration, sleep efficiency, sleep disturbances, and use of sleep medications	[32]

soaked in two drops of lavender oil at a distance of 10 cm from their nose and breathe slowly for 10 min. Pain intensity was measured 10 min before, and immediately, 5, 10, and 15 min after CTR. The results showed that aromatherapy with lavender can be effective in reducing anxiety levels so that it can reduce anxiety levels by 38.2 ± 5.4 – 23.2 ± 3.8 . Lavender can also decrease pain intensity from 3.1 ± 1.3 before intervention to 1.6 ± 1.3 at 15 min after CTR.^[21]

In 2013, Heydari *et al.* have evaluated the effect of aromatherapy for measuring patients' anxiety level on 90 patients who underwent open heart surgery. The subjects in the intervention group inhaled two drops of lavender essential oil on the gauze for 20 min and the control group inhaled two drops of distilled water on the gauze at the same period time. They used Spielberger state anxiety

questionnaire for measuring patients' anxiety level. The data suggest that aromatherapy with lavender oil can reduce the anxiety score from 56.37 ± 5.6 to 54.73 ± 5.42 , while the level of anxiety in the control group has increased.^[22]

Hosseini *et al.* have demonstrated the effects of aromatherapy, the use of lavender essential oil, on anxiety and blood cortisol on 90 patients who candidates for open heart surgery into intervention and control groups. The intervention group inhaled two drops of lavender essential oil and the control group inhaled two drops of distilled water for 20 min. Two milliliters of blood were taken before and after the intervention to measure blood cortisol and used Spielberger State Anxiety questionnaire for measuring patients' anxiety level. Finally, the collected information is analyzed by Chi-square in the form of mean, SD, and frequency distribution,

independent *t*-test, paired *t*-test, and analysis of covariance, with a significance level of $P = 0.05$ to modify the pre-test scores. The results show that aromatherapy with lavender essence reduces anxiety score from 56.73 to 54.73 and can also reduce plasma cortisol levels from 16.76 to 14.88.^[23]

Pourmohad *et al.* have shown the effects of lavender essential oil on 64 patients who underwent CABG surgery. The intervention group inhaled two drops of lavender essential oil and the control group inhaled 2 drops of distilled water for 20 min. They used Spielberger State Anxiety questionnaire for measuring patients' anxiety level before and after intervention. The study showed the use of aromatherapy with lavender oil can reduce the level of anxiety from 45.71 ± 14.27 to 39.53 ± 9.28 .^[24]

Rajaei *et al.* have studied the effect of aromatherapy on anxiety and stress in patients undergoing coronary artery surgery. In this study, the effect of inhaling lavender essential oil on the physiological and psychological condition of patients was investigated. The study was performed on 60 patients in the Army Hospital. These patients were divided into two groups of 30 patients. The first group was tested for the scent of lavender and the second group inhaled natural air. The results of this study showed that aromatherapy is not very effective in terms of the effect of stress and other physiological variables, but it is an effective way to reduce heart rate and anxiety in heart patients before coronary artery surgery, and aromatherapy can be used as an effective and safe relaxation method before aggressive interactions.^[25]

Seifi *et al.* have demonstrated the effects of lavender essential oil on reducing anxiety in patients after CABG surgery. This study was a double-blind randomized controlled study on 60 patients that was performed in a 2-day intervention. Patients in the aromatherapy group inhaled two drops of 2% lavender essential oil 2nd and 3rd days after surgery for 20 min and in the control group inhaled two drops of distilled water as a placebo at the same period time like aromatherapy group. Anxiety level before and after the intervention was assessed by a questionnaire and vital signs were recorded. The results showed that it reduced patients' anxiety levels, although there was no statistically significant difference in the mean anxiety scores between aromatherapy and control groups and lavender essential oil after CABG surgery did not have a significant effect on patients' anxiety.^[26]

Recently, Fazlollahpour-Rokni *et al.* have studied the effect of aromatherapy inhalation with rose essential oil on the anxiety of patients undergoing CABG surgery. In this study, 66 patients were studied. The experimental group inhaled three drops of 4% rose essential oil for 10 min overnight and 1 h. Before the operation, the control group did not receive any intervention from the research team. Anxiety was measured before and 30 min after the intervention using a Spielberger. The results show inhalation aromatherapy

with rose essential oil cannot significantly reduce anxiety in CABG patients.^[27]

In 2015, in a clinical trial, Gorji *et al.* randomly divided 50 patients who were CABG candidates into two equal groups, the control group (25 patients) and the case group (25 patients). The case group received two drops of 2% lavender oil every 15 min with extra oxygen and the control group received only supplemental oxygen through the face mask. The pain perception intensity was measured with VAS and showed in the case group was lower than that in the control group at the 30- and 60-min phases after intervention ($P < 0.0001$).^[28]

In 2018, Hosseinabadi *et al.* have evaluated the effect of aromatherapy using lavender essential oil on hemodynamic parameters (systolic blood pressure, diastolic blood pressure, pulse rate, and respiration rate) of patients after CABG surgery was conducted by. In this study, 98 patients who were placed in a laboratory or placebo group 3 days after CABG surgery. The used five drops of lavender oil for intervention group to inhale and five drops of distilled water for the placebo group to inhaled for 30 min. Before and after the intervention, patients' hemodynamic indices were measured and recorded. The intervention was performed every 24 h for three consecutive days. Among the hemodynamic parameters tested, only the blood pressure of patients with lavender essential oil decreased after CABG surgery. Therefore, to stabilize the patient's blood pressure can be used as a simple, complementary, and intervention after CABG surgery.^[29]

A study conducted by Darzi *et al.* have performed to determine the effect of aromatherapy with rose and lavender on the patient after open heart surgery on 160 patients who were divided into four groups. One routine care group, the placebo group received a water-soaked cotton ball, and the other two groups received a cotton ball containing three drops of rose or lavender (0.2 ml). Anxiety was not significantly different between groups. The duration of tube removal and pain at the surgical site was significant in the rose and lavender groups compared with the control group. They used the VAS and Spielberger State Anxiety questionnaire for measuring patients' anxiety levels. As a result, aromatherapy can reduce the time it takes to come out, the severity of pain at the surgical site, and the anxiety in patients undergoing OHS.^[30]

Maghami *et al.* (2020) have evaluated the aromatherapy effects of peppermint essential oil on nausea and vomiting in 60 patients after cardiac surgery. In that study, patients in the intervention group received 0.1 ml of 10% peppermint essential oil aromatherapy for 30 min before tracheal extubation, 4 h, and 8 h after endotracheal tube removal. They result showed that significant differences were observed among the groups in regarding of the frequency of nausea,

nausea duration, and severity, and in the frequency of vomiting episodes in the first 4 h after extubation ($P < 0.05$).^[31]

Recently, in a clinical trial carried out by Emami-Sigaroudi (2021), 97 patients undergoing CABGr to inhale the lavender or damask rose randomly every night for 5 consecutive nights at 22:00; whereas the control group received normal nursing orders in line with the hospital practice. They reported that after 5-night aromatherapy a qualified improvement of sleep quality in intervention groups was observed in comparison to the control group; however, no significant effect was observed on any of delayed sleep, sleep duration, sleep efficiency, sleep disturbances, and use of sleep medications.^[32]

Considering the possible mechanisms of aromatherapy, the previous studies have demonstrated that aromatherapy stimulates the olfactory bulbs, results in the olfactory bulb to send signals to the hypothalamus.^[13] On the other hand, it can increase serotonin reuptake, endorphin, serotonin and noradrenaline secretion, inhibition of regulatory receptors controlling HT1B-5 in presynaptic cells, nerve irritability, neurogenesis, etc., which result in improving the severity of anxiety conditions.^[13,33]

CONCLUSION

The findings of the present investigation demonstrated that aromatherapy management particularly with lavender is able to significantly decrease anxiety, pain, nausea and vomiting, and sleep quality, Hemodynamic indices, blood pressure, and extubation time in patients with CABG surgery. However, more studies investigations are required to confirm the accurate mechanisms and side effects of the alternative treatment.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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