



The effects of aromatherapy on patients undergoing coronary angiography: a systematic review of clinical trials

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ABSTRACT

As a diagnostic and therapeutic technique for coronary artery disease, angiography is usually associated with some disorders and complications such as fear, pain, discomfort, limited mobility, and anxiety. The present study is a systematic review determining the effects of aromatherapy with different plants in patients undergoing angiography. This review was conducted according to the 06-PRISMA guideline and registered in the CAMARADES-NC3Rs Preclinical Systematic Review and Meta-Analysis Facility (SyRF) database. The English databases were Google Scholar, PubMed, Scopus, Web of Science, EBSCO, and ScienceDirect to search articles regarding the effects of aromatherapy with different plants in patients experiencing angiography without a date limitation. The searched keywords in this study were “aromatherapy”, “angiography”, “coronary artery disease”, “anxiety”, “stress”, and “cardiovascular diseases”. Out of 1835 papers, 20 papers up to 2021, met the inclusion criteria for discussion in this systematic review with the data extracted. Most studies were intended to evaluate the effect of aromatherapy on patients’ anxiety with coronary artery bypass graft surgery (11 papers, 55.0%). The most widely used essential oil belonged to the lavender essential oil (13 papers, 65.0%). The results of the current review confirmed that aromatherapy management with lavender, damask rose, orange, and peppermint is able to significantly decrease anxiety, pain, nausea and vomiting, sleep quality, hemodynamic indices, blood pressure, etc. in patients with coronary angiography. However, more investigation is required to confirm the precise mechanisms and side effects of the alternative treatment.

Implication for health policy/practice/research/medical education:

This review provides a detailed insight into that aromatherapy management particularly with lavender in decreasing anxiety, pain, nausea, vomiting, sleep quality, hemodynamic indices, blood pressure, etc. in patients with coronary angiography.

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Introduction

In recent years, despite noticeable advances in understanding the pathophysiology and risk factors for cardiovascular diseases, these diseases are still the leading cause of death worldwide (1). According to the American Heart Association statistics, cardiovascular diseases are the principal cause of death worldwide, with nearly 17.9 million deaths annually (2). Coronary artery disease (CAD) is a disorder when atherosclerotic plaque forms on the wall of the coronary arteries; consequently narrowing or blockage of the coronary

arteries, resulting in acute clinical symptoms such as angina and myocardial infarction (3). Today, diagnostic and therapeutic techniques have led to a remarkable reduction in mortality of these diseases (4). Angiography has the underlying method of coronary artery imaging for a long time with high diagnostic sensitivity. Despite non-invasive methods, invasive angiography is still the gold standard diagnostic method of CAD (5). Angiography is also an important technique to examine the extent of coronary artery occlusion and determine the appropriate treatment process (5,6). Angiography is usually associated

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with disorders and complications such as fear, pain, discomfort, limited mobility, and anxiety (7,8).

Increased anxiety in cardiovascular patients can lead to physical and psychological changes and negatively impact the heart (9). On the other hand, anxiety is associated with vascular endothelial dysfunction, increased respiration rate, increased heart rate, high blood pressure, and decreased immunity (9,10). Therefore, more attention is required to manage the effect of anxiety on patients' conditions and disruption of the angiography process (10).

In recent years, complementary and alternative therapies such as massage therapy, acupuncture, and aromatherapy have been widely used to reduce and manage anxiety in patients with cardiovascular diseases (11,12). Aromatherapy is one of the most common methods of complementary therapy utilizing aromatic plant essential oils for medical purposes, which is done by inhalation, compress, and bath with herbs and minerals, and is used to reduce pain, stress, and depression and improve hemodynamic variables (13). Previous studies revealed that following parasympathetic stimulation during aromatherapy, the secretion of endorphins increases leading to relaxation and improvement of the patient's anxiety (14,15).

Several studies have investigated aromatherapy with various essential oils as a non-invasive nursing intervention in different conditions, including the improvement of anxiety in patients undergoing angiography and stenting, hemodialysis, general surgery, reduction of cortisol concentration and cardiac parameters such as blood pressure and pulse rate (16). In addition, a number of studies have reported the positive effects of herb essential oil inhalation on reducing anxiety in patients with cardiovascular diseases (17). The present study is a systematic review determining the effects of aromatherapy with different plants in patients undergoing angiography.

Methods

Database search

This review was conducted according to the 06-PRISMA guideline and registered in the CAMARADES-NC3Rs Preclinical Systematic Review and Meta-Analysis Facility (SyRF) database (18).

The English databases were Google Scholar, PubMed, Scopus, Web of Science, EBSCO, and ScienceDirect to search articles regarding the effects of aromatherapy with different plants in patients undergoing angiography without a date limitation. The searched keywords in this study were "aromatherapy", "angiography", "coronary artery disease", "anxiety", "stress", and "cardiovascular diseases".

Quality assessment and article selection

The articles which assessed the effects of aromatherapy with different plants in patients undergoing angiography

were evaluated. Duplicate articles were deleted after importing studies into EndNote X9 (Thomson Reuters, New York, NY, USA). Then, the title and abstract of the articles were assessed by three independent authors; whereas, they selected the eligible articles that sufficiently met the inclusion criteria for further analysis. Exclusion criteria in the present review were articles with inadequate information and the ones in which the abstract was submitted in congresses as preceding papers, conferences, and editorials without full text. In addition, studies with poor methodology, inadequate data, inappropriate analysis, inconsistency between methods and results, too much emphasis on the importance of results, and confusing presentation were excluded from this review (Figure 1).

Data extraction

Three independent authors extracted the required information from the designated articles, and if there was any obligatory, the differences were resolved upon discussions with the corresponding author. The extracted data included the Authors' names, publication year, type of herbs, control group, evaluated factor, dose, intervention process, results, and reference.

Results and Discussion

Out of 1835 papers, 20 papers up to 2021 met the inclusion criteria for discussion in this systematic review with the data extracted (Table 1). Most studies were carried out upon aromatherapy's effect on patients' anxiety with coronary artery bypass graft surgery (11 papers, 55.0%). The most commonly used essential oil belonged to lavender oil (13 papers, 65.0%).

In a randomized clinical trial conducted by Abdi et al, the effect of aromatherapy with orange oil on the anxiety intensity of 78 patients with coronary angiography was evaluated (19). Patients' anxiety information was collected before and after inhalation using the Spielberg Anxiety Inventory and recorded the patients' vital signs. In this study, samples were randomly selected and divided into control (n=33) and intervention (n=35) groups (10 patients were excluded). The intervention group was given napkins (made of polyethylene), added 2 drops of orange oil, and asked to inhale for 20 minutes. The same process was repeated for the control group, except that the patients used distilled water instead of orange oil. After analyzing the obtained data, it was found that the mean anxiety scores of the intervention group before and after the intervention were 42.89 ± 9.03 and 36.26 ± 7.65 and in the control ones were 48 ± 11.12 and 41.21 ± 10.10 , respectively ($P < 0.05$). However, no noticeable difference was observed in the control group before and after inhalation ($P > 0.05$). Their results illustrated that aromatherapy with orange oil reduces the severity of anxiety in patients with coronary angiography.

Recently, Asgari et al compared the effect of acupressure

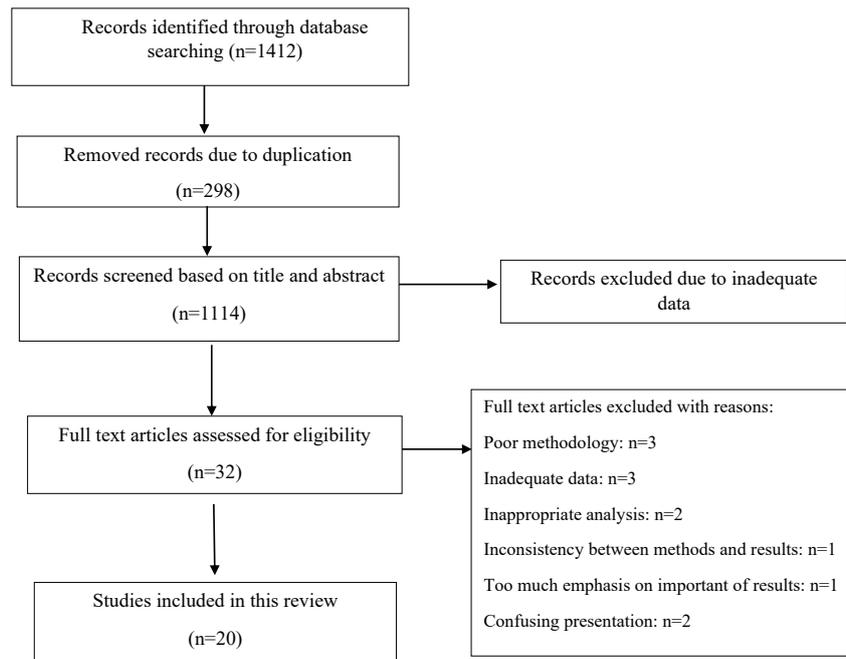


Figure 1. Flowchart describing the study design process.

and aromatherapy with *Citrus aurantium* on sleep quality in patients undergoing coronary skin treatment. In their study, 85 patients were divided into 5 groups: aromatherapy ($n = 17$), placebo aromatherapy ($n = 17$), acupressure ($n = 17$), acupressure with placebo ($n = 17$), and control ($n = 17$). Sleep quality of patients in each group was recorded before and after the intervention by the visual analog scale (VAS). The aromatherapy group was then given a cotton ball soaked in 2 drops of Citrus aurantium 10% and asked to inhale the essential oil deeply from 10 PM to 8 AM before percutaneous coronary intervention (PCI). They did the same for the control group and used sunflower oil for inhalation. For the acupressure group, they also identified points (HT7) and wore wristbands with plastic buttons around their wrists from 10 PM to 8 AM. For the acupressure group with placebo, the same wristbands were used and pressure was applied to a point that had no effect on the patient's sleep quality (points in front of HT7). No intervention was performed on the control group except normal nursing care. Data analysis showed that the mean scores before and after the intervention in the aromatherapy group were 2.91 ± 0.53 and 3.72 ± 1.84 , in the placebo aromatherapy group 2.84 ± 0.47 and 3.70 ± 1.83 , in the acupressure group 2.98 ± 0.59 and 7.35 ± 0.99 , in the acupressure group with placebo 2.75 ± 0.41 and 2.67 ± 0.41 , and in the control group 2.88 ± 0.41 and 2.72 ± 0.34 .

In this study, a significant relationship was observed between the five groups ($P < 0.05$) so that the sleep quality of patients in the acupressure group was improved more than other groups. According to the data, acupressure significantly increased the sleep quality of PCI patients

compared to aromatherapy with *C. aurantium* (20).

In a clinical trial carried out by Bikmoradi et al, it was found that aromatherapy with rose Damask essential oil reduced the severity of anxiety in patients with coronary angiography. In this study, 98 patients were divided into aromatherapy ($n = 49$) and control ($n = 49$) groups and asked to complete the Standard Characteristic and Positive Anxiety Inventory (STAI) before and after angiography. The aromatherapy group was given a piece of cloth soaked in 5 drops of 40% Damask rose essential oil and asked to inhale it for 20 minutes. They did the same for the control group, except that they used distilled water instead of Damask rose essential oil. After reviewing the obtained data, it was found that the mean anxiety scores of the aromatherapy group before and after the intervention were $37/73 \pm 13/34$ and 35.2 ± 9.92 , and in the control group were 37.08 ± 12.14 and 35.2 ± 9.92 , respectively ($P < 0.05$) (21).

In another study (22), 98 patients were divided into control and intervention groups. Data on stress, anxiety and hemodynamic measurements of the groups were collected before and after coronary angiography using the DASS-21 questionnaire. The intervention group was given a piece of cloth soaked in 5 drops of 40% Damask rose essential oil to inhale for 20 minutes before angiography and the control group was given a piece of cloth soaked in 5 drops of distilled water to inhale for 20 minutes. A significant difference was observed between anxiety and stress in both groups ($P < 0.05$). It was also found that there was a significant difference in mean arterial pressure ($P = 0.001$), systolic pressure ($P = 0.003$), diastolic blood pressure ($P = 0.001$), heart rate ($P = 0.001$), and SpO₂

Table 1. List of studies on the effect of aromatherapy on patients undergoing coronary angiography

Authors and year	Herbs	Control group	Evaluated factor	Dosage	Intervention process	Results	Ref
Abdi et al, 2018	Orange essence	Sterile water	Anxiety	2 Drops	For 20 minutes	Measurement of anxiety level with Spielberger state –trait anxiety scale before and after aromatherapy showed that in 35 patients in the experimental group, orange essence collapsed anxiety levels after coronary angiography and reduced anxiety levels from 42.89 ± 9.03 to 36.26 ± 7.65 .	(19)
Asgari et al, 2020	<i>Citrus aurantium</i>	Placebo	Sleep quality	2 Drops	Two to three deep breaths	Aromatherapy with <i>Citrus aurantium</i> could increase sleep quality.	(20)
Bikmoradi et al, 2020	Damask rose	Distilled water	Anxiety	5 Drops	For 20 minutes	Aromatherapy with Damask rose could reduce the level of anxiety from 13.34 ± 37.73 before aromatherapy to 8.76 ± 32 after aromatherapy, while in the control group the anxiety decreased from 12.14 ± 37.08 to 9.92 ± 35.2 ($P < 0.05$).	(21)
Bikmoradi et al, 2021	Damask rose	Distilled water	Stress, anxiety and hemodynamic parameters	5 Drops	For 20 minutes	This study was performed on 98 patients candidate for coronary angiography. Anxiety, stress levels ,and hemodynamic parameters were measured with DASS-21 questionnaire and checklist. Damask rose could reduce anxiety and stress levels and improve hemodynamic parameters.	(22)
Cho et al, 2013	Lavender, Roman chamomile, and Neroli essential oils	None	Anxiety, vital signs, and sleep quality	2 Drops	10 deep breaths, before and after PCI	Aromatherapy reduced anxiety levels from 5.10 to 0.36, while anxiety levels increased in the control group. Also, the quality of sleep in the experimental group increased significantly compared to the control group.	(23)
Kim et al, 2014	Bergamot, Lavender and Ylang Ylang essential oils	None	Anxiety ,state of sleep and satisfaction of sleep	3 Drops	For 5 minutes	Aromatherapy with lavender essential oil, Bergamot and Ylang could reduce anxiety level from $46.67 \pm 11.76\%$ to $39.00 \pm 7.35\%$ and increased sleep satisfaction.	(24)
Koohestani et al, 2020	Peppermint oil	Placebo	Anxiety	0.2 mL	For 20 minutes	Peppermint oil aromatherapy on 80 patients who were candidates for angiography could reduce the level of anxiety from 51.95 ± 5.12 to 47.87 ± 6.12 in the experimental group while in the control group there was no change ($P < 0.05$).	(25)
Moradi et al, 2021	<i>Citrus aurantium</i> essential oil	Distilled water	Anxiety	4 mL	For 15-20 minutes	Aromatherapy could reduce anxiety, systolic blood pressure, diastolic blood pressure, pulse rate, and respiratory rate in the experimental group.	(26)
Panjalizadeh et al, 2019	Lavender oil	Sterile water	Blood pressure and heart rate	5 Drops	For 5 minutes	The results obtained in 80 patients revealed that 30 minutes after aromatherapy with lavender oil could reduce blood pressure, heart rate, and systolic and diastolic blood pressures.	(27)
Pourmirzaie et al, 2017	Lavender extract	Placebo	Hemodynamic indices	2 Drops	For 20 minutes	The results obtained by the Spielberger questionnaire demonstrated that lavender extract could be effective in reducing hemodynamic indices such as blood pressure and respiratory rate.	(28)
Song et al, 2018	Lavender, Ylang-Ylang, and Neroli oil	None	Stress responses, Autonomic nervous system, and blood pressure	3 Drops	Deep breaths	Aromatherapy lowered stress score from 4.41 before the intervention to 0.28 in 4 hours after the intervention and could also reduce systolic blood pressure from 122.21 to 112.35, with no effect on control group.	(29)
Tahmasebi et al, 2015	Lavender	None	Anxiety	2 Drops	For 3 minutes	Covert anxiety was not observed in the experimental group after aromatherapy.	(30)

Table 1. Continued

Authors and year	Herbs	Control group	Evaluated factor	Dosage	Intervention process	Results	Ref
Tahmasebi et al, 2015	Lavender	None	Diastolic and systolic blood pressure, pulse rate and respiratory rate	3 Drops	For 3 minutes	Anxiety reduction by lavender aromatherapy from 47.67 to 44.18, while in the control group no change was seen. Also, other physiological indicators such as heart rate were significantly reduced.	(31)
Tahmasebi et al, 2016	Lavender essential oil	None	Vital signs	3 Drops	For 3 minutes	Aromatherapy with lavender decreased the pulse number from 74.9 to 71.9 and reduced the number of respiratory rate from 18.3 to 17.1. Also, aromatherapy reduced systolic and diastolic blood pressure.	(32)
Tazakori et al, 2016	Damask rose	Placebo	Anxiety	15 Drops	3 times every 8 hours	Aromatherapy with Damask rose could reduce the level of anxiety from 33.91 to 32.12 in the experimental group. Aromatherapy also reduced systolic and diastolic blood pressure and increased peripheral oxygen saturation (SpO ₂).	(33)
Teymouri et al, 2020	Lavender essential oil	Placebo	Stress and anxiety	2 Drops	For 20 minutes	Aromatherapy in these patients reduced anxiety from 46.31 to 30.68 and reduced stress from 14.48 to 9.57.	(34)
Ziyaeifard et al, 2017	Lavender essential oil	Distilled water	Anxiety and pain	5 Drops	For 5 minutes	After inhaling lavender extract, 80% of patients in the experimental group did not have anxiety, while in the control group only 20% were not anxious.	(35)
Ziyaeifard et al, 2017	Lavender essential oil	Distilled water	Blood pressure and heart rate	5 Drops	For 5 minutes	Aromatherapy could reduce systolic blood pressure in the experimental group from 124.13 to 118.38 mm Hg. It also reduces diastolic blood pressure from 80.83 mm Hg to 79.25 mm Hg. Finally, aromatherapy with lavender was effective in reducing heart rate after angiography.	(36)
Rafi et al, 2020	Lavender	Essential oil	Quality of sleep	15 Drops	24 Hours before intervention	The quality of sleep in the intervention group improved remarkably in comparison with the control group ($P < 0.001$).	(37)
Otaghi et al, 2017	Lavender	Essential oil	Quality of sleep	15 drops	24 Hours prior to angiography and every 8 hours	No statistically noticeable difference was observed in the case or control groups with respect to sleep quality before and after the intervention ($P > 0.05$).	(38)

($P=0.02$) between the two groups ($P<0.05$). The findings showed that aromatherapy with Damask rose essential oil reduced the severity of anxiety and stress and improved hemodynamic parameters in patients with coronary angiography.

In a study, the members of the intervention group were given an aromatic stone impregnated with 2 drops of an essential blended oils, including lavender, Roman chamomile and neroli in ratios of 6: 2: 0.5 and asked to breathe before and after the intervention with 10 deeply-inhaled breaths. For the control group, only nursing care was performed. The alteration rate of anxiety scores in the intervention group was 5.10 but in the control group was 2.07. The results showed that aromatherapy with lavender essential oil, chamomile, tumeric and neroli (*Citrus aurantium*) improved the severity of anxiety and sleep quality and lowered the extension of clinical symptoms in PCI patients (32).

In a study, the intervention group was given a gauze infused with 3 drops of Bergamot, Lavender and Ylang Ylang essential oils in 3: 3: 1 ratio and asked to inhale the essential oils from a distance of 3 cm for 5 minutes. The controls simply received nursing care. The anxiety intensity of the intervention group decreased from 46.67 ± 11.76 percent to 39.00 ± 7.35 percent, but in the control group from 43.14 ± 13.81 percent to 46.14 ± 11.85 percent ($P<0.05$).

During a randomized clinical trial, peppermint essential oil aromatherapy had the ability to reduce the severity of anxiety in patients with coronary angiography (25). The patients in the intervention group were given an eye pad soaked in 0.02 mL of peppermint essential oil and asked to inhale the essential oil for 20 minutes and then attached the pad to the patients' clothes. Controls received the same with 0.02 mL normal saline. The anxiety in the intervention group decreased significantly compared to the control group ($P<0.05$).

In 2021, Moradi et al in a randomized controlled trial examined the effect of aromatherapy with *C. aurantium* essential oil on the severity of anxiety in patients with coronary angiography (26). About 1 hour before angiography, the intervention group was given cotton wool impregnated with 4 ml of *C. aurantium* essential oil and asked to inhale it for 15 to 20 minutes. The control group received the same with distilled water. The findings of this study showed that aromatherapy with *C. aurantium* essential oil could improve the anxiety of coronary angiography patients.

In a study, the intervention group received cotton swabs soaked in 5 drops of lavender oil to inhale for 5 minutes at a distance of 5 cm. The same procedure was performed on the benzodiazepine group with distilled water, except that patients were given 10 mg of oxazepam the night before angiography. No significant difference was observed between the two groups in terms of vital signs (heart rate, systolic pressure, diastolic pressure, etc) ($P>0.05$) (27).

In another study, lavender essential oil aromatherapy could improve patients' hemodynamic parameters at the time of Sheath's departure after cardiac angiography (28). In this study, patients were asked to complete a Spielberger questionnaire related to vital signs before, 10, and 20 minutes after the intervention. Four hours after angiography, the experimental group was given 20% cotton soaked in 2 drops of lavender essential oil and patients were asked to inhale it for 20 minutes from a distance of 5 cm. Same procedure was performed on the control group with distilled water. The number of breaths ($P=0.001$) and diastolic pressure ($P=0.001$) at 10 and 20 minutes after inhalation significantly improved ($P<0.05$) compared to the control group.

In a non-randomized study, aromatherapy with lavender, ylang-ylang, and neroli essential oils improved stress response, autonomic nervous system (ANS) function, and blood pressure in patients who underwent coronary angiography (29). The intervention group in the first treatment was given as an aromatic stone impregnated with 1 drop of a mixture of essential oils in a ratio of 4: 2: 1. In the second treatment, patients were given 3 drops of essential compound oils in a ratio of 4: 2: 1. The control group received only nursing care. ANS activity ($P=0.005$), stress parameters ($P=0.016$), and vital signs, such as systolic ($P=0.14$) and diastolic ($P=0.001$) blood pressure after inhalation (4 hours after the second treatment), significantly decreased in the intervention group compared to the control group ($P<0.05$).

In another study, lavender extract was given to the subject group by a cotton wool impregnated with 10 mL of *Lavandula* essential oil and asking them to inhale the essential oil from a distance of 5 cm for 3 minutes. The control group received the same with distilled water. The level of anxiety and hemodynamic parameters in the subject group significantly decreased in comparison with the control group ($P<0.05$) (30).

In a study, patients in the aromatherapy group were given 3 drops of *Lavandula* impregnated cotton and asked to inhale the essential oil for 5 minutes at a distance of 5 cm. The mean anxiety in the aromatherapy group after inhalation decreased from 47.67 to 44.18 and the mean anxiety in the relaxation group decreased from 46.09 to 43.09 after inhalation. The researchers found that aromatherapy with *Lavandula* essential oil could reduce anxiety and slightly improved hemodynamic parameters (heart rate, blood pressure, etc) in coronary angiography patients (31). In another study by this group the vital signs in patients with coronary angiography were improved (32).

A clinical trial with Damask rose on the severity of anxiety was conducted by Tazakori et al, and found that this essential oil could reduce the severity of anxiety in patients with coronary angiography (33). In this study, the intervention group 15 drops of Damask rose essential oil with water were given to the patients 3 times every 8 hours

to inhale. The level of anxiety in the was significantly reduced in the intervention group ($P < 0.05$). Furthermore, vital signs such as systolic and diastolic blood pressure, and oxygen saturation in the intervention group were improved after inhalation ($P < 0.05$). In another study, aromatherapy with lavender extract reduced the severity of anxiety and stress after sheath removal in patients following coronary angiography (34). In this study, there was a noticeable difference between the two groups before and after the intervention in favor of lavender ($P < 0.05$). In a similar study, the case group inhaled lavender oil during angiography and the control group received 1 mg of lorazepam the night before surgery. After lavender oil aromatherapy, hemodynamic parameters such as systolic and diastolic blood pressure and heart rate, significantly decreased in the intervention group compared to the control group ($P < 0.05$).

In another clinical trial on 80 patients, the intervention group who inhaled lavender, demonstrated lower anxiety compared to the control group ($P < 0.05$). Data collection method included 3 forms of demographic information, Spielberger standard questionnaire and visual analog pain scale that were recorded by both groups before and after aromatherapy.

In a recent clinical trial, lavender essential oil could improve sleep quality in patients after angiography ($P < 0.05$) (37). In another clinical trial, the same results were obtained when lavender essential oil inhalation was evaluated on sleep quality of 60 patients seeking angiography (38).

Concerning the chemical composition of the essential oil of lavender as the most prevalent plant for aromatherapy, the studies have shown that the main components of lavender essential oil are monoterpenes such as linalool, linalyl acetate, β -caryophyllene (39). Previously, studies demonstrated that these monoterpenes are able to show nerve-calming activity through modulating the N-methyl-D-aspartate (NMDA) receptors, neurochemicals categorized as ionotropic glutamate receptors (iGLURs), which are involved in some neurological and psychiatric conditions, including epilepsy and parkinsonism (40,41). In addition, the antidepressant and anxiolytic activities of lavender are related to its role as an inhibitor on the NMDA-receptors and inhibition of serotonin transporter (42). Regarding the promising mechanisms of aromatherapy, previous studies have demonstrated three likely mechanisms in which aromatherapy may affect brain functioning: (i) the activation of nasal olfactory chemoreceptors and the consequent effect of olfactory signals on the brain. The olfactory system is well-known as a unique system between the sensory systems for having direct anatomical and functional contacts with the limbic system. Consequently, olfactory stimuli can have a potent effect on mood; (ii) the direct diffusion of essential oil molecules through the olfactory nerve into

connected brain parts and the stimulation of cellular and molecular procedures; (iii) the alveolar absorption of essential oil molecules into the blood circulation, passing the blood-brain barrier to act with particular brain areas (43). Aromatherapy with essential oils can elaborate 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 (44).

Limitations

The main limitations of the present study are the lack of chemical composition and phytochemical analysis on most herbs to identify the main components of the plant, the lack of basic mechanisms of aromatherapy in all clinical studies.

Conclusion

The results of the current review confirmed that aromatherapy management with lavender, damask rose, orange, and peppermint is able to significantly decrease anxiety, pain, nausea and vomiting, sleep quality, hemodynamic indices, blood pressure, etc, in patients with coronary angiography. However, more investigation is required to confirm the accurate mechanisms and side effects of the alternative treatment.

Authors' contributions

AA, SN, MK, MA, and NM reviewed and contributed to data collection and preparation of the manuscript. The first draft was prepared by SN, and NM. All authors read the final version and confirmed it for publication.

Conflict of interests

The authors declared no competing interests.

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication and etc) have been completely observed by the authors.

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