

Application Progress of Aromatherapy in Perioperative Patients

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Abstract: Aromatherapy is a sort of natural therapy for body maintenance using essential oils and vegetable oils extracted from natural plants. It belongs to the category of homeopathy. Aromatherapy combines the dual functions of art and treatment, comprehensively considers the needs of human physiology and psychology, and is widely used in the field of medical care. Aromatherapy is one of the complementary and alternative treatments extensively studied at home and abroad. It has a relieving effect on postoperative pain, sleep disturbance, nausea, vomiting and preoperative anxiety, and is an important intervention in perioperative care. A large number of research data show that for a long time, the application of aromatherapy is an effective alternative and auxiliary medical means, which can improve people's comfort and solve many health problems. There are a lot of controversies about the possible risks and safety of aromatherapy, but in general, compared with traditional drugs for the treatment of some diseases, aromatherapy is safe and has few records of serious side effects. This review intends to provide an overview of aromatherapy and its application status in the perioperative period, in order to provide a reference for improving the comfort and quality of life of patients in the perioperative period.

Keywords: Aromatherapy; anxiety; sleep disorders; pain; nausea and vomiting

1 Introduction

According to reports, more than 312.9 million surgeries are performed globally each year [1]. With the increase in the number of operations, while restoring physical health, non-drug therapy to promote physical and mental health and improve comfort of patients also presents challenges to current perioperative care.

Complementary and alternative medicine (CAM), as adjuvant therapy, refers to supplementing or replacing mainstream medicine with non-mainstream medicine. Aromatherapy is one of them. Its theoretical basis is Nightingale's environmental theory, which refers to human health as the center



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and believes that a patient is an individual in the process of repairing who is strongly affected by the environment. Nursing activities can improve repair processes and promote health by altering a single element or elements in the environment, such as the use of aromatic essential oils [2]. Several studies have shown that aromatherapy can relieve anxiety, dysmenorrhea, menopausal symptoms, nausea, vomiting, pain, and sleep disturbances in patients [3–8]. A study [9] from the Department of Anesthesiology at Yale University found that more than 70% of surgical patients were willing to use CAM to relieve the stress of perioperative complications, and clinicians in over 30 countries have been authorized to use CAM in holistic care [10].

The CAM therapy system mainly consists of four categories: body-mind therapy, natural product therapy, body adjustment therapy and energy therapy. Body-mind therapy includes meditation, biofeedback, tai chi, qigong, yoga, and prayer. Energy therapy includes Reiki therapy, Qigong and contact therapy. At present, countries around the world attach great importance to CAM, and many universities medical schools have established CAM research centers. A lot of medical schools in the United States, Canada, Germany and other western countries have opened CAM courses and incorporated them into the training programs of residents and family doctors. Surveys show that in developed countries and regions, about 20% to 65% of patients have received CAM every year, or self-treatment of CAM at home.

CAM is an outside of mainstream medicine that complements mainstream medicine and provides methods of diagnosis, treatment and prevention that mainstream medicine cannot provide. These approaches diversify the concept of medicine and contribute to the medical profession. The National Center for Complementary and Alternative Medicine (NCCAM) went on to define CAM as medical practice that is not currently considered an integral part of mainstream medicine. This definition implies that CAM is the practice of medicine which is proven safe and effective and has the potential to be integrated into mainstream medicine.

The rest of the paper is organized as follows. Section 2 mainly introduces the concept of complementary and alternative medicine. Section 3 introduces the overview of aromatherapy. Section 4 introduces the application of aromatherapy in perioperative period. Section 5 gives a final summary.

2 Complementary and Alternative Medicine

Complementary and alternative medicine is an ancient medical practice. About 80% of the world's population uses complementary replacement therapy as a form of primary health care [11–16]. In developing countries, where medicinal plants are abundant, using complementary and alternative therapies to treat diseases may be the only treatment option available to some groups. Studies have shown that complementary and alternative therapies have beneficial effects on human health.

The Office of Alternative Medicine (OAM) was added to the National Institutes of Health (NIH) in America in 1992 with the goal and mission of positively evaluating traditional medicine, which has been rejected by modern medicine [17]. In 1998, OAM was promoted to the National Center for Complementary and Alternative Medicine (NCCAM), becoming one of NIH's 27 research centers. NCCAM is now renamed National Center for Complementary and Integrative Health (NCCIH). The NIH officially names Traditional and Folk Medicine as Complementary and Alternative Medicine. The NCCIH defines CAM as a medical practice that is not currently considered an integral part of mainstream medicine.

Currently, the use of CAM is more and more wide in the world. In CAM therapy, traditional Chinese medicine treatment methods such as acupuncture, herbal medicine, and massage are important

parts of CAM. According to World Health Organization (WHO) regional offices statistics, in Europe, there are more than 100 million people who use CAM, and one-fifth of them use CAM regularly [18–20]. In Asia, Africa, Australia and other countries and regions, there are more CAM users. And 86% and 76% of the population still use CAM regularly in Korea and Singapore. 59 million Americans had tried some kind of alternative therapy in 2012, and Americans spent \$30.2 billion on alternative therapy according to a 2012 report jointly released by the NCCIH and the Centers for Disease Control in the United States.

In order to advance traditional and complementary medicine in many Member States, significant efforts have made by WHO since 2000. The *WHO Traditional Medicine Strategy 2002–2005* established policies for Member States to facilitate the safe and effective use of CAM. The number of Member States implementing traditional medicine policies increased from 25 in 1999 to 69 in 2012, and the number of Member States managing herbal medicines increased from 65 to 119 according to the first WHO global survey in 2005 and the second in 2012. WHO formulated the *Traditional Medicine Strategy 2014–2023* to promote the global integration of CAM into health systems in 2013. And put forward three strategic goals and four main goals: including formulating and implementing national traditional medicine policies and plans, improving the safety, effectiveness and quality of traditional medicine, improving the accessibility of traditional medicine to the population, and rationalizing the use of traditional medicine therapy, etc.

There is no doubt that WHO's traditional medicine strategy has played a crucial role in promoting CAM in various countries. For example, in 2016, under the promotion of WHO's traditional medicine strategy, China issued the first national strategy of traditional Chinese medicine-the outline of the strategic plan for the development of traditional Chinese medicine (2016–2030). Standing at the height of the country and the nation, the guiding ideology, basic principles and main tasks of the development of traditional Chinese medicine have been clarified. In 2006, Brazil enacted a law to name traditional Chinese medicine, acupuncture, homeopathy, medicinal plants and herbs in the Unified Health System (SUS) as Complementary and Alternative Medicine. The overall frequency of complementary and alternative therapies used in Brazil was 4.5%. The northern and southern regions have the highest prevalence of homeopathy use. The survey found that women over the age of 40 with a higher education were the most frequent use of homeopathy.

The number of Member States offering higher education programmes in traditional and complementary medicine rose to 39, according to the second WHO Global Survey of Traditional Medicine. At least 75 medical schools in the United States have set up CAM courses, including acupuncture, massage, massage, herbal medicine and natural remedies. In 1978, Japan's Ministry of Education, Culture, Sports and Tourism officially approved the establishment of the world's first formal acupuncture university-Meiji University of Acupuncture and Moxibustion. There are more than 80 comprehensive university medical departments and medical schools offering traditional Kampo medicine courses. All six systems of traditional medicine officially recognized in India have an institutionalized education system, with 508 associated colleges capable of enrolling 25,000 undergraduates each year, and 117 also enrolling postgraduates. Traditional medicine has been incorporated into the curriculum of pharmacy and medical students in various universities including Economic Community of West African States (ECOWAS), Democratic Republic of Congo, South Africa, Tanzania, etc.

3 Aromatherapy

Aromatherapy is the extraction of spices or essential oils from aromatic plants, which are absorbed by the body through the skin or through the sense of smell. The purpose is to prevent and treat diseases,

balance the functions of the zang-fu organs, and strengthen the body [21]. Plants include seeds, stems, leaves, needles, petals, flowers, peels, fruits, wood, resins, roots and rhizomes, and grasses, and essential oils are extracted by distillation or mechanical cold pressing [22]. The absorption routes of essential oils include inhalation, external application, internal use (such as mouthwash, suppository, lavage, etc.), oral use (such as capsules, honey dilution, etc.) [23]. Inhalation as the preferred route is easy to implement and has a rapid onset of action. Drop 1–2 drops on a paper towel, inhale the aroma, or diffuse the essential oil into the air using heat, water and atomization, and better absorb the essential oil molecules through the mucous membrane [24]. Its mechanism of action has not been fully established, but it is speculated that aroma activates the limbic system while activating olfactory neurons. Different aromas release different neurotransmitters, including enkephalins, endorphins, norepinephrine, and serotonin, which relieve pain and induce a healthy, relaxed feeling [25]. The famous French chemist Rene Maurice Gattefossé first proposed the concept of “aromatherapy” in 1928, and published a monograph named “aromatherapy” in 1936 [26]. Then, aromatherapy began to prevail in Europe and was widely used in integrative medicine. Including lavender, which has been shown to have sedative, hypnotic, and anxiety-relieving and pain-relieving effects in many studies [6,27], peppermint, lemon, and ginger that can relieve nausea and vomiting [28,29], frankincense essential oil, which has a relieving effect on cancer-related fatigue, etc. [30]. For the French, it is considered a medical specialty, while the British understand it as an integrative complementary practice (ICP), which is also used as a supplement in the United States and Australia [31].

In a broad sense, aromatherapy is the use of aromatic medicines or aromatic plant essential oils to prevent and treat diseases. Specifically, it is to extract volatile aromatic substances from the flowers, leaves, stems, roots or fruits of plants to make essential oils. Using fumigation, bathing, scraping, massage and other methods, through the sensory function of the human body, it is used to improve physical and mental comfort. The taste and function of essential oils are due to their different chemical compositions [32–34]. For example, alcohol-containing plant essential oils are fragrant and have refreshing and exciting, good antiseptic and antiviral functions; most of aldehyde-containing plant essential oils have the fragrance of citrus plants, which have calming and soothing effects and can effectively relax the nervous system; most plant oils containing esters have a strong fruity aroma and are often used to soothe and balance; most plant oils containing ketones are toxic, but ketones are believed to reduce congestion, reduce mucus secretion and heal scar tissue; phenol-containing plant essential oils have bactericidal and invigorating effects, but are irritating to the skin; alkene-containing plant essential oils have antiviral, antiseptic, anti-inflammatory and bactericidal properties; oxidized plant essential oils can solve some respiratory problems, especially eucalyptus essential oils mostly have expectorant properties.

The main routes of administration of essential oils are oral, intestinal, vaginal, topical skin (massage) and inhalation routes. Studies have shown that essential oils are generally rapidly absorbed after oral administration and enter the blood circulation through the portal vein. Other routes of application of essential oils are not as well absorbed as the oral route [35,36]. However, from a safety point of view, inhalation and topical skin administration are relatively safe and effective, because the inhalation and topical skin administration are limited in body absorption and are easy to control.

The aroma inhalation method can be summarized as atomization release, heating release, normal temperature release and so on.

- 1) Atomized release: Aromatic atomization inhalation therapy is currently a commonly used method for the treatment of respiratory sub health and other diseases. Different atomizers use the principle of gas jet to impact the liquid into tiny particles suspended in the airflow,

enter the respiratory system, and perform local humidification. At the same time, adding targeted aromatic substances into the atomized liquid can achieve local therapeutic purposes such as stabilizing emotions, improving mentality, anti-inflammatory, antispasmodic, and expectorant.

- 2) Heat release: Heating with an open flame, that is, after heating the aromatic substance with an open flame heat source, the aroma is released. This process is generally used in a small area indoors. Considering safety, it has now faded out of the market. There is also an electric heat source heating method, which currently occupies a large proportion in the market. When the electric heater is connected to the power supply, the positive temperature coefficient resistor (PTCR) element starts to heat up, so that the temperature is constant in the best release state of the natural fragrance.
- 3) Release at room temperature: The most representative examples of aroma release at room temperature are households, public places, office environments, and automotive supplies. The product utilizes capillaries similar to wick cellulose substances to attract aromas from the container to the air to disperse aromas or use sols to release aromas slowly, which is called normal temperature aroma release.

With the development and progress of science and technology in modern society, the products and application methods of aromatherapy have undergone tremendous changes. The method of applying aromatherapy in traditional Chinese medicine has also expanded on the basis of following traditional methods.

4 Application of Aromatherapy in Perioperative Period

4.1 Anxiety

Ramsay et al. [37,38] found in their studies that preoperative anxiety was caused by patients' worries about disease, hospitalization, anesthesia, surgery and unknown uncertainties. Considered a potential, preventable risk factor for postoperative complications. A randomized controlled trial (RCT) of 80 breast cancer patients found that inhalation of a gauze bandage with 3 to 4 drop of lavender essential oil for 20 min on the morning of surgery reduced preoperative anxiety levels [39]. Huang et al. analyzed 10 clinical studies of aromatherapy for preoperative anxiety, including 750 patients. The results showed that patients using aromatherapy before surgery had lower levels of anxiety than those who using placebo or no intervention, and none of the studies showed adverse effects of aromatherapy. On the other hand, the authors stated that due to the lack of standardization in the use of aromatherapy, the heterogeneity among studies is large, and further high-quality study designs are needed to determine the conclusions [3]. In a single-blind, randomized, prospective study, patients who inhaled 0.1 or 0.3 ml of lavender essential oil dissolved in 120 ml of water one hour before surgery had no effect on preoperative anxiety in orthognathic surgery patients compared with no intervention. The authors pointed out that future research needs to pay more attention to different inhalation time and essential oil concentration [40].

4.2 Nausea and Vomiting

Nausea, a feeling of discomfort in the upper abdomen, often accompanied by vomiting, is one of the most common side effects of surgery and all anaesthesia. Not only does it cause discomfort to the patient, but it may also lead to dehydration, electrolyte disturbances, increased tension at the incision suture, esophageal tears, hypotension, and increased postoperative resuscitation room time [41]. Hines et al. [42] systematically evaluated the efficacy of 16 cases of aromatherapy in postoperative

nausea and vomiting. Their results showed that isopropanol vapor inhalation can rapidly relieve short-term nausea and reduce the use of antiemetics in adults, but the level of evidence is low, and it is recommended when antiemetics are not available or the patient refuses to use them. Wazqar et al. [43] conducted a study of aromatherapy to relieve postoperative nausea and vomiting in patients with gynecological malignant tumors. 202 patients were divided into experimental group and control group according to odd and even room numbers. Lemon juice was dripped near the bed unit of the experimental group, lemon slices were placed on the bedside table, and the control group received routine nursing care. Postoperative nausea and vomiting visual analogue scale (VAS) were used for scoring. The results demonstrated that the scores decreased compared with the control group at 6 and 12 h after the operation, and the patient satisfaction was high, and it was hoped that they could continue to use it. The authors suggest that lemon juice is irritating to a certain extent, and care should be taken not to touch the patient's mucous membranes and eyes when using it.

4.3 Pain

In the Warfield and Kahn study, 75% of patients reported postoperative pain, and 80% rated postoperative pain as moderate to severe [44]. For medical staff, it is obviously not enough to focus only on pain intensity, but also on the overall quality of life of patients. Postoperative pain can lead not only to difficulty sleeping, increased opioid use, lower satisfaction, and even longer hospital stays. Kim et al. [45] compared the analgesic effect of lavender inhalation in 50 patients after breast biopsy. The intervention group was given an oxygen mask to inhale 2 drops of 2% lavender essential oil, while the control group was given conventional oxygen inhalation. Pain visual analog scale and pain control satisfaction were evaluated at 5 min, 30 min and 60 min after operation, respectively. The results showed that there was no significant difference in the pain score between the intervention group and the control group, while the intervention group was significantly more satisfied with pain control than the control group [46–50]. In another single-blind, randomized clinical trial, Seifi et al. confirmed that aromatherapy can relieve pain after coronary artery bypass grafting, but they pointed out that it is only effective in the short-term, and the long-term effect needs further research [5].

4.4 Sleep Disorder

A RCT by Ayik et al. [51] included 80 patients with colorectal surgery. The intervention group used 5% lavender essential oil to massage for 10 min at 19:00–21:00 one day before surgery and 6:30–8:00 in the morning of surgery, while the control group had no intervention. The two groups filled out the Anxiety State Inventory (SAI) and Richard-Campbell Sleep Scale at 16:00–17:00 on the 1st day before surgery and from 6:30–8:00 in the morning of surgery to evaluate the anxiety level and sleep quality of the patients. The results show that the level of anxiety in the intervention group decreased, and the quality of sleep was significantly improved [52]. Similarly, Cho et al. [6] formulated a refrigerated oil mixture of lavender, chamomile, and neroli essential oils in a ratio of 6:2:0.5 and dripped them on the stone. Patients undergoing percutaneous coronary intervention were given 10 deep breaths of aromatherapy before and after surgery and placed under their pillows [53]. The findings not only alleviate sleep disturbances, but also have a positive effect on stabilizing blood pressure, and the authors suggest that aromatherapy can be used as an independent nursing intervention, but more high-quality research is needed as a nursing clinical practice.

5 Conclusion

Aromatherapy can relieve anxiety, pain, sleep disturbance, nausea and vomiting in perioperative patients, and has the advantages of low cost, quick effect, and easy use. However, since aromatherapy

cannot be double-blind in research design, lack of use standards, and most studies are limited to short-term, the effect of late follow-up has not been reported, and the long-term effectiveness is still controversial. But what is clear is that, as a clinical nursing intervention, aromatherapy can improve patient comfort, feel tranquility, and maximize well-being from environmental, physical, emotional, and other aspects.

Aromatherapy is effective in treating diseases that are not well treated by Western medicine. At the same time, we also need to pay attention to the long-term efficacy of aromatherapy in the later stage, improve its safety, and reduce the possibility of side effects.

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References

- [1] T. G. Weiser, A. B. Haynes, G. Molina, S. R. Lipsitz, M. M. Esquivel *et al.*, "Size and distribution of the global volume of surgery in 2012," *Bulletin of the World Health Organization*, vol. 94, no. 3, pp. 201–209, 2016.
- [2] F. Nightingale, "Notes on nursing: What it is, and what it is not," *Lippincott Williams & Wilkins*, vol. 92, no. 3, pp. 172–176, 1992.
- [3] H. Huang, Q. Wang, X. Guan, X. Zhang, J. Kang *et al.*, "Effect of aromatherapy on preoperative anxiety in adult patients: A meta-analysis of randomized controlled trials," *Complementary Therapies in Clinical Practice*, vol. 42, no. 11, pp. 101302, 2021.
- [4] K. Asay, C. Olson, J. Donnelly and E. Perlman, "The use of aromatherapy in postoperative nausea and vomiting: A systematic review," *Journal of PeriAnesthesia Nursing*, vol. 34, no. 3, pp. 502–516, 2019.
- [5] Z. Seifi, A. Bikmoradi, M. -R. Bazrafshan, J. Poorolajal, M. Araghchian *et al.*, "The effect of inhalation aromatherapy with lavender essential oil on pain severity of patients after coronary artery bypass surgery: A single-blind randomised clinical trial," *Journal of Clinical & Diagnostic Research*, vol. 12, no. 7, pp. 287–295, 2018.
- [6] M. Y. Cho, E. S. Min, M. H. Hur and M. S. Lee, "Effects of aromatherapy on the anxiety, vital signs, and sleep quality of percutaneous coronary intervention patients in intensive care units," *Evidence-Based Complementary and Alternative Medicine*, vol. 2013, no. 9, pp. 289–293, 2013.
- [7] J. A. Song, M. K. Lee, E. Min, M. E. Kim, G. Fike *et al.*, "Effects of aromatherapy on dysmenorrhea: A systematic review and meta-analysis," *International Journal of Nursing Studies*, vol. 84, no. 1, pp. 1–11, 2018.
- [8] N. Roozbeh, M. Ghazanfarpour, T. Khadivzadeh, L. Kargarfard, F. R. Dizavandi *et al.*, "Effect of lavender on sleep, sexual desire, vasomotor, psychological and physical symptom among menopausal and elderly women: A systematic review," *Journal of Menopausal Medicine*, vol. 25, no. 2, pp. 88–92, 2019.
- [9] S. M. Wang, A. A. Andrews and Z. N. Kain, "The use of complementary and alternative medicines by surgical patients: A follow-up survey study," *Anesthesia & Analgesia*, vol. 97, no. 4, pp. 1010–1015, 2003.
- [10] J. E. Gee, W. A. Bower A. Kunkel, J. Petras, J. Gettings *et al.*, "Multistate outbreak of melioidosis associated with imported aromatherapy spray," *New England Journal of Medicine*, vol. 386, no. 9, pp. 861–868, 2022.
- [11] B. Ali, N. A. A. Wabel, S. Shams, A. Ahamad, S. A. Khan *et al.*, "Essential oils used in aromatherapy: A systemic review," *Asian Pacific Journal of Tropical Biomedicine*, vol. 5, no. 8, pp. 601–611, 2015.

- [12] J. Dolah, A. K. C. A. Singh, A. C. Ahmad, M. Mustafa, A. Z. A. Majid *et al.*, “Review on the effectiveness of aromatherapy oils in the learning of autistic children in an educational setting,” *Journal of Human Centered Technology*, vol. 1, no. 1, pp. 1–9, 2022.
- [13] E. L. Ball, B. O. Booth, A. Gray, S. D. Shenkin, J. Hewitt *et al.*, “Aromatherapy for dementia,” *Cochrane Database of Systematic Reviews*, vol. 20, no. 8, pp. 985–993, 2020.
- [14] H. Ebrahimi, A. Mardani, M. H. Basirinezhad, A. Hamidzadeh and F. Eskandari, “The effects of lavender and chamomile essential oil inhalation aromatherapy on depression, anxiety and stress in older communitydwelling people: A randomized controlled trial,” *Explore*, vol. 18, no. 3, pp. 272–278, 2022.
- [15] J. R. Gnatta, L. F. S. Kurebayashi, R. N. T. Turrini and M. J. P. D. Silva, “Aromatherapy and nursing: Historical and theoretical conception,” *Revista da Escola de Enfermagem da USP*, vol. 50, no. 3, pp. 127–133, 2016.
- [16] P. Posadzki, A. Alotaibi and E. Ernst, “Adverse effects of aromatherapy: A systematic review of case reports and case series,” *International Journal of Risk & Safety in Medicine*, vol. 24, no. 3, pp. 147–161, 2012.
- [17] S. Bahraini, A. Naji and R. Mannani, “Effects of aromatherapy and its application,” *Nursing and Midwifery Journal*, vol. 9, no. 1, pp. 1–6, 2011.
- [18] S. E. Lakhan, H. Sheaffer and D. Tepper, “The effectiveness of aromatherapy in reducing pain: A systematic review and meta-analysis,” *Pain Research and Treatment*, vol. 2016, no. 7, pp. 521–528, 2016.
- [19] C. A. Smith, C. T. Collins and C. A. Crowther, “Aromatherapy for pain management in labour,” *Cochrane Database of Systematic Reviews*, vol. 11, no. 7, pp. 59–64, 2011.
- [20] T. Dunning, “Aromatherapy: Overview, safety and quality issues,” *OA Altern. Med.*, vol. 1, no. 1, pp. 6–12, 2013.
- [21] Z. X. Y. Yiwu and W. Y. L. T. Y. Shuang, “Research and development of aromatherapy,” *International Journal of Risk & Safety in Medicine*, vol. 24, no. 9, pp. 542–550, 2012.
- [22] A. J. Farrar and F. C. Farrar, “Clinical aromatherapy,” *Nursing Clinics*, vol. 55, no. 4, pp. 489–504, 2020.
- [23] J. Buckle, “Clinical aromatherapy: Essential oils in healthcare,” *Churchill Livingstone*, vol. 16, no. 1, pp. 527–533, 2016.
- [24] D. Stewart, “The chemistry of essential oils made simple: God’s love manifest in molecules,” *Care Publications*, vol. 5, no. 2, pp. 331–339, 2005.
- [25] M. H. Hur, J. A. Song, J. Lee and M. S. Lee, “Aromatherapy for stress reduction in healthy adults: A systematic review and meta-analysis of randomized clinical trials,” *Maturitas*, vol. 79, no. 4, pp. 362–369, 2014.
- [26] R. Gattefosse, *Gattefosse’s Aromatherapy*, 1st ed., Paris, France: C.W. Daniel Company, pp. 155–208, 1993.
- [27] H. Babatabar Darzi, A. Vahedian-Azimi, S. Ghasemi, A. Ebadi, T. Sathyapalan *et al.*, “The effect of aromatherapy with rose and lavender on anxiety, surgical site pain, and extubation time after open-heart surgery: A double-center randomized controlled trial,” *Phytotherapy Research*, vol. 34, no. 10, pp. 2675–2684, 2020.
- [28] M. Karsten, D. Prince, R. Robinson and J. Stout-Aguilar, “Effects of peppermint aromatherapy on postoperative nausea and vomiting,” *Journal of Peri Anesthesia Nursing*, vol. 35, no. 6, pp. 615–618, 2020.
- [29] C. Necmiye, “Usage of aromatherapy in symptom management in cancer patients: A systematic review,” *International Journal of Caring Sciences*, vol. 13, no. 1, pp. 537–546, 2020.
- [30] D. Reis and T. T. Jones, “Frankincense essential oil as a supportive therapy for cancer-related fatigue: A case study,” *Holistic Nursing Practice*, vol. 32, no. 3, pp. 140–142, 2018.
- [31] J. Jiang, “Comparative study on origins of traditional Chinese aromatherapy and western aromatherapy,” *Journal of Anhui TCM College*, vol. 32, no. 6, pp. 4–6, 2013.
- [32] E. Hwang and S. Shin, “The effects of aromatherapy on sleep improvement: A systematic literature review and meta-analysis,” *The Journal of Alternative and Complementary Medicine*, vol. 21, no. 2, pp. 61–68, 2015.
- [33] E. Karadag, S. Samancioglu, D. Ozden and E. Bakir, “Effects of aromatherapy on sleep quality and anxiety of patients,” *Nursing in Critical Care*, vol. 22, no. 2, pp. 105–112, 2017.

- [34] R. Schneider, N. Singer and T. Singer, "Medical aromatherapy revisited—Basic mechanisms, critique, and a new development," *Human Psychopharmacology: Clinical and Experimental*, vol. 34, no. 1, pp. e2683, 2019.
- [35] S. Fayazi, M. Babashahi and M. Rezaei, "The effect of inhalation aromatherapy on anxiety level of the patients in preoperative period," *Iranian Journal of Nursing and Midwifery Research*, vol. 16, no. 4, pp. 278, 2011.
- [36] M. S. Lee, J. Choi, P. Posadzki and E. Ernst, "Aromatherapy for health care: An overview of systematic reviews," *Maturitas*, vol. 71, no. 3, pp. 257–260, 2012.
- [37] M. Ramsay, "A survey of pre-operative fear," *Survey of Anesthesiology*, vol. 17, no. 5, pp. 459–460, 1973.
- [38] D. M. Stamenkovic, N. K. Rancic, M. B. Latas, V. Neskovic, G. M. Rondovic *et al.*, "Preoperative anxiety and implications on postoperative recovery: What can we do to change our history," *Minerva Anestesiologica*, vol. 84, no. 11, pp. 1307–1317, 2018.
- [39] A. Beyliklioglu and S. Arslan, "Effect of lavender oil on the anxiety of patients before breast surgery," *Journal of Perianesthesia Nursing*, vol. 34, no. 3, pp. 587–593, 2019.
- [40] P. Bozkurt and C. Vural, "Effect of lavender oil inhalation on reducing presurgical anxiety in orthognathic surgery patients," *Journal of Oral and Maxillofacial Surgery*, vol. 77, no. 12, pp. 2466–e1, 2019.
- [41] A. S. Collins, "Postoperative nausea and vomiting in adults: Implications for critical care," *Critical Care Nurse*, vol. 31, no. 6, pp. 36–45, 2011.
- [42] S. Hines, E. Steels, A. Chang and K. Gibbons, "Aromatherapy for treatment of postoperative nausea and vomiting," *Cochrane Database of Systematic Reviews*, vol. 4, no. 4, pp. CD007598, 2009.
- [43] D. Y. Wazqar, H. A. Thabet and A. M. Safwat, "A quasi-experimental study of the effect of ginger tea on preventing nausea and vomiting in patients with gynecological cancers receiving cisplatin-based regimens," *Cancer Nursing*, vol. 44, no. 6, pp. E513–E519, 2021.
- [44] C. A. Warfield and C. H. Kahn, "Acute pain management: Programs in us hospitals and experiences and attitudes among us adults," *The Journal of the American Society of Anesthesiologists*, vol. 83, no. 5, pp. 1090–1094, 1995.
- [45] J. T. Kim, M. Wajda, G. Cuff, D. Serota, M. Schlame *et al.*, "Evaluation of aromatherapy in treating postoperative pain: Pilot study," *Pain Practice*, vol. 6, no. 4, pp. 273–277, 2006.
- [46] J. Tillett and D. Ames, "The uses of aromatherapy in women's health," *The Journal of Perinatal & Neonatal Nursing*, vol. 24, no. 3, pp. 238–245, 2010.
- [47] K. Rezaie-Keikhaie, M. Hastings-Tolsma, S. Bouya, F. S. Shad, M. Sari *et al.*, "Effect of aromatherapy on post-partum complications: A systematic review," *Complementary Therapies in Clinical Practice*, vol. 35, no. 2, pp. 290–295, 2019.
- [48] S. Hamzeh, R. Safari-Faramani and A. Khatony, "Effects of aromatherapy with lavender and peppermint essential oils on the sleep quality of cancer patients: A randomized controlled trial," *Evidence-Based Complementary and Alternative Medicine*, vol. 2020, no. 1, pp. 1–6, 2020.
- [49] M. Hassanzadeh, F. Kiani, S. Bouya and M. Zarei, "Comparing the effects of relaxation technique and inhalation aromatherapy on fatigue in patients undergoing hemodialysis," *Complementary Therapies in Clinical Practice*, vol. 31, pp. 210–214, 2018.
- [50] H. K. Son, W. Y. Soe and M. Kim, "Effects of aromatherapy combined with music therapy on anxiety, stress, and fundamental nursing skills in nursing students: A randomized controlled trial," *International Journal of Environmental Research and Public Health*, vol. 16, no. 21, pp. 4185, 2019.
- [51] C. Ayik and D. Ozden, "The effects of preoperative aromatherapy massage on anxiety and sleep quality of colorectal surgery patients: A randomized controlled study," *Complementary Therapies in Medicine*, vol. 36, pp. 93–99, 2018.

- [52] M. Xiong, Y. Li, P. Tang, Y. Zhang, M. Cao *et al.*, “Effectiveness of aromatherapy massage and inhalation on symptoms of depression in Chinese community-dwelling older adults,” *The Journal of Alternative and Complementary Medicine*, vol. 24, no. 7, pp. 717–724, 2018.
- [53] F. Ghaderi and N. Solhjoui, “The effects of lavender aromatherapy on stress and pain perception in children during dental treatment: A randomized clinical trial,” *Complementary Therapies in Clinical Practice*, vol. 40, no. 4, pp. 101–112, 2020.