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Aromatherapy in Nursing and Midwifery Practice: A Scoping Review of Published Studies Since 2005

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Running Head: Aromatherapy in Nursing/Midwifery Practice:Review

TITLE

Aromatherapy in Nursing and Midwifery Practice: A Scoping Review of Published Studies Since 2005

Associate Editor and Reviewer Comments	Author Responses
Reviewer 1	Thank you for your helpful comments
Clarify Concepts of Clinical Nursing and practice	"clinical" removed from title and "acute clinical" removed from page 4, changed with nursing and midwifery for consistency. Removed else here as nursing and midwifery stand on own terms. No further explanation needed.
Aims of article restructure using PICO	Reference added and descriptions of PICOS added (as not only RCTs in review), rewrote aim 1 to reflect PICOS, and removed the original aim. The second aim adds in date of previous review to identify how this builds on
Quality Appraisal	A further statement added on page 7 to address this "The author reviewed each included article to the aims and inclusion parameters as a way of self-review in accordance with the requirements of the PRISMA-ScR(Tricco et al., 2018)." This constant cross checking and self- review replaced a peer review. Having an external reviewer was not possible in this single author study
Conclusion	First paragraph reworded- "This scoping review of published mulita participant studies from 2005-2021 investigated the use of aromatherapy within nursing and midwifery practice in several different conical areas around the world. A holistic lens has been applied to the methodology through selecting studies which include RCTs and non RCT's, with all studies presenting a clear clinical outcome using an accepted measuring tool. Using this approach to the review enhances the ability of a diverse and innovative approach to this topic, while still having quality measures around the inclusion process. The increase in both quality and quality of research is evident since 2005, supporting the growth of expertise in conducting research in this area".
Reviewer 2	Thank you for your kind words. This is very encouraging. Language changed to American English and changes made through the text. The length was necessary to be able to cover all aspects. Initially the author consider breaking up into Adult and maternal/child health but this did not work as well as a way for a practitioner to source all as some maternal care is given by nurses and some neonatal are may be given by midwives so there is a crossover.

ABSTRACT

Background: Since the 1990's aromatherapy has been a popular adjunct to nursing and midwifery care in a variety of health care settings.

Objective: The scoping review seeks to identify and confirm the benefits of incorporating aromatherapy into holistic nursing and midwifery practice

Design: A scoping review using PRISMA-ScR of experimental studies where care is provided to the patient by a registered nurse or midwife.

Settings and participants. Any health care setting where nurses or midwives provide care.

Review Methods: A multi- engine search using a range of MeSH and non-MeSH terms with the Boolean search [AND]. Inclusion criteria were; publication date from 2005-2021, study involved aromatherapy as an intervention, conducted in a clinical nursing or midwifery environment and the published article is available in full in English. Excluded were; single patient cases, animal studies, in vitro studies, use of essential oils internally or a whole plant extract was used or use was non-nursing/midwifery related.

Results: 124 studies met the inclusion criteria (n=19188), classified into seven themes.

Conclusion: The evidence supports the use of aromatherapy within a range of nursing and midwifery practices enhancing a holistic model of care.

Impact: This scoping review contributes evidence to support the inclusion of aromatherapy into holistic nursing and midwifery practice.

Key words: aromatherapy, aromatherapy in nursing, clinical aromatherapy, essential oils, scoping review, aromatherapy in midwifery, maternal health, pediatric care

INTRODUCTION

The application of aromatherapy has continued to be a popular holistic nursing and midwifery intervention since its emergence in the late 1980's. It involves the external application of volatile aromatic plant oils to promote health, wellbeing, improve wellbeing or provide relief from a named condition (Gnatta et al., 2016; Post-White et al., 2009). Aromatic plant extracts, obtained by various methods of extraction, and are usually diluted and applied externally through methods such as diffusion,

inhalation and application to the skin (Moore et al., 2019). There is a growing body of evidence to support of the inclusion of aromatherapy as part of evidence based holistic nursing to relieve anxiety, pain, insomnia, nausea, and exhaustion (Reis & Jones, 2017), with many more randomized clinical trials (RCTs) emerging since a previous extensive literature review covering 1990-2004 (Maddocks-Jennings & Wilkinson, 2004).

Several reviews and meta-analyses have identified that aromatherapy can help with specific clinical situations such as post-operative nausea and vomiting (PONV), acute and chronic pain relief, dementia, anxiety and stress reduction (Ayik & Özden, 2018; Joswiak et al., 2016; Koo, 2017; Lee et al., 2012). While this evidence is generally positive with minimal adverse effects reported (Hur et al., 2014), the research design and analyses are of variable quality between the studies. Most of these reviews and meta- analyses generally identify positive effects; however, there is often little consideration of the holistic nature of including aromatherapy within nursing practice, rather presenting aromatherapy as a quick or pleasant alternative to a pharmacological agent.

This scoping review uses the PRISMA-ScR methodology, to address this gap by examining the extent, range and nature of evidence related to aromatherapy in nursing and midwifery practice (Tricco et al., 2018). This type of review is more appropriate to answer the broader question " what are the benefits of incorporating aromatherapy within holistic nursing and midwifery practice"?

AIMS

The aims for this scoping review follow the PICOS approach discussed by (Methley et al., 2014). This is the population (people who are receiving care from a nurse or a midwife), intervention (aromatherapy treatment), comparison (usual treatment or another therapeutic intervention such as plain massage), outcome (reduction in patient symptoms or improved health outcomes) and study design (recognizing that not studies are RCTs)(Methley et al., 2014).

- To determine whether the use of aromatherapy within a nursing or midwifery context has improved patient outcome compared to usual care or other therapeutic interventions
- To examination the evidence, benefits, risks and potential in using aromatherapy as part of a holistic clinical nursing and midwifery care, building on a previous review of published studies from 1990-2004 (Maddocks-Jennings & Wilkinson, 2004).

METHODS

Design. The PRISMA-ScR methodology was applied in conducting the scoping review (Tricco et al., 2018) and the protocol was preregistered on Open Science Framework (OSF) 22 July 2021. This scoping review examines extant studies conducted within clinical healthcare environments 2005-2021. Inclusion criteria is; aromatherapy was a primary intervention and performed in a clinical nursing or midwifery context or had value to practice; the full study was available in English; an experimental study with a clear clinical outcome and aromatherapy applied externally with an expected beneficial effect. Excluded were single case studies, studies where the whole plant was used internally (e.g. herbal tea), or aromatherapy was used as general ambient room fragrance.

Search methods. CINAHL, The Cochrane Library, Embase, Medline, Ovid SP, PsychINFO, PubMed, Google scholar, Web of Science were searched along with other articles proposed by the PROQUEST literature search engine. The following [MeSH] terms were used: "aromatherapy", "aroma therapy", "aroma therapies", "essential oils". The Boolean search [AND] was used between the first MeSH terms and the following MeSH terms "patient care", "nursing care", "adult", or "clinical practice nursing research", "p(a)ediatric", "maternal", "antenatal" , "prenatal", "infant", "child". The MeSH term "clinical" with [AND] was used before terms using 'aroma*'. Other non-MeSH search terms included 'aromatic health care' and 'aromatic nursing care.' Table 1 shows some of search results using the MeSH term "aromatherapy" with other limiters applied in the multisearch database. Table 2 shows some of google scholar searching showing the same terms without the limiters.

Search # Library Multi Search	**Search Strategy**	
#2	"aromatherapy" [MeSH]	7982
#6	#2 AND "nursing care" [MeSH]	563
#7	"clinical" [MeSH] AND #6	509
#8	#7 AND "clinical trial" [MeSH]	204
#9	#8 AND "adult" [MeSH]	146

Table 1: Search results of the multi database with the following limiters applied, 'full text online', 'peer reviewed' and 'journal article only' (since 2004)

Search # Google Scholar no limiters	**Search Strategy**	

#2	"aromatherapy" [MeSH]	26500
#6	#2 AND "nursing care" [MeSH]	3380
#7	"clinical" [MeSH] AND #6	3040
#8	#7 AND "clinical trial" [MeSH]	931
#9	#8 AND "adult" [MeSH]	435

Table 2: Results of the adult search strategy using Google Scholar (since 2004) with no limiters

Search outcomes and Quality Appraisal

Once the limiters were applied, abstracts were reviewed and full articles downloaded to NVIVO and Endnote for classification and detailed analysis. The flow of this literature is presented in Figure 1. Seven broad patient groups were identified based on the patient group or outcome. These are; maternal and women's health (MWH), mental health and wellbeing (MHWB), perioperative care (POC), pain, oncology (ONC), child health (CH) and elder health (EH). Reasons for rejections included: the internal use of essential oils, use of animal models or not using an aromatic extract (e.g. an herbal tincture not essential oil). The author reviewed each included article to the aims and inclusion parameters as a way of self-review in accordance with the requirements of the PRISMA-ScR (Tricco et al., 2018). This constant crosschecking and self-review replaced a peer review.

Data abstraction

Reviewed articles were added to an excel spreadsheet collating the key features of each study which is summarized in Tables 3-9 (for each patient group). These were then used to conduct numerical evaluation of the results.

Synthesis

To be included in one of the previously mentioned groups the primary outcome of the research needed to be the topic under review and to avoid duplication articles are only included under one group. For example, post-operative hysterectomy pain would be under post-operative care not women's health.

RESULTS

One hundred and twenty four studies met the inclusion criteria published during 2005-2021 (Q1), involving 19188 patients from eleven different countries. Iran was the most prolific country at 39.6%, Turkey the second at 24.5% and USA the third at 18.8%. Lavender oil was the most popular sole essential oil used. Rose oil was the second most popular, which is not surprising given the large number of Iranian and Turkish studies, where rose oil is an integral part of Middle Eastern cultures. Blends were either commercially made or prepared by staff, or patients could select from a range of offered oils.

Adults

Maternal and Women's Health

This section includes studies involving pregnancy, post-partum period and non-pregnancy related women's health. Thirty studies involving 2775 participants are included here (see Table 3).

Dysmenorrhea

Two literature reviews indicated that either inhaling or massaging with essential oils reduces dysmenorrhea (Song et al., 2018; Sut & Kahyaoglu-Sut, 2017). Two further studies not mentioned in either of these reviews, involved either massaging lavender oil on the abdomen during menstruation (Apay et al., 2012) or inhaling diluted lavender oil during mesntruation Dehkordi et al. (2014), with both studies reporting a significant reduction in pain experienced. While not exactly related to dysmenorrhea, one study explored the effects of diffused lavender oil while undergoing routine pelvic examinations and found that STAI and pain/discomfort was significantly improved (Tugut et al., 2017).

Premenstrual syndrome (PMS)

Symptoms of PMS include poor sleep, irritability and bloating which can affect quality of life. A RCT of university students, Uzunçakmak & Alkaya, (2018) found that inhaling lavender oil ten days before their period was due and during menstruation statistically improved all PMS symptoms. These results were consistent with another RCT of university students who found that inhaling orange blossom oil reduced PMS symptoms over two cycles (Heydari et al., 2018). Two studies evaluated the effects of Yuzu oil, *Citrus junos* had on various PMS symptoms using the profile of moods states (POMS) and other physiological parameters. Both studies found that inhaling Yuzu oil significantly reduced POMS scores (Matsumoto et al., 2016, 2017).

Menopausal/Post-menopausal

A study of menopausal, healthy health care workers found that inhaling clary sage (*Salvia sclarea*) essential oil for five minutes had a significant effect on the plasma 5-HT levels, a neurotransmitter which is depleted in depression which can be associated with menopause (Lee et al., 2014). Researchers explored the effect of inhaled lavender oil on post-menopausal women who had previously undergone a cardiac surgery procedure (Bakhtiari et al., 2019). The participants completed a tested tool called MENQOl (menopause specific quality of life). At the end of four weeks there was a statistically significant improvement in vasomotor symptoms, sexual performance and psychosocial dimensions (Bakhtiari et al., 2019). These results were consistent with an earlier study which found that inhaling lavender oil significantly helped with symptoms of menopause (Kazemzadeh et al., 2016)

Similar improvements on psychological symptoms related to post menopause were observed in a RCT of 87 women who received either an aromatherapy massage with a blend of rose/lavender/geranium and rosemary oil or a plain massage. Both the massage and aroma massage groups had some significant reduction in symptoms such as feeling irritable, anxiety or low mood. The aroma group however had higher average improvements compared to the massage group (Taavoni et al., 2013).

Pregnancy and Post-natal Care

Labor Pain

The main perceived benefits of using aromatherapy during labor has been for anxiety and pain relief (Alleemudder et al., 2015). For primiparous mothers there is also an element of fear of the unknown which can affect some of the birthing hopes a mother may make (Hamdamian et al., 2018). Within Iran

rose oil is widely available, is considered effective for anxiety and tension associated with childbirth (Mohebitabar et al., 2017). Hamdamian et al. (2018) designed a single blind trial of women who were about to give birth (n=110). The aromatherapy group had 2% Iranian rose oil (*Rosa damascena*) distilled for the project which was diluted in Iranian sesame seed oil. The control group received normal saline. After randomization, two drops of either the diluted rose oil or the saline was applied to a piece of gauze and applied to the patient's clothing once the patient was 4cm dilated. Pain and anxiety were recorded according to a Visual Analogue Scale (VAS) and Spielberg Anxiety Questionnaire (SAQ), ten minutes after administration, and at three further dilation points. Anxiety was measured ten mins after inhalation at two dilation points. All assessments were completed in-between contractions. The authors found that pain and anxiety scores in the aromatherapy group were significantly lower at all three measurements after inhaling the oil. No adverse effects were noted in either the mother or babies (verified by Apgar scoring) (Hamdamian et al., 2018).

A similar study by Vakilian et al. (2018) explored the inhalation of lavender oil for managing the first stage of labor pain (n=120). Participants were randomly assigned to either aromatherapy + breathing group or a breathing only group. This study used *Lavandula stoechas* oil, which is not considered relaxing (Woronuk et al., 2011), however has known analgesic constituents. Along with the specialized breathing techniques, diluted lavender was inhaled via a nebulizer. Pain was measured at three phases related to cervical dilatation, with the last assessment at full (10cm) dilatation. The aromatherapy group had statistically improved pain scores when at full dilation (Vakilian et al., 2018).

Caesarean Pain

Post-operative caesarean pain poses challenges for clinical staff due to the possible risks of analgesia on the baby via breast milk and delaying mobilization of the mother (Lakhan et al., 2016). In a placebo RCT of planned caesarean mothers (n=60), patients received either inhaled lavender oil (10%) or inhaled

plain oil at the first report of post-operative pain. Patients who received the lavender oil had significantly reduced pain scores through to twelve hours post intervention with a high level of satisfaction (90%). No negative physiological effects were recorded (Olapour et al., 2013).

Sleep and Fatigue Post-partum

It is expected that sleep will be disrupted after delivery and while the mother and baby settle into a routine of feeding in the early post-partum period. Poor sleep over a prolonged period of time can impact the development of post-natal depression (Afshar et al., 2015). Primiparous women, (n=158), were randomly allocated to either an aroma group or a control group. The aroma group inhaled diluted lavender oil at 10% each night for at least four nights and the control group inhaled unscented sesame oil. Follow up occurred for eight weeks. At four weeks there was no significant difference between the two groups using the Pittsburgh Sleep Quality Index (PSQUI), however there was a significant difference at eight weeks with a $p<0.05$ (Afshar et al., 2015). Similar positive effects were observed in a pilot study of early postpartum fatigue (Asazawa et al., 2017). In contrast to the previous study, this study involved arm massages with a selected single essential applied by trained clinicians while the mothers were in hospital. In Japan, it is usual for women to stay in hospital for four to five days post-vaginal delivery and eight days for a caesarean delivery. Participants received a single massage with follow up on day three. All had significant improvements between pre-test and post-test of Fatigue and Relaxation scales. The most popular oils chosen were citrus oils (Asazawa et al., 2017).

Post-Partum Depression (PPD)

Conrad and Adams (2012) study included participants who were up to eighteen months post-partum, as the symptoms of PPD could take that long to manifest. This pilot study found that aromatherapy massage and inhalation using a blend of rose and lavender oil, significantly reduced depression scores using the Edinburgh Depression Scale (EDS) after receiving two treatments a week for four weeks. The

control group had regular psychological support. All participants had pre-intervention EDS scores of ten or higher, indicating mild to moderate symptoms of anxiety or depression (Conrad & Adams, 2012).

Inhaling lavender oil immediately after delivery and eight hourly for four weeks after birth had a positive reduction in depression as measured by the EDS and depression, anxiety and stress scale (Kianpour et al., 2016). The positive effect was sustained until three months when final measures were taken. In this study the control group did not receive any intervention. A later study by the same group (Kianpour et al., 2018) built on their earlier findings by commencing the aromatherapy inhalation at 38 weeks (before delivery) and all participants were considered to be 'at risk' of developing PPD through screening. They also added in a fake aroma as a control and compared with usual cares. Blinding further added to the rigor and the results continued to be significant for the six weeks after delivery for the EDS (Kianpour et al., 2018).

Perineal Repair

Figures vary globally for the rate of episiotomies performed on primiparous women with rates from 33% to 88% cited; however, in Iran it is a routine procedure due to the lack of antenatal education. While iodine has been widely used to heal surgical wounds, it inhibits healing through allergic reactions or inhibiting fibroblast activity (Hajhashemi et al., 2018). Three RCTs found that using essential oils instead of the usual betadine (iodine) was effective in improving healing and reducing pain according to REEDA measures, a tool which assesses inflammation and tissue healing (redness, edema, ecchymosis, discharge and approximation of wound) (Alvarenga et al., 2015). A blinded RCT of 120 primiparous women found that twice-daily lavender sitz baths improved healing compared to iodine baths (Vakilian et al., 2010). A second Iranian RCT (N=60) found improved pain, improved REEDA scores with lavender sitz baths (Sheikhan et al., 2012).

A third blinded RCT undertaken in Egypt explored a combination of lavender oil mixed with thymol oil (N=129) (Marzouk et al., 2015). In this study, *Lavandula officinalis* oil was distilled specially for the study and added to thymol oil (no species stated) in equal proportions and diluted at 2% in jojoba oil, a fixed carrier oil. Thymol has a long history of use in would healing (Najafloo et al., 2020). The experimental group (n=64) cleaned their episiotomy site twice a day for seven days. The control group (n=64) followed the same process but used sterile water as the control. By the end of the study, 60 women remained (n=30 in each group) who were followed up for longer than the earlier Iranian study (Sheikhan et al., 2012) with the final assessment occurring seven weeks after birth. By day seven, the aroma group had significantly improved REEDA scores along with lower pain scores. By the seventh week, the aroma group experienced less dyspareunia and had significantly less analgesic consumption. It is assumed these affects are due to the combination of lavender and thymol. It is not clear if jojoba oil had any effect and ideally, this could have been included as the placebo group.

Mental Health and Wellbeing (MHWB)

This section had sixteen studies involving 1048 patients (see table 4). Many people turn to aromatherapy to help manage stress associated with a chronic condition, to manage anxiety or sleep disorders (Miller et al., 2019) or to improve general wellbeing.

Anxiety/Stress

State-Trait Anxiety Inventory (STAI) is a well-tested assessment clinical and research tool used in clinical practice. Recovering from a serious illness such as a stroke or coronary event can increase blood pressure, stress and anxiety, which in turn can impede recovery. While the RCT by Lee et al. (2017) found that wearing an aromatherapy pendant, along with nightly oil diffusions had statistically improved sleep and stress there was no effects on any immune

markers. Three RCTs explored both STAI and other physiological parameters along with the hospital anxiety and depression scale (HADS). Two of these studies found that diluted lavender oil massaged into foot reflexology points significantly improved most physiological parameters and HADS in the acute cardiac setting (Bahrami et al., 2017; Bahrami et al., 2018). Similar positive effects were noted with acute myocardial infarction (AMI) patients who inhaled geranium oil over a period of two days had significantly lower STAI scores compared to the control group who inhaled plain sunflower oil (Shirzadegan et al., 2017). An underpowered study on stroke patients who inhaled essential oils had positive but non-significant effects (Iokawa et al., 2018).

Altered sleep/fatigue

In hospital, altered sleep or fatigue can be a side effect of treatment or the actual illness and affects recovery. Inhaling diluted rose oil each night for three nights after admission to the CCU significantly improved the PSQI scores compared to the control group (Hajibagheri et al., 2014). These results were similar to a RCT on 60 CCU patients who inhaled diluted lavender oil at night, and had significantly improved PSQI (Karadag et al., 2017). Another measure of hospital sleep is the St Mary's Hospital Sleep quality tool (SMHSQ) which was used in a RCT of post cardiac surgery patients (N=90). Both the aroma and acupressure groups had statistically improved sleep after inhaling valerian oil compared to the control group (Bagheri-Nesami et al. 2015).

One RCT of hemodialysis patients found inhaling lavender oil during dialysis significantly reduced fatigue measured by the Brief Fatigue Inventory (BFI) (Hassanzadeh et al., 2018).

However, these results contradicted an earlier study where inhaling lavender oil during dialysis had no significant effects on fatigue as measured by the Fatigue Severity Scale (FSS) (Bagheri-Nesami, et al. 2016). This could be due to the choice of oil (lavender is considered sedating) or the variable nature of chronic renal failure on the person. By increasing the time of the intervention and comparing lavender and sweet orange inhalation with inhaled water (placebo) statistically reduced fatigue in hemodialysis patients (Ahmady, et al 2019). These results supported an earlier similar study conducted by (Muz & Tasci, 2017) where patients who inhaled essential oils over a period of a month experienced significant improvements in sleep.

Peri-operative Care

The perioperative period includes pre-operative, intra operative and post anesthetic care, usually provided in a post-operative care unit (PACU). Nineteen studies involving 12504 patients were reviewed (see Table 5).

Pre-operative anxiety

Most studies reviewed explored the effects of inhaling essential oils immediately pre operatively, usually using a fitted oxygen mask or attached to the neck of the hospital gown. Hozumi et al. (2017) found that inhaling osmanthus oil before undergoing a colonoscopy significantly reduced anxiety and abdominal discomfort compared to inhaled grapefruit or placebo oil. Three RCTs identified that inhaling either lavender or lavandin oil pre operatively also significantly reduced anxiety measured by STAI or VAS scales (Beyliklioğlu & Arslan, 2019; Braden et al., 2009; Saritaş et al., 2018). In Braden et al. (2009) study, the lavandin oil was also placed on a pedal pulse on the feet. The composition of lavandin oil can vary widely as it is a

hybrid (Bombarda et al., 2008) and as no further chemical analysis was provided it is impossible to say which hybrid was used. All these results are consistent with an observational pilot study where an occlusive commercial lavender patch was used preoperatively , and all patients had statistically improved anxiety scores (Jaruzel et al., 2019).

In contrast, inhaling 4% rose oil did not improve preoperative Speilberger Anxiety Index (SAI) in cardiac patients (Fazlollahpour-Rokni et al., 2019). Two other studies on pre-operative patients also found that inhaled aromatherapy had no significant effects on anxiety possibly due to poor design (Franco et al., 2016; Tamaki et al., 2017). One RCT investigated aromatherapy massage with 2% lavender given both the day before and morning of colorectal surgery STAI and sleep quality measured with the Richardson Campbell Sleep Questionnaire (RCSQ), were significantly improved in the aroma group pre and post operatively (Ayik & Özden, 2018)

Post-operative/discharge nausea and vomiting (PO/DNV)

The experience of PO/DNV is a distressing symptom for patients, especially for those who have day surgery, affecting 30-37% of patients post discharge. A Cochrane review of sixteen studies found that while aromatherapy appeared to be as effective as other measures (including inhaling isopropyl alcohol); the evidence was low quality (Hines, Steels, Chang & Gibbons, 2018).

Three studies presented here explored the use of a commercial aromatherapy product called QueaseEASE (QE), (https://soothing-scentes.com/product/queseease/, n.d). It was found to be effective in reducing PONV in one study (Hodge et al., 2014), however two other studies found minimal or no effects (McIlvoy et al., 2014; Stallings-Welden et al., 2018).

Post-operative pain/anxiety

Unresolved post-operative pain can impede recovery from surgery as complications such as infection and delayed wound healing can occur, along with increased readmission rates (Schreiber et al., 2014; Smith et al., 2019). An underpowered study found that inhaled lavender oil had no effect of post-operative breast biopsy pain (Kim et al., 2006). This led to a second RCT by the same group investigating the use of lavender for post-operative pain for laparoscopic gastric band patients. Inhaling lavender oil significantly reduced the amount of morphine needed; however, there was not a reduction in the pain scores (Kim et al., 2007). This lack of effect on pain scores was consistent with a trial on open-heart surgery patients (N=40) who inhaled 2% lavender upon extubation (Salamati et al., 2014). Post vitrectomy (eye removal) patients have to lie face down to prevent complications and this can cause discomfort and pain. Adachi et al (2014) found that a neck massage with or without an essential oil was effective in reducing pain, with the aroma group having a more sustained effect.

Pain

The 30 studies (N=905) reviewed here include surgical, burns, chronic and procedural pain for adults as per Table 6.

Wound and Burn Pain

In Iran, burn rates are high in women due to cooking over open fires in rural areas, and care is a burden in developing countries due to the complex, lengthy management with many painful procedures often with associated high mortality rates compared to Westernized countries. The

first RCT found that both an aroma massage with lavender and inhaling rose oil prior to dressing changes significantly reduced pain and STAI. Of note with this study is that only one treatment was given, and no additional pain relief was offered even if required and the authors conclude that inhalation especially is both effective and cost effective as no additional training is required (Seyyed-Rasooli et al., 2016).

A second Iranian RCT of second degree burn patients investigated whether inhaled rose oil at 40% either with or without a Benson relaxation technique (BRT) improved pain anxiety scores during dressing changes (Daneshpajooh et al., 2019). The measuring tool was a validated Persian version of a burn specific pain anxiety pain score (BSPAS). Both the aroma and BRT had significantly improved pain anxiety scores that were sustained over the three days of the study (Daneshpajooh et al., 2019).

Procedural pain

Obtaining vascular access for drug administration or ongoing hemodialysis can be a painful experience. Inhaling lavender oil before inserting a peripheral venous cannula (PVC) significantly reduced the experience of pain and anxiety (Karaman et al., 2016). Three RCT's found that either inhaling or spraying lavender oil directly onto the arteriovenous (AV) fistula site used for hemodialysis had significant reductions in the experience of pain during AV cannulation (Bagheri-Nesami et al., 2014; Ghods et al., 2015; Karaman et al., 2016))

Musculoskeletal Conditions

Several studies support the addition of lavender oil massage for various musculo-skeletal ailments. Yip and Tse (2006) found that lavender oil + acupressure was more effective than acupressure alone for the treatment of neck pain in a trial of 28 adults. These effects were similar to another RCT of lavender oil self-applied to knees for osteoarthritis where participants experienced significant pain reduction over a three period (Nasiri et al., 2016). This significant effect was similar to a professionally applied massage with a blend of essential oils applied weekly (Efe Arslan et al., 2019).

Another RCT compared a blend of oils with reflexology for pain and fatigue associated with rheumatoid arthritis (RA). The aroma group showed sustained and significant effects on pain as well as physiological inflammatory markers and joint tenderness (DAS28) (Gok Metin & Ozdemir, 2016).

Neurological Pain

One RCT found that regular hand and foot massage significantly reduced pain and improved QOL in a RCT conducted on diabetic patients with peripheral neuropathy (Gok Metin et al., 2017). Two studies explored the effects of topically applied aromatherapy on pain experienced by carpal tunnel syndrome sufferers. If untreated the trapped nerves can lead to motor problems in the arms. The first used German chamomile in a RCT of 26 patients measured by a modified Boston Carpal Tunnel Questionnaire (BQ). The aroma group had significantly improved scores and functionality compared to the placebo group (Hashempur et al., 2015). The second study, by Eftekharsadat et al. (2018) explored the effect of a different type of lavender oil, *Lavandula stoechas*, applied for wrist pain. *L. stoechas* has strong analgesic

properties due to the constituents such as camphor (Khavarpour et al., 2019). Using a daily aroma cream and wearing a brace significantly, improved pain scores and function over time in the aromatherapy group (Eftekharsadat et al., 2018).

Elder Health

The nine studies (N=414) reviewed in this section involve the intervention being applied to the elderly population (aged 65+) or includes conditions that primarily involve the older adult (e.g. dementia) (as per table 7). There are very limited RCTs relating to elder health apart from in dementia care. One survey of patients with Parkinson's disease identified aromatherapy as a tool to help with things like restlessness, sleep and anxiety (Donley et al., 2019). Another found that aromatherapy massage over a four week period improved sleep and cognitive function in a pilot group of ten healthy volunteers (Noda et al., 2019).

Dementia

Reduction of agitation and distress is a key goal in the provision of care to patients with dementia. The use of smell, in particular rosemary has a long history of use for recalling memories for patients with dementia and other memory activities (Ali et al., 2015; Filiptsova et al., 2017; Lee, 2005). In addition, there is a strong emotional connection between odor and memory (Moore et al., 2019). There is some indication however that Alzheimer's disease and other dementia conditions may be anosmic, however the extent of this is not fully known (Snow et al., 2004).

However, a lack of effect to inhaled aromatherapy was not observed in a 28 day cross over study of 28 elderly Japanese patients with diagnosed cognition disorders. Daily morning and evening diffusions of essential oils resulted in statistically significant improvements across a range of verified tools used to assess dementia. In addition, regular blood monitoring indicated no adverse effects (Kimura & Takamatsu, 2013). This positive effect was also recorded in a RCT investigating agitation in dementia

patients who received either a spray with diluted lavender oil + a hand massage or a placebo spray or an aroma hand massage, using the CMAI. While not significant, there was an overall downward trend in aggression and agitation (Fu et al., 2013).

Other significant improvements in behavioural and psychological symptoms (BPSD) in patients with dementia were observed in a three armed study conducted by Fung and Tsang (2018). At the three-month follow up, their study showed that combining an aroma massage + an acupressure protocol was as effective as cognition training. In addition combining aroma with cognition training mitigated the irritation experienced (Fung & Tsang, 2018). Another study also included caregivers in the intervention where an aroma hand massage was given to dementia patients, and caregivers provided inhaled oils at home (Turten & Ozdemir, 2017). A number of agitation tools were used and over the time of the aroma treatments, there was significant reductions in agitation.

Using inhaled lavender to stimulate olfactory senses was explored in a RCT by (Sakamoto et al., 2012) in a residential elderly population. Lavender oil was applied on a patch and compared with a group who had an unscented patch. The number of falls was counted over 360 days and while lower in the aromatherapy group, it was not significant.

Cancer Care

Several authors report the use of aromatherapy to support physical or emotional symptoms for cancer patients (Reis & Jones, 2017), as a tool in a comfort kit, as an adjuvant therapy (Benney & Gibbs, 2013; Lua et al., 2015; Lyons, 2018), or as part of a massage programme (Ho et al., 2017). Two separate audits involving 675 patients found the main reasons for use were nausea, relaxation and anxiety or sleep problems, with lavender oil being the most popular (Dyer et al., 2014). Managing cancer related pain requires complex pharmacological and non-pharmacological measures to relieve and is one of the most feared symptoms experienced by cancer patients (Blackburn, 2019). It involves complex pathological

issues and is often unremitting and referred elsewhere in the body providing a challenge for nurses to provide effective pain relief (Bartoszczyk & Priyadarshini, 2018). An early Cochrane review found that there was no reliable evidence to support the use of massage either with or without aromatherapy for cancer pain (Wilkinson et al., 2008). Despite this review, several cancer centres in the USA add aromatherapy products to their comfort kits along with other CAM tools, with aromatherapy being used by 15% of patient users with perceived benefits and no side effects (Blackburn, 2019). Lymphoedema is a common unsightly and painful side effect in cancer patients, especially if lymph nodes have been removed. Lymphatic massage is an effective treatment however, adding essential oils did not add any extra benefits (Barclay et al., 2006). This section presents seven studies involving 836 cases.

Anxiety and sleep

Two studies identified that inhaling or diffusing essential oils at night during chemotherapy treatment significantly improved STAI, Pittsburgh Sleep Quality Index (PSQI), and Edmonton Symptom Assessment Scale ESAr scores. These benefits were sustained (Blackburn et al., 2017; Özkaraman et al., 2018).

Palliative care

The aim of palliative care is to be life affirming and support quality of life rather than offer a treatment (Kyle, 2006). Aromatherapy is suggested for a variety of palliative symptoms such as fatigue (Rose, 2016); insomnia (Rose, 2017a; Soden et al., 2004); spiritual distress (Rose, 2017b); and breathlessness (Rose, 2018). This is one area of research however, that is often difficult to determine significance in RCTS due to high patient attrition or variability in symptoms on a day-to-day basis. Where RCTS have been attempted, the results tend to be positive even if statistical significance cannot be demonstrated (Kyle, 2006; Wilcock et al., 2004). Reviews of quantitative studies found that RCTS of palliative care are overall poor quality (Candy, 2019), whereas qualitative studies show more positive effects and are higher quality (Armstrong et al 2019).

Children

A possible 214 studies were sourced and of these 17 met the criteria for inclusion under the pediatric theme (n=1590). These are summarized in table 9. Of these seventeen, twelve demonstrated significant effects, however most authors noted how difficult it is to conduct studies on children. For example one small study (n=11) found that regular aromatherapy foot massages positively improved sleep quality in children with autism using a within subject methodology, however due to the small sample size results were not significant (Williams, 2006).

Post-operative Care in Children

Pain

Pediatric pain assessment requires a different approach to adults and a well-accepted tool in pediatric intensive care (PICU) is the COMFORT B scale, which measures comfort and distress through different behaviours and physiological parameters (Boerlage et al., 2015). In a single blind RCT of post-operative craniofacial pediatric patients (N=60), mandarin oil used diluted at 1% with a specialized massage technique called 'M' technique had no observable effect compared with plain M Technique Massage® or a control (usual cares) (de Jong et al., 2012). Filmed observations were conducted for four hours afterwards by a trained, blinded observer combined with physiological recordings. While the authors concluded that the study was underpowered due to staffing and timing, no ill effects were recorded and the study was worth repeating with parents being taught the technique (de Jong et al., 2012). Soltani et al (2013) examined whether inhaling undiluted lavender oil (*Lavandula angustifolia*) affected post tonsillectomy pain scores and analgesia use in a RCT of children aged 6-12 years (N=48). Both groups received acetaminophen (paracetamol) every six hours as required. The aromatherapy group also inhaled four drops of undiluted lavender oil placed on the hands and inhaled for three minutes, every six

hours. While the regular use of inhaled lavender oil reduced the need for ingested acetaminophen (statistically significant), there was no difference in pain scores between the two groups (Soltani et al 2013).

Rose oil, *Rosa damascena*, has known positive effects of the autonomic nervous system (Mohebitabar et al., 2017). Inhaled rose oil was significantly effective in reducing pain over a 12-hour period in a RCT on post-operative pain on toddlers undergoing surgical procedures. Pain was measured using the TPPPS (Toddler, preschooler post-op pain score) in the RCT comparing inhaled rose oil, with placebo oil (sweet almond) in a study conducted across two hospitals (Marofi et al, 2015).

A combination of diluted lavender and ginger oil was used in a RCT of pediatric peri-operative comfort (Nord & Belew, 2009). The intervention was given on induction of anesthesia to a pulse point, and the control of jojoba oil was applied at the same time (N=94). In addition, a drop of each oil was added to a cotton ball attached to the hospital gown 30cm from the face. Reapplication occurred post operatively if the patient was in surgery for longer than three hours. As this hospital specialized in both pediatric patients and patients who had developmental delay (DD), the outcome measure of FLACC was used (faces, legs, arms, cry and consolability), rather than a pain, VAS as this is more accurate in very young children or those with DD who cannot verbalize pain. The convenience sample of consecutive surgical patients were randomly assigned to either the intervention or the control group (plain jojoba). Both the FLACC tool and the acceptability of the oil was tested in a feasibility study (Nord & Belew, 2009).

One study was sourced which evaluate the use of QueaseEASE in pediatric PONV, however this flawed and underpowered study did not show any effect (Kiberd et al., 2016).

Burn pain

An observational pilot study had indicated that aromatherapy massage could be beneficial for pediatric patients who have suffered burns (O'Flaherty et al., 2012), however this could not be statistically

demonstrated in a later larger study (van Dijk et al., 2018). The trend continued to be positive however, for this patient group the burns often involved the face or a parent was with the child helping them. This made it hard for the blinded observers to measure consistently the outcomes of muscle tension inventory (MTI), behavioural relaxation scale, the COMFORT scale and physiological observations which were all recorded by video during the massage or rest period. In addition, most of the children were aged under three. Another group found that inhaling lavender oil during burn dressing changes helped with anxiety and pain in a group of 20 children (Gallardo et al., 2018).

Procedural pain

The experience of procedural pain by children has a unique aspect depending on the age of the child. The imagination of the pain and lack of understanding about the pain, especially in the preschool age child (<6) may impact the ability of the care giver to provide care or conduct a procedure (Bikmoradi et al., 2017). In their quasi-experimental study preschool children (N=60) who had not undergone intravenous cannulation before either inhaled aromatherapy or plain water. Outcomes was pain using the OUCHER scale (children's faces). All children wore a patch with either plain water or 25 lavender oil for twenty minutes before the procedure. The aromatherapy group had statistically significant reduced pain (p=0.001) which was shorter than the control group (p=0.002) (Bikmoradi et al., 2017). Neonates can have up to 16 painful procedures a day with cannulation and blood sampling occurring. Sometimes glucose drops are used to alleviate neonatal pain (Schneider et al., 2018). Razaghi et al. (2020) found that both inhaled lavender or glucose drops were effective in reducing the pain of needle insertions in a RCT of 120 neonates.

Another procedural pain study on children was conducted by Küçük Alemdar and Yaman Aktaş (2019) in a prospective RCT on children (N=195) undergoing phlebotomy. Inhalation aromatherapy, bubble-blowing distraction, dermal local anesthetic, thermomechanical stimulation and a control group were

compared. Outcomes measured were; salivary cortisol, procedural fear scores (CFS), pain using the Oucher VAS, and the parent's perception of distress. All measures were statistically effective, however aromatherapy was the least effective overall (Küçük Alemdar & Yaman Aktaş, 2019). Infant vaccination is another short-lived procedurally painful experience. Though infants have no awareness what is about to happen, they may become aware of parental anticipatory distress. One study found that inhaling diluted lavender oil from a sachet for one minute before the vaccination significantly reduced the experience of pain as evidence by a reduction in crying and groaning in a double blind RCT conducted by (Vaziri et al., 2019).

Anxiety

Once study looked at anxiety experienced by children with diabetes in a CT of 60 children. Inhaling sweet orange oil at night over a period of two weeks. The researchers found that there was a significant reduction in anxiety measured by the STAI and a scale called Children's Manifest Scale (Motaghi et al., 2017).

Pediatric cancer

Hope and relief of distressing symptoms are why parents will try aromatherapy and other measures for children undergoing cancer treatment (Post-White et al., 2009), with several reviews supporting using aromatherapy on children for painful procedures and treatment side effects (Thrane, 2013) or with end of life care (Stewart et al., 2018). However in a review of non-pharmacologic interventions aromatherapy was not mentioned as an option (Rheingans, 2007). One study explored the inhalation of bergamot oil while undergoing stem cell transplant found positive but not significant effects on anxiety, pain or nausea Ndao et al. (2012). Inhaling particular essential oils through a specially designed sachet was found to be statistically significant in a three armed study involving palliative pediatric patients (N=180) for different symptoms (Weaver et al., 2020).

Infant Colic

This commonly occurs in the first few weeks of life and is not related to any abnormal physiology. The constant crying of a distressed baby is one of the main reasons parents seek medical health. In a blinded RCT conducted in Iran (N=66), Vaziri et al. (2018) found that the inhaling diluted lavender oil had a significant reduction in the severity and length of crying especially during the evenings.

Premature Neonates

In premature low birthweight babies it was found that placing diluted rose oil near the baby while they were in an incubator significantly reduced apneic attacks through and improvement in SPO_2 and reduction in bradycardic episodes and apneic episodes (Aghagoli et al., 2016). Another study, mentioned in a systematic review of the use of aromatherapy in the management of apnea (Nakhaei et al., 2019), used vanillin of unknown origin (possibly synthetic) and therefore could not be considered an aromatherapy intervention so has been excluded from this review (Edraki et al., 2013)

DISCUSSION

This scoping review of clinical trials continues to support including aromatherapy within a range of nursing and midwifery practices. Of the 19188 participants, there were five reported minor side effects. These figures suggest that aromatherapy is a safe and well-tolerated therapeutic intervention, which can be incorporated effectively into holistic nursing and midwifery care. Conducting a Scoping review has meant that studies which have an outcome measure can be included, even if they fall outside the parameters of a systematic review. Such studies may also capture some of the holistic essence of nursing or midwifery care, beyond that which can be captured by a numerical scale.

The studies were categorized into seven patient or outcome groups, with almost 27% relating to mental health and wellbeing. Some of the studies had multiple outcomes they were measuring including blood levels and electrical monitoring of heart and brain (EEG) along with validated tools of anxiety, pain, agitation and sleep quality, further supporting the notion of holistic care.

Inhalation (58.5%) was the main route with lavender oil, *Lavandula angustifolia*, being the most popular single oil (39%). While the quality of results reporting varied, 81% of the studies reviewed had results that were statistically significant in at least one of their outcome measures. Where significance was not achieved, it was usually due to the study being underpowered, or high attrition rates or variable patient conditions such as terminal care of cognitive impairment. The general trend of effects were positive in these non-significant studies, which may support the human nature of interaction that occurs for example when giving a massage or applying essential oils in some other way. This human, nurturing aspect of holistic care cannot always be captured by a numerical measure in RCTS. If an individual patient reports an aromatic experience as being positive or beneficial, then the objective of the aromatherapy intervention has been achieved regardless of whether it was statistically 'proven' to be the aromatherapy which 'caused' effect.

In contrast to earlier reviews, Turkey and Iran have made significant contributions to the empirical evidence in this field. As with other bioscience areas there has been concern globally about some of the conduct of research publications from Middle Eastern countries such as Iran, with questionable ethics, falsifying results and plagiarism (Shamsoddin et al., 2021). There was

no evidence of this behavior in the studies presented here; however, the author was extra vigilant and conducted more background searching of the principle authors to check their credentials.

This scoping review has demonstrated clear evidence into the inclusion of aromatherapy in certain clinical areas having benefits for patients. Overall, there was high compliance, with minimal side effects, and in some cases result in reduced pharmacological interventions. Given the current opioid crisis (Shipton, 2018), anything which can reduce the use of narcotic pain relief in a safe way is worthy of consideration. Reducing pain and anxiety related to procedures or surgical interventions as well as other anxiety related experiences remain the most popular effects of aromatherapy within nursing and midwifery care.

Limitations

This review was limited to clinical studies conducted on human participants only. Within the aromatherapy literature there are many studies based on in vitro work, which in due course may translate to clinical benefits. In addition, non-peer reviewed single case studies which are popular in the aromatherapy journals have not been included. Some studies could not be sourced in English, many of which originate in China, Taiwan and Korea where aromatherapy is a popular adjunctive tool in clinical care.

Very few of the studies had participants choosing their oils, which is not how aromatherapy is typically practiced outside the hospital environment. With most of the studies only exploring the use of lavender, this may be a limiting factor for applying the results to a wider individualized aromatherapy treatment. In an attempt to fit an empirical scientific paradigm,

many of the studies omit to investigate the often-intangible benefits of an aromatherapy treatment. These include the relationship between the aromatherapist and recipient, the range of oils a therapist has available, the individual method of treatment based on the assessment of the patient. When looking at these results and considering wider clinical treatment options, nurses, midwives and practitioners need to look beyond the statistical evidence and view the experience of the patient in a holistic way, however the statistical evidence is need to provide a measure of safety of efficacy.

CONCLUSION

This scoping review of published mulita participant studies from 2005-2021 investigated the use of aromatherapy within nursing and midwifery practice in several different conical areas around the world. A holistic lens has been applied to the methodology through selecting studies that include RCTs and non-RCTs, with all studies presenting a clear clinical outcome using an accepted measuring tool. Using this approach to the review enhances the ability of a diverse and innovative approach to this topic, while still having quality measures around the inclusion process. The increase in both quality and quality of research is evident since 2005, supporting the growth of expertise in conducting research in this area.

An ideal holistic theoretic framework for future research would be studies that include both quantitative and qualitative information, using a mixed method and phenomenological approach. More emphasis on patient satisfaction with treatment, monitoring any adverse reactions and careful recording of botanical classifications would further enhance the knowledge of using aromatherapy in holistic nursing and midwifery practice.

Based on the findings of this review the use of inhaled and topically applied essential oils in a diluted form are effective in reducing anxiety, PONV and pain in some circumstances. It remains critical that when aromatherapy is offered to patients as part of holistic care, there are clear guidelines for use and policies around handling and storage of oils. It should also be an optional tool for nurses and midwives who are trained in the practice to use on patents.

References

Afshar, M. K., Moghadam, Z. B., Taghizadeh, Z., Bekhradi, R., Montazeri, A., & Mokhtari, P. (2015). Lavender fragrance essential oil and the quality of sleep in postpartum women. *Iranian red crescent medical journal, 17*(4).

Aghagoli, S., Salimi, A., Salimi, M., Ghazavi, Z., Marofi, M., & Mohammadbeigi, A. (2016). Aromatherapy with Rosa Damascenes in Apnea, Bradycardia and Spo2 of Preterm Infants; a Randomized Clinical Trial. *International Journal of Pediatrics, 4*(6), 1911-1918. https://doi.org/10.22038/ijp.2016.6894

Ali, B., Al-Wabel, N. A., Shams, S., Ahamad, A., Khan, S. A., & Anwar, F. (2015). Essential oils used in aromatherapy: A systemic review. *Asian Pacific Journal of Tropical Biomedicine, 5*(8), 601-611.

Alleemudder, D. I., Kuponiyi, Y., Kuponiyi, C., McGlennan, A., Fountain, S., & Kasivisvanathan, R. (2015). Analgesia for labour: an evidence-based insight for the obstetrician. *The Obstetrician & Gynaecologist, 17*(3), 147-155.

Alvarenga, M. B., Francisco, A. A., de Oliveira, S. M. J. V., da Silva, F. M. B., Shimoda, G. T., & Damiani, L. P. (2015, Jan-Feb). Episiotomy healing assessment: Redness, Oedema, Ecchymosis, Discharge, Approximation (REEDA) scale reliability. *Revista latino-americana de enfermagem, 23*(1), 162-168. https://doi.org/10.1590/0104-1169.3633.2538

Asazawa, P. K., Kato, B. Y., Yamaguchi, M. A., & Inoue, B. A. (2017). The Effect of Aromatherapy Treatment on Fatigue and Relaxation for Mothers during the Early Puerperal Period in Japan: A Pilot Study. *International journal of community based nursing and midwifery, 5*(4), 365-375.

Ayik, C., & Özden, D. (2018). The effects of preoperative aromatherapy massage on anxiety and sleep quality of colorectal surgery patients: a randomized controlled study. *Complementary Therapies in Medicine, 36*, 93-99.

Bagheri-Nesami, M., Espahbodi, F., Nikkhah, A., Shorofi, S. A., & Charati, J. Y. (2014). The effects of lavender aromatherapy on pain following needle insertion into a fistula in hemodialysis patients. *Complementary therapies in clinical practice, 20*(1), 1-4.

Bahrami, T., Rejeh, N., Heravi- Karimooi, M., Vaismoradi, M., Tadrisi, S. D., & Sieloff, C. (2017). Effect of aromatherapy massage on anxiety, depression, and physiologic parameters in older patients with the acute coronary syndrome: A randomized clinical trial. *International Journal of Nursing Practice, 23*(6), e12601-n/a. https://doi.org/10.1111/ijn.12601

Bahrami, T., Rejeh, N., Heravi-Karimooi, M., Vaismoradi, M., Tadrisi, S. D., & Sieloff, C. L. (2018). Aromatherapy massage versus reflexology on female elderly with acute coronary syndrome. *Nursing in Critical Care, 23*(5), 229-236. https://doi.org/10.1111/nicc.12302

Bakhtiari, S., Paki, S., Baradaranfard, F., Mosleh, S., & Jokar, M. (2019). Effect of lavender aromatherapy through inhalation on quality of life among postmenopausal women covered by a governmental health center in Isfahan, Iran: A single-blind clinical trial. *Complementary therapies in clinical practice, 34*, 46-50.

Barclay, J., Vestey, J., Lambert, A., & Balmer, C. (2006). Reducing the symptoms of lymphoedema: Is there a role for aromatherapy? *European Journal of Oncology Nursing, 10*(2), 140-149. https://doi.org/10.1016/j.ejon.2005.10.008

Benney, S., & Gibbs, V. (2013). A literature review evaluating the role of Swedish massage and aromatherapy massage to alleviate the anxiety of oncology patients. *Radiography, 19*(1), 35-41.

Beyliklioğlu, A., & Arslan, S. (2019). Effect of Lavender Oil on the Anxiety of Patients Before Breast Surgery. *Journal of PeriAnesthesia Nursing, 34*(3), 587-593.

Bikmoradi, A., Khaleghverdi, M., Seddighi, I., Moradkhani, S., Soltanian, A., & Cheraghi, F. (2017). Effect of inhalation aromatherapy with lavender essence on pain associated with intravenous catheter

insertion in preschool children: A quasi-experimental study. *Complementary therapies in clinical practice, 28*, 85-91.

Blackburn, L., Achor, S., Allen, B., Bauchmire, N., Dunnington, D., Klisovic, R. B., Naber, S. J., Roblee, K., Samczak, A., Tomlinson-Pinkham, K., & Chipps, E. (2017). The Effect of Aromatherapy on Insomnia and Other Common Symptoms Among Patients With Acute Leukemia. *ONCOLOGY NURSING FORUM, 44*(4), E185-E193. https://doi.org/10.1188/17.ONF.E185-E193

Boerlage, A., Ista, E., Duivenvoorden, H., De Wildt, S., Tibboel, D., & van Dijk, M. (2015). The COMFORT behaviour scale detects clinically meaningful effects of analgesic and sedative treatment. *European Journal of Pain, 19*(4), 473-479.

Bombarda, I., Dupuy, N., Le Van Da, J.-P., & Gaydou, E. (2008). Comparative chemometric analyses of geographic origins and compositions of lavandin var. Grosso essential oils by mid infrared spectroscopy and gas chromatography. *analytica chimica acta, 613*(1), 31-39.

Braden, R., Reichow, S., & Halm, M. A. (2009). The use of the essential oil lavandin to reduce preoperative anxiety in surgical patients. *Journal of PeriAnesthesia Nursing, 24*(6), 348-355.

Conrad, P., & Adams, C. (2012). The effects of clinical aromatherapy for anxiety and depression in the high risk postpartum woman–a pilot study. *Complementary therapies in clinical practice, 18*(3), 164-168.

Daneshpajooh, L., Najafi Ghezeljeh, T., & Haghani, H. (2019). Comparison of the effects of inhalation aromatherapy using Damask Rose aroma and the Benson relaxation technique in burn patients: A randomized clinical trial. *Burns, 45*(5), 1205-1214. https://doi.org/10.1016/j.burns.2019.03.001

de Jong, M., Lucas, C., Bredero, H., van Adrichem, L., Tibboel, D., & van Dijk, M. (2012). Does postoperative 'M'technique® massage with or without mandarin oil reduce infants' distress after major craniofacial surgery? *Journal of advanced nursing, 68*(8), 1748-1757.

Donley, S., McGregor, S., Wielinski, C., & Nance, M. (2019). Use and perceived effectiveness of complementary therapies in Parkinson's disease. *Parkinsonism and Related Disorders, 58*, 46-49. https://doi.org/10.1016/j.parkreldis.2018.08.003

Dyer, J., Cleary, L., Ragsdale-Lowe, M., McNeill, S., & Osland, C. (2014). The use of aromasticks at a cancer centre: A retrospective audit. *Complementary therapies in clinical practice, 20*(4), 203-206.

Edraki, M., Pourpulad, H., Kargar, M., Pishva, N., Zare, N., & Montaseri, H. (2013). Olfactory stimulation by vanillin prevents apnea in premature newborn infants. *Iranian journal of pediatrics, 23*(3), 261.

Efe Arslan, D., Kutlutürkan, S., & Korkmaz, M. (2019). The Effect of Aromatherapy Massage on Knee Pain and Functional Status in Participants with Osteoarthritis. *Pain Management Nursing, 20*(1), 62-69. https://doi.org/10.1016/j.pmn.2017.12.001

Eftekharsadat, B., Roomizadeh, P., Torabi, S., Heshmati-Afshar, F., Jahanjoo, F., & Babaei-Ghazani, A. (2018). Effectiveness of Lavendula stoechas essential oil in treatment of mild to moderate carpal tunnel syndrome: A randomized controlled trial. *Journal of Hand Therapy, 31*(4), 437-442. https://doi.org/10.1016/j.jht.2017.07.004

Fazlollahpour-Rokni, F., Shorofi, S. A., Mousavinasab, N., Ghafari, R., & Esmaeili, R. (2019). The effect of inhalation aromatherapy with rose essential oil on the anxiety of patients undergoing coronary artery bypass graft surgery. *Complementary therapies in clinical practice, 34*, 201-207.

Filiptsova, O., Gazzavi-Rogozina, L., Timoshyna, I., Naboka, O., Dyomina, Y. V., & Ochkur, A. (2017). The essential oil of rosemary and its effect on the human image and numerical short-term memory. *Egyptian journal of basic and applied sciences, 4*(2), 107-111.

Franco, L., Blanck, T. J., Dugan, K., Kline, R., Shanmugam, G., Galotti, A., von Bergen Granell, A., & Wajda, M. (2016). Both lavender fleur oil and unscented oil aromatherapy reduce preoperative anxiety in breast surgery patients: a randomized trial. *Journal of clinical anesthesia, 33*, 243-249.

Fu, C.-Y., Moyle, W., & Cooke, M. (2013). A randomised controlled trial of the use of aromatherapy and hand massage to reduce disruptive behaviour in people with dementia. *BMC Complementary and Alternative Medicine, 13*(1), 165-165. https://doi.org/10.1186/1472-6882-13-165

Fung, J. K. K.-m., & Tsang, H. W.-h. (2018). Management of behavioural and psychological symptoms of dementia by an aroma-massage with acupressure treatment protocol: A randomised clinical trial. *Journal of clinical nursing, 27*(9-10), 1812-1825. https://doi.org/10.1111/jocn.14101

Gallardo, A., Neal, D., Palmieri, T., Greehalgh, D. G., & Sen, S. S. (2018). 447 Aromatherapy Reduces Anxiety During Wound Care for Pediatric Burn Patients. *Journal of burn care & research, 39*(suppl_1), S196-S196. https://doi.org/10.1093/jbcr/iry006.369

Ghods, A. A., Abforosh, N. H., Ghorbani, R., & Asgari, M. R. (2015). The effect of topical application of lavender essential oil on the intensity of pain caused by the insertion of dialysis needles in hemodialysis patients: a randomized clinical trial. *Complementary Therapies in Medicine, 23*(3), 325-330.

Gnatta, J. R., Kurebayashi, L. F. S., Turrini, R. N. T., & Silva, M. J. P. d. (2016). Aromatherapy and nursing: historical and theoretical conception. *Revista da Escola de Enfermagem da USP, 50*(1), 127-133.

Gok Metin, Z., Arikan Donmez, A., Izgu, N., Ozdemir, L., & Arslan, I. E. (2017). Aromatherapy Massage for Neuropathic Pain and Quality of Life in Diabetic Patients. *Journal of Nursing Scholarship, 49*(4), 379-388. https://doi.org/10.1111/jnu.12300

Gok Metin, Z., & Ozdemir, L. (2016). The effects of aromatherapy massage and reflexology on pain and fatigue in patients with rheumatoid arthritis: a randomized controlled trial. *Pain Management Nursing, 17*(2), 140-149.

Hajhashemi, M., Ghanbari, Z., Movahedi, M., Rafieian, M., Keivani, A., & Haghollahi, F. (2018). The effect of Achillea millefolium and Hypericum perforatum ointments on episiotomy wound healing in primiparous women. *The Journal of Maternal-Fetal & Neonatal Medicine, 31*(1), 63-69.

Hajibagheri, A., Babaii, A., & Adib-Hajbaghery, M. (2014). Effect of Rosa damascene aromatherapy on sleep quality in cardiac patients: a randomized controlled trial. *Complementary therapies in clinical practice, 20*(3), 159-163.

Hamdamian, S., Nazarpour, S., Simbar, M., Hajian, S., Mojab, F., & Talebi, A. (2018). Effects of aromatherapy with Rosa damascena on nulliparous women's pain and anxiety of labor during first stage of labor. *Journal of integrative medicine, 16*(2), 120-125.

Hashempur, M. H., Lari, Z. N., Ghoreishi, P. S., Daneshfard, B., Ghasemi, M. S., Homayouni, K., & Zargaran, A. (2015). A pilot randomized double-blind placebo-controlled trial on topical chamomile (Matricaria chamomilla L.) oil for severe carpal tunnel syndrome. *Complementary therapies in clinical practice, 21*(4), 223-228. https://doi.org/10.1016/j.ctcp.2015.08.001

Hassanzadeh, M., Kiani, F., Bouya, S., & Zarei, M. (2018). Comparing the effects of relaxation technique and inhalation aromatherapy on fatigue in patients undergoing hemodialysis. *Complementary therapies in clinical practice, 31*, 210-214.

Heydari, N., Abootalebi, M., Jamalimoghadam, N., Kasraeian, M., Emamghoreishi, M., & Akbarzadeh, M. (2018). Investigation of the effect of aromatherapy with Citrus aurantium blossom essential oil on premenstrual syndrome in university students: A clinical trial study. *Complementary therapies in clinical practice, 32*, 1-5.

Ho, S. S., Kwong, A. N., Wan, K. W., Ho, R. M., & Chow, K. M. (2017). Experiences of aromatherapy massage among adult female cancer patients: A qualitative study. *Journal of clinical nursing, 26*(23-24), 4519-4526.

Hodge, N. S., McCarthy, M. S., & Pierce, R. M. (2014). A Prospective Randomized Study of the Effectiveness of Aromatherapy for Relief of Postoperative Nausea and Vomiting. *Journal of PeriAnesthesia Nursing, 29*(1), 5-11. https://doi.org/10.1016/j.jopan.2012.12.004

Hozumi, H., Hasegawa, S., Tsunenari, T., Sanpei, N., Arashina, Y., Takahashi, K., Konnno, A., Chida, E., & Tomimatsu, S. (2017). Aromatherapies using Osmanthus fragrans oil and grapefruit oil are effective complementary treatments for anxious patients undergoing colonoscopy: A randomized controlled study. *Complementary Therapies in Medicine, 34*, 165-169. https://doi.org/10.1016/j.ctim.2017.08.012

https://soothing-scentes.com/product/queseease/. (n.d). Retrieved december 2019,

Hur, M.-H., Song, J.-A., Lee, J., & Lee, M.-S. (2014). Aromatherapy for stress reduction in healthy adults: a systematic review and meta-analysis of randomized clinical trials. *Maturitas, 79*(4), 362-369.

Iokawa, K., Kohzuki, M., Sone, T., & Ebihara, S. (2018). Effect of olfactory stimulation with essential oils on cardiovascular reactivity during the moving beans task in stroke patients with anxiety. *Complementary Therapies in Medicine, 36*, 20-24.

Jaruzel, C. B., Gregoski, M., Mueller, M., Faircloth, A., & Kelechi, T. (2019). Aromatherapy for Preoperative Anxiety: A Pilot Study. *Journal of PeriAnesthesia Nursing, 34*(2), 259-264.

Joswiak, D., Kinney, M. E., Johnson, J. R., Kolste, A. K., Griffin, K. H., Rivard, R. L., & Dusek, J. A. (2016). Development of a health system-based nurse-delivered aromatherapy program. *JONA: The Journal of Nursing Administration, 46*(4), 221-225.

Karadag, E., Samancioglu, S., Ozden, D., & Bakir, E. (2017). Effects of aromatherapy on sleep quality and anxiety of patients. *Nursing in Critical Care, 22*(2), 105-112. https://doi.org/10.1111/nicc.12198

Karaman, T., Karaman, S., Dogru, S., Tapar, H., Sahin, A., Suren, M., Arici, S., & Kaya, Z. (2016). Evaluating the Efficacy of Lavender Aromatherapy on Peripheral Venous Cannulation Pain and Anxiety: A Prospective, Randomized Study. *Complementary therapies in clinical practice, 23*, 64-68. https://doi.org/10.1016/j.ctcp.2016.03.008

Kazemzadeh, R., Nikjou, R., Rostamnegad, M., & Norouzi, H. (2016). Effect of lavender aromatherapy on menopause hot flushing: A crossover randomized clinical trial. *Journal of the Chinese Medical Association, 79*(9), 489-492.

Khavarpour, M., Vahdat, S. M., Moghadamnia, A. A., Hasanzadeh, O., Salimi, Z., & Rahmanpour, N. (2019). Chemical Composition, Antibacterial and Analgesic Activity of Lavandula stoechas Flowers from North of Iran. *International Journal of Engineering, 32*(8), 1065-1073.

Kianpour, M., Mansouri, A., Mehrabi, T., & Asghari, G. (2016, Mar-Apr). Effect of lavender scent inhalation on prevention of stress, anxiety and depression in the postpartum period. *Iran J Nurs Midwifery Res, 21*(2), 197-201. https://doi.org/10.4103/1735-9066.178248

Kianpour, M., Moshirenia, F., Kheirabadi, G., Asghari, G., Dehghani, A., & Dehghani-tafti, A. (2018). The effects of inhalation aromatherapy with rose and lavender at week 38 and postpartum period on postpartum depression in high-risk women referred to selected health centers of Yazd, Iran in 2015. *Iranian journal of nursing and midwifery research, 23*(5), 395-401. https://doi.org/10.4103/ijnmr.IJNMR_116_16

Kiberd, M. B., Clarke, S. K., Chorney, J., d'Eon, B., & Wright, S. (2016). Aromatherapy for the treatment of PONV in children: A pilot RCT. *BMC Complementary and Alternative Medicine, 16*(1), 450-450. https://doi.org/10.1186/s12906-016-1441-1

Kim, J. T., Ren, C. J., Fielding, G. A., Pitti, A., Kasumi, T., Wajda, M., Lebovits, A., & Bekker, A. (2007, Jul 2007

2014-03-30). Treatment with Lavender Aromatherapy in the Post-Anesthesia Care Unit reduces Opioid Requirements of Morbidly Obese Patients Undergoing Laparoscopic Adjustable Gastric Banding. *Obesity Surgery, 17*(7), 920-925. https://doi.org/http://dx.doi.org/10.1007/s11695-007-9170-7

Kim, J. T., Wajda, M., Cuff, G., Serota, D., Schlame, M., Axelrod, D. M., Guth, A. A., & Bekker, A. Y. (2006). Evaluation of aromatherapy in treating postoperative pain: pilot study. *Pain Practice, 6*(4), 273-277.

Kimura, T., & Takamatsu, J. (2013). Pilot study of pharmacological treatment for frontotemporal lobar degeneration: Effect of lavender aroma therapy on behavioral and psychological symptoms. *Geriatrics & Gerontology International, 13*(2), 516-517. https://doi.org/10.1111/ggi.12025

Koo, M. (2017). A bibliometric analysis of two decades of aromatherapy research. *BMC research notes, 10*(1), 1-9. https://doi.org/10.1186/s13104-016-2371-1

Küçük Alemdar, D., & Yaman Aktaş, Y. (2019). The Use of the Buzzy, Jet Lidokaine, Bubble-blowing and Aromatherapy for Reducing Pediatric Pain, Stress and Fear Associated with Phlebotomy. *Journal of Pediatric Nursing, 45*, e64-e72. https://doi.org/10.1016/j.pedn.2019.01.010

Kyle, G. (2006). Evaluating the effectiveness of aromatherapy in reducing levels of anxiety in palliative care patients: Results of a pilot study. *Complementary therapies in clinical practice, 12*(2), 148-155. https://doi.org/10.1016/j.ctcp.2005.11.003

Lakhan, S. E., Sheafer, H., & Tepper, D. (2016). The Effectiveness of Aromatherapy in Reducing Pain: A Systematic Review and Meta-Analysis. *Pain Research and Treatment, 2016*, 8158693-8158613. https://doi.org/10.1155/2016/8158693

Lee, K.-B., Cho, E., & Kang, Y.-S. (2014). Changes in 5-hydroxytryptamine and Cortisol Plasma Levels in Menopausal Women After Inhalation of Clary Sage Oil: 5-HT AND CORTISOL PLASMA LEVEL IN MENOPAUSAL WOMEN. *Phytotherapy Research, 28*(11), 1599-1605. https://doi.org/10.1002/ptr.5163

Lee, M. S., Choi, J., Posadzki, P., & Ernst, E. (2012). Aromatherapy for health care: an overview of systematic reviews. *Maturitas, 71*(3), 257-260.

Lee, S. Y. (2005, 4/). The Effect of Lavender Aromatherapy on Cognitive Function, Emotion, and Aggressive Behavior of Elderly with Demenita. *J Korean Acad Nurs, 35*(2), 303-312.

Lua, P. L., Salihah, N., & Mazlan, N. (2015). Effects of inhaled ginger aromatherapy on chemotherapy-induced nausea and vomiting and health-related quality of life in women with breast cancer. *Complementary Therapies in Medicine, 23*(3), 396-404. https://doi.org/10.1016/j.ctim.2015.03.009

Lyons, M. (2018). R3 The Use of Aromatherapy for Symptom Management. *Pain Management Nursing, 19*(2), 111.

Maddocks-Jennings, W., & Wilkinson, J. M. (2004). Aromatherapy practice in nursing: literature review. *Journal of advanced nursing, 48*(1), 93-103.

Marzouk, T., Barakat, R., Ragab, A., Badria, F., & Badawy, A. (2015). Lavender-thymol as a new topical aromatherapy preparation for episiotomy: A randomised clinical trial. *Journal of Obstetrics and Gynaecology, 35*(5), 472-475. https://doi.org/10.3109/01443615.2014.970522

Matsumoto, T., Kimura, T., & Hayashi, T. (2016, 2016

2016-06-17). Aromatic effects of a Japanese citrus fruit-yuzu (Citrus junos Sieb. ex Tanaka)-on psychoemotional states and autonomic nervous system activity during the menstrual cycle: a single-blind randomized controlled crossover study. *BioPsychoSocial Medicine, 10*. https://doi.org/http://dx.doi.org/10.1186/s13030-016-0063-7

Matsumoto, T., Kimura, T., & Hayashi, T. (2017). Does Japanese Citrus Fruit Yuzu (Citrus junos Sieb. ex Tanaka) Fragrance Have Lavender-Like Therapeutic Effects That Alleviate Premenstrual Emotional Symptoms? A Single-Blind Randomized Crossover Study. *Journal of Alternative & Complementary Medicine, 23*(6), 461-470. https://doi.org/10.1089/acm.2016.0328

McIlvoy, L., Richmer, L., Kramer, D., Jackson, R., & Shaffer, L. (2014). The Efficacy of Aromatherapy in the Treatment of Post-Discharge Nausea in Patients Undergoing Outpatient Abdominal Surgery. *Journal of PeriAnesthesia Nursing, 29*(5), e38-e39. https://doi.org/10.1016/j.jopan.2014.08.126

Methley, A. M., Campbell, S., Chew-Graham, C., McNally, R., & Cheraghi-Sohi, S. (2014, 2014/11/21). PICO, PICOS and SPIDER: a comparison study of specificity and sensitivity in three search tools for qualitative systematic reviews. *BMC Health Services Research, 14*(1), 579. https://doi.org/10.1186/s12913-014-0579-0

Miller, M., Renn, B. N., Chu, F., & Torrence, N. (2019). Sleepless in the hospital: A systematic review of non-pharmacological sleep interventions. *General hospital psychiatry*.

Mohebitabar, S., Shirazi, M., Bioos, S., Rahimi, R., Malekshahi, F., & Nejatbakhsh, F. (2017). Therapeutic efficacy of rose oil: A comprehensive review of clinical evidence. *Avicenna journal of phytomedicine, 7*(3), 206.

Moore, M., Schuler, M., Wilson, S., Whisenhunt, M., Adams, A., Leiker, B., Butler, T., Shankweiler, C., Jones, M., & Gibson, C. (2019). More than pills: alternative adjunct therapies to improve comfort in hospitalised patients. *BMJ Open Quality, 8*(2), e000506. https://doi.org/10.1136/bmjoq-2018-000506

Motaghi, M., Borji, M., & Moradi, M. (2017). The effect of orange essence aromatherapy on anxiety in school-age children with diabetes. *Biomedical and Pharmacology Journal, 10*(1), 159-164.

Najafloo, R., Behyari, M., Imani, R., & Nour, S. (2020, 2020/12/01/). A mini-review of Thymol incorporated materials: Applications in antibacterial wound dressing. *Journal of Drug Delivery Science and Technology, 60*, 101904. https://doi.org/https://doi.org/10.1016/j.jddst.2020.101904

Nakhaei, A. A., Javid, A., Marefat, M., Chaichy, Z., Alshahrestani, A., & Nazarpour, P. (2019). Is Aromatherapy Effective for Apnea in Preterm Infants? A Systematic Review. *International journal of pediatrics (Mashhad), 7*(7), 9741-9747. https://doi.org/10.22038/ijp.2019.40056.3402

Nasiri, A., Mahmodi, M. A., & Nobakht, Z. (2016). Effect of aromatherapy massage with lavender essential oil on pain in patients with osteoarthritis of the knee: A randomized controlled clinical trial. *Complementary Therapies in Clinical Practice, 25*, 75-80.

Ndao, D. H., Ladas, E. J., Cheng, B., Sands, S. A., Snyder, K. T., Garvin Jr, J. H., & Kelly, K. M. (2012). Inhalation aromatherapy in children and adolescents undergoing stem cell infusion: results of a placebo-controlled double-blind trial. *Psycho-Oncology, 21*(3), 247-254. https://doi.org/https://doi.org/10.1002/pon.1898

Noda, A., Funaki, N., Hirashita, R., Nakashima, H., Mita, Y., Masato, O., Miyata, S., Iwamoto, K., Ozaki, N., & Urakami, K. (2019). 0704 Effects of Aromatherapy on Sleep and Cognitive Function in the Elderly. *Sleep, 42*(Supplement_1), A282-A283.

Nord, D., & Belew, J. (2009). Effectiveness of the essential oils lavender and ginger in promoting children's comfort in a perianesthesia setting. *Journal of PeriAnesthesia Nursing, 24*(5), 307-312.

O'Flaherty, L.-A., van Dijk, M., Albertyn, R., Millar, A., & Rode, H. (2012). Aromatherapy massage seems to enhance relaxation in children with burns: an observational pilot study. *Burns, 38*(6), 840-845.

Olapour, A., Behaeen, K., Akhondzadeh, R., Soltani, F., Razavi, F. A. S., & Bekhradi, R. (2013). The effect of inhalation of aromatherapy blend containing lavender essential oil on cesarean postoperative pain. *Anesthesiology and Pain Medicine, 3*(1), 203-207. https://doi.org/10.5812/aapm.9570

Özkaraman, A., Dügüm, Ö., Yılmaz, H. Ö., & Yeşilbalkan, Ö. U. (2018). Aromatherapy. *Clinical Journal of Oncology Nursing, 22*(2), 203-210. https://doi.org/10.1188/18.CJON.203-210

Post-White, J., Fitzgerald, M., Hageness, S., & Sencer, S. F. (2009). Complementary and Alternative Medicine Use in Children With Cancer and General and Specialty Pediatrics. *Journal of pediatric oncology nursing, 26*(1), 7-15. https://doi.org/10.1177/1043454208323914

Razaghi, N., Aemmi, S. Z., Sadat Hoseini, A. S., Boskabadi, H., Mohebbi, T., & Ramezani, M. (2020). The effectiveness of familiar olfactory stimulation with lavender scent and glucose on the pain of blood sampling in term neonates: A randomized controlled clinical trial. *Complementary Therapies in Medicine, 49*, 102289-102289. https://doi.org/10.1016/j.ctim.2019.102289

Reis, D., & Jones, T. (2017). Aromatherapy. *Clinical Journal of Oncology Nursing, 21*(1), 16. https://doi.org/10.1188/17.CJON.16-19

Rheingans, J. I. (2007). A Systematic Review of Nonpharmacologic Adjunctive Therapies for Symptom Management in Children With Cancer. *Journal of pediatric oncology nursing, 24*(2), 81-94. https://doi.org/10.1177/1043454206298837

Rose, C. (2016). Cancer-related fatigue: the potential of aromatherapy. *International Journal of Clinical Aromatherapy,, 11*(2), 32-38.

Rose, C. (2017a). Insomnia in patients with cancer: The potential of aromatherapy. *International Journal of Clinical Aromatherapy, 12*(2), 3-4.

Rose, C. (2017b). Spiritual distress in patients with cancer: The potential of aromatherapy,. *International Journal of Clinical Aromatherapy, 12*((1)), 4-13.

Rose, C. (2018). Breathlessness in patients with life-limiting illness: The potential of aromatherapy. *International Journal of Clinical Aromatherapy, 13*(1), 7-10.

Sakamoto, Y., Ebihara, S., Ebihara, T., Tomita, N., Toba, K., Freeman, S., Arai, H., & Kohzuki, M. (2012). Fall Prevention Using Olfactory Stimulation with Lavender Odor in Elderly Nursing Home Residents: A Randomized Controlled Trial. *Journal of the American Geriatrics Society, 60*(6), 1005-1011. https://doi.org/10.1111/j.1532-5415.2012.03977.x

Salamati, A., Mashouf, S., Sahbaei, F., Mojab, F., & Mojab, F. (2014). Effects of inhalation of lavender essential oil on Open-Heart surgery pain. *Iranian Journal of Pharmaceutical Research, 13*(4), 1257-1261.

Saritaş, S., Kavak, F., & Savaş, B. (2018). The effect of lavender oil on anxiety levels of patients before laparoscopic cholecystectomy. *Complementary therapies in clinical practice, 32*, 51-54.

Schneider, J., Duerden, E. G., Guo, T., Ng, K., Hagmann, P., Graz, M. B., Grunau, R. E., Chakravarty, M. M., Hüppi, P. S., & Truttmann, A. C. (2018). Procedural pain and oral glucose in preterm neonates: brain development and sex-specific effects. *Pain, 159*(3), 515-525.

Schreiber, J. A., Cantrell, D., Moe, K. A., Hench, J., McKinney, E., Preston Lewis, C., Weir, A., & Brockopp, D. (2014). Improving Knowledge, Assessment, and Attitudes Related to Pain Management: Evaluation of an Intervention. *Pain Management Nursing, 15*(2), 474-481. https://doi.org/10.1016/j.pmn.2012.12.006

Seyyed-Rasooli, A., Salehi, F., Mohammadpoorasl, A., Goljaryan, S., Seyyedi, Z., & Thomson, B. (2016). Comparing the effects of aromatherapy massage and inhalation aromatherapy on anxiety and pain in burn patients: A single-blind randomized clinical trial. *Burns, 42*(8), 1774-1780.

Shamsoddin, E., Torkashvand-Khah, Z., Sofi-Mahmudi, A., Janani, L., Kabiri, P., Shamsi-Gooshki, E., & Mesgarpour, B. (2021, 2021/06/21). Assessing research misconduct in Iran: a perspective from Iranian medical faculty members. *BMC Medical Ethics, 22*(1), 74. https://doi.org/10.1186/s12910-021-00642-2

Sheikhan, F., Jahdi, F., Khoei, E. M., Shamsalizadeh, N., Sheikhan, M., & Haghani, H. (2012). Episiotomy pain relief: Use of Lavender oil essence in primiparous Iranian women. *Complementary therapies in clinical practice, 18*(1), 66-70.

Shipton, E. A. (2018). The opioid epidemic-a fast developing public health crisis in the first world. *NZ Med J, 131*, 7-9.

Shirzadegan, R., Gholami, M., Hasanvand, S., Birjandi, M., & Beiranvand, A. (2017). Effects of geranium aroma on anxiety among patients with acute myocardial infarction: A triple-blind randomized

clinical trial. *Complementary therapies in clinical practice, 29*, 201-206. https://doi.org/10.1016/j.ctcp.2017.10.005

Smith, A. M., Farrington, M. M., & Bruene, D. (2019). C5 SCENTsible Aromatherapy. *Pain Management Nursing, 20*(2), 102.

Snow, A. L., Hovanec, L., & Brandt, J. (2004). A controlled trial of aromatherapy for agitation in nursing home patients with dementia. *Journal of Alternative and Complementary Medicine, 10*(3), 431-437. https://doi.org/10.1089/1075553041323696

Soden, K., Vincent, K., Craske, S., Lucas, C., & Ashley, S. (2004). A randomized controlled trial of aromatherapy massage in a hospice setting. *Palliative medicine, 18*(2), 87-92. https://doi.org/10.1191/0269216304pm874oa

Stallings-Welden, L. M., Doerner, M., Ketchem, E. L., Benkert, L., Alka, S., & Stallings, J. D. (2018). A comparison of aromatherapy to standard care for relief of PONV and PDNV in ambulatory surgical patients. *Journal of PeriAnesthesia Nursing, 33*(2), 116-128.

Stewart, M. T., Misra, S. M., Weydert, J. A., Tsai, S.-L., McClafferty, H., Brenner, M. G., & Brown, M. L. (2018). Integrative Therapies to Support Pediatric Palliative Care: the Current Evidence. *Current pediatrics reports (Philadelphia, PA), 6*(2), 150-157. https://doi.org/10.1007/s40124-018-0167-6

Taavoni, S., Darsareh, F., Joolaee, S., & Haghani, H. (2013). The effect of aromatherapy massage on the psychological symptoms of postmenopausal Iranian women. *Complementary Therapies in Medicine, 21*(3), 158-163. https://doi.org/10.1016/j.ctim.2013.03.007

Tamaki, K., Fukuyama, A. K., Terukina, S., Kamada, Y., Uehara, K., Arakaki, M., Yamashiro, K., Miyashita, M., Ishida, T., McNamara, K. M., Ohuchi, N., Tamaki, N., & Sasano, H. (2017). Randomized trial of aromatherapy versus conventional care for breast cancer patients during perioperative periods. *Breast Cancer Research and Treatment, 162*(3), 523-531. https://doi.org/10.1007/s10549-017-4134-7

Thrane, S. (2013). Effectiveness of Integrative Modalities for Pain and Anxiety in Children and Adolescents With Cancer:A Systematic Review. *Journal of pediatric oncology nursing, 30*(6), 320-332. https://doi.org/10.1177/1043454213511538

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., Moher, D., Peters, M. D. J., Horsley, T., Weeks, L., Hempel, S., Akl, E. A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M. G., Garritty, C., Lewin, S., Godfrey, C. M., MacDonald, M. T., Langlois, E. V., Soares-Weiser, K., Moriarty, J., Clifford, T., Tunçalp, Ö., & Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Annals of internal medicine, 169*(7), 467-473. https://doi.org/10.7326/M18-0850

Tugut, N., Demirel, G., Baser, M., Ata, E. E., & Karakus, S. (2017). Effects of lavender scent on patients' anxiety and pain levels during gynecological examination. *Complementary therapies in clinical practice, 28*, 65.

Vakilian, K., Atarha, M., Bekhradi, R., & Chaman, R. (2010). Healing advantages of lavender essential oil during episiotomy recovery: A clinical trial. *Complementary therapies in clinical practice, 17*(1), 50-53. https://doi.org/10.1016/j.ctcp.2010.05.006

Vakilian, K., Keramat, A., & Gharacheh, M. (2018). Controlled Breathing With or Without Lavender Aromatherapy for Labor Pain at the First Stage: A Randomized Clinical Trial. *Crescent Journal of Medical and Biological Sciences, 5*(3), 172-175.

van Dijk, M., O'Flaherty, L. A., Hoedemaker, T., van Rosmalen, J., & Rode, H. (2018). Massage has no observable effect on distress in children with burns: A randomized, observer-blinded trial. *Burns, 44*(1), 99-107. https://doi.org/10.1016/j.burns.2017.10.002

Vaziri, F., Khosropoor, M., Hidari, M., Pourahmad, S., Morshed Behbahani, B., & Saki, F. (2019). The Effect of Aromatherapy by Lavender Oil on Infant Vaccination Pain: a Double Blind Randomized Controlled Trial. *Journal of caring sciences, 8*(1), 17-21. https://doi.org/10.15171/jcs.2019.003

Vaziri, F., Sahebkaram, Z., Bahrami, R., Pourahmad, S., & Azima, S. (2018). Lavender oil aromatherapy on infantile colic and maternal mood: A double blind randomized clinical trial. *Pharmaceutical Sciences, 24*(1), 38-43. https://doi.org/10.15171/PS.2018.07

Weaver, M. S., Robinson, J., & Wichman, C. (2020). Aromatherapy improves nausea, pain, and mood for patients receiving pediatric palliative care symptom-based consults: A pilot design trial. *Palliative & supportive care, 18*(2), 158-163. https://doi.org/10.1017/S1478951519000555

Wilcock, A., Manderson, C., Weller, R., Walker, G., Carr, D., Carey, A.-M., Broadhurst, D., Mew, J., & Ernst, E. (2004). Does aromatherapy massage benefit patients with cancer attending a specialist palliative care day centre? *Palliative medicine, 18*(4), 287-290. https://doi.org/10.1191/0269216304pm895oa

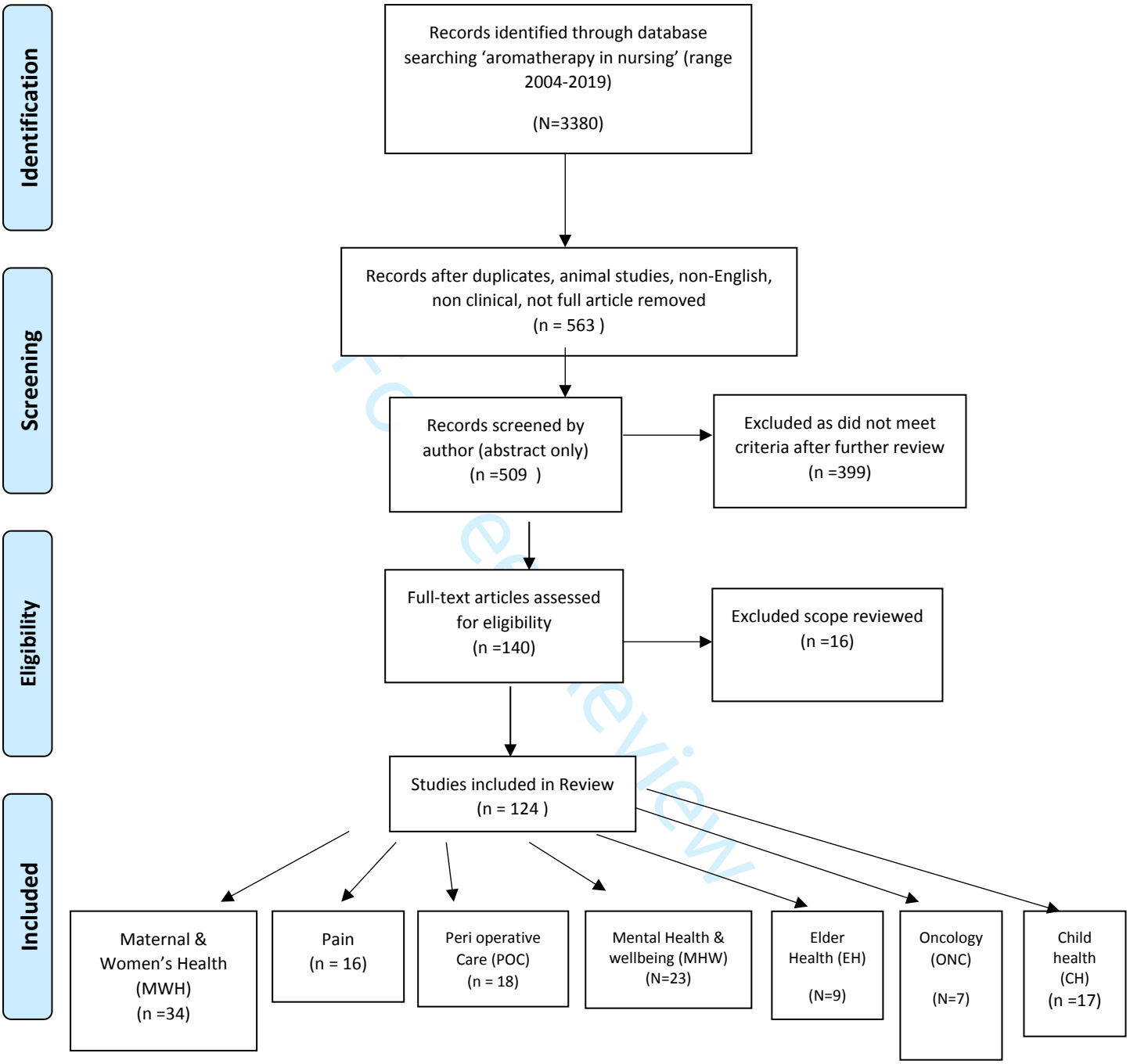
Williams, T. I. (2006). Evaluating effects of aromatherapy massage on sleep in children with autism: A pilot study. *Evidence-based Complementary and Alternative Medicine, 3*(3), 373-377. https://doi.org/10.1093/ecam/nel017

Woronuk, G., Demissie, Z., Rheault, M., & Mahmoud, S. (2011). Biosynthesis and therapeutic properties of Lavandula essential oil constituents. *Planta medica, 77*(01), 7-15.

Yip, Y. B., & Tse, S. H.-M. (2006). An experimental study on the effectiveness of acupressure with aromatic lavender essential oil for sub-acute, non-specific neck pain in Hong Kong. *Complementary therapies in clinical practice, 12*(1), 18-26. https://doi.org/10.1016/j.ctcp.2005.09.005

Running Head: SYSTEMATIC REVIEW OF THE USE OF AROMATHERAPY IN ADULT NURSING PRACTICE (2005-2019)

Figure 1: Flow Diagram



Authors	Year	Country	Trial Type	Reason	EO	N	Active	Placebo	control	Route	Outcomes	Significance
Bagheri-Nesami et al	2016	Iran	RCT	Fatigue	Lavender	59	EO	N/A	Usual	INH	FSS	NO
Bahrami et al	2017	Iran	RCT	Anxiety ACS	Lavender	90	EO	N/A	Usual care	MASS	HADS, physiological	YES
Bahrami et al	2018	Iran	RCT	Fatigue ACS	Lavender	135	EO +MASS	Reflexology	control	MASS	RFS, physiological	YES
Donaldson et al	2017	USA	Quasi	Anxiety	BLEND	44	Blend EO's	N/A	N/A	DIFF	STAI-Y1	NO
Eren et al	2017	Turkey	Quasi	Anxiety	Lavender	45	EO	Sunflower	N/A	INH	STAI I and II	NO
Farner et al	2019	USA	Quasi	Pre exam anxiety	Lavender + Rosemary	14	EO's	Plain	nil	MASS + INH	WTAS GSES	NO
Hajibagheri et al	2014	Turkey	RCT	Sleep	Rose	60	EO	N/A	Usual care	INH night	PSQi	YES
Hassanzadeh et al	2018	Iran	RCT	Fatigue dialysis	Lavender	60	EO	Relaxation	Usual	INH	BFI	YES
Iokawa et al	2018	Japan	RT	Anxiety, accuracy	Lavender + Grapefruit	28	EO's	Water	N/A	INH	STAI, accuracy	mixed
Johnson et al	2017	USA	Quasi	Nurse stress	Lavender	71	EO	N/A	N/A	DIFF	workplace stress	YES
Karadag et al	2015	Turkey	RCT	Sleep/anxiety	Lavender	60	EO	N/A	Usual care	INH	PSQI	YES
Karadag et al	2015	Turkey	RCT	Sleep/anxiety	Lavender	60	EO	N/A	Usual care	INH	PSQI	YES
Lee M.K et al	2017	korea	RCT	Fatigue, sleep , immunity	BLEND	60	EO's blend	N/A	Usual care	INH	NRS, bloods	MXD
Muz et al	2017	Turkey	RCT	Fatigue/sleep HD	Lavender + sweet orange	62	EO'S	N/A	Usual	INH	VAS, PSQI, Pfi	YES
Seo et al	2017	Korea	CT	Stress/haliotosis/ Xerostomia	BLEND	120	Blend EO's	Saline	Usual care	Gargle	VAS, pH, breath check	YES
Shirzadegan et al	2017	Iran	RCT	Anxiety AMI	German. Chamomile	80	EO	Plain oil	N/A	INH	STAI	YES
					TOTAL	**1048**						

Table 3 **Studies Related to Mental Health and Wellbeing (MHW)**

Authors	Year	Country	Study Type	Condition	N	Active	Placebo	Control	Route	Main Outcome	Significance
Afshar et al	2015	Iran	RCT	Post partum fatigue	158	EO	Sesame	N/A	INH	PSQUI	YES
Alavi et al	2014	Iran	Exp	Labour	120	Jasmine mass	jasmine inhale	N/A	MASS +inhale	Pain/anxiety	YES
Apay et al	2012	Turkey	Quasi	Dysmen.	150	EO +M	Plain oil	Nil	MASS	VAS	YES
Asazawa	2017	Japan	Quasi	fatigue	34	Blend	N/A	N/A	MASS	Fatigue/anxiety	YES
Bagheri-Nesami et al	2016	Iran	RCT	Fatigue	59	EO	N/A	Usual	INH	FSS	No
Bahrami et al	2017	Iran	RCT	Anxiety ACS	90	EO	N/A	Usual care	MASS	HADS,	Sig
Bahrami et al	2018	Iran	RCT	Fatigue ACS	135	EO +M	Reflexology	control	MASS	RFS, physiological	Mixed
Bakhtiari et al	2014	Iran	RCT	Menopause	62	EO	Water	N/A	INH	MENQOl	YES
Burns et al	2007	Italy	RCT	Labour Pain	513	EO blend	N/A	Usual	MASS	Pain VAS	NO
Conrad & Adams	2012	USA	Pilot	Post part fatigue	28	EO	N/A	N/A	INH +MASS	PND	YES
Dehkordi et al	2014	Iran	RCT	Dysmen.	96	EO	Sesame	N/A	INH	pain, bleeding	MXD
Effati-Daryani et al	2018	Iran	RCT	Fatigue delivery	141	EO +MASS	Plain MASS	N/A	MASS	PSQI	YES
Heydari et al	2018	Iran	RCT	PMT	62	EO	Plain oil	N/A	INH	PMS screening tool	YES
Karaman	2016	Turkey	RCT	Procedural pain + anxiety	106	EO	Water	N/A	INH	VAS pain + STAI	YES
Kazemzadeh et al	2016	Iran	RCT cross over	menopause	100	EO	Diluted milk	N/A	INH	hot flushes	YES
Lee, Cho, Kang	2014	Korea	Experimental	50HT/cortisol	22	EO	N/A	N/A	INH	plasma 5-HT and cortisol	YES
Matsumoto et al	2016	Japan	RCT	PMS emotional	21	EO	Water	N/A	INH	POMS	YES
Matsumoto et al	2017	Japan	RCT	PMS emotional	17	EO	N/A	Lav	INH	POMS	YES
Sheikhan et al	2012	Iran	RCT	Episiotomy	60	EO	N/A	Usual care	SITZ	REEDA	YES
Sriasih et al	2019	Indonesia	QUASI	Labour Pain	70	EO +M	Coconut Oil Mass	N/A	MASS	VAS pain	YES
Tadokoro et al	2017	Japan	Quasi	Labour oxytocin	11	EO	Propyl glycol	N/A	INH	Saliva	NO
Tanvisut et al	2018	Thailand	RC	Labour pain	104	EO	N/A	Usual are	INH	VAS pain	YES

Taavoni et al	2013	Iran	RCT	Menopause	87	Blend EO's	Plain	Usual care	MASS	MRS	YES
Umura et al	2006	Japan	Quasi	Post partum anxiety	36	EO +M	n/a	Usual caes	MASS	BLUES, POMS, STAI	YES
Uzuncakmak & Alkaya	2018	Turkey	RCT	PMS	77	EO	N/A	Nil	INH	PMS scale	YES
Vakilan et al	2010	Iran	RCT	Episiotomy	120	EO + breath	Water inhale	Iodine	SITZ	REEDA VAS pain	YES
IBID	2018	Iran	RCT	Labour pain	120	EO + M	Plain M	N/A	INH	VAS Pain	YES
Varziri	2017	Iran	RCT	Post partum pain, fatigue	56	EO	Sesame	N/A	INH	Vas pain, fatigue	YES
Yazdkhasti et al	2016	Iran	RCT	Labour	120	EO	Water	N/A	INH	Pain VAS	YES
				TOTAL	**2775**						

Table 4: Maternal and Women's Health

Key to table 4

RCT- random controlled trial

CT-controlled trial

MHW- mental health and wellbeing

WH=women's health

EO= essential oil

M=MASS

N/R- nil reported

N/S- not stated

	Year	Country	Type	Condition	EO	N	Active	Control	Placebo	Route	Outcome	Signifi-cance
Adib-Hajbaghery & Hosseini	**2015**	**Iran**	**RCT**	PONV/PNDV	Ginger	120	EO	N/A	Saline	INH	PONV VAS	Y
Anderson & Gross	**2004**	**UK**	**RCT**	PONV/PNDV	P'mint	33	EO	Saline	Iso-propyl	INH	PONV VAS	Y
Ayik & Ozden	2018	Turkey	RCT	Pre op anxiety	Lav	80	EO	N/A	Usual	Mass	STAI, sleep	Y
Beylikioglu & Arslan	2018	Turkey	RCT	Pre op anxiety	Lav	80	EO	N/A	Usual	INH	STAI	Y
Braden et al	2009	USA	RCT	Pre op anxiety	Lavandin	150	EO	Jojoba	Usual care	INH skin	anxiety reduction	Y
Fazlollahpour-Rokni et al	2019	Iran	RCT	Pre op anxiety CABG	Rose	66	EO	N/A	Usual care	INH	SAI	N
Ferruggiari et al	2012	USA	Quasi	PONV/PNDV	P'mint	71	EO	N/A	saline	INH	PONV VAS	N
Franco et al	2015	USA	RCT	Pre op anxiety	Lav	91	EO	Plain oil	N/A	INH	STAI, vitals	N
Hodge et al	2016	USA	RCT	PONV/PNDV	Quease Ease	339	QE	Blank INH	N/A	INH	VAS	Y
Hozumi et al	2018	Japan	RCT	Pre op anxiety Abo dis.	RANGE	361	EO	Vapour	Water	DIFF	0-10 VAS	Y
Jaruzel et al	2019	USA	Obs.	Pre op anxiety	Lav	30	EO	N/A	N/A	INH	Anxiety VAS	Y
Johnson et al	2016	USA	RETRO	Pain, anxiety, nausea	BLEND.	10372	EO	N/A	N/A	INH, SKIN	VAS	Y
kim et al	2006	USA	RCT	Post op pain	Lav	50	EO + O2	N/A	oxygen	INH	post op pain	N
kim et al	2007	USA	RCT	Post op pain	Lav	54	EO + O2	baby oil	O2	INH	VAS	y
Mcilvoy	2012	USA	Prosp.	PNDV	BLEND	70	QE	N/A	N/A	INH	VDS	N
Saritas et al	2018	Turkey	RCT	Pre op anxiety	Lav	110	EO	-	Usual care	INH	STAI	Y
Sites et al	2014	USA	RCT	PONV/PNDV	P'mint	11	EO ALCO HOL	BREATH	N/A	INH	PONV	Y
Stallins-Welden et al	2014	USA	RCT	PONV/PNDV	BLEND	254	QE	N/A	Usual care	INH	VDS nausea	Y
Tamaki et al	2017	Japan	RCT	Peri op anxiety	RANGE	162	choice EO's	N/A	Usual care	INH	QOL, vitals, meds	N

KEY: VDS = Verbal descriptive Scale

Table 5 Perioperative Care Studies

Name	Year	Country	Method	Reason	Essential Oil	N=	Active	Placebo	Control	Route	Outcome	Significance
Bagheri-Nesami et al	**2014**	**Iran**	**RCT**	Procedural	Lav	46	EO	Plain oil	**N/A**	INH	pain VAS	Y
Bikmoradi et al	2017	Iran	Quasi	IV pain	Lav	60	EO + alcohol	Water	N/A	sterile water	VAS pain + STAI	Y
Daneshpajooh et al	2019	Iran	RCT	Burns	Rose	132	EO	Benson relaxation	Usual	INH	Pain Anxiety score	Y
Efe Arslan et al	2019	Turkey	RCT	Arthritis	BLEND	90	EO + MASS	MASS	N/A	MASS M	VAS	Y
Eftekharsadat et al	2018	Iran	RCT	Carpal Tunnel	Lav. Stoechas	48	EO cream	Plain cream	N/A	MASS M	VAS BCTQ function	Y
Ghods et al	2015	Iran	RCT	Procedural pain anxiety	Lav	34	EO	N/A	water	Dermal spray	VAS	Y
Gok Metin et al	2017	Turkey	RCT	Neuropathic pain	BLEND	46	EO + MASS	N/A	Usual care	MASS H&F	VAS, QOL	Y
Gok Metin et al	2016	Turkey	RCT	R. arthritis	BLEND	51	Blend EO's	Reflex.	Usual cares	MASS	VAS, fatigue, physiological	Y
Hasempur	2015	Iran	RCT	Carpal tunnel	Ger. Cham	26	EO	Plain oil	N/A	Dermal spray	BQ + motor function	Y
Kane et al	2004	UK	cross over	Wound pain	Lav/ lemon + music	8	Chosen EO + music	Music	Usual care	INH	VAS	y
Karaman	2016	Turkey	RCT	Procedural pain anxiety	Lav	106	EO	Water	N/A	INH	VAS pain + STAI	y
Nasiri, Mahmodi & Nobakht	2016	Iran	RCT	Chronic pain	Lav	80	EO	Almond oil	nil	Self MASS	VAS	y
Seyyed-Rasooli et al	2016	Iran	RCT	Burns	Lav, rose	90	EO + MASS	EO INH	Usual care	INH + mass	anxiety + pain	y

Taşan et al	2019	Turkey	RCT	Procedural pain + anxiety	Lav	60	EO	N/A	Usual care	INH	VAS	statistically significant
YIP & Tse	2005	Hong Kong	Experimental	Neck pain	Lav	28	EO + ACUP	N/A	ACUP	MASS	pain VAS	sig pain reduction
					Total	**905**						

Table 6: Adult studies on the effects of Aromatherapy on Pain

Authors	Year	Country	Method	Reason	Essential Oils	N	Active	Placebo	control	Route	Outcomes	Significance
Fu et al	2013	Australia	RCT	Dementia agitation	Lav	67	EO spray or hand MASS	Water	EO spray	Dermal	C-MAI-SF	N
Fung, J.K.K. & Tsang, H.W.	2018	Hong Kong	RCT	Dementia	Lav	60	EO +ACU + exercise	Cog + ex	AM+ACU + cognition training	MASS M	C-CMAI-29 Agitation scale	Y
Jimbo et al	2009	Japan	Cross over	Dementia	BLEND	28	Blends	N/A	N/A	INH	Various cognitive tests	Y
Kimura et al	2013	Japan	Cross over	Agitation dementia	Lav	20	EO	N/A	Usual cares	INH		Y
Noda et al	2019	Japan	EXP	sleep + cognition	day + night oils	10	EO	N/A	N/A	MASS	sleep/activity monitor/cognition	N
Sakamoto et al	2012	Japan	RCT	falls	lavender	145	EO	Plain patch	N/A	INH	Number of falls	N
Snow et al	2004	USA	Pilot	Dementia agitation	Lav	7	EO	thyme	N/A	INH	agitation	N
Turten & Ozdemir	2017	Turkey	RCT	Agitation Dementia	L' grass, Euc	28	EO + hand MASS	N/A	Usual care	MASS + INH	NPI, CMAI,ZBI	Y
Watson et al	2019	Australia	RCT	Dementia agitation	Lav/Melissa	49	EO'S	N/A	usual care	INH	NPI, CMAI	Y
					Total	**414**						

Table 7: Elder Health

Author	Year	Country	Design	Condition	Essential oils	N	Active	Placebo	Control	Route	Outcome	Significance
Blackburn et al	2017	USA	RCT	Insomnia	BLEND	50	chosen EO	Rose hydro.	Usual care	DIFF	PSQI/ESAS	Y
Dyer et al	2013	UK	Audit	Nausea	MULTIPLE	514	any EO	N/A	N/A	INH	nausea, anxiety	N
Kyle, G	2006	UK	RCT	Anxiety Palliative	S' wood	34	EO + MAS	MASS	DIFFUSE	INH + MASS	anxiety	N
Lua et al	2015	Malaysia	RCT/crossover	CINV	Ginger	60	EO	Fake ginger	N/A	INH	VAS/HQoL	MXD
Ozkaraman et al	2018	Turkey	RCT	Chemotherapy anxiety	Lav	90	EO	Tea tree oil	Usual care	INH	STAI PSQI-	MIXED
Soden et al	2004	uk	RCT	Anxiety	Lav	42	EO	N/A	plain oil	MASS	VAS, HAD, RSCL, VSH sleep	Y
Wilcock et al	2004	UK	RCT	Anxiety Palliative	Lav/Cham	46	EOS BLEND	N/A	Usual care	M' MASS	VAS	N
					TOTAL	**836**						

Table 8 Studies on Oncology

Authors	Year	Country	Design	Condition	(n=)	Experimental	Placebo	Control	Route	Key outcome	Significant
Aghagoli et al	2016	Iran	RCT	Apnea (prem)	60	EO	water	N/A	INH	HR SPO_2 Apnae	Y
Bikmoradi et al	2017	Iran	Quasi	Procedure -IVC	60	EO	water	N/A	INH	Pain (Oucher)	Y
De Jong et al	2021		RCT	Post op pain	60	EO	Plain massage	Usual care	M Mass	Observation +physiological	N
Gallardo et al	2018	USA	Quasi	Burn pain/anxiety dressing	20	EO	n/a	N/A	INH	Self assess	Y
Kiberd et al	2016	Canada	RCT pilot		162	Aroma	saline inhaler	N/A	INH	BARF	FLAWED
KÜÇÜK et al	2019	Turkey	RCT	procedural blood	195	aroma	buzzy jet others	N	INH	Oucher score' CFS, Parental obs, salivary cortisol	Y
Marofi, M	2015	Iran	RCT	Post op pain	64	EO	Almond oil	N/A	INH	Toddler, preschool . post op pain scale	Y
Nord & Belew	2009	USA	RCT	Peri op comfort	94	EO	Jojoba	INH	MXD	FLACC SCALE	Y
Oflaherty et al	2012	South Africa	Obers	Burns	71	aroma mass	N/A	N	MASS	varied	N
Razaghi et al	2020	Iran	RCT	needle pain	120	aroma mass	glucose	usual	INH	CRYING	Y
Soltani et al	2013	Iran	RCT		48	aroma +pain	N/A	pain relief	INH	VAS	Y
Yvakilan et al	2018	Iran	RCT		120	aroma +breathing	water inhale	N/A	INH	VAS pain	Y
van Dijk et al	2017	South Africa	RCT	Burns	284	aroma mass	plain mass	Usual Care	M MASS	MTI COMFORT Physiological	N
Vaziri et al	2018	Iran	RCT	colic	66	inhale	sweet almond	N/A	Inhale	maternal depression crying /sleep/	Y
Vaziri et al	2019	Iran	RCT	Vaccination pain	97	INH	sweet almond	N/A	Inhale	Pain (video)	Y

Weaver	2019	UK	CT	nausea/pain/mood	180	aroma mass	visualisation	Usual	Inh	BARF FACES CAPS	Y
Williams	2006	UK	within subject	Autism	11	aroma mass	N/A	Usual	massage	sleep patterns	N
					1590						

Table (; Summary of studies reviewed for infants and Children