The use of essential oils for pain relief and anxiety during childbirth: a systematic review

RM van Rooyen


orcid.org/0000-0001-9961-7972

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Supervisor: Prof CS Minnie

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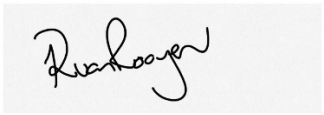
Student number: 10872329

DECLARATION

I, Rachel M van Rooyen, M.Cur student 10872329, declare that the following study is my own work and that no plagiarism was committed that I am aware of. Whenever literature was needed to support or strengthen an argument, full credit was given to the authors as cited in the text and bibliography.



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ABSTRACT

Background

Essential oils as an option for natural pain relief, as well as relief of anxiety during labour, is growing more popular globally. Traditional treatment options for pain and anxiety during childbirth have side-effects that may have a negative effect on both the mother and the baby. Healthcare workers need to be up-to-date with pharmacological as well as non-pharmacological pain and anxiety relief medication and methods in order to provide up-to-date information to pregnant women including both the positive effects, as well as the side effects thereof. Various studies have been done on alternative methods for pain relief and anxiety during childbirth, but only limited research on the use of essential oils as pain and anxiety relief during labour has been done.

Aim

The aim of the research was to synthesise the best available evidence of relevant studies of the use of essential oils as non-pharmacological relief of pain and anxiety during labour to contribute to information for pregnant women enabling them to make informed decisions on the desired method to relieve pain and anxiety.

Method

This study was a systematic review to present a summary of the best available evidence, as well as to provide a clear overview of the use of essential oils as relief of pain and anxiety during labour. The following databases were used namely: The Cochrane Library, Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, EBSCOhost, Web-of-Science, ProQuest CINAHL, PubMed and Scopus. Furthermore, in order to ensure transparency, the research was registered on the Prospective Register of Systematic Reviews (PROSPERO) with registration number: CRD42018105529. Additionally, the reference lists of relevant academic literature were searched to determine if any other primary sources needed to be included. Inclusion and exclusion criteria were used, and all relevant studies were critically appraised with the relevant critical appraisal tools.

Results

Fourteen studies were included in the final report. These studies were conducted in countries like India, Indonesia, Thailand, Iran and the United Kingdom. Different methods of administration were used, such as massage, footbath or essential oils added in a birthing pool, and different inhalation methods. Essential oils found to have a positive effect on pain and anxiety during labour included Lavender, Frankincense Olibanum, Clary Sage, Peppermint, Lemon, Mandarin, Rose Absolute, Jasmine, Eucalyptus and Chamomile.

Conclusion

The best available evidence acquired during this systematic review indicated that essential oils are perceived to be an effective non-pharmacological method to reduce pain and anxiety during labour.

Keywords

Alternative anxiety relief, alternative pain relief, anxiety, aroma therapy, birth, childbirth, essential oils, labour, labor, non-pharmacological pain relief, systematic review

LIST OF ABBREVIATIONS

ADA	American Dietetic Association
CAM	Complementary and Alternative Medicine
CASP	Critical Appraisal Skills Programme
CAT	Complementary and Alternative Treatment
CENTRAL	Cochrane Central Register of Controlled Trials
CPD	Continuing Professional Development
CRD	Centre for Reviews and Dissemination
EPPI	Evidence for Policy and Practice Information-reviewer
HADS	Hospital Anxiety and Depression Scale
HREC	Health Research Ethics Committee
INSINQ	Focus Area Research to Promote Quality in Nursing and Midwifery (old name)
NuMIQ	Focus Area Research to Promote Quality in Nursing and Midwifery (new name)
NRS	Numeric rating scale
NPRS	Numeric pain rating scale
PICO	Patient, Intervention, Comparison and Outcome
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PROSPERO	International prospective register of Systematic Reviews
RN	Registered Nurse
SAI	State Anxiety Inventor
SR	Systematic review
STAI	Spielberger state-trait anxiety inventory
TAI	Trait Anxiety Inventory
VAS	Visual Analogue Scale

VASA	Visual analogue scale for anxiety
WHO	World Health Organization

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CHAPTER 1: OVERVIEW AND BACKGROUND

1.1 Introduction

"Just as a woman's heart knows how and when to pump, her lungs to inhale, and her hand to pull back from fire, so she knows when and how to give birth." - Virginia Di Orio (s.a.)

Giving birth is a natural phenomenon. However, the means and how to give birth depend amongst others on the option chosen by the mother to facilitate pain relief and to lessen anxiety (Lindholm & Hildingsson, 2015:75). Labour pains intensify as labour progresses and can lead to the mother being anxious, which in turn can lead to poor relaxation during and between contractions and a negative childbirth experience (Lindholm & Hildingsson, 2015:75). Management of anxiety and pain is vital, either pharmacological or non-pharmacological.

Various studies have been conducted on non-pharmacological and alternative anxiety and pain relief methods during childbirth, but only limited research on the use of essential oils has been done (Chaillet *et al*., 2014:130; Kozhimannil *et al*., 2013:2; Robertson & Johansson, 2010:446; Sanders & Lamb, 2017:80).

This study aims to review the best available evidence on the use of essential oils as a method of non-pharmacological relief of pain and anxiety during labour.

1.2 Background to study

Natural childbirth can be defined as labour and parturition accomplished by a mother with little or no medical intervention (Mosby's dictionary of medicine, nursing & health professions, 2013:1203). Another definition, according to Dippenaar and da Serra (2012:350), is that natural childbirth can be seen as a controlled, relaxed, satisfying childbirth, especially if a mother is continuously assisted during the birth process. Natural pain relief methods are preferred during natural childbirth (Sullivan & McGuiness, 2015:20). Natural pain relief is when the pain associated with uterine contractions is relieved without using pharmacological interventions. Other related terms used in research for natural pain relief are non-pharmacological pain relief and pain relief using complementary and alternative medicine (CAM) or - therapies (CAT) (Steel *et al.,*

2015:309; Sullivan & McGuiness, 2015:20). CAT and CAM are defined by Tournaire and Theau-Yonneau (2007:409) as medicines, theories or practices that are currently not predominantly applied for pain and anxiety relief during labour.

A woman's knowledge of alternative pain relief options versus pharmacological pain relief options and their side effects can influence her choice and perspective of pain medication. According to Lally *et al*. (2008:1) as well as Lindholm and Hildingsson (2015:74), a woman's lack of knowledge about the risks and benefits of the various methods of pain relief can heighten anxiety which leads to increased pain during childbirth. Pascali-Bonaro and Kroeger (2004:5) maintain that women will have childbirth memories for a 'lifetime', and thus every possible measure should be taken to ensure a positive childbirth experience. The WHO states that a positive childbirth experience can be seen as a positive outcome of birth regardless of previous views or anticipation by a woman as well as participating in decisions made for interventions (WHO, 2018).

Already in 1942, the well-known Dr Grantly Dick-Read proclaimed that every woman should be granted the experience of personally mastering motherhood positively (Dick-Read, 1947:46). Recent recommendations for a positive childbirth experience compiled by WHO also recommend alternative methods for pain management during labour if this is the woman's preferred decision (WHO, 2018). Women are increasingly expected- and are expecting, participating in decisions about their healthcare (Sullivan & McGuiness, 2015:20; Lally *et al*., 2008:2). The National Institute for Clinical Excellence (NICE) of the United Kingdom has stated that health care workers need effective ways of supporting pregnant women in making informed decisions during labour (NICE, 2003:37). O'Brien *et al*. (2017:6) indicate that the relationship between mothers and health care workers prior to labour may influence the choice of pain and anxiety relief, as well as the method of giving birth. Training of health care workers on how to manage pain in labour is vital (Ohaeri *et al*., 2019:5). Furthermore, Ohaeri *et al*. (2019:5) specify that pain management in labour should be part of the mandatory continuing professional development (CPD) programme for nurses and midwives. Ohaeri *et al*. (2019:5) proposed that labour pain management should be an essential obligatory to renew the annual licence for health care professionals and midwives. Part of the health care worker's responsibility is to ensure that the woman receives all the information needed to make informed decisions.

Mothers have the right to know of the possible adverse side effects of non-pharmacological as well as pharmacological agents (Bricker & Lavender, 2002:107). When opioids like Pethidine are administered, side effects such as sedation, light-headedness, nausea and oxygen desaturation may occur (Kokki *et al*., 2012:183; Kaur Makkar *et al*., 2015:160). Bricker and Lavender (2002:105) state that besides the unpleasant maternal side effects of opioids, such as sedation, nausea, and vomiting, risks associated with physiological changes in labour may be worsened. Moreover, the administering of opioids during labour may result in respiratory depression of the mother and can be aggravated during physiological hyperventilation and result in respiratory alkalosis. In addition, opioids may intensify the already increased gastric acid secretion and decreased gastrointestinal motility during labour, which results in an increased risk of regurgitation and pulmonary aspiration (Bricker & Lavender, 2002:105). It is not only the mother who may experience adverse effects.

Neonates experience adverse outcomes when mothers receive medication, such as Fentanyl or Pethidine (opioids), before or during labour. Opioids cross the placenta as they are lipid-soluble, and therefore, when opioids are administered to the mother for pain relief during labour, it may cause neonatal respiratory difficulties. The baby may become lethargic, struggling to latch, suck and feed, as well as have a low Apgar score (Bricker & Lavender, 2002:10). These effects have a negative impact on the mother and baby during the golden hour, which refers to the first sixty minutes after birth (Brimdyr *et al*., 2015:325).

Many women experience anxiety during pregnancy and childbirth (Muzik & Hamilton, 2016:2268). According to Dick-Read (1947:39), constant fear or anxiety, ranging from minor to extreme, may result in chronic anxiety, and according to Allison (2004:197), anxiety, as the most common psychiatric disorder, may cause or result in depression. However, anxiety medication is also not without side-effects. The four main areas of concern when using anxiety medication during pregnancy and childbirth, such as selective serotonin reuptake inhibitors (SSRIs), are teratogenicity, pregnancy and birth outcomes, neonatal outcomes and child neurodevelopmental outcomes (Muzik & Hamilton, 2016:2272, 2276; Allison, 2004:196). During pregnancy, women with known depression and clinical signs need to continue with a pharmacological option where the risks of discontinuing the medication outweigh the benefits (Allison, 2004:196; Muzik & Hamilton, 2016:2269). When anxiety is left untreated, it has an adverse effect on neonatal

outcomes and even premature delivery (Muzik & Hamilton, 2016:2276). According to Allison (2004:198), some anti-depressants are not safe to use during pregnancy. The following table of the American Congress of Obstetricians and Gynaecologists (ACOG) can be used as a guideline to individualise the continuing or tapering off of pharmacological intervention for anxiety or depression.

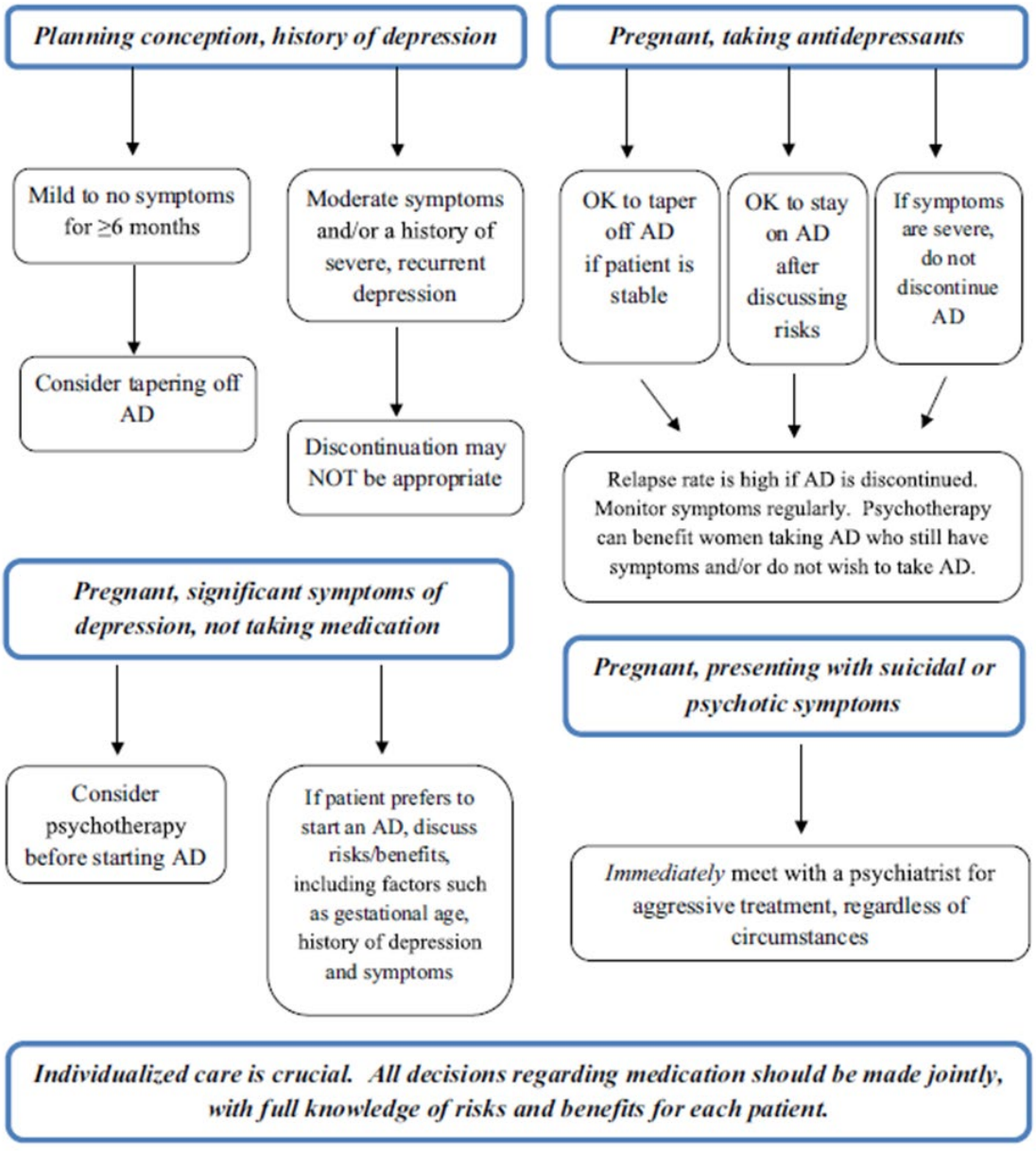

Figure 1-1: ACOG guidelines for pharmacological intervention for anxiety

(Allison, 2004:198)

For low-risk women, essential oils as a non-pharmacological treatment option may be successfully used for anxiety or depression, as well as pain relief during labour.

Non-pharmacological or natural pain and anxiety relief options can especially be helpful during labour. These agents can be divided into categories with sub-categories such as mind-body interventions (hypnosis, yoga and relaxation therapies, and immersion in water), alternative medical practice (homoeopathy, traditional Chinese medicine), manual healing methods (massage, reflexology) and bio-electromagnetic applications (magnets) and herbal medicines (Smith *et al.,* 2012:3; Page & McCandlish, 2006:349). The use of essential oils can be considered a mind-body intervention or a manual healing method when combined with massage therapy during labour. Essential oils can be used solitary as an inhalation method during labour or combined with several of the above sub-categories to relieve pain and anxiety. In Table 1-1, a list of essential oils and their general actions on mental effects is provided.

Table 1-1: General action of essential oils on the mental effect

Essential Oil	General action on the mental effect
Jasmine Rose Sandlewood Ylang-Ylang	Euphoric: Uplifting to emotions, enhances sensuality, lifts mild depression, possible light narcotic and euphoric effect
Lavender Sweet marjoram Neroli Mandarin	Sedative: calms emotions, relieves anxiety, reduces nervous tension, sedates
Geranium Bergamot Rosewood Clary Sage Grapefruit	Balancing: Regulating, uplifting of emotions
Rosemary Basil Peppermint Lemon	Stimulant: awakening, mental stimulant

(Sheppard-Hanger, 2015:43)

Essential oils are highly concentrated oils derived from plants. The oils are extracted through pressure, hydro diffusion and steam distillation (Manion & Widder, 2017:514; Ali *et al*., 2015:601). In aromatherapy literature, essential oils are referred to as plant "essences", and the classification of the aromatic substance is done depending on the method used to extract the essential oils (Manion & Widder, 2017:154; Ali *et al*., 2015:601; Sanders & Lamb, 2017:81). According to Manion and Widder (2017:154), "neat" oil refers to the pure, undiluted oil and is extremely concentrated; therefore, they have to be diluted in a carrier oil. Carrier oils include oils such as sweet almond, jojoba, olive, coconut, sunflower and canola oil (Manion & Widder, 2017:154).

Extractions are prepared from various parts of the plant; for example, Bergamot, Lemon, Lime, Sweet Orange, Tangerine and Mandarin are made from the fruit peel, whereas Cinnamon is extracted from the bark of the plant. Citronella, Lemongrass, Petitgrain, Palmarosa, and Patchouli are extracted from the leaves of the plant. The entire plant is used for essential oils made from Geranium, Lavender, Rosemary and Spike Lavender, but only the roots are used in Ginger and Vetiver essential oils. Lastly, Jasmine, Neroli, Rose and Ylang Ylang are made from the flowers of the plants (Ali *et al*., 2015:603).

Photos of the different parts of the plants used for essential oils are presented in Table 1.2.

Table 1-2: Plants used for Essential Oils

Photo	Name and Botanical name
	Clary Sage *Salvia Sclarea Linn.*

Photo	Name and Botanical name
	Eucalyptus *Eucalyptus Globulus Labill*
	Geranium *Pelargonium graveolens L'Herit*
	Lavender *Lavendula Officinalis Chaix*

Photo	Name and Botanical name
	Lemon *Citrus Limon Linn.*
	Peppermint *Mentha piperita*

Photo	Name and Botanical name
	Roman Chamomile *Anthemis nobelis*
	Rosemary *Rosmarinus officinalis*
	Tea tree *Melaleuca altemifolia*

Photo	Name and Botanical name
	Ylang-Ylang *Cananga odorata*

(Ali *et al*., 2015:603)

Depending on the therapeutic goal, a single essential oil could be added, or a mixture of two or more oils could be added to the carrier oil (Manion & Widder, 2017:154). Essential oils, when diluted in carrier oils, are used in aromatherapy for various therapeutic purposes. During childbirth, aromatherapy can be used for various indications such as to encourage uterine contractions, pain relief, as well as calming the woman (Musil, 2013:58). It can also be used in various ways.

Different methods of applying essential oils include topical application, inhalation, oral intake or added to a bath to enhance the absorption of the oils for maximum effect (Ali *et al*., 2015:601; Sanders & Lamb, 2017). For topical application, it can be rubbed on the patient's palms or be used to massage the patient (Ali *et al*., 2015:601). An example of this is when the birth companion applies essential oils to the mother through massage (Adams & Bianchi, 2008: 106). Inhalation of essential oils could have both psychological and physiological effects on the patient. Physiologically, inhalation is the fastest route to the bloodstream, and psychologically, essential oils may have an immediate impact on emotions and mental state through the connection to the brain via the limbic system (Zahra & Leila, 2013:427; Sheppard-Hanger & Hanger, 2015:44). The smell of essential oils might impact memory, learning, emotions, thinking and feelings and calm the nervous system to lessen anxiety during labour (Sheppard-Hanger & Hanger, 2015:44). Therefore, the woman should smell the oil before applying a specific oil as the same therapeutic effect might not be achieved if she found the smell unpleasant. (Sheppard-

Hanger & Hanger, 2015:45). The safest way of applying essential oils would be in the air to inhale or topically, mixed with a carrier oil (Sheppard-Hanger & Hanger, 2015:45). The usually recommended dilution that is safe for application on the skin is a blend of 2.5% or 15 drops in 30 ml. of carrier oil (Sheppard-Hanger & Hanger, 2015:44).

As highly-concentrated substances, essential oils could have a powerful effect on a person's physical and mental state. Therefore, healthcare workers should be educated in using essential oils to ensure that the outcomes are safe and positive to assist the patients in wholesome ways (Sheppard-Hanger & Hanger, 2015:46). Drug effects might be altered when essential oils are used, especially in larger dosages than needed, decreasing or increasing the effectiveness of some drugs (Reis & Jones, 2017:17). Moreover, Reis and Jones (2017:17) state that obtaining good quality essential oils is vital as plants are often sprayed with pesticides. Citrus oils, such as orange essential oil, should not be used topically on any area unprotected against ultraviolet light as it is phototoxic (Reis & Jones, 2017:19).

The most common side-effects of essential oils are allergic reactions to specific oils and reactions caused by the incorrect use or preparation of essential oils (Schilcher, 1985:217). Sensitisation as an allergic reaction can be caused by continuous topical use of undiluted essential oils. According to Sheppard-Hanger and Hanger (2015:43), pregnant women are more at risk for sensitisation. Essential oils that are known to cause sensitisation such as Cassia (*Cinnamomum cassia*), Cinnamon bark (*Cinnamomum zeylanicum*), Peru balsam (*Myroxylon pereirae*), Verbena absolute (*Lippia citriodora*), Tea absolute (*Camellia sinensis*), Lemon Myrtle (*Backhousia citriodora*), Turpentine oil (*Pinus spp*.) and Inula (*Inula graveolens*) should be avoided during pregnancy (Sheppard-Hanger & Hanger, 2015:45). Although these essential oils are unsafe for use during pregnancy, there is a list of oils which are considered safe for pregnancy and labour, as seen in Table 1-3.

Table 1-3: Essential oils considered safe for pregnancy

Common name of essential oil	Botanical name of essential oil
Cardamom	Elettaria cardamomum
German and Roman chamomile	Matricaria recutita, Anthemis noblis
Frankincense	Boswellia carterii

Geranium	Pelargonium graveolens
Ginger	Zingiber officinale
Lavender	Lavandula
Neroli or Orange Blossom	Citrus aurantium bigaradia
Patchouli	Pogostemon cablin
Petitgrain	Citrus aurantium
Rose	Rosa damascene
Sandalwood	Santalum album

(Guba, 2001; Sayorwan *et al*., 2012:603)

Pregnant women need more information concerning non-pharmacological pain and anxiety management (Sullivan & McGuiness, 2015:20). Included in this advice should be information on the use of essential oils as an option for natural pain and anxiety relief during labour (Lakhan *et al*., 2016:4). Sullivan and McGuiness (2015:20) stress the importance that childbirth professionals should keep up with the latest findings and research to be well informed on all the aspects concerning anxiety and pain management during labour. This includes the use of essential oils as a non-pharmacological management option.

1.3 Problem statement

Women are often not informed about all their options for pain relief and methods to reduce anxiety during childbirth (Sullivan & McGuiness, 2015:20; Lakhan *et al*., 2016:2; Sheppard-Hanger & Hanger, 2015:43). There is a worldwide trend that women choose a more naturalistic approach to relieve pain and anxiety during childbirth (Sullivan & McGuiness, 2015:20). Bohren *et al.* (2017:8) consider relevant information given to a mother as one of the essential support features during childbirth. Moreover, if the mother is well informed regarding the use of essential oils as an alternative method for the relief of pain and anxiety, she would be more prepared, among others, to make an informed decision regarding what form of pain relief to use for the birth process (Bohren *et al*., 2017:8).

Childbirth educators, doulas, midwives and nurses who have early and multiple contacts with pregnant women are in an excellent position to provide information about non-pharmacological pain relief options and options to reduce anxiety by using essential oils

(Weatherspoon, 2011:44). O'Brien *et al*. (2017:6) indicate that the relationship between mothers and maternity care workers before labour may influence the mothers' choice and method of giving birth. In order for the patient to feel safe and have a feeling that optimised care is provided, it is vital to establish effective communication between women and health care staff (Hayes *et al*., 2011:326).

However, Sullivan and McGuiness (2015:20) found that women usually receive limited information on the use of essential oils. This information is needed regarding essential oils either as pain relief (Lakhan *et al*., 2016:2) or as relief of anxiety (Sheppard-Hanger & Hanger, 2015:43) during labour. Moreover, there is also limited available evidence for health care workers to use when engaging in consultation and giving information to women (Adams, 2012:40). Although primary studies are available, there is a need for synthesised evidence. Thus, to obtain a summary of the best available evidence, this study reviewed available research evidence on the use of essential oils as pain and anxiety relief during labour.

1.4 Research question

What is the best available research evidence about the use of essential oils as pain relief and relief of anxiety during childbirth?

1.5 Paradigmatic perspective

A paradigmatic perspective is how the researcher views and interprets the world, which affects the researcher's viewpoint and, therefore, also the manner of research. Clarifying to the readers the researcher's paradigmatic perceptive gives a better understanding of the researcher's assumptions, as well as the decisions made during the research process (Botma *et al*., 2015:187). This perspective consists of three types of assumptions, namely: meta-theoretical- theoretical- and methodological assumptions.

1.5.1 Meta-theoretical assumptions

Meta-theoretical assumptions refer to the researcher's beliefs and how the world is experienced by the researcher (Botma *et al*., 2015:187). The researcher's belief about a person as a human being is strongly grounded in the belief that (יהוה) YHVH (Almighty) is the Creator of heaven and earth, and that YHVH breathed life into man when He created

man in His image, according to Genesis 1:27 (Bible, 2012). This leads to the understanding during this study that all women giving birth to a newborn infant during labour should be treated with the necessary dignity to respect the new life given by YHVH. The researcher also sees natural birth as the ideal method, if possible, and believes that all women should be made aware of non-pharmacological pain relief options during labour. However, this does not exclude medical intervention when necessary. It is the researcher's opinion that non-pharmacological options are readily available and usually inexpensive and need much more exposure and research.

1.5.2 Theoretic assumptions

Theoretical assumptions reflect the researcher's knowledge of existing theoretical or conceptual frameworks (Botma *et al*., 2015:187).

1.5.2.1 Definition of concepts

In Table 1-4, a list of definitions and the meaning of the concepts in this study are presented.

Table 1-4: Concept definitions

Concept	Definition	Definitions as applied in this study
Natural Labour	Natural childbirth is defined as labour and parturition accomplished by a mother with little or no medical intervention. (Mosby's dictionary of medicine, nursing & health professions, 2013:1203)	Natural childbirth occurs when a mother utilises natural pain relief methods such as essential oils, breathing, massage and inhalations, and companionship during labour.
Pain	Pain is a subjective feeling experienced differently by each individual but is primarily an indicator or warning sign which requires attention (Mosby's dictionary of medicine, nursing & health professions, 2013:1313).	Pain could be experienced by an individual ranging from mild to excruciating. Individuals have different levels of pain tolerance.

Concept	Definition	Definitions as applied in this study
Labour pain	Labour pains are defined as pain associated with contractions of the uterus during childbirth (Mosby's dictionary of medicine, nursing & health professions, 2013:1002).	Labour pain is pain associated and experienced during the birth process due to contractions and anxiety.
Pain relief	Pain can be relieved or alleviated by non-pharmacological and pharmacological methods (McCauley *et al*., 2017:55).	In this study, pain is used as alleviating pain through the use of essential oils.
Natural pain relief during labour	Natural pain relief during labour eliminates the physical sensation of labour pain by non-pharmacological methods (Simkin & Bolding, 2004:489).	In this study, natural pain relief is the relief of sensations associated with uterine contractions without using pharmacological interventions.
Essential oils	Essential oils are highly concentrated, fragrant oils of plant origin extracted through steam distillation, hydro diffusion, or pressure (Manion & Widder, 2017:154).	Essential oils are a highly concentrated plant-based fragrant oil that could be used to relieve labour pains.
Anxiety	Anxiety is a state of tension that affects both mind and body (Bailliere's nurse's dictionary for nurses and health care workers, 2012).	Anxiety is a state of nervousness that may have adverse effects on childbirth and the mind.
Aromatherapy	Aromatherapy is one of the complementary therapies that make use of essential oils as the primary therapeutic agents (Ali *et al*., 2015:601).	Aromatherapy is a complementary therapy that uses essential oils as the basis – in this instance, to relieve labour pains.

1.5.2.2 Theoretical models

Grantly Dick-Read described three main components which form the fear-tension-pain cycle (Dick-Read 1959:25). Even though Dick-Read theorised the cycle in the early 1900s, it is still widely used today (Smith, 2015:33; Scarborough, 2003:5). According to Dick-Read (1947:37), the sensation of fear is not inevitably perceived as abnormal as it is a natural protective state. However, the fear of labour pains through pathological tension brings out actual pain, better known as the Fear-Tension-Pain Syndrome. As soon as this pattern is created, a continuous circle with aggravating effects is experienced with consequential effects unless the cycle is broken (Dick-Read, 1947:25). Figure 1-2 shows the Fear-Tension-Pain cycle as illustrated by Smith (2015:34).

Figure 1-2: Dick-Read's Fear-Tension-Pain cycle

(Smith, 2015:34)

If a woman suffers from uncontrollable fear during labour, the natural process of childbirth is inhibited (Dick-Read, 1947:41). Physiologically, the blood vessels in the uterus become enlarged during labour to ensure that enough blood is pumped through for powerful and effective contractions and retraction. Dick-Read (1947:41) explains that when the sympathetic nervous system is stimulated by fear, it results in lesser blood flow to and from organs like the uterus, which may cause inefficient contractions of the uterus. The physiological mechanism of labour is changed, causing various complications during labour that could have been normal labour, which is one of the most profound influences of fear during labour (Dick-Read, 1947:41). Therefore, it is essential to break the cycle by

educating pregnant women and health care workers on pain and anxiety relief during labour and the safe use of essential oils.

Figure 1-3 illustrates how fear inhibits labour and initiates pain. A woman in labour becomes aware of or is capable of interpreting pain when the cognitive detection of stimuli is sent to the brain (Dick-Read, 1947:16). Sensations (S1) from the uterus pass through (A) of the spinal cord (S2) to the thalamus (B) via the blue tracks, which relay: (1) all sensations of feelings, (2) centre of pain analysis and (3) the predominant centre for emotional communication and fear.

Feelings aggravated by fear pass by (S3) strands taken to (C) the cortex.

(C) Cortex: (1) receives the maximum stimulated sensation, (2) associates past and present experiences, both physical and psychological, in order to manage the response to increase the thalamic interpretations and (3) sends out motor impulses according to the extent of messages it receives.

(M1) Cortical cells send strands down (M2) motor tracks passing out of the cord to (M2) motor nerves to the uterus.

Consequently, if the thalamus is over-sensitised by fear or stimulated emotionally, the sensations of labour are overemphasised and communicated by S3 to the cortex in a more intense manner to stimulate the uterus. Cortex C responds by way of M1, 2, 2 causing the circular muscles of the uterus to contract, obstructing the course of labour. Thus fear becomes an inhibitor of labour and the initiator of pain.

Applied in this study - if fear and anxiety can be reduced, the perception of pain will also be reduced.

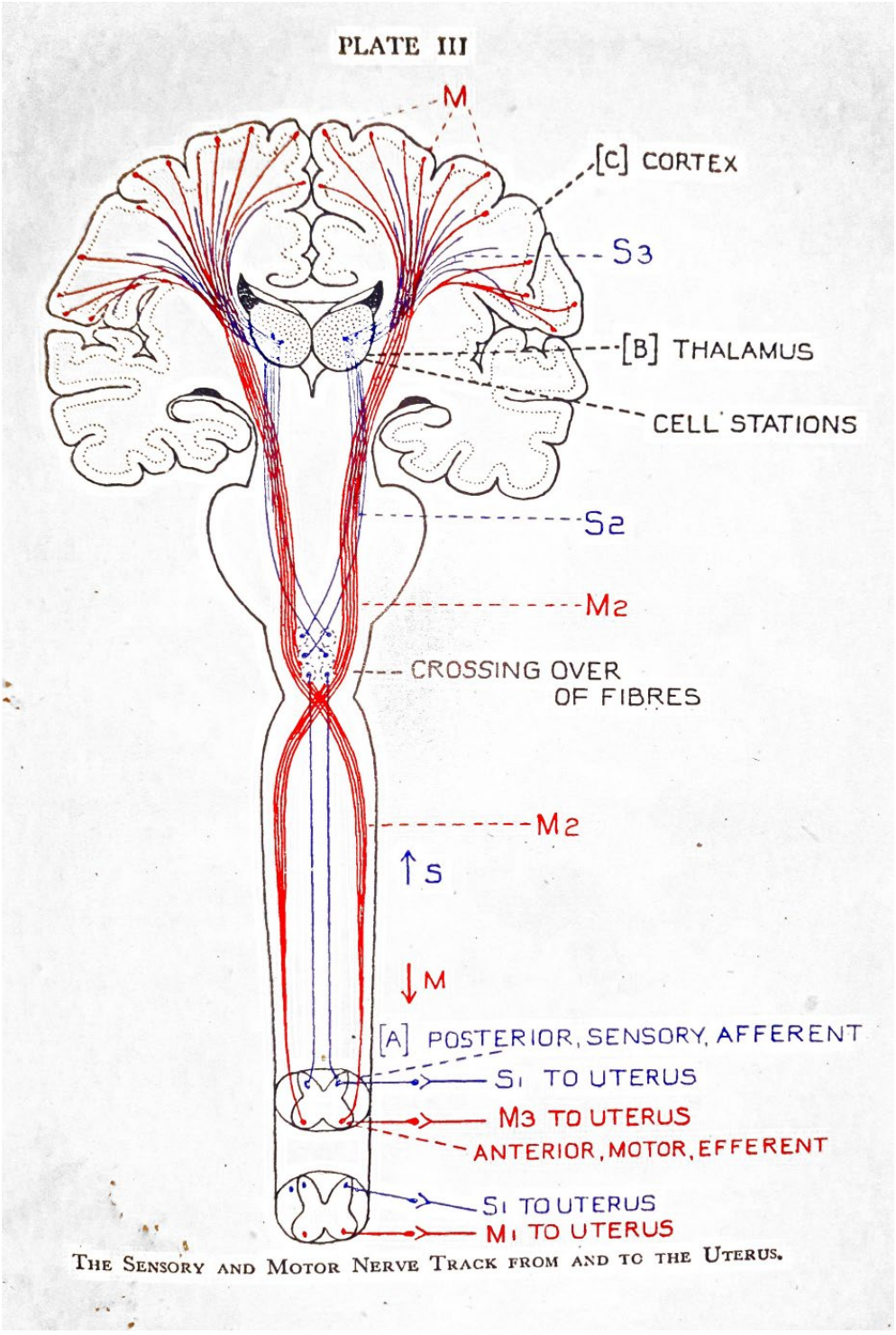

Figure 1-3: Image of the sensory and motor nerve track from and to the uterus (Dick-Read, 1947).

1.5.3 Methodological assumptions

Methodological assumptions describe how the researcher views good scientific research (Botma *et al.,* 2015:188). A systematic review is an explicit method used to assist

researchers in obtaining and reviewing the literature by summarising and assessing the existing empirical evidence (Kitchenham, 2014:1). This synthesised evidence on the use of essential oils used as relief of pain and anxiety during labour could be used in health education for women.

1.6 Research aim and objectives

The research aim and objective are presented in the following paragraphs:

1.6.1 Research aim

The aim of the research was to synthesise the best available evidence related to the use of essential oils as non-pharmacological pain relief and anxiety during childbirth to contribute to information for pregnant women, enabling them to make informed decisions on the desired method to relieve pain and anxiety.

1.6.2 Research objective

The objective of this review was to:

- Identify and synthesise the best available evidence about the use of essential oils used as pain relief and relief of anxiety during childbirth.

1.7 Research design

This study was done as a systematic review to analyse, describe and organise data using a structured method (Webb & Roe, 2007:138). A summary of the best available evidence was made to provide a clear overview of the use of essential oils as pain relief and relief of anxiety during labour. A systematic review could aid to educate as well as highlight unresolved issues and provide guidelines for future research (Webb & Roe, 2007:139).

For this systematic review, qualitative, quantitative and mixed-method studies were included, providing a broader selection of studies on the use of essential oils used for relief of anxiety and pain during childbirth.

1.8 Research method

A systematic review is an integration of a summary of effectiveness produced by studies that are reviewed by the researcher to answer the research question posed

(Gopalakrishnan & Ganeshkaman, 2013:9). Systematic reviews use data collection methods of literature that are objective, clearly stated, methodologically critically appraised and reproducible in an attempt to reduce reviewer bias (Gopalakrishnan & Ganeshkaman, 2013:9). A systematic review is a literature review designed to locate, appraise and synthesise the best available evidence relating to a specific research question to provide informative and evidence-based answers. These reviews are considered the standard way to synthesise the findings of several studies considering the same question (Boland *et al*., 2017:2). A thorough systematic review summarises research and aims to identify and classify information comprehensively, ensuring all available literature is included on a specific topic and simultaneously defining a clear and complete approach (Aveyard, 2014:10, Hemingway & Brereton, 2009:1).

The researcher used the five steps of the systematic review as suggested by the American Dietetic Association (ADA) (2016:3) and presented in Figure 1-4.

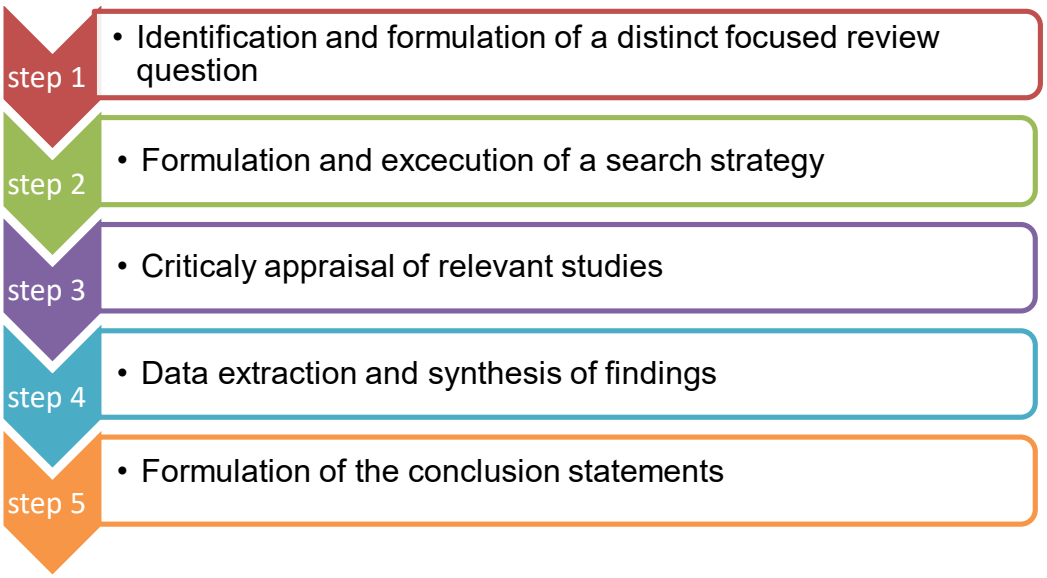

Figure 1-4: Five steps of a systematic review

(ADA, 2016:3).

1.9 Rigour

Brackett and Batten (2020:660) state that rigour requires precision, good quality, attention to detail, transparency and self-control in research. In order to ensure transparency, the systematic review was registered on the Prospective Register of Systematic Reviews,

better known as PROSPERO. PROSPERO is an international database of forthcoming registered systematic reviews with a health-related outcome (University of York. Centre for reviews and dissemination (CRD), 2019). The purpose of the registration with PROSPERO was to avoid duplication of studies and to reduce the risk of bias by comparing the completed review with what was intended initially by the review. PROSPERO also limits unnecessary time spent on topics already in process (Holly *et al.,* 2012:147). The PROSPERO registration number is CRD42018105529.

Inclusion and exclusion criteria were stipulated to prevent investigator bias by choosing specific studies. A librarian was consulted to assist with the search strategy to ensure a comprehensive search covering all possible evidence on the topic. Only published studies - journal articles that had gone through a peer-review process before publication, published books d and the primary studies included in systematic reviews were included (no grey literature). Language bias was limited by including all languages in the study, on the condition that there was an English abstract. The researcher used the Evidence for Policy and Practice Information-reviewer (EPPI) reviewer to search various databases for relevant literature. By using the PRISMA-P checklist, duplicate study reports were excluded, bias across studies was restricted, and the avoidance of studies within studies was ensured (Moher *et al.,* 2015:7). The researcher and a co-viewer independently critically appraised the studies for selection. Reference lists of selected studies were also checked to ensure that no studies had been overlooked. Thereafter data was extracted and appropriately synthesised.

1.10 Ethical considerations

No human participants were directly involved in this systematic review; thus, there was no need for any declaration of anonymity, informed consent or confidentiality. This study was reviewed by the scientific committee of the NuMIQ Research Focus Area. The following ethical issues were considered (Vergnes *et al.*, 2010:772)

- Ensure that ethical sufficiency was obtained in the original study;
- Ensure that there was no conflict of interest and the statement of financial disclosure was checked;
- Declare all collaboration agreements if applicable;

- Ensure that no plagiarism occurred;
- Give credit to the necessary authors, organisations or editors of the relevant studies;
- Ensure unbiased reporting of results;
- Collected data from primary studies only; and
- Check reference lists of systematic reviews to ensure that no studies had been overlooked.

Lastly, the research results will be shared with other researchers and a dissertation submitted for examination. After examination, the study will be submitted for publication as a journal manuscript.

1.11 Dissertation structure

Chapter 1 - Overview and background

Chapter 2 - Research methodology

Chapter 3 - Review findings

Chapter 4 - Conclusions, limitations and recommendations

1.12 Executive Summary

Limited scientific literature has been published on the use of essential oils as a natural non-pharmacological pain relief and anxiety relief method during labour. However, to reach a concrete conclusion, all relevant studies must be reviewed to determine the use of essential oils during childbirth in order to empower health care workers to give relevant information.

For this systematic review, the five steps according to ADA (2016:3) were used to select, critically appraise and synthesise qualitative, quantitative and mixed-method studies making use of Evidence for Policy and Practice Information-reviewer (EPPI) reviewer to search various databases to answer the review question about women's views and the use of essential oils. Even though no human participants were involved, the researcher ensured that ethical considerations were met throughout.

CHAPTER 2: RESEARCH METHODOLOGY

2.1 Introduction

Botma *et al*. (2015:240) consider systematic review approaches as the cornerstone of evidence-based practise, therefore forming the foundation of investigating research studies.

The research methodology of this systematic review will be described in this section. The five steps described by ADA (2016:3), namely the conceptual phase, search strategy, data evaluation, data synthesis and, finally, the conclusion statement, will be described.

2.2 Systematic review method

All systematic reviews follow specific steps to develop a research question by identifying relevant studies and then reviewing each study. After that, data is extracted, and the findings are synthesised, which finally result in an appropriate conclusion relating to the relevant research question (Boland *et al.* 2017:3; Milner, 2015:90).

For this systematic review, the following outline based on ADA (2016:3) was used.

(1) Conceptual phase
- Step 1: Identification and formulation of a distinct review question

(2) Literature search strategy
- Step 2: Formulation and execution of search strategy

(3) Data evaluation process
- Step 3: Critical appraisal of relevant studies

(4) Data synthesis
- Step 4: Data extraction and synthesis of findings

(5) Conclusion statement
- Step 5: Formulation of the conclusion statement

2.2.1 Conceptual phase

One of the key issues that must be attended to when starting with a systematic review, as Siddaway (2019:756) mentioned, is the formulation of a review question. In order to

do this, the population, intervention, comparison, and outcome, are identified through the PICO method, an essential and indispensable tool to formulate a systematic review question (Milner, 2015:90; Cooke *et al*., 2015:1436). Cooke *et al*. (2015:1438) and ADA (2016:19) define P as the population that in this study refers to women who had gone through labour, I as the intervention, and in this study, it is the use of essential oils or aromatherapy to reduce pain and anxiety, C is the comparison to the intervention, more specific in this study it indicates other methods of pain and relief of anxiety and finally O as the outcome, which in this study includes the effect of the use of essential oils.

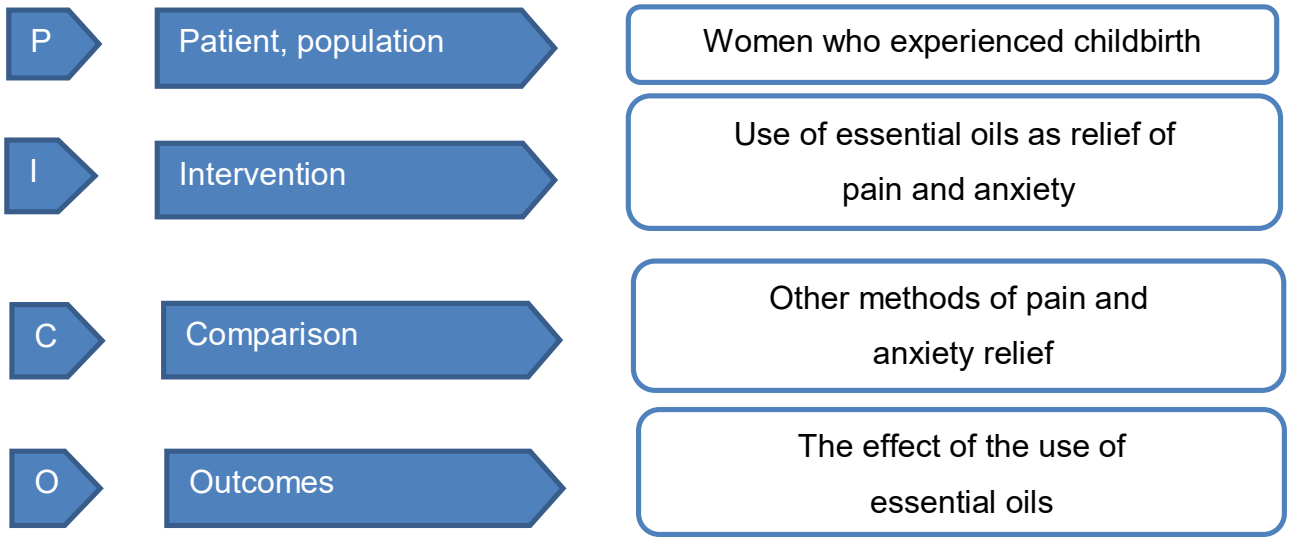

Figure 2-1: PICO acronym used to formulate review question

A clear research question should be formulated as precisely and specifically as possible in order to guide the search and identify whether the research evidence is relevant and has an influence on practice (Baird, 2018:339; ADA, 2016:7).

This leads to formulating the research question making use of the PICO acronym:

- *What is the effect of using essential oils or aromatherapy as pain relief and relief of anxiety during childbirth?*

2.2.2 Literature search strategy

Once the research question has been formulated and the conceptual phase has been completed, the next step is to develop the best and most appropriate research strategy that would address the question. Several actions were taken to find the best available research records.

- Development of inclusion and exclusion criteria;
- Involvement of a subject librarian's assistance to ensure that the search results represented all applicable academic literature;
- Use of the Evidence for Policy and Practice Information-reviewer (EPPI-reviewer) 4 software to select literature and managed the review process by compiling a list of all the academic literature found by the search and then removing all the duplicate records;
- Search for various sources, including bibliographies and databases;
- Review citations and abstracts.

Determining the inclusion and exclusion criteria for the search will enable the researcher to find the best available evidence by sifting through the evidence (Ham-Baloyi & Jordan, 2016:123). The following inclusion criteria were applied to this systematic review:

- Studies where essential oils or aromatherapy were used during labour as a pain relief option;
- Studies where essential oils or aromatherapy were used to reduce anxiety during childbirth;
- Studies that reported on ethical considerations, e.g. obtaining ethics approval and/or obtaining informed consent; and
- Studies must have at least an English or Afrikaans abstract.

The following exclusion criteria were applied to eliminate irrelevant studies:

- Studies that did not include use during the latent or active phases of labour;
- Studies that did not involve humans as participants;
- Studies that reported only on pharmacological interventions;
- Studies including other oils which did not contain essential oils or aromatherapy; and

- Commentaries, editorials or narrative literature studies.

The researcher kept in mind that if needed, personal contact could be made with the authors of the published studies to request additional data or information. For example, if the data to determine relevance was not available in English or Afrikaans, the author could be contacted to determine if it is available in English. For this study, the researcher deemed it necessary to exclude grey literature (unpublished studies and studies published outside peer-reviewed journals) like conference proceedings and dissertations and only used peer-reviewed studies. This was done as there is a large body of non-scientific literature on essential oils.

The expertise of a librarian forms an essential and even critical part of a search strategy to ensure that all relevant literature is included (Ham-Baloyi & Jordan, 2016:123). For this study, a subject librarian was consulted to ensure that the appropriate databases and all applicable search terms were included to ensure that the results included all the relevant literature.

The following databases available at the North-West University, were searched for relevant information: The Cochrane Library, Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, EBSCOhost, Web-of-Science, ProQuest CINAHL, PubMed and Scopus. All databases were searched from the commencement of the database until the end of 2019.

Formulating the correct combination of search terms entails scrutinising the review question and dividing it into sections to ensure that all possible alternative terms are used to ensure a comprehensive search (Centre for Reviews and Dissemination (CRD), 2009:19). The thoroughness of the search and inclusiveness of the studies identified, will influence the quality of the outcomes of the literature review (Harari *et al*., 2020:1).

The following keywords were used in the search: (essential oil* OR aromatherapy) AND (labor OR labour OR delivery OR childbirth) AND (pain* OR anxiety*) AND (non-pharmacological OR natural pain relief OR alternative pain relief OR supplementary pain relief) AND (non-pharmacological OR natural anxiety relief OR alternative anxiety relief OR supplementary anxiety relief) AND (woman OR women OR female OR prim* grav* OR multigrav* OR multipara*) AND (effect* OR experience* OR view*).

The EPPI-reviewer 4 software was used to search all types of studies according to the keywords as well as inclusion criteria. The web-based program could also be used for data analysis (EPPI-Centre, 2008:1) but for this study, the function was not used. Studies identified with the search strategy were first screened for duplicates. Thereafter, the titles and abstracts were reviewed according to the inclusion and exclusion criteria. According to Ham-Baloyi and Jordan (2016:124) and Milner (2015:90), the applicability of some studies can only be determined after the full text is obtained. Therefore, when the final decision regarding applicability could not be made based on the title or abstract, the full text of the study was reviewed. Lastly, the reference lists of articles were checked for further relevant studies.

In order to ensure that this systematic review is of high quality and to avoid bias by excluding duplications of studies, only primary studies were used. Therefore, systematic reviews included in the search strategy were examined to identify further primary studies using essential oils for the relief of pain or anxiety from the bibliography and included in the critical appraisal.

In order to obtain a visual impression of the selection process, the PRISMA flow diagram was used as presented in Figure 2-2.

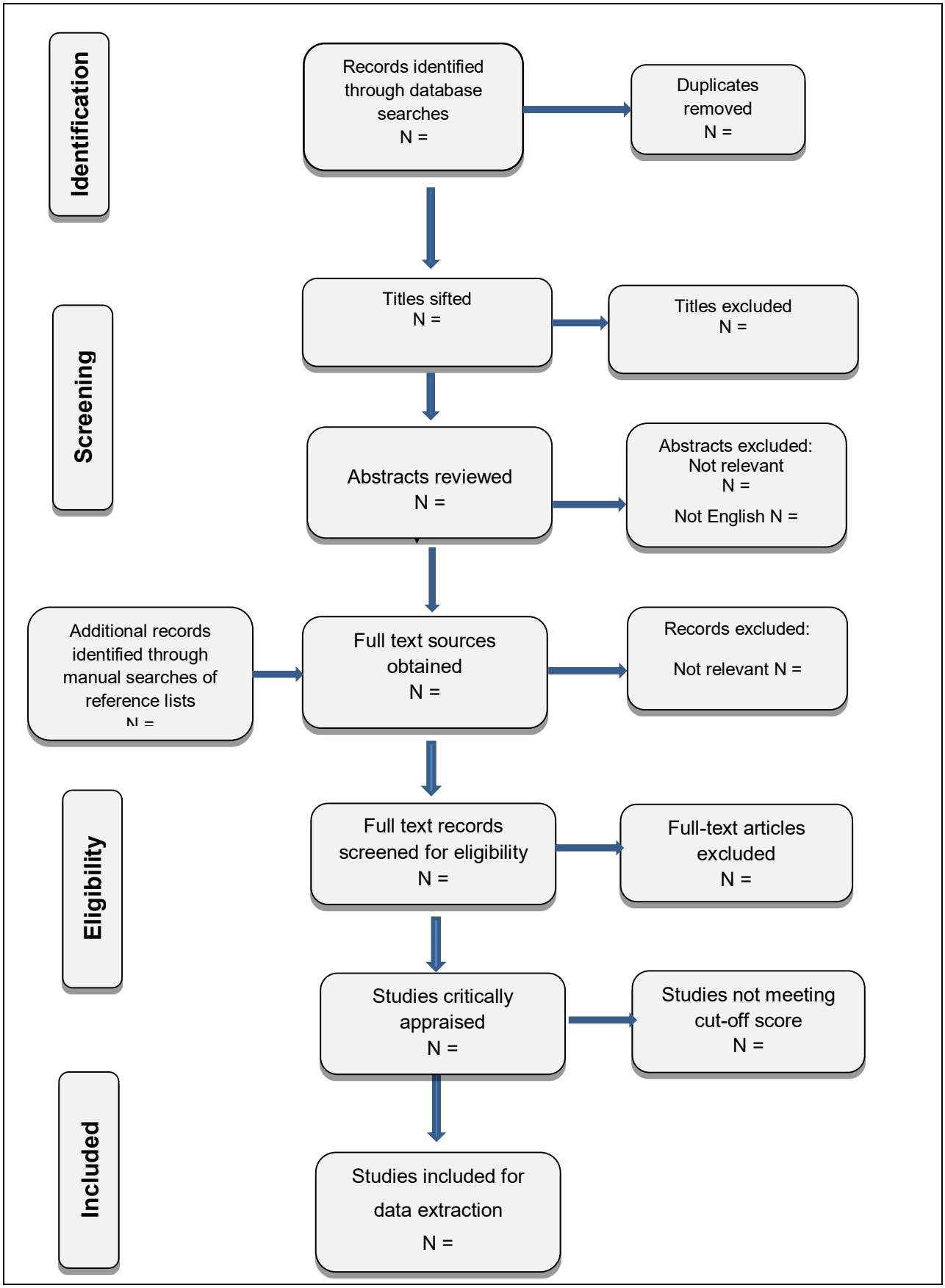

Figure 2-2: Proposed PRISMA flow chart

(Moher *et al*., 2009:3)

2.2.3 Data evaluation process

In this step, reviewers do a critical appraisal of the full text of the relevant studies (Milner, 2015:89). The objective is to obtain high-quality studies for the systematic review and to reduce bias (Milner, 2015:91). The critical appraisal skills program (CASP) tools (See Annexure A, B, and C) were used to appraise randomised control trials, case-control studies and cohort studies. The researcher and another experienced reviewer critically appraised the research reports independently. After that, discrepancies were discussed and resolved. Only studies that were appraised and found to obtain equal or more than the cut-off mark of 70% were included in the next step of data synthesis (Lindholm & Hildingsson, 2015:75).

2.2.4 Data synthesis

A data extraction tool should be used to obtain the required data from the selected studies. In this study, a data extraction tool/table was designed to extract information and findings from the studies that were identified as relevant, applicable and rigorously conducted and could be used to answer the review question. The results of the primary studies that contributed to answering the review question were extracted in the last column of the table (Annexure D). All extracted data, whether quantitative or qualitative, should be clear and unambiguous so that uniformity and impartiality are maintained throughout. Incorporating various study types and data into a review could be challenging but could lead to the development of more suitable and effective interventions (Thomas *et al.,* 2004:1012).

For data extraction to be objective, at least two experienced researchers trained in data extraction should work separately before the results are compared (Milner, 2015:91; Webb & Roe, 2007:16; Haddaway *et al*., 2017:357). Therefore, two reviewers did the data-extraction independently and discussed their results to reach a consensus. According to Milner (2015:91), the various studies' conclusions, limitations and quality of the studies, as well as where additional research is needed, should be addressed.

For this systematic review, the results were synthesised according to the effects of the essential oils used for pain and anxiety during childbirth.

2.2.5 Formulation of conclusion statement

The last step of the systematic review is the formulation of a conclusion statement. Thus, after meta-synthesis was done, a conclusion statement was formulated. The conclusion statement was based on the evidence obtained, guarding against bias and presenting reliable, trustworthy evidence (ADA, 2016:73). Motivation needs to be provided if the research was of good quality and the effect of essential oils used for the relief of pain and anxiety during labour. Lastly, it must be concluded if the findings answered the review question.

2.3 Conclusion

For a systematic review to contribute to future research, the studies used need to be of high quality, directed by the research methodology and have a consistent and transparent rationale (Milner, 2015:92; Barker & Marin, 2019:313). Therefore, after completing the research methodology in chapter 2, the review's implementation and the thereof will ensue in chapter 3.

CHAPTER 3: REVIEW FINDINGS

3.1 Introduction

Chapter 3 will discuss the review findings of all the studies that were found to be relevant and of high enough quality. To begin with, search outcomes will be described, and finally, a conclusion will be formulated based on the synthesised findings of the systematic review.

3.2 Study selection

The initial search yielded 574 records that were identified through the database search using the Cochrane Library, Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, EBSCOhost, Web-of-Science, ProQuest CINAHL, PubMed and Scopus databases. Furthermore, using EPPI reviewer 4, 114 duplicate academic literature records were removed from the original 574 records, leaving 460 records. After sifting the titles of the remaining 460 academic literature records, 81 titles that were not relevant to this study were excluded. Thus 397 abstracts of academic literature records were reviewed, of which one could not be used, as the abstract was not available in English. In addition, a further 288 abstracts were omitted due to not being relevant to the current study. Five additional records were identified through a manual search of the reference lists of the remaining 90 records giving a total of 95. The full texts were obtained from these last-mentioned five records. Thereafter, the full-text records were screened for eligibility based on the inclusion and exclusion criteria, and only 24 records were found to be eligible. Of these 24 records, seven were systematic reviews, which were excluded (but used as an additional source of applicable primary studies). Two additional relevant primary studies were found in the systematic reviews reference list. Nineteen studies were critically appraised, after which a further five records did not meet the 70% cut off point and were excluded. Finally, 14 records were included for data extraction and synthesis.

See Figure 3-1 of the Prisma flow diagram for a graphic overview of the study selection.

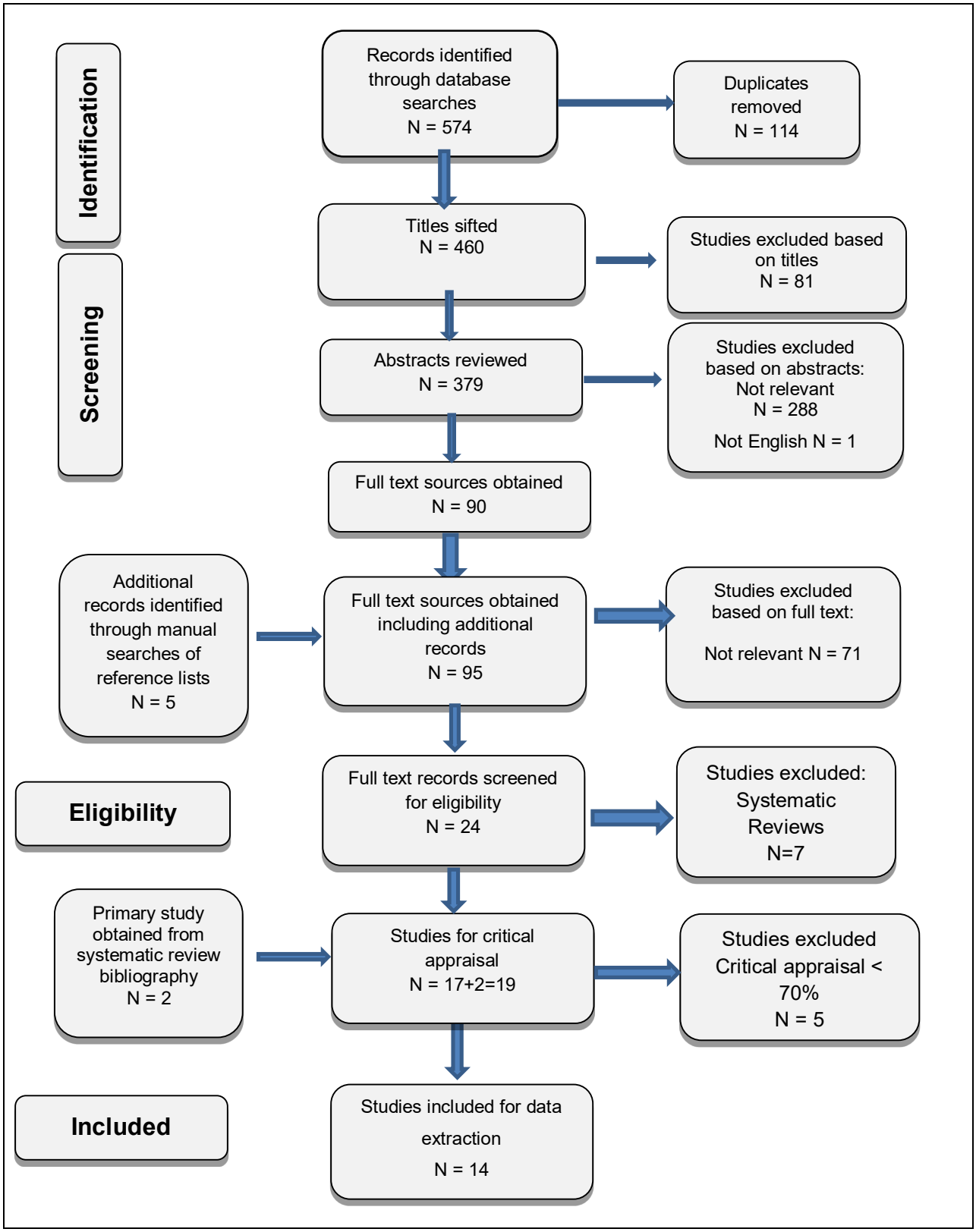

Figure 3-1: PRISMA Flow diagram of search outcomes

Systematic literature reviews gave secondary information and in this review was used exclusively to identify primary sources. These primary studies were identified from the reference lists of the systematic reviews which were specifically applicable to answering the research question. This strategy limited bias by preventing duplication of information and studies. Therefore, no findings from systematic reviews were used in the data extraction but only those of the individual primary studies.

Of the seven systematic reviews found in the original search, two were not considered due to a combination of factors, such as the results not being transparent, that not all aromatherapy methods were explained clearly, and when it was not clear if rigour was taken into account.

The primary studies identified from the systematic reviews are presented in Table 3-1. From the remaining five systematic reviews, six primary studies were found. Of these six studies, five were not found in the database or reference list searches. Burns *et al*. (2000a) used in the systematic review of Simkin and Bolding (2004) was already included for critical appraisal as an individual randomised control study. The study of Burns *et al*. (2000b) from the systematic review of Habanananda (2004) was excluded as it was a summary of the original study of Burns *et al*. (2000a). The systematic review of Osório *et al*. (2014) incorporated Burns *et al*. (2007), as well as Gayeski and Bruggemann (2010). Both of these studies were not included in the present review as Burns *et al*. (2007) did not measure pain or anxiety during labour but focussed on neonatal outcomes and options to improve maternal outcomes, while the abstract of the study by Gayeski and Bruggemann (2010) was not available in English. The study of Calvert (2000), referred to in Smith *et al*. (2006), has not been published (grey data) and was excluded to ensure that only high-quality studies were used. Thus the only other primary study that was included for critical appraisal was the study of Janula and Mahipal (2015) that was used in the systematic review of Vitale and Jenner (2018). This study of Janula and Mahipai (2015) was added to the critical appraisal list, and the critical appraisal score was above 70%, and therefore included in the data extraction.

Table 3-1: Primary studies extracted from Systematic Reviews

Systematic review Authors and date	Title	Original primary studies	In-or Excluded
Habanananda (2004)	Non-Pharmacological Pain Relief in Labour	Burns, E., Blamey, C., Ersser, S.J., Lloyd, A.J. & Barnetson, L. 2000b. The use of aromatherapy in intrapartum midwifery practice. An observational study. *Complementary therapies in nursing and midwifery*, 6(1):33-34.	Excluded because the primary study was a summary of the original study of Burns *et al*. (2000a)
Osório *et al.* (2014)	Assessment of the effectiveness of non-pharmacological methods in pain relief during labor	Burns, E., Zobbi, V., Panzeri, D., Oskrochi, R. & Regalia, A. 2007. Aromatherapy in childbirth: a pilot randomised controlled trial. *International Journal of Obstetrics and Gynacology*; 114(7):838-44.	Excluded because study focussed on neonatal outcomes and options to improve maternal outcomes
		Gayeski, M.E. & Bruggemann, O.M. 2010. Métodos não farmacológicos para alívio da dor no trabalho de parto: uma revisão sistemática. Texto Contexto Enferm; 19(4):774-82.	Excluded as abstract not available in English
Simkin & Bolding (2004)	Update on Nonpharmacological Approaches to Relieve Labor Pain and Prevent Suffering	Burns, E., Blamey, C., Ersser, S.J., Barnetson, L & Lloyd, A.J. 2000a. An investigation into the use of aromatherapy in intrapartum midwifery practice. *Journal of Alternative and Complementary Medicine*; 6:141-7.	Included for critical appraisal but then excluded as only received only 64% in critical appraisal
Smith *et al*. (2006)	Complementary and alternative therapies for pain management in labour (Review)	Smith, (2011). The evaluation of the use of herbal substances in the bath water of labouring women. Calvert.	Excluded as study was not published
Vitale & Jenner (2018)	Use of Aromatherapy for Discomfort in Labor	Janula, R. & Mahipal, S. 2015. Effectiveness of aromatherapy and biofeedback in promotion of labour outcome during childbirth among primigravidas. *Health Science Journal*, 9(1).	Included

3.3 Critical appraisal

Studies found to be relevant according to the inclusion criteria were critically appraised. A specific critical appraisal skills program (CASP) tool was used for each type of study. See Appendix A for the randomised control trials tool, Appendices B for the case-control studies tool and C for the cohort studies tool. Only studies that were appraised and obtained equal to or more than the cut-off mark of 70% were included in the next step (Lindholm & Hildingsson, 2015:75). To be included in the final report, studies had to score 70% or more during the critical appraisal. Five studies were excluded due to scoring less than 70%.

Table 3-2: Critical appraisal

Randomised controlled trials (CASP)												
	1 Did the trial address a clearly focused issue?	2 Was the assignment of patients to treatments randomised?	3 Were all of the patients who entered the trial properly accounted for at its conclusion?	4 Were patients, health workers and study personnel blind' to treatment?	5 Were the groups similar at the start of the trial?	6 Aside from experimental intervention, were the groups treated equally?	7 How large was the treatment effect?	8 How precise was the estimate of treatment effect?	9 Can the results be applied to the local population, or in your context?	10 Were all clinically important outcomes considered?	11 Are the benefits worth the harms and costs?	
Alavi *et al.* (2017)	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**27%**
Notes	No clear focus issue could be found as both the control group and test group used Jasmine oil. Not all who entered the trial were accounted for. Alavi *et al*. mention rats in sentences as if they were people. It is unclear what the study measured due to the fact that one group received Jasmine oil, and the other group received aromatherapy with Jasmine oil. Therefore, it seems unsure what Alavi *et al.* define as aromatherapy and what they interpret as aromatherapy oils.											
Burns *et al*. (2007)	**0**	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**64%**
Notes	The title mentions intrapartum midwifery practice and the objective mentions maternal comfort as a tool to improve quality care. The reader needs to read the aim a few times to be certain what is meant. The outcome measured the mothers' rating of various topics with no mention of aromatherapy. Unable to blind aromatherapy studies. Different stages of labour, as well as breech and twins, were included.											

Randomised controlled trials (CASP)												
	1 Did the trial address a clearly focused issue?	2 Was the assignment of patients to treat-ments randomised?	3 Were all of the patients who entered the trial properly accounted for at its conclusion?	4 Were patients, health workers and study personnel blind' to treatment?	5 Were the groups similar at the start of the trial?	6 Aside from experi-mental intervention, were the groups treated equally?	7 How large was the treatment effect?	8 How precise was the estimate of treatment effect?	9 Can the results be applied to the local population, or in your context?	10 Were all clinically important outcomes considered?	11 Are the benefits worth the harms and costs?	
Esmaelzadeh-Saeieh *et al.* (2018)	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**91%**
Notes	It is not possible to blind aromatherapy as an intervention.											
Hamdamian *et al.* (2018)	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**91%**
Notes	It was not possible to blind the intervention - aromatherapy.											
Janula and Mahipal (2015)	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**82%**
Notes	No mention was made if all the patients completed the study. It is not possible to blind aromatherapy as an intervention.											
Karo *et al.* (2017)	**1**	**1**	**0**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**73%**
Notes	No mention is made if all patients completed the study. It is not possible to blind aromatherapy as an intervention. There is no mention of how the control group was treated.											

Randomised controlled trials (CASP)												
	1 Did the trial address a clearly focused issue?	2 Was the assignment of patients to treat-ments randomised?	3 Were all of the patients who entered the trial properly accounted for at its conclusion?	4 Were patients, health workers and study personnel blind' to treatment?	5 Were the groups similar at the start of the trial?	6 Aside from experi-mental intervention, were the groups treated equally?	7 How large was the treatment effect?	8 How precise was the estimate of treatment effect?	9 Can the results be applied to the local population, or in your context?	10 Were all clinically important outcomes considered?	11 Are the benefits worth the harms and costs?	
Kaviani *et al*. (2014)	**1**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**73%**
Notes	It is unclear if patients were randomised to treatment. No mention was made if all the participants completed the study. It is not possible to blind aromatherapy as an intervention.											
Kheirkhah *et al.* (2014)	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**82%**
Notes	It is not possible to blind aromatherapy as an intervention. It is difficult to say if anxiety can be measured by means of visual analysis only.											
Namazi *et al.* (2014a)	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**91%**
Notes	It is not possible to blind aromatherapy as an intervention.											
Namazi *et al*. (2014b)	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**82%**

Randomised controlled trials (CASP)												
	1 Did the trial address a clearly focused issue?	2 Was the assignment of patients to treat-ments randomised?	3 Were all of the patients who entered the trial properly accounted for at its conclusion?	4 Were patients, health workers and study personnel blind' to treatment?	5 Were the groups similar at the start of the trial?	6 Aside from experi-mental intervention, were the groups treated equally?	7 How large was the treatment effect?	8 How precise was the estimate of treatment effect?	9 Can the results be applied to the local population, or in your context?	10 Were all clinically important outcomes considered?	11 Are the benefits worth the harms and costs?	
Notes	No mention is made if the assignments of patients were made randomly. It is not possible to blind aromatherapy as an intervention.											
Rashidi-Fakari *et al.* (2015a)	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**82%**
Notes	It is not possible to blind aromatherapy trials. It is difficult to measure anxiety as each person's perception of pain and anxiety is different. Furthermore, individual heart rhythm and blood pressure analyses can be influenced by other factors such as pain and movement and not only anxiety.											
Rashidi-Fakari *et al.* (2015b)	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**73%**
Notes	It is impossible to blind aromatherapy studies. The precise estimate is difficult to measure due to the fact that each person's perception of pain is different. Furthermore, individual heart rhythm and blood pressure analyses can be influenced by other factors such as pain and movement and not only anxiety.											
Tanvisut *et al*. (2018)	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**91%**
Notes	It is not possible to blind aromatherapy as an intervention.											

Randomised controlled trials (CASP)												
	1 Did the trial address a clearly focused issue?	2 Was the assignment of patients to treat-ments randomised?	3 Were all of the patients who entered the trial properly accounted for at its conclusion?	4 Were patients, health workers and study personnel blind' to treatment?	5 Were the groups similar at the start of the trial?	6 Aside from experi-mental intervention, were the groups treated equally?	7 How large was the treatment effect?	8 How precise was the estimate of treatment effect?	9 Can the results be applied to the local population, or in your context?	10 Were all clinically important outcomes considered?	11 Are the benefits worth the harms and costs?	
Vakilian *et al.* (2018)	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**91%**
Notes	It is not possible to blind aromatherapy as an intervention.											
Yazdkhasti & Pirak (2016)	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**91%**
Notes	It is not possible to blind aromatherapy as an intervention.											

Case-Control Study (CASP)													
	1 Did the study address a clearly focused issue?	2 Did the authors use an appropriate method to answer their question?	3 Were the cases recruited in an acceptable way?	4 Were the controls selected in an acceptable way?	5 Was the exposure accurately measured to minimise bias?	6a Aside from the experimental intervention, were the groups treated equally?	6b Have the authors taken account of the potential confounding factors in the design and/or in their analysis?	7 How large was the treatment effect?	8 How precise was the estimate of the treatment effect?	9 Do you believe the results?	10 Can the results be applied to the local population?	11 Do the results of this study fit with other available evidence?	
Joseph & Fernandes (2013)	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**1**	**0**	**67%**
Notes	Exposure was not measured accurately to minimise bias. Inconsistent factors were found in the analysis. Although Jasmine oil was used, the effect evaluated was the massage and not essential oils.												

Cohort (CASP)															
	1 Did the study address a clearly focused issue?	2 Was the cohort recruited in an acceptable way?	3 Was the exposure accurately measured to minimise bias?	4 Was the outcome accurately measured to minimise bias?	5a Have the authors identified all important confounding factors?	5b Have they taken account of the confounding factors in the design and/or analysis?	6a Was the follow up of subjects complete enough?	6b Was the follow up of subjects long enough?	7 What are the results of this study?	8 How precise are the results?	9 Do you believe the results?	10 Can the results be applied to the local population?	11 Do the results of this study fit with other available evidence?	12 What are the implications of this study for practice?	
Burns *et al*. (2000c)	1	1	1	1	1	1	0	0	1	1	1	1	1	1	86%
Notes	There was no mention of any follow-up in this study.														
Lehugeur *et al*. (2017)	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**58%**
Notes	The study did not have a clearly focussed issue. The exposure, as well as the outcome measurements, are not reflected accurately to minimise bias. No follow up was done, and there is no ratio between the exposed versus unexposed difference.														
Pollard (2008)	1	1	0	0	1	0	0	0	1	1	1	1	1	1	64%
Notes	The study mentioned that 33 forms were incomplete with regards to pain management, and Pollard (2008) acknowledged that it may influence the results. No mention was made in the study of a follow up on the subjects.														

To summarise the information in table 3.2, 19 randomised control trials were critically appraised, and two did not reach the requirements as set out in the CASP tool (see Appendix A). These two were excluded due to objectives that were not clearly focussed and participants that were not randomly assigned during the trials. Furthermore, studies were not blinded due to the difficulty of blinding aromatherapy. One study did not use aromatherapy oils at all but only used olive oil which is considered a carrier oil for aromatherapy oils. There was only one case-control study, and the study did not meet the critical appraisal cut-off. Lastly, two of the three cohort studies scored less than 70% during the critical appraisal with minimal information. No mention of a follow-up study was made, and there was no indication of what methods were used.

In conclusion, a total of 19 academic studies were critically appraised - 15 randomised control trials, one case-control and three cohort studies. Of these, 14 studies met the cut-off mark and were found both relevant and of good quality and were included in the data extraction table.

3.4 Data extraction

Data extraction of the fourteen relevant articles of high quality was done according to the author, year, article title, study design, sample, intervention and measurement, indication and type of oil used, as well as application method of the oil and findings. Different instruments were used to measure the level of pain/anxiety. These instruments are presented in Table 3-3 to produce an overview of the different instruments as well as their corresponding acronym or abbreviation to be used in the data extraction tool.

Table 3-3: Tools used to measure outcomes

Acronym	Full Name	Used to measure
NPRS	Numeric Pain Rating Scale (Likert)	Pain
STAI	Spielberger State-Trait Anxiety Inventory	Anxiety
VASA	Visual Analogue Scale for Anxiety	Anxiety
VAS	Visual Analogue Scale	Pain
NRS	Numerical Rating Scale	Pain

The studies extracted are presented in table 3-4 in the newly designed data extraction tool (Appendix D)

Table 3-4: Data extraction of primary academic literature

Author, year	Article Title	Study design	Sample	Intervention and measurement	Indication and type of oil used as well as manner used	Findings
Burns *et al.* (2000c)	Aromatherapy in childbirth: An effective approach to care	Cohort evaluative study	8058 mothers over 8 years from 1990 till 1998.	Each mother was individually assessed and decided upon the oils to be used as well as the mode of use. Guidelines were drawn up with the assistance of a consultant aromatherapist. NPRS was used for evaluation.	Lavender Frankincense Olibanum Clary Sage Peppermint Lemon Mandarin Rose Absolute Jasmine Eucalyptus Roman Chamomile Application modes: Footbath Birthing pool Droplet on forehead or palm Massage Taper or drop on pillow or clothing Compress Inhalation via bowl Perineal lavage	This study found a minimal incidence (less than 1%) of side-effects, and proved to be an inexpensive care option. The two predominant essential oils used to reduce anxiety, fear, and pain were Lavender 53% and Frankincense 31%. These oils have calming and analgesic properties, which have been shown to reduce anxiety, fear and pain.

Author, year	Article Title	Study design	Sample	Intervention and measurement	Indication and type of oil used as well as manner used	Findings
Esmaelzadeh-Saeieh *et al.* (2018)	The Effects of Inhalation Aromatherapy with Boswellia carterii Essential Oil on the Intensity of Labor Pain among Nulliparous Women	Randomised control trial	126 eligible women were recruited, and 124 completed the study.	The intervention was done every 30 min up to 10cm cervical dilatation. Assessment at 3-4 cm, 5-7 cm and 8-10 cm using the NRS was completed before and after the intervals.	Pain: Boswellia carterii (Frankincense) A mixture of 0.2ml of 0.2% Boswellia carterii diluted in 2ml normal saline was applied on gauze and attached to each woman's collar in the aromatherapy group and pure 2ml normal saline for the placebo group.	Boswellia carterii aromatherapy used as inhalation has a positive effect on labour pain and can be used to relieve pain in the first stage of labour.
Hamdamian *et al.* (2018)	Effects of aromatherapy with Rosa damascena on nulliparous women's pain and anxiety of labour during first stage of labour	Randomised control trial, Single-blinded clinical trial	116 nulliparous women, 110 completed the study	The pain was measured 10 minutes after the essential oils were attached to the participant's collar using the NRS at three intervals, namely: 4-5, 6-7 and 8-10cm of dilatation of the cervix. Anxiety was measured twice at 4-7 and 8-10cm cervical dilatation, both 10 minutes after application as well using STAI.	Pain and anxiety: Rosa damascena (Rose) A 10 x 10 cm cotton gauze pad with 2 drops (0,8ml) of R.damascena were attached to the participant's collar.	It was found that Rosa damascena decreases pain and anxiety during labour and can be used as alternative relief of pain and anxiety during labour.

Author, year	Article Title	Study design	Sample	Intervention and measurement	Indication and type of oil used as well as manner used	Findings
Janula & Mahipal (2015)	Effectiveness of aromatherapy and biofeedback in promotion of labour outcome during childbirth among primigravidas	Randomised control trial	600 nulliparous women	The aromatherapy participants were massaged until the end of the first stage of labour. Assessment of pain was done in latent, active and transitional phases. The control group only received routine care with the same pain assessment as the experimental group. The Biofeedback group also received routine care as well as the same pain assessment as the other 2 groups. A CTG machine was used in this group.	Pain: Lavender Aromatherapy application was made using massage.	Lavender oil and biofeedback are effective methods of reducing pain perception during labour. As a non-pharmacological intervention, these are easy to administer, cost-effective and harmless.
Karo *et al.* (2017)	Lavender (Lavandula angustifolia) aromatherapy as an alternative treatment in reducing pain in primiparous mothers in the active first stage of labor.	Randomised control trial – quasi-experimental	40 primigravida women in the first stage of labour with cervical dilatation between 4-10cm	Lavender was diffused for 5 minutes in the intervention room, and women stayed in the room for 30 minutes. NRS was used before and after the intervention.	Pain: Lavender 10ml lavender aromatherapy was diffused in the electric diffuser.	Lower intensity of labour pain was documented after lavender aromatherapy was used.

Author, year	Article Title	Study design	Sample	Intervention and measurement	Indication and type of oil used as well as manner used	Findings
Kaviani *et al.* (2014)	The effect of lavender aromatherapy on pain perception and intrapartum outcome in primiparous women	Randomised control trial	160 primiparous women more than 36 weeks with single pregnancy and 3-4cm cervical dilatation.	Pain was measured using the VAS as a baseline and again 30 minutes and 60 minutes after the intervention.	Pain: Lavender In the experimental group, 0.1ml Lavender mixed with 1ml distilled water added to cotton fabrics. The control group only received 2ml distilled water to inhale.	Lavender was reported to lower labour pain and reduce caesarean sections caused by fear of labour pain.
Kheirkhah *et al.* (2014)	Comparing the Effects of Aromatherapy With Rose Oils and Warm Foot Bath on Anxiety in the First Stage of Labor in Nulliparous Women	Randomised control trial-clinical trial	120 women Nulliparous, 38-42 weeks, cephalic presentation and 3cm cervical dilatation. 108 patients completed the study	Interventions were done at the beginning of the active phase (4cm) and again at the beginning of the transition phase (8cm). A visual ruler was used to measure anxiety and the visual analogue scale for anxiety (VASA) before and after each intervention.	Anxiety: Rose essential oil Rose essential oil evaporated by Brenner room for 10 min as well as s foot bath with rose essential oil with 1% water.	Aromatherapy and footbath were effective to reduce the anxiety of mothers and caused them to feel safe, comfortable and more satisfied. This method is recommended as a complementary modality in supportive care as a low risk, cheap and functional modality.

Author, year	Article Title	Study design	Sample	Intervention and measurement	Indication and type of oil used as well as manner used	Findings
Namazi *et al.* (2014a)	Effects of Citrus Aurantium (Bitter orange) on the Severity of First-Stage Labor Pain	Randomised control trial through utilising a randomised table of numbers.	126 primiparous women between 18-35 years, full-term, singleton pregnancy and 3-4cm cervical dilatation at time of enrollment to the study. 113 completed the study	Pain severity was measured before and after 3-4cm, 5-7cm and 8-10cm cervical dilatation. Demographic and obstetric questionnaires were used, observation and exam checklist, as well as the NRS.	Pain: Citrus aurantium (Bitter Orange) Gauze squares soaked in 4ml C.aurantium distilled water attached to the collar of participants. Only 4 ml of normal saline used for the control group also on gauze attached to the collar.	Results showed Citrus aurantium reduces labour pain and is recommended as an approach to reduce pain based on its low cost, ease of application and non-invasiveness.
Namazi *et al.* (2014b)	Aromatherapy With Citrus Aurantium Oil and Anxiety During the First Stage of Labor	Randomised clinical trial	126 women, Iranian, primiparous and 18-35 with term singleton cephalic presentation, 3-4cm cervical dilatation. 113 completed the study.	Anxiety was measured at 3-4cm and 6-8cm. Data were collected using a demographic and obstetric questionnaire, as well as the STAI questionnaire as a baseline and again after each intervention.	Anxiety: Citrus Aurantium (Bitter Orange) Gauze filled with 4ml C. aurantium or 4ml distilled water attached to the collar of participants. Gauzes were changed every 30 minutes.	The study showed that Citrus aurantium blossom oil as a simple, inexpensive. noninvasive and effective intervention to reduce anxiety during labour.

Author, year	Article Title	Study design	Sample	Intervention and measurement	Indication and type of oil used as well as manner used	Findings
Rashidi-Fakari *et al.* (2015a)	Effect of Inhalation of Aroma of Geranium Essence on Anxiety and Physiological Parameters during First Stage of Labor in Nulliparous Women: a Randomized Clinical Trial	Randomised clinical trial	100 Nulliparous women in the first stage of labor 18-35 years with cervical dilatation between 3-5cm 87 completed the study	The STAI questionnaire was used both before and 20 minutes after the intervention to measure the level of anxiety.	Anxiety: Geranium 2 Drops of 2% concentrated Geranium oil dropped onto fabric attached to the participant's collar. For the control group, distilled water was used.	The result of this study with Geranium essential oil during labour is an effective method of reducing state anxiety.
Rashidi-Fakari *et al.* (2015b)	The effect of aromatherapy by essential oil of orange on anxiety during labor: A randomized clinical trial	Randomised control trial	112 nulliparous women between 18-35 years old entered and 96 completed.	Parameters were measured 20 minutes after the intervention by completing the STAI inventory.	Anxiety: Citrus sinesis (Orange peel) Non-absorbable napkins were attached 20cm from the participant's chin	Orange scent may be helpful in childbirth units to help women experiencing this stressful stage of their life (labour) in decreasing their anxiety and tension.

Author, year	Article Title	Study design	Sample	Intervention and measurement	Indication and type of oil used as well as manner used	Findings
Tanvisut *et al.* (2018)	Efficacy of aromatherapy for reducing pain during labor: a randomized controlled trial	Randomized control trial	106 primigravidae 104 completed the study	The level of pain was assessed using the NRS scale. A baseline score was documented and then again at 3-4cm, 5-7cm and 8-10cm cervical dilatation.	<u>Pain:</u> Lavender Geranium Rose Citrus Jasmine Diffused continuously, 4 drops of oil/300ml water.	Physicians can provide aromatherapy as another option because of its possible effectiveness for alleviating pain, simplicity to use, low cost, non-aggressive method, no adverse effect and aiding relaxation.
Vakilian *et al.* (2018)	Controlled Breathing With or Without Lavender Aromatherapy for Labor Pain at the First Stage: A Randomized Clinical Trial	Randomised control trial-Single-blind	120 labouring mothers 119 completed the study	Pain measurement was done using the VAS at 3 phases of cervical dilatations at 4-6cm, 7-8cm and 9-10cm. Measurements were taken before and after the intervention.	Pain: Lavender Aromatherapy oil Inhalation of oil via nebuliser connected to a mask and only sterile water for the control group.	This study illustrated that Lavender essential oil reduced the pain of late labour. They recommend midwives use this kind of aromatherapy during labour to alleviate labour pain.

Author, year	Article Title	Study design	Sample	Intervention and measurement	Indication and type of oil used as well as manner used	Findings
Yazdkhasti & Pirak (2016)	The effect of aromatherapy with lavender essence on severity of labor pain and duration of labor in primiparous women	Randomised control trial – Single-blinded	120 singleton pregnant women ≥37 weeks with cervical dilatation greater than 3-4 cm and cephalic presentation. 119 completed the study.	The intervention was done three times at 4-5cm, 6-7cm and 8-9cm cervical dilation. The severity of labor pain was measured by NRS both before and after the intervention.	Pain: Lavender essence 2 drops inhaled at three stages given to the experimental group and distilled water as a placebo to the control group.	This study confirmed aromatherapy with Lavender essence is a simple, inexpensive, non-invasive and effective intervention to reduce labour pain.

3.4.1 Findings of data extraction

Studies that include essential oils are conducted globally; however, the studies included in this data extraction were conducted in India (Janula & Mahipal, 2015), Indonesia (Karo *et al*., 2017), and Thailand (Tanvisut *et al.,* 2018). Furthermore, there were a few studies done in different parts of Iran, including Shiraz (Kaviani *et al*., 2014), Tehrah (Kheirkhah *et al*., 2014), Bojnourd (Rashidi-Fakari *et al.,* 2015a; Rashidi-Fakari *et al*., 2015b), Karaj (Esmaelzadeh-Saeieh *et al*., 2018; Hamdamian *et al.,* 2018), Shahroud (Vakilian *et al.,* 2018), Tuyserkon (Namazi *et al*., 2014a), Hamadon (Namazi *et al*., 2014b), Khorasan and the Sistan-Balouchestan province (Yazdkhasti & Pirak, 2016). The most extensive study consisting of 8058 mothers, was done in the United Kingdom (Burns *et al*. 2000c).

The mean age of the women participating in the different studies can be seen in Table 3-5; however, not all studies mentioned the age of the participants. Burns *et al.* (2000c) did not give information on the age of the participants, whereas Janula and Mahipal (2015:2) commented that the average age of the women participating in the study was between the ages of 21-25. In the study of Esmaelzadesh-Saeieh *et al*. (2018), 57 women were between 20-25 years of age, 42 between 26-30 years, 20 between 31-35 and five between the ages of 36-40.

Table 3-5: Mean age of women across studies

Authors of Study	Number of participants	Mean age of Essential oil group	Mean age of the control group
Hamdamian *et al*. (2018)	116	25.87	26.24
Karo *et al*. (2017)	40	23.55	23.7
Kaviani *et al.* (2014)	160	23	22
Kheirkhah *et al*. (2014)	120	23.08	23.75
Namazi *et al*. (2014a)	126	26.43	26.6
Namazi *et al*. (2014b)	126	26.43	26.6
Rashidi-Fakari *et al*. (2015a)	100	23	21
Rashidi-Fakari *et al*. (2015b)	112	20	21
Tanvisut *et al*. (2018)	106	26.54	24.92
Vakilian *et al*. (2018)	120	25.5	26
Yazdkhasti & Pirak (2016)	120	18.26	19.13

Various methods of applying essential oils were used across the studies. These methods included massage, diffusion, essential oils inserted into a birth- or foot bath and inhalation. Of the 14 studies in the data extraction table, inhalation was the most frequently used method. Table 3-6 shows the different methods of application used in these studies.

Table 3-6: Essential oils application method used

Application method	Author of the study
Massage	Janula & Mahipal (2015) Burns *et al*. (2000c)
Diffusion	Karo *et al.* (2017) Tanvisut *et al*. (2018)
Inhalation	Burns *et al*. (2000c) Esmaelzadeh-Saeieh *et al*. (2018) Hamdamian *et al*. (2018) Kaviani *et al.* (2014) Namazi *et al*. (2014a) Namazi *et al*. (2014b) Rashidi-Fakari *et al.* (2015a) Rashidi-Fakari *et al*. (2015b) Vakilian *et al*. (2018) Yazdkhasti & Pirak (2016) Kheirkhah *et al.* (2014)
Essential oils inserted in a birth bath	Burns *et al.* (2000c)
Essential oils inserted in a foot bath	Kheirkhah *et al*. (2014) Burns *et al*. (2000c)

A variety of essential oils were used in these studies. As seen in Table 3-7, Lavender oil was used the most often, followed by Citrus oil and, thirdly, Rose oil. Other essential oils that were used and found proven to relieve perceived anxiety and pain during labour were Jasmine, Chamomile, Frankincense and Geranium.

Table 3-7: Essential oils used in the various studies

Essential oils used	Author of the study
Lavender	Janula & Mahipal (2015) Burns *et al*. (2000c) Karo *et al*. (2017) Kaviani *et al*. (2014) Tanvisut *et al*. (2018) Vakilian *et al*. (2018) Yazdkhasti & Pinak (2016)
Frankincense	Esmaelzadeh-Saeieh *et al*. (2018) Burns *et al*. (2000c)
Rose	Hamdamian *et al*. (2018) Kheirkhah *et al*. (2014) Burns *et al*. (2000c) Tanvisut *et al*. (2018)
Citrus	Namazi *et al*. (2014a) Burns *et al*. (2000c) Namazi *et al*. (2014b) Rashidi-Fakari *et al*. (2015b) Tanvisut *et al*. (2018)
Geranium	Rashidi-Fakari *et al*. (2015a) Tanvisut *et al*. (2018)
Jasmin	Tanvisut *et al*. (2018) Burns *et al*. (2000c)
Camomile	Burns *et al*. (2000c)
Eucalyptus	Burns *et al*. (2000c)
Clary sage	Burns *et al*. (2000c)
Peppermint	Burns *et al*. (2000c)

Different methods were used to determine the use of essential oils on pain and anxiety during labour. These methods included the Numeric Pain Rating Scale (NPRS), the Visual Analogue Scale (VAS) and the Numerical Rating Scale (NRS) for pain. The Spielberger State Trait Anxiety Inventory (STAI) and the Visual Analogue Scale for Anxiety (VASA) were used to measure anxiety outcomes.

Table 3-8: Different scales used in the studies

Study	Scale used	Pain/Anxiety
Burns *et al*. (2000c)	NPRS	Pain and Anxiety
Esmaelzadeh-Saeieh *et al*. (2018)	NRS	Pain
Hamdamian *et al*. (2018)	STAI NRS	Anxiety Pain
Janula and Mahipal (2015)		Pain
Karo *et al*. (2017)	NRS	Pain
Kaviani *et al.* (2014)	VAS	Pain
Kheirkhah *et al*. (2014)	VASA	Anxiety
Namazi *et al*. (2014a)	NRS	Pain
Namazi *et al*. (2014b)	STAI	Anxiety
Rashidi-Fakari *et al*. (2015a)	STAI	Anxiety
Rashidi-Fakari *et al*. (2015b)	STAI	Anxiety
Tanvisut *et al*. (2018)	NRS	Pain
Vakilian *et al*. (2018)	VAS	Pain
Yazdkhasti & Pirak (2016)	NRS	Pain

3.4.2 Limitation of the studies

A few limitations in the design and implementation of the included studies were noted. Although the majority of the studies evaluated essential oils making use of inhalation as the method to absorb the essential oils, massage was also used as a method of applying essential oils. Massage on its own is seen as an alternative therapy for pain relief during labour, making it difficult to determine the effect of essential oils, as only the aromatherapy (intervention) group in the study by Janula and Mahipal (2015) received massage as well as essential oils. The combination of massage and essential oils limits the accuracy of the results as there was not a control group that received massage only without essential oils to determine the effectiveness of essential oils on its own. The outcome still confirmed that the use of essential oils has a positive effect on relieving pain during labour and may also indicate that essential oils can be combined effectively with other alternative interventions for relief of pain and anxiety during labour.

Not all studies specified the dilution ratio of the essential oils used for pain and anxiety. Janula and Mahipal (2015) and Burns *et al*. (2000c) were two of the studies that did not mention the ratio of essential oils used. The ratio of the dilution is essential in order to ensure that future studies can achieve the same results. The concentration determines what effect the essential oils used have to reduce pain and anxiety during labour. Therefore, more research is needed to determine the minimum and maximum dilution ratio that is most effective.

Further limitations of the studies were that some of the studies such as Esmaelzadeh-Saeieh *et al*. (2018), Hamdamian *et al*. (2018), Janula and Mahipal (2015), Karo *et al*. (2017), Kaviani *et al*. (2014), Kheirkhah *et al*. (2014), Rashidi-Fakari *et al*. (2015a), Rashidi-Fakari *et al*. (2015b), and Yazdkhasti and Pirak (2016) only used primigravidas during their research. Further studies are needed to determine if this effect will have the same outcome if multigravidas were included.

Furthermore, the study of Burns *et al*. (2000c) and Tanvisut *et al*. (2018) indicated that more than one essential oil or a combination of oils could also have a positive effect on the relief of pain and anxiety. The assumption that combined oils are effective needs to be explored to determine if it is the combination or only a specific oil used in the combination that aids in the relief of pain and anxiety during childbirth. Further studies need to be done to determine this effect.

3.5 Synthesis of results

Data were extracted from the different studies according to the name of the essential oil, the manner in which it was applied and whether it was used for pain or anxiety. These studies used different methods to determine the outcomes and therefore, it is not possible to compare or integrate the results. Consequently, extracted data were divided into two groups, namely essential oils used for pain and essential oils used for anxiety, as seen in Table 3-9.

Table 3-9: Studies that used essential oils for pain and anxiety

Studies that used essential oils for pain	Studies that used essential oils for anxiety
Janula &Mahipal (2015) Burns *et al*. (2000c) Esmaelzadeh-Saeieh *et al*. (2018) Hamdamian *et al.* (2018) Karo *et al.* (2017) Kaviani *et al*. (2014) Namazi *et al*. (2014a) Tanvisut *et al*. (2018) Vakilian *et al.* (2018) Yazdkhasti & Pinak (2016)	Burns *et al*. (2000c) Hamdamian *et al*. (2018) Kheirkhah *et al.* (2014) Namazi *et al*. (2014b) Rashidi-Fakari *et al*. (2015a) Rashidi-Fakari *et al.* (2015b)

3.5.1 Use of essential oils to reduce anxiety during labour

Overall, six studies used essential oils to reduce anxiety. These six studies found that the use of essential oils has a positive effect on reducing anxiety during labour. All studies emphasise an individualised approach when each essential oil must first be tested on every individual as not all essential oils are suitable for all patients. The essential oils used in the studies from which data were extracted were Lavender, Frankincense, Camomile, Rose, Citrus, Orange peel and Geranium.

Of the six studies that used essential oils to reduce anxiety during childbirth, three studies used Rose essential oil (Burns *et al*., 2000c; Hamdamian *et al*., 2018; Kheirkhah *et al*., 2014). All three studies found that the use of Rose essential oils has a positive effect on reducing anxiety. The other studies, as well as Burns *et al.* (2000c), used a variety of essential oils, namely, Lavender, Citrus Aurantium, Geranium and Orange peel (Burns *et al.,* 2000c; Namazi *et al*., 2014; Rashidi-Fakari *et al*., 2015a and Rashidi-Fakari *et al*., 2015b).

Several application methods were used across the studies to apply the oils and were used as preferred by the mother's choice of application. These methods included inhalation and essential oils added to a foot bath. All six studies used inhalation as the

method of application of essential oils except Kheirkhah *et al*. (2014), who also used essential oils in a foot bath for the relief of anxiety during labour. Burns *et al*. (2000c) did an extensive study over eight years with various application methods, without specific mention as to which method of application was used for anxiety.

Regarding adverse effects, Burns *et al*. (2000c) found that women with asthma-related hay fever reported headache or nausea after using Lavender essential oil. However, further studies are needed to determine whether it was a result of essential oil or a natural side effect of labour. Burns *et al.* (2000c) also found that only 1% of the 8058 mothers in their study rated essential oils as unhelpful with minor undesired effects such as rash, rapid labour and headache. Once again, it could not be determined if these effects were due to the essential oils or the natural cause of childbirth.

The perceived positive effect of reducing anxiety remains the same across all the studies, even if different essential oils and application methods were used.

3.5.2 Use of essential oils to reduce pain during labour

Essential oils used for pain relief during labour were used in ten studies and included the following oils, namely: Lavender, Rose, Camomile, Frankincense, Jasmine, Citrus and Geranium. These oils were used separately or as a combination of two or three oils. Burns *et al*. (2000c) explained that although essential oils can be used in combination, they only used single oils in their study to simplify the analysis of the data. Nevertheless, each individual oil needs to be tested for each individual before use to ensure that there is no reaction or aversion to the odour of the oil. The testing can be done just before the application of the essential oil.

Lavender essential oil was used in studies by Burns *et al*. (2000c), Janula and Mahipal (2015), Karo *et al*. (2017), Kaviani *et al*. (2014), Tanvisut *et al*. (2018), Vakilian *et al*. (2018) and lastly by Yazdkhasti and Pinak (2016). All these studies found that using Lavender seems to have a positive effect on relieving pain during childbirth.

Rose essential oils were used in the studies of Burns *et al*. (2000c), Hamdamian *et al*. (2018), and Tanvisut *et al.* (2018) and were found to be beneficial for reducing pain during childbirth. These studies used inhalation as the method of essential oils application.

The use of citrus essential oils were found to have a positive effect on pain in the studies of Namazi *et al*. (2014a) and Tanvisut *et al*. (2018). These studies also used inhalation as a method of application.

Although most studies used inhalation as the application method, Janula and Mahipal (2015) used massage only. Burns *et al*. (2000c) used various methods of application and did not explicitly mention which application methods were used with which essential oil.

Lastly, Geranium, Frankincense, Jasmin and Camomile were used in the studies by Burns *et al*. (2000c), Esmaelzadeh-Saeieh *et al*. (2018), and Tanvisut *et al*. (2018), all with a reduced sensation of pain during childbirth. Once again, inhalation was the preferred method used for applying essential oils.

According to Rashidi-Fakari *et al*. (2015:140a) and Tanvisut *et al*. (2018:1149), applying essential oils directly to the skin could pose a risk for mothers with sensitive skin and therefore, inhalation is preferred.

Table 3-10 provides a summary of the essential oils that can be used for pain and anxiety during labour. None of the studies from which data were extracted indicated that Jasmine could be used for anxiety, or Orange peel for pain relief during labour.

Table 3-10: Summary of essential oils for pain and anxiety

Type of Essential Oil	Essential oils used for Anxiety during labour	Essential oils used for Pain during labour
Chamomile	Yes	Yes
Citrus	Yes	Yes
Frankincense	Yes	Yes
Geranium	Yes	Yes
Jasmine		Yes
Lavender	Yes	Yes
Orange peel	Yes	
Rose	Yes	Yes

3.6 Discussion

Other studies that were not included in the data extraction also found that the use of essential oils had a positive effect when used for reducing pain and anxiety during labour. These studies correlate with the findings of this systematic review. A study done by Buckle *et al*. (2014), where Rose essential oil was used to reduce anxiety during labour, as well as studies by Tafazoli *et al.* (2011) and Adams (2012), found that using essential oils relieve the effects of anxiety during childbirth.

A study done by Roozbahani *et al*. (2015), found that Rose essential oils reduced pain during labour. Further studies confirming essential oils to manage pain during labour include studies by Ghiasi *et al*. (2017), Pollard (2008) and Vitale and Jenner (2018). Joseph and Fernandes (2013) also confirmed that using Jasmine essential oil positively affected reducing pain during childbirth.

Two systematic reviews done recently, in 2020 and 2021, found that aromatherapy as an intervention was effective when used to manage pain and anxiety during labour (Ching-Chu *et al*., 2021; Tabatabaeichehr & Mortazavi, 2020). This confirms the findings of the current systematic review that essential oil had a positive effect on reducing pain and anxiety during labour.

In addition to providing answers to the research question (the effects of using essential oils on anxiety and pain during childbirth), some of the studies also addressed other issues.

Some studies mention the use of essential oils for other purposes than the alleviation of anxiety or pain. Burns *et al.* (2000c) mentioned the use of Clary sage to augment contractions; Peppermint for nausea and vomiting; and Eucalyptus, although there is no explicit mention of the indication for what Eucalyptus was used for. In addition, the most commonly used carrier oil was Sweet Almond.

Essential oils can also have adverse effects. Lavender oil should be avoided by mothers who have asthma-related conditions, and Camomile is the only essential oil that is safe for use by mothers who have multiple allergies (Burns *et al.,* 2000c). Furthermore, Peppermint, Eucalyptus, and Clary Sage should not be used in the birthing-pool due to the fact that these oils cause topical blood circulation to increase, causing a cooling effect

on the skin (Burns *et al.,* 2000c). Moreover, Burns *et al*. (2000c) caution against the use of the above-mentioned oils in the birth bath as they may lead to a premature gasp of babies born underwater.

With the exception of one study done by Burns *et al.* (2000c), inhalation, massage and foot bath were the only methods of application used in this systematic review. Additional methods of applying essential oils such as oral intake, topical application by means of a drop on the brow or palm, birth bath or compress need to be explored. Burns *et al*. (2000c) mentioned the use of these applications but did not specify if these methods were used for pain and anxiety or other labour related complications such as enhancement of contractions, nausea and headaches.

Regarding evidence about the use of essential oils not being effective, Esmaelzadeh-Saeieh *et al*. (2018), reported that the Cochrane review by Smith *et al*. (2011) found that essential oils did not meaningfully reduce labour pains. However, the review of Smith *et al*. (2011) only included two studies, namely Calvert (2000) and Burns *et al.* (2007). The full study of Calvert (2000) could not be obtained and only presented unpublished data on 22 participants (as cited by Smith *et al*., 2011). However, the article title named: 'The evaluation of the use of herbal substances in the bathwater of labouring women' gives the impression that herbs and not essential oils, were used. Burns *et al*. (2007) did not include pain or anxiety as outcome but mentioned that the use of essential oils was found effective in the relief of pain and anxiety.

3.7 Conclusion

Initially, 574 studies were found on the various databases and reference lists. These studies were narrowed down after duplicates and irrelevant studies were removed, and finally, 14 studies were left over after the 70% cut off during critical appraisal. The findings of the 14 studies were then extracted and synthesised. The outcomes of the studies could not be combined or compared as the specific interventions differ, and the studies used different methods to determine the outcomes.

Positive effects with the use of essential oils were reported when Chamomile, Citrus, Rose, Clary sage, Frankincense, Jasmine, as well as Lavender were found favourable in relieving the symptoms of pain during childbirth. Similarly, Citrus, Frankincense, Geranium, Camomile, Jasmine, Lavender, Orange peel and Rose essential oils were

found helpful to relieve anxiety during labour. These studies reported various methods of applying the essential oils, including topical application, inhalation, massage and drops in water, for either the birthing pool or a foot bath.

There were also minimal adverse effects found concerning the use of essential oils. The use of Lavender essential oil can cause headaches or nausea in women with asthma-related hay fever. A small percentage of mothers found essential oils unfavourable with symptoms such as rash and headache.

CHAPTER 4: CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

4.1 Introduction

In chapter 4, the conclusion, recommendations and limitations regarding the use of essential oils and the effect thereof for pain relief and anxiety during labour will be presented as found in this systematic review. Firstly, the evaluation of the study will be discussed, followed by a summary of evidence and, thirdly, limitations will be addressed where after recommendations for research, for practice, and policy-makers will be made. Lastly, a conclusion regarding the significance of the study will be provided.

4.2 Evaluation of the study

Both the way the research method was executed and whether the aim and objective were met, were evaluated.

Throughout this systematic review, rigour was minimised. A search strategy was designed and followed using PICO and carefully considered in- and exclusion criteria. A subject librarian was consulted to ensure a comprehensive search. The researcher made use of EPPI reviewer to search various databases, as well as to exclude duplicates. Furthermore, the reference lists of key papers were also checked to ensure that all possible studies were included. Two researchers critically appraised the studies individually to ensure the quality of studies to be included. Lastly, data were extracted and synthesised.

Potential bias due to cross-referencing to the same studies was a possibility if the same study was identified from different sources. Duplication of studies was avoided by not using synthesised data from systematic reviews but only using systematic reviews to identify studies that were not found during the original search. Lastly, reporting bias was minimised by reporting on both supporting and contradicting findings on the use of essential oils to reduce pain and anxiety during labour.

The objective of this research was met, namely: to synthesise the best available evidence of all relevant studies related to the use of essential oils for natural pain relief and anxiety during labour. In addition, this research also aimed to contribute to information for

healthcare professionals and pregnant women to make informed decisions on the desired method to relieve pain and anxiety. The aim was met by providing a summary of the use of essential oils and their effect on the relief of pain and anxiety during childbirth. This summary can be used by healthcare professionals as well as to inform pregnant women to enable them to make informed decisions on the desired method to relieve pain and anxiety during childbirth.

To further assist mothers and healthcare workers, an information pamphlet was designed to aid mothers in making informed decisions about non-pharmacological pain and anxiety options, specifically the use of essential oils to reduce pain and anxiety during childbirth (Figures 4-1 and 4-2). This pamphlet can be used during antenatal classes and other information sessions to give information to the mothers. It can also aid in training doulas and midwives on how to use essential oils during labour. Moreover, the pamphlet can be enlarged to poster size and be used in labour wards.

Figure 4-1: Pamphlet front

(Graphics from https://www.youngliving.com/vo/#/resources/index)

Figure 4-2: Pamphlet back

(Graphics from https://www.youngliving.com/vo/#/resources/index)

4.3 Summary of evidence

This systematic review found that the use of essential oils mostly have a positive effect and can aid in the relief of pain and anxiety during labour. Different routes of application such as massage, birth bath, foot bath, neat application to the skin, and inhalation to reach the desired outcome of alleviating pain and anxiety. The majority of the studies evaluated made use of inhalation as the method to absorb the essential oils.

The different essential oils used to relieve anxiety in the studies included Lavender, Chamomile, Frankincense, Rose, Citrus Aurantium, Orange peel and Geranium. The oils used for pain relief were Lavender, Rose, Chamomile, Frankincense, Jasmine oil and Citrus Aurantium. Lavender, Rose, Chamomile, Frankincense, Geranium and Citrus Aurantum had a positive effect when used in relieving both pain and anxiety during labour.

There was not much evidence of adverse effects using essential oils; however, Lavender should be avoided by mothers with asthma conditions. Furthermore, care must be taken to apply essential oils according to instructions.

Consequently, the study's main aim was reached by meeting the objective, which was to identify and synthesise the best available evidence about the use of essential oils used as pain relief and relief of anxiety during childbirth. Essential oils seem to have a positive outcome on the relief of pain and anxiety during childbirth. Due to the variation in research methods and outcomes in the included studies, the findings of the different studies could not be combined. However, the best available evidence indicates that the use of essential oils is perceived to have a positive effect to relieve pain and anxiety during labour.

4.4 Limitations

There may be studies that were not found by the researcher either due to human error for example the choice of search words or because they were not listed on the databases that the researcher had access to. An example is the review done by Chen *et al*. (2019), on labour pain control by aromatherapy which will be included in the article that will be written.

The outcomes of the studies could not be combined or compared as the specific interventions differed too much, and a final conclusion regarding the effective use of

essential oils to relieve anxiety and pain during labour could not be made. More research is needed.

4.5 Recommendations

Recommendations are proposed for research, practise and policy-makers.

4.5.1 Recommendations for research

There are many different essential oils on the market, but only a few have been used in clinical trials and other studies on essential oils as relief of pain and anxiety during labour. Therefore, more studies are needed to determine the effect of the use of other essential oils on pain and anxiety during labour.

Academic literature focused on the relief of pain and anxiety during labour using essential oils in various manners. There are many other symptoms during pregnancy that need to be researched further in order to study the use of essential oils on these symptoms. The following recommendations for nursing research are made:

- More research is needed on specific symptoms during pregnancy, such as nausea, vomiting, the increase or decrease of contractions and natural induction of labour with the focus on how to use essential oils to alleviate these specific symptoms;
- Research is needed to determine which essential oil or combination of oils are the best to use to improve the symptoms;
- The most effective method of application of essential oils for different symptoms need to be determined; and
- Research is needed to determine what dosages of essential oils are the most effective for the different methods of applications.

4.5.2 Recommendations for practise

Nurses and midwives are continuously involved in the care and treatment of pregnant and labouring women. Therefore, recommendations for nurses, midwives and other health care workers involved with patients during pregnancy and labour follows:

- Health care workers, more specifically midwives, need to increase their knowledge regarding essential oils and the use of these oils to reduce pain and anxiety during labour through basic training and CPD.

- Nurses and midwives need to gain knowledge on how to use essential oils safely. Training should include dosage, method and the specific oils used to relieve pain and anxiety. This would result in improved health education for pregnant women.

- The health care workers need to teach patients how to safely and effectively use essential oils during labour for pain or anxiety. This can be done using posters, pamphlets or videos.

4.5.3 Recommendations for policy-makers

Essential oils are not used in all hospitals; therefore, hospital and clinic policies need to be written on the implementation of essential oils as a treatment option for pain and anxiety for patients resulting in the following recommendations:

- Policies need to be written about the use of essential oils in practice and could incorporate the use of essential oils during pregnancy also, not just during labour;

- Furthermore, clinics and hospitals need policies and guidelines on the type of essential oils and for which symptoms it may be used as well as the method;

- Policies concerning the scope of practice for health care professionals regarding the use of aromatherapy and how to combine it with current routine care are needed; and

- Hospitals could develop and implement policies to allow patients to bring private aroma therapists into labour wards for the relief of pain and anxiety or other labour related relief via aromatherapy.

4.6 Conclusion regarding the significance of the study

The use of essential oils in the medical field, especially during pregnancy from conception up to the labour ward, is not yet a standard option of management or treatment. Essential oils need to be understood by healthcare professionals first. Thereafter, effective communication can be given to patients regarding alternative options for pain or anxiety

relief during pregnancy and labour. Health care providers need to be trained to provide information to patients in all aspects of care, pharmacologically, as well as non-pharmacologically. Therefore, emphasising the importance of training personnel in labour wards in the skill of safely and effectively applying essential oils needs to be implemented worldwide. The pamphlet can provide valuable information to health care providers and mothers to safely use essential oils during labour to make informed decisions regarding a non-pharmacological option for the relief of anxiety or pain.

Essential oils have few side effects for both the mother and infant if used correctly, resulting in a more positive birth experience. Research has found that the fear of labour pains bring about actual pain - known as the Fear-Tension-Pain Cycle of Dick-Read. This cycle where fear leads to pain needs to be broken to prevent aggravating effects during birth. By using essential oils to reduce anxiety, this cycle can be broken to alleviate and lessen perceived pain. Likewise, by making use of essential oils for pain, anxiety can be reduced.

LIST OF REFERENCES

ADA (American Dietetic Association). 2016. Evidence analysis manual: steps in the ADA evidence analysis process. Chicago: Scientific affairs and research, American dietetic association. http://www.andeal.org/files/Docs/2012_Jan_EA_Manual.pdf Date of access: 12 Mat 2017.

Adams, E.D. & Bianchi, A.L. 2008. A practical approach to labor support. *Journal of Obstetrics, Gynecologic & Neonatal Nursing*, 37(1):106-115.

Adams, J.D. 2012. Massage and other CAM in pregnancy*. International Journal of Childbirth Education,* 27(3):37-42.

Alavi, A., Askari, M., Nejad, E.D. & Bagheri, P. 2017. Study the effect of massage with jasmine oil in comparison to aromatherapy with jasmine oil on childbirth process in hospitals of Abadan city in 2013. *Annals of Tropical Medicine & Public Health*, 10(4):904-909.

Ali, B., Al-Wabel, N.A., Shams, S., Ahamad, A., Khan, S.A. & Anwar, F. 2015. Review article: Essential oils used in aromatherapy: A systemic review. *Asian pacific journal of tropical biomedicine*, 5:601-611.

Allison, S.K. 2004. Psychotropic medication in pregnancy ethical aspects and clinical management. *Journal of perinatal and neonatal nursing*, 18(3):194-205.

Aveyard, H., 2014. *Doing a literature review in health and social care a practical guide*. 3rd ed. England: McGraw Hill education.

Bailliere's nurses dictionary for nurses and health care workers. 2012. Elsevier.

Baird, R. 2018. Systematic reviews and meta-analytic techniques. *Seminars In Pediatric Surgery*, 27(6):338-344.

Barker, T.H. & Marin, T.S. 2019. A Systematic Review Protocol: the Foundation of a High Quality Systematic Review. *Pacific Rim International Journal of Nursing Research*, 23(4):311-313.

Bible. 2012. The Scriptures. Northriding: Institute for Scripture Research.

Bohren, M.A., Hofmeyr, G.J. Sakala, C., Fukuzawa, R.K. & Cuthbert, A. 2017. Continuous support for women during childbirth (Review). *Cochrane Database of Systematic Reviews*, Issue 7. Art. No.: CD003766. DOI: 10.1002/14651858. CD003766.pub6.

Boland, A., Cherry, G. & Dickson, R. 2017. Doing a systematic review: A student's guide. London: Sage.

Botma, Y., Greeff, M., Mulaudzi, F.M. & Wright, S.C.D. 2015. *Research in health sciences.* Cape Town: Pearson.

Brackett, A. & Batten, J. 2020. Ensuring the rigor in systematic reviews: Part 1, the overview. *Heart & Lung*, 49(5):660-661.

Bricker, L. & Lavender, T. 2002. The nature and management of labor pain: peer reviewed papers from an evidence-based symposium: parenteral opioids for labor pain relief: a systematic review. *American journal of obstetrics and gynecology*, 186:94-109.

Brimdyr, K., Cadwell, K., Widström, A.M., Svensson, K., Neumann, M., Hart, E.A., Harrington, S. & Phillips, R. 2015. The association between common labor drugs and suckling when skin-to-skin during the first hour after birth. *Birth: Issues in perinatal care*, 42(4):319-328.

Buckle, J., Ryan, K. & Chin, K.B. 2014. Clinical Aromatherapy for Pregnancy, Labor and Postpartum. *International Journal of Childbirth Education*, 29(4):21-27.

Burns, E., Blamey, C., Ersser, S.J., Barnetson, L & Lloyd, A.J. 2000a. An investigation into the use of aromatherapy in intrapartum midwifery practice. *Journal of Alternative and Complementary Medicine,* 6:141-7.

Burns, E., Blamey, C., Ersser, S.J., Lloyd, A.J. & Barnetson, L. 2000b. The use of aromatherapy in intrapartum midwifery practice. An observational study. *Complementary therapies in nursing and midwifery*, 6(1)33-34.

Burns, E., Blamey, C. & Lloyd, A.J. 2000c. Aromatherapy in childbirth: an effective approach to care. *British Journal of Midwifery*, 8(10):639-644.

Burns, E., Zobbi, V., Panzeri, D., Oskrochi, R. & Regalia, A. 2007. Aromatherapy in childbirth: a pilot randomised controlled trial. *International Journal of Obstetrics and Gynaecology*, 114(7):838-844.

CASP. 2019, Critical appraisal skills programme. https://casp-uk.net/ Date of access 12 February 2019.

Chaillet, N., Belaid, L., Crochetière, C., Roy, L., Gagné, G.-P., Moutquin, J.M., Rossignol, M., Dugas, M., Wassef, M. & Bonapace, J. 2014. Nonpharmacologic approaches for pain management during labor compared with usual care: A Meta-Analysis. *Birth: Issues in Perinatal Care*, 41(2):122-137.

Ching-Chu, L., Shao-Huan, L., Yea-Yin, Y., Yen-Ping, H. & Shou-Jen, L. 2021. Aromatherapy intervention on anxiety and pain during first stage labour in nulliparous women: a systematic review and meta-analysis. *Journal of Obstetrics & Gynaecology*, 41(1):21-31.

Cooke, A., Smith, D. & Booth, A. 2015. Beyond PICO: The SPIDER tool for qualitative evidence synthesis: *Qualitative health research*, 22(10):1435-1443.

CRD. 2009. Centre for reviews and dissemination.

Dick-Read, G. 1959. *Childbirth without fear*. 3rd ed. London: The Whitefriars Press Ltd.

Dick-Read, G. 1947. *Revelation of childbirth*. 2nd ed. London: The Whitefriars Press Ltd.

Dippenaar, J. & da Serra, D. 2012. *Sellers' Midwifery*. Cape Town: Juta.

Di Orio, V. s.a. Referred to on why birth at home. http://www.midwife.net/Why%20 Homebirth.html. Date of access: 12 March 2017.

EPPI-Centre. 2008. EPPI-Reviewer 4 Features. https://eppi.ioe.ac.uk/cms /Default.aspx?tabid=3396. Date of access: 12 June 2017.

Esmaelzadeh-Saeieh, S., Rahimzadeh, M., Khosravi-Dehaghi, N. & Torkashvand, S. 2018. The effects of inhalation aromatherapy with Boswellia carterii essential oil on the

intensity of labor pain among nulliparous women. *Nursing and midwifery studies*, 7(2):45-49.

Ghiasi, A., Hasani, M., Mollaahmadi, L., Hashemzadeh, M. & Haseli, A. 2017. The effect of aromatherapy on labor pain relief: a systematic review of clinical trials. *Iranian Journal of Obstetrics, Gynecology and Infertility*, 20(2):89-105.

Gopalakrishnan, S. & Ganeshkumar, P. 2013. Systematic Reviews and Meta-analysis: Understanding the Best Evidence in Primary Healthcare: *Journal of Family Medicine and Primary Care,* 2(1):9-14.

Gayeski, M. E., Brüggemann, O. M. 2010. Non-pharmacological approach to pain relief during labor as hard-light care technology: a systematic review. *Texto & Contexto Enfermagem*, 19(4):774-782.

Guba, R. 2001. Toxicity Myths. *International Journal of Aromatherapy*, 11(2):76-83.

Habanananda, T. 2004. Non-pharmacological pain relief in labour. *Journal Of The Medical Association Of Thailand*, 87(4):194-202.

Haddaway, N. R., Land, M. & Macura, B. 2017. “A little learning is a dangerous thing”: A call for better understanding of the term ‘systematic review’. *Environment international*, 99:356-360.

Ham-Baloyi, W. & Joran, P. 2016. Systematic review as a research method in post-graduate nursing education. *Health SA Gesondheid*, 21:120-128.

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.

Harari, Michael B., Parola, H. R., Hartwell, C. J. & Riegelman, A. 2020. Literature searches in systematic reviews and meta-analyses: A review, evaluation, and recommendations, *Journal of Vocational Behavior*, 118:1-11.

Hayes, I., Enohumah, K. & McCaula, C. 2011. Care of the migrant obstetric population: *International Journal of Obstetric Anaesthesia*, 20, 321–329.

Hemingway, P. & Brereton, N. 2009. What is a systematic review? http://www.bandolier.org.uk/painres/download/whatis/Syst-review.pdf. Date of access: 4 July 2018.

Holly, C., Salmond, S.W. & Saimbert, M.K. 2012. Comprehensive systematic review for advanced nursing. http://www.midwiferycollege.org/AcademicProgramme/ Downloads /MSM/*550* Comprehensivesystematicreviewforadvancednursing.pdf Date of access: 15 February 2017.

Janula, R. & Mahipal, S. 2015. Effectiveness of Aromatherapy and Biofeedback in Promotion of Labour Outcome during Childbirth among Primigravidas. *Health Science Journal*, 9(1):1-5.

Joseph, R.M. & Fernandes, P. 2013. Effectiveness of Jasmine oil massage on reduction of labor pain among primigravida mothers. Nitte University Journal of Health Science, 3(4):104-107.

Karo, H. Y. K., Pramono N., Wahyuni, S., Mashoedi, I.D. & Latifah, L. 2017. Lavender (Lavendulaangustifolia) aromatherapy as an alternative treatment in reducing pain in primiparous mothers in the active first stage of labor, *Belitung Nursing Journal*, 3(4):420-425.

Kaur Makkar, J., Jain, K., Bhatai, N., Jain, V. & Mal Mithrawal, S. 2015. Comparison of analgesic efficacy of paracetamol and tramadol for pain relief in active labor. *Journal of clinical anesthesia*, 27:159-163.

Kaviani, M., Azima, S., Alavi, N. & Tabaei, M. H. 2014. The effect of lavender aromatherapy on pain perception and intrapartum outcome in primiparous women. *British Journal of Midwifery*, 22(2):125-128.

Kitchenham, B. 2014. *Procedures for Performing Systematic Reviews*. Keele University. http://www.inf.ufsc.br/~aldo.vw/kitchenham.pdf Accessed 5 March 2018.

Kheirkhah, M., Pour, N.S.V., Nisani, L. & Haghani, H. 2014. Comparing the Effects of Aromatherapy with Rose Oils and Warm Foot Bath on Anxiety in the First Stage of Labor in Nulliparous Women. *Iranian Red Crescent Medical Journal*, 16(9): 1-5.

Kokki, M. Franco, M.G., Raatikainen, K., Välitalo, P., Sankilampi, U., Heinonen, S., Neuvonen, P.J. & Kokki, H. 2012. Intravenous oxycodone for pain relief in the first stage of labour – maternal pharmacokinetics and neonatal exposure. *Basic and clinical pharmacology and toxicology*, 111(3):182-188.

Kozhimannil, K.B., Johnson, P.J., Attanasio, L.B., Gjerdingen, D.K. & McGovern, P.M. 2013. Use of Nonmedical Methods of Labor Induction and Pain Management Among U.S. Women. *Birth: Issues in perinatal care*, 40(4):227-236.

Lakhan, S.E., Sheafer, H. and Tepper, B. 2016. The effectiveness of aromatherapy in reducing pain: A systematic review and meta-analysis. *Pain research and treatment*, 2016:1-13.

Lally, J.E., Murtagh, M.J., Macphail, S. & Thomson, R. 2008. More in hope than expectation: a systematic review of women's expectations and experience of pain relief in labour. *BMC Medicine*, 6:1-10.

Lehugeur, D., Strapasson, M.R. & Fronza, E. 2017. Non-Pharmacological management of relief in deliveries assisted by an obstetric nurse. *Journal of Nursing UFPE / Revista de Enfermagem UFPE*, 11(12):4929-4937.

Lindholm, A. & Hildingsson, I. 2015. Women's preferences and received pain relief in childbirth - A prospective longitudinal study in a northern region of Sweden. *Sexual & reproductive healthcare*, 6:74-81.

Manion, C.R. & Widder, R.M. 2017. Essentials of essential oils. *American journal of Health-System pharmacy*, 74(9):e153-e162.

McCauley, M., Stewart, C. & Kebede, B. 2017. A survey of healthcare providers' knowledge and attitudes regarding pain relief in labor for women in Ethiopia. *BMC Pregnancy & Childbirth*, 17:1-6.

Milner, K. A. 2015. Systematic reviews. *Oncology Nursing Forum*, 42(1): 89-93.

Moher D, Liberati A, Tetzlaff J, Altman D.G. & The PRISMA Group. 2009. Preferred Reporting Items for Systematic Reviews and MetaAnalyses: The PRISMA Statement. *PLoS Med* 6(7):1-6.

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P. & Stewart, L.A. 2015. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P). *Systematic reviews*, 4(1):2-9.

Mosby's dictionary of medicine, nursing & health professions. 2013. Missouri: Elsevier.

Musil, A. 2013. Labor encouragement with essential oils. *Midwifery today,* (107):57-58.

Muzik, M. & Hamilton, S.E. 2016. Use of antidepressants during pregnancy?: What to consider when weighing treatment with antidepressants against untreated depression. *Maternal and child health journal*, 20:2268-2279.

Namazi, M., Akbari, S. A., Mojab, F., Talebi, A. & Jannesari, S. 2014a. Effects of Citrus Aurantium (Bitter Orange) on the Severity of First-Stage Labor Pain. *Iranian Journal of Pharmaceutical Research*, 13(3): 1011-1018.

Namazi, M., Akbari, S. A. A., Mojab, F., Talebi, A., Majd, H. A. & Jannesari, S. 2014b. Aromatherapy with citrus aurantium oil and anxiety during the first stage of labor. *Iranian Red Crescent Medical Journal* 16(6): 18371-18371.

National Institute for Clinical Excellence (NICE). 2003. Guideline 6: Antenatal Care: Routine Care for the Healthy Pregnant Woman. London: NICE.

NICE see National Institute for Clinical Excellence

O'Brien, D., Butler, M.M. & Casey, M. 2017. A participatory action research study exploring women's understandings of the concept of informed choice during pregnancy and childbirth in Ireland. *Midwifery*, 46:1-7.

Ohaeri, B., Owolabi, G. & Ingwu, J. 2019. Skilled health attendants' knowledge and practice of pain management during labour in health care facilities in Ibadan, Nigeria. *European journal of midwifery*, 3(3):1-7.

Osório, S.M.B., da Silva, L.G. & Nicolau, A.J.O. 2014. Assessment of the effectiveness of non-pharmacological methods in pain relief during labor. *Revista da Rede de Enfermagem do Nordeste*, 15(1):174-184.

Page, L.A., & McCandish, R. 2006. The new midwifery, science and sensitivity in practice. 2nd ed. Elsevier.

Pascali-Bonaro, D. & Kroeger, M. 2004. Continuous female companionship during childbirth: a crutial resource in times of stress or calm. *Midwifery women's Health*, 49(4):19-27.

Pollard, K.R. 2008. Introducing aromatherapy as a form of pain management into a delivery suite. *Journal of the Association of Chartered Physiotherapists in Women's Health*, 103:12-16.

Rashidi-Fakari, F., Tabatabaeichehr, M., Kamali, H., Rashidi Fakari, F. & Naseri, M. 2015a. Effect of inhalation of aroma of Geranium Essence on anxiety and physiological parameters during first Stage of labor in nulliparous women: a randomized clinical trial. *Journal of Caring Sciences*, 4(2): 135-141.

Rashidi-Fakari, F., Tabatabaeichehr, M. & Mortazavi, H. 2015b. The effect of aromatherapy by essential oil of orange on anxiety during labor: A randomized clinical trial. *Iranian Journal of Nursing & Midwifery Research*, 20(6): 661-664.

Reis, D. & Jones, M.S.W. 2017. Aromatherapy Using essential oils as a supportive therapy: *Clinical Journal of Oncology Nursing,* 21(1):16-19.

Robertson, E. & Johansson, S.E. 2010. Use of complementary, non-pharmacological pain reduction methods during childbirth among foreign-born and Swedish-born women. *Midwifery*, 26:442-449.

Roozbahani. 2015. The effect of rose water aromatherapy on reducing labor pain in primiparous women. *Complementary Medicine Journal of Faculty of Nursing and Midwifery*, 5(1):1042-1053.

Sayorwan, W., Siripornpanich, V., Piriyapunyaporn, T., Hongratanaworakit, T., Kotchabhakdi, N. & Ruangrungsi, N. 2012. The effects of lavender oil inhalation on emotional states, autonomic nervous system, and brain electrical activity. *Journal of the Medical Association Thailand,* 95(4):598-606.

Sanders, R.A. & Lamb, K. 2017. Non-pharmacological pain management strategies for labour: Maintaining a physiological outlook. *British Journal of Midwifery*, 25(2):78-85.

Scarborough, S. 2003. A new way to present the “Fear/Tension/Pain” cycle of childbirth: *International journal of childbirth education*, 16(1):4-5.

Schilcher, H. 1985. Essential oils and aromatic plants. Netherlands. https://link.springer.com/chapter/10.1007/978-94-009-5137-2_26 Date of access: 20 March 2018.

Sheppard-Hanger, S. & Hanger, N. 2015. The importance of safety when using aromatherapy. *International journal of childbirth education* (1):42.

Siddaway, A.P., Wood, A.M. & Hedges, L.V. 2019. How to do a Systematic Review: A Best Practice Guide for conducting and reporting Narrative Reviews, Meta-Analyses, and Meta-Syntheses. *Annual Review of Psychology,* 70:747-770.

Simkin, P. & Bolding, A. 2004. Update on Non-pharmacological approaches to relieve labor pain and prevent suffering. *Journal of Midwifery & Women’s Health,* 49(6):489-504.

Smith, C.A., Collins, C.T., Cyna, A.M. & Crowther, C.A. 2006. Complementary and alternative therapies for pain management in labour. *The Cochrane Database of Systematic Reviews*, 4:1-54.

Smith, C.A., Collins, C.T. & Crowther, C.A. 2011. Aromatherapy for pain management in labour. *The Cochrane Database of Systematic Reviews*, 7:1-32.

Smith, C.A. Collins, C.T. & Crowther, C.A. (2011). Referring to Calvert, I. (2000) The evaluation of the use of herbal substances in the bath water of labouring women. (Unpublished).

Smith, C.A., Levett, K.M., Collins, C.T. & Jones, L. 2012. Massage, reflexology and other manual methods for pain management in labour (Review). Cochrane Database Systematic reviews, (2):CD009290. doi: 10.1002/14651858.CD009290.pub2.

Smith, N. 2015. Grantly Dick-Read. *International journal of birth and parent education*. 3(1):33-36.

South Africa. 2003. National Health Act 61 of 2003.

Steel, A., Adams, J., Sibbritt, D. & Broom, A. 2015. The outcome of complementary and alternative medicine use among pregnant and birthing women: current trends and future directions. *Women's health* (3):309.

Sullivan, D.H. & McGuiness, C. 2015. Natural labor pain management. *International journal of childbirth education*, 30(2):20-25.

Tabatabaeichehr, M. & Mortazavi, H. 2020. The effectiveness of aromatherapy in the management of labour pain and anxiety: a systematic review. *Ethiopian Journal of Health Sciences*, 30(3):449-458.

Tafazoli, M., Zaremobini, F., Mokhber, N. & Emami, A. 2011. The effects of Lavender oil inhalation on level of anxiety during first stage of labor in primigravida women. *Journal of fundamentals of mental health*, 12(4):48.

Tanvisut, R., Traisrisilp, K. & Tongsong, T. 2018. Efficacy of aromatherapy for reducing pain during labor: a randomized controlled trial. *Archives of Gynecology and Obstetrics,* 297:1145-1150.

Thomas, J., Harden, A., Oakley, A., Oliver, S., Sutcliffe, K., Rees, R., Brunton, G & Kavanagh, J. 2004. Integrating qualitative research with trials in systematic reviews. *British Medical Journal*, (328):1010-1012.

Tournaire, M. & Theau-Yonneau, A. 2007. Complementary and alternative approaches to pain relief during labor. *Obstetrics and gynaecology*, 4(4):409-417.

University of York. Centre for reviews and dissemination. 2019. PROSPERO. PROSPERO. International prospective register of systematic reviews https://www.crd.york.ac.uk/prospero/ Date of access 12 February 2019.

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. *Crecent journal of medical and biological sciences,* 5(3):172-175.

Vergnes, J., Mearchal-Sixou, C., Nabet, C., Mearet, D., Hamel, O. 2010. Ethics in systematic reviews. *Journal of Medical Ethics*, 36(12):771-774.

Vitale, A. & Jenner, M. 2018. Use of Aromatherapy for Discomfort in Labor. *International Journal of Childbirth Education*, 33(2):31-35.

Weatherspoon, D. 2011. Current practices in easing discomfort from labor and delivery: Alternative and medical practices. *International journal of childbirth education*, 26(4):44-48.

Webb, C. & Roe, B. 2007. *Reviewing research evidence for nursing practice systematic reviews*. Oxford: Blackwell Publishing.

WHO (World health orginisation). 2018. *WHO recommendations for intrapartum care for a positive childbirth experience https://www.who.int/reproductivehealth/publications /intrapartum-care-guidelines/en/*. Date of access: 30 March 2021.

Yazdkhasti, M. & Pirak, A. 2016. The effect of aromatherapy with lavender essence on severity of labor pain and duration of labor in primiparous women. *Complementary therapies in clinical practice,* 25:81-86.

Zahra, A. & Leila, M.S. 2013. Lavender aromatherapy massage in reducing labor pain and duration of labor: a randomised controlled trial. *African journal of pharmacy and pharmacology*, 7(8):426-430.

ANNEXURE A: CRITICAL APPRAISAL TOOL FOR RANDOMISED CONTROL TRIALS

www.casp-uk.net
info@casp-uk.net
Summertown Pavilion, Middle Way Oxford OX2 7LG

CASP Checklist: 11 questions to help you make sense of a Randomised Controlled Trial

How to use this appraisal tool: Three broad issues need to be considered when appraising a trial:

- Are the results of the study valid? (Section A)
- What are the results? (Section B)
- Will the results help locally? (Section C)

The 11 questions on the following pages are designed to help you think about these issues systematically. The first three questions are screening questions and can be answered quickly. If the answer to both is "yes", it is worth proceeding with the remaining questions. There is some degree of overlap between the questions, you are asked to record a "yes", "no" or "can't tell" to most of the questions. A number of italicised prompts are given after each question. These are designed to remind you why the question is important. Record your reasons for your answers in the spaces provided.

About: These checklists were designed to be used as educational pedagogic tools, as part of a workshop setting, therefore we do not suggest a scoring system. The core CASP checklists (randomised controlled trial & systematic review) were based on JAMA 'Users' guides to the medical literature 1994 (adapted from Guyatt GH, Sackett DL, and Cook DJ), and piloted with health care practitioners.

For each new checklist, a group of experts were assembled to develop and pilot the checklist and the workshop format with which it would be used. Over the years overall adjustments have been made to the format, but a recent survey of checklist users reiterated that the basic format continues to be useful and appropriate.

Referencing: we recommend using the Harvard style citation, i.e.: *Critical Appraisal Skills Programme (2018). CASP (insert name of checklist i.e. Randomised Controlled Trial) Checklist. [online] Available at: URL. Accessed: Date Accessed.*

CASP
Critical Appraisal Skills Programme

Paper for appraisal and reference:.....

Section A: Are the results of the trial valid?

1. Did the trial address a clearly focused issue?

Yes ☐
Can't Tell ☐
No ☐

HINT: An issue can be 'focused' In terms of
- the population studied
- the intervention given
- the comparator given
- the outcomes considered

Comments:

2. Was the assignment of patients to treatments randomised?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
- how this was carried out
- was the allocation sequence concealed from researchers and patients

Comments:

3. Were all of the patients who entered the trial properly accounted for at its conclusion?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
- was the trial stopped early
- were patients analysed in the groups to which they were randomised

Comments:

Is it worth continuing?

CASP
Critical Appraisal Skills Programme

4. Were patients, health workers and study personnel 'blind' to treatment?

Yes ☐
Can't Tell ☐
No ☐

Comments:

5. Were the groups similar at the start of the trial

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
• other factors that might affect the outcome, such as; age, sex, social class

Comments:

6. Aside from the experimental intervention, were the groups treated equally?

Yes ☐
Can't Tell ☐
No ☐

Comments:

Section B: What are the results?

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Critical Appraisal Skills Programme

7. How large was the treatment effect?

HINT: Consider
- what outcomes were measured
- Is the primary outcome clearly specified
- what results were found for each outcome

Comments:

8. How precise was the estimate of the treatment effect?

HINT: Consider
- what are the confidence limits

Comments:

Section C: Will the results help locally?

9. Can the results be applied to the local population, or in your context?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider whether
- the patients covered by the trial are similar enough to the patients to whom you will apply this
- how they differ

Comments:

10. Were all clinically important outcomes considered?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider whether
- there is other information you would like to have seen
- if not, does this affect the decision

Comments:

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11. Are the benefits worth the harms and costs?

Yes	
Can't Tell	
No	

HINT: Consider
- even if this is not addressed by the trial, what do you think?

Comments:

ANNEXURE B: CRITICAL APPRAISAL TOOL FOR CASE CONTROL STUDIES

www.casp-uk.net
info@casp-uk.net
Summertown Pavilion, Middle Way Oxford OX2 7LG

CASP Checklist: 11 questions to help you make sense of a Case Control Study

How to use this appraisal tool: Three broad issues need to be considered when appraising a case control study:

- Are the results of the study valid? (Section A)
- What are the results? (Section B)
- Will the results help locally? (Section C)

The 11 questions on the following pages are designed to help you think about these issues systematically. The first three questions are screening questions and can be answered quickly. If the answer to both is "yes", it is worth proceeding with the remaining questions. There is some degree of overlap between the questions, you are asked to record a "yes", "no" or "can't tell" to most of the questions. A number of italicised prompts are given after each question. These are designed to remind you why the question is important. Record your reasons for your answers in the spaces provided.

About: These checklists were designed to be used as educational pedagogic tools, as part of a workshop setting, therefore we do not suggest a scoring system. The core CASP checklists (randomised controlled trial & systematic review) were based on JAMA 'Users' guides to the medical literature 1994 (adapted from Guyatt GH, Sackett DL, and Cook DJ), and piloted with health care practitioners.

For each new checklist, a group of experts were assembled to develop and pilot the checklist and the workshop format with which it would be used. Over the years overall adjustments have been made to the format, but a recent survey of checklist users reiterated that the basic format continues to be useful and appropriate.

Referencing: we recommend using the Harvard style citation, i.e.: *Critical Appraisal Skills Programme (2018). CASP (insert name of checklist i.e. Case Control Study) Checklist. [online] Available at: URL. Accessed: Date Accessed.*

CASP
Critical Appraisal Skills Programme

Paper for appraisal and reference:.....

Section A: Are the results of the trial valid?

1. Did the study address a clearly focused issue?

Yes ☐
Can't Tell ☐
No ☐

HINT: An issue can be 'focused' In terms of
- the population studied
- Whether the study tried to detect a beneficial or harmful effect
- the risk factors studied

Comments:

2. Did the authors use an appropriate method to answer their question?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
- Is a case control study an appropriate way of answering the question under the circumstances
- Did it address the study question

Comments:

CASP
Critical Appraisal Skills Programme

Is it worth continuing?

3. Were the cases recruited in an acceptable way?

Yes	
Can't Tell	
No	

Comments:

HINT: We are looking for selection bias which might compromise validity of the findings

- are the cases defined precisely
- were the cases representative of a defined population (geographically and/or temporally)
- was there an established reliable system for selecting all the cases
- are they incident or prevalent
- is there something special about the cases
- is the time frame of the study relevant to disease/exposure
- was there a sufficient number of cases selected
- was there a power calculation

4. Were the controls selected in an acceptable way?

Yes	
Can't Tell	
No	

Comments:

HINT: We are looking for selection bias which might compromise the generalisability of the findings

- were the controls representative of the defined population (geographically and/or temporally)
- was there something special about the controls
- was the non-response high, could non-respondents be different in any way
- are they matched, population based or randomly selected
- was there a sufficient number of controls selected

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Critical Appraisal Skills Programme

5. Was the exposure accurately measured to minimise bias?

Yes	
Can't Tell	
No	

HINT: We are looking for measurement, recall or classification bias

- was the exposure clearly defined and accurately measured
- did the authors use subjective or objective measurements
- do the measures truly reflect what they are supposed to measure (have they been validated)
- were the measurement methods similar in the cases and controls
- did the study incorporate blinding where feasible
- is the temporal relation correct (does the exposure of interest precede the outcome)

Comments:

6. (a) Aside from the experimental intervention, were the groups treated equally?

HINT: List the ones you think might be important, that the author may have missed

- genetic
- environmental
- socio-economic

List:

6. (b) Have the authors taken account of the potential confounding factors in the design and/or in their analysis?

Yes	
Can't Tell	
No	

HINT: Look for

- restriction in design, and techniques e.g. modelling, stratified-, regression-, or sensitivity analysis to correct, control or adjust for confounding factors

Comments:

CASP
Critical Appraisal Skills Programme

Section B: What are the results?

7. How large was the treatment effect?

HINT: Consider
- what are the bottom line results
- is the analysis appropriate to the design
- how strong is the association between exposure and outcome (look at the odds ratio)
- are the results adjusted for confounding, and might confounding still explain the association
- has adjustment made a big difference to the OR

Comments:

8. How precise was the estimate of the treatment effect?

HINT: Consider
- size of the p-value
- size of the confidence intervals
- have the authors considered all the important variables
- how was the effect of subjects refusing to participate evaluated

Comments:

CASP
Critical Appraisal Skills Programme

9. Do you believe the results?

Yes ☐
No ☐

HINT: Consider
- big effect is hard to ignore!
- Can it be due to chance, bias, or confounding
- are the design and methods of this study sufficiently flawed to make the results unreliable
- consider Bradford Hills criteria (e.g. time sequence, does-response gradient, strength, biological plausibility)

Comments:

Section C: Will the results help locally?

10. Can the results be applied to the local population?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider whether
- the subjects covered in the study could be sufficiently different from your population to cause concern
- your local setting is likely to differ much from that of the study
- can you quantify the local benefits and harms

Comments:

11. Do the results of this study fit with other available evidence?

Yes ☐
Can't Tell ☐
No ☐

HINT: Consider
- all the available evidence from RCT's Systematic Reviews, Cohort Studies, and Case Control Studies as well, for consistency

Comments:

Remember One observational study rarely provides sufficiently robust evidence to recommend changes to clinical practice or within health policy decision making. However, for certain questions observational studies provide the only evidence. Recommendations from observational studies are always stronger when supported by other evidence.

ANNEXURE C: CRITICAL APPRAISAL TOOL FOR COHORT STUDIES

www.casp-uk.net
info@casp-uk.net
Summertown Pavilion, Middl
Way Oxford OX2 7LG

CASP Checklist: 12 questions to help you make sense of a Cohort Study

How to use this appraisal tool: Three broad issues need to be considered when appraising a cohort study:

- Are the results of the study valid? (Section A)
- What are the results? (Section B)
- Will the results help locally? (Section C)

The 12 questions on the following pages are designed to help you think about these issues systematically. The first two questions are screening questions and can be answered quickly. If the answer to both is "yes", it is worth proceeding with the remaining questions. There is some degree of overlap between the questions, you are asked to record a "yes", "no" or "can't tell" to most of the questions. A number of italicised prompts are given after each question. These are designed to remind you why the question is important. Record your reasons for your answers in the spaces provided.

About: These checklists were designed to be used as educational pedagogic tools, as part of a workshop setting, therefore we do not suggest a scoring system. The core CASP checklists (randomised controlled trial & systematic review) were based on JAMA 'Users' guides to the medical literature 1994 (adapted from Guyatt GH, Sackett DL, and Cook DJ), and piloted with health care practitioners.

For each new checklist, a group of experts were assembled to develop and pilot the checklist and the workshop format with which it would be used. Over the years overall adjustments have been made to the format, but a recent survey of checklist users reiterated that the basic format continues to be useful and appropriate.

Referencing: we recommend using the Harvard style citation, i.e.: *Critical Appraisal Skills Programme (2018). CASP (insert name of checklist i.e. Cohort Study) Checklist. [online] Available at: URL. Accessed: Date Accessed.*

CASP
Critical Appraisal Skills Programme

Paper for appraisal and reference:.....

Section A: Are the results of the study valid?

1. Did the study address a clearly focused issue?

Yes ☐
Can't Tell ☐
No ☐

HINT: A question can be 'focused' in terms of
- the population studied
- the risk factors studied
- is it clear whether the study tried to detect a beneficial or harmful effect
- the outcomes considered

Comments:

2. Was the cohort recruited in an acceptable way?

Yes ☐
Can't Tell ☐
No ☐

HINT: Look for selection bias which might compromise the generalisability of the findings:
- was the cohort representative of a defined population
- was there something special about the cohort
- was everybody included who should have been

Comments:

Is it worth continuing?

CASP
Critical Appraisal Skills Programme

3. Was the exposure accurately measured to minimise bias?

Yes	
Can't Tell	
No	

HINT: Look for measurement or classification bias:

- did they use subjective or objective measurements
- do the measurements truly reflect what you want them to (have they been validated)
- were all the subjects classified into exposure groups using the same procedure

Comments:

4. Was the outcome accurately measured to minimise bias?

Yes	
Can't Tell	
No	

HINT: Look for measurement or classification bias:

- did they use subjective or objective measurements
- do the measurements truly reflect what you want them to (have they been validated)
- has a reliable system been established for detecting all the cases (for measuring disease occurrence)
- were the measurement methods similar in the different groups
- were the subjects and/or the outcome assessor blinded to exposure (does this matter)

Comments:

CASP
Critical Appraisal Skills Programme

5. (a) Have the authors identified all important confounding factors?

Yes	
Can't Tell	
No	

HINT:
- list the ones you think might be important, and ones the author missed

Comments:

5. (b) Have they taken account of the confounding factors in the design and/or analysis?

Yes	
Can't Tell	
No	

HINT:
- look for restriction in design, and techniques e.g. modelling, stratified-, regression-, or sensitivity analysis to correct, control or adjust for confounding factors

Comments:

6. (a) Was the follow up of subjects complete enough?

Yes	
Can't Tell	
No	

HINT: Consider
- the good or bad effects should have had long enough to reveal themselves
- the persons that are lost to follow-up may have different outcomes than those available for assessment
- in an open or dynamic cohort, was there anything special about the outcome of the people leaving, or the exposure of the people entering the cohort

6. (b) Was the follow up of subjects long enough?

Yes	
Can't Tell	
No	

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Comments:

Section B: What are the results?

7. What are the results of this study?

HINT: Consider
- what are the bottom line results
- have they reported the rate or the proportion between the exposed/unexposed, the ratio/rate difference
- how strong is the association between exposure and outcome (RR)
- what is the absolute risk reduction (ARR)

Comments:

8. How precise are the results?

HINT:
- look for the range of the confidence intervals, if given

Comments:

CASP
Critical Appraisal Skills Programme

9. Do you believe the results?

Yes	
Can't Tell	
No	

HINT: Consider
- big effect is hard to ignore
- can it be due to bias, chance or confounding
- are the design and methods of this study sufficiently flawed to make the results unreliable
- Bradford Hills criteria (e.g. time sequence, dose-response gradient, biological plausibility, consistency)

Comments:

Section C: Will the results help locally?

10. Can the results be applied to the local population?

Yes	
Can't Tell	
No	

HINT: Consider whether
- a cohort study was the appropriate method to answer this question
- the subjects covered in this study could be sufficiently different from your population to cause concern
- your local setting is likely to differ much from that of the study
- you can quantify the local benefits and harms

Comments:

11. Do the results of this study fit with other available evidence?

Yes	
Can't Tell	
No	

Comments:

CASP
Critical Appraisal Skills Programme

12. What are the implications of this study for practice?

Yes	
Can't Tell	
No	

HINT: Consider

- one observational study rarely provides sufficiently robust evidence to recommend changes to clinical practice or within health policy decision making
- for certain questions, observational studies provide the only evidence
- recommendations from observational studies are always stronger when supported by other evidence

Comments:

ANNEXURE D: DATA EXTRACTION TABLE

Author, year	Article Title	Study design	Sample	Intervention and measurement	Indication and type of oil used as well as manner used	Findings

ANNEXURE E: ETHICAL CLEARANCE CERTIFICATE

Private Bag X6001, Potchefstroom
South Africa 2520

Tel: 018 299-1111/2222
Web: http://www.nwu.ac.za

Health Sciences Ethics Office for Research, Training and Support

North-West University Health Research Ethics Committee (NWU-HREC)
Tel: 018-285 2291
Email: Wayne.Towers@nwu.ac.za

Prof CS Minnie
Nursing Sciences
NuMIQ

05 May 2019

Dear Prof Minnie

APPROVAL OF YOUR APPLICATION BY THE NORTH-WEST UNIVERSITY HEALTH RESEARCH ETHICS COMMITTEE (NWU-HREC) OF THE FACULTY OF HEALTH SCIENCES

Ethics number: NWU-00431-19-S1

Kindly use the ethics reference number provided above in all future correspondence or documents submitted to the administrative assistant of the North-West University Health Research Ethics Committee (NWU-HREC) secretariat.

Study title: The use of essential oils for pain relief and anxiety during childbirth: a systematic review

Study leader: Prof CS Minnie

Student: RM van Rooyen-10872329

Application type: Systematic review

Risk level: Minimal (monitoring report required annually)

Expiry date: 31 May 2020 (monitoring report is due at the end of May annually until completion)

Yours sincerely

Digitally signed by Wayne Towers
Date: 2019.05.06 09:39:33 +02'00'

Prof Wayne Towers
Chairperson: NWU-HREC

Digitally signed by Prof Minrie Greeff
Date: 2019.05.06 15:13:21 +02'00'

Prof Minrie Greeff
Head of Health Sciences Ethics Office for Research, Training and Support

Current details: (23239522) G:\My Drive\9. Research and Postgraduate Education\9.1.5.3 Letters Templates\9.1.5.4.1_Approval_letter_HREC.docm
30 April 2018

File reference: 9.1.5.4.1

ANNEXURE F: STUDIES THAT WERE CRITICALLY APPRAISED

Randomised Control Trials

Alavi, A., Askari, M., Nejad, E.D. & Bagheri, P. 2017. Study the effect of massage with jasmine oil in comparison to aromatherapy with jasmine oil on childbirth process in hospitals of Abadan city in 2013. *Annals of Tropical Medicine & Public Health*, 10(4):904-909.

Burns, E., Blamey, C., Ersser, S. J., Barnetson, L. & Lloyd, A. J. 2000a. An investigation into the use of aromatherapy in intrapartum midwifery practice. *The Journal of Alternative and Complimentary medicine*, 6(2):141-147.

Esmaelzadeh-Saeieh, S., Rahimzadeh, M., Khosravi-Dehaghi, N. & Torkashvand, S. 2018. The effects of inhalation aromatherapy with Boswellia carterii Essential Oil on the intensity of labor pain among nulliparous women. *Nursing and midwifery studies*, 7(2):45-49.

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.

Janula, R. & Mahipal, S. 2015. Effectiveness of aromatherapy and biofeedback in promotion of labour outcome during childbirth among primigravidas. *Health Science Journal*, 9(1):1-5.

Karo, H. Y. K., Pramono N., Wahyuni, S., Mashoedi, I.D. & Latifah, L. 2017. Lavender (Lavendulaangustifolia) aromatherapy as an alternative treatment in reducing pain in primiparous mothers in the active first stage of labor, *Belitung Nursing Journal*, 3(4):420-425.

Kaviani, M., Azima, S., Alavi, N. & Tabaei, M. H. 2014. The effect of lavender aromatherapy on pain perception and intrapartum outcome in primiparous women. *British Journal of Midwifery*, 22(2):125-128.

Kheirkhah, M., Pour, N.S.V., Nisani, L. & Haghani, H. 2014. Comparing the effects of aromatherapy with Rose Oils and warm foot bath on anxiety in the first stage of labor in nulliparous women. *Iranian Red Crescent Medical Journal*, 16(9): 1-5.

Namazi, M., Akbari, S. A., Mojab, F., Talebi, A. & Jannesari, S. 2014a. Effects of Citrus Aurantium (Bitter Orange) on the severity of first-stage labor pain. *Iranian Journal of Pharmaceutical Research*, 13(3): 1011-1018.

Namazi, M., Akbari, S. A. A., Mojab, F., Talebi, A., Majd, H. A. & Jannesari, S. 2014b. Aromatherapy with citrus aurantium oil and anxiety during the first stage of labor. *Iranian Red Crescent Medical Journal*, 16(6): 18371-18371.

Rashidi-Fakari, F., Tabatabaeichehr, M., Kamali, H., Rashidi Fakari, F. & Naseri, M. 2015a. Effect of inhalation of aroma of Geranium Essence on anxiety and physiological parameters during first stage of labor in nulliparous women: a randomized clinical trial. *Journal of Caring Sciences*, 4(2): 135-141.

Rashidi-Fakari, F., Tabatabaeichehr, M. & Mortazavi, H. 2015b. The effect of aromatherapy by essential oil of orange on anxiety during labor: A randomized clinical trial. *Iranian Journal of Nursing & Midwifery Research*, 20(6): 661-664.

Tanvisut, R., Traisrisilp, K. & Tongsong, T. 2018. Efficacy of aromatherapy for reducing pain during labor: a randomized controlled trial. *Archives of Gynecology and Obstetrics,* 297:1145-1150.

Yazdkhasti, M. & Pirak, A. 2016. The effect of aromatherapy with lavender essence on severity of labor pain and duration of labor in primiparous women. *Complementary therapies in clinical practice,* 25:81-86.

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. *Crecent journal of medical and biological sciences,* 5(3):172-175.

Case-Control Studies

Janula, R. & Mahipal, S. 2015. Effectiveness of aromatherapy and biofeedback in promotion of labour outcome during childbirth among primigravidas. *Health Science Journal*, 9(1):1-5.

Cohort Studies

Burns, E., Blamey, C. & Lloyd, A.J. 2000c. Aromatherapy in childbirth: an effective approach to care. *British Journal of Midwifery*, 8(10):639-644.

Lehugeur, D., Strapasson, M.R. & Fronza, E. 2017. Non-Pharmacological management of relief in deliveries assisted by an obstetric nurse. *Journal of Nursing UFPE / Revista de Enfermagem UFPE*, 11(12):4929-4937.

Pollard, K.R. 2008. Introducing aromatherapy as a form of pain management into a delivery suite. *Journal of the Association of Chartered Physiotherapists in Women's Health*, 103:12-16.

ANNEXURE G: STUDIES FROM WHICH DATA WERE EXTRACTED

Burns, E., Blamey, C. & Lloyd, A.J. 2000. Aromatherapy in childbirth: an effective approach to care. *British Journal of Midwifery*, 8(10):639-644.

Esmaelzadeh-Saeieh, S., Rahimzadeh, M., Khosravi-Dehaghi, N. & Torkashvand, S. 2018. The effects of inhalation aromatherapy with Boswellia carterii essential oil on the intensity of labor pain among nulliparous women. *Nursing and midwifery studies*, 7(2):45-49.

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.

Janula, R. & Mahipal, S. 2015. Effectiveness of aromatherapy and biofeedback in promotion of labour outcome during childbirth among primigravidas. *Health Science Journal*, 9(1):1-5.

Karo, H. Y. K., Pramono N., Wahyuni, S., Mashoedi, I.D. & Latifah, L. 2017. Lavender (Lavendulaangustifolia) aromatherapy as an alternative treatment in reducing pain in primiparous mothers in the active first stage of labor. *Belitung Nursing Journal*, 3(4):420-425.

Kaviani, M., Azima, S., Alavi, N. & Tabaei, M. H. 2014. The effect of lavender aromatherapy on pain perception and intrapartum outcome in primiparous women. *British Journal of Midwifery*, 22(2):125-128.

Kheirkhah, M., Pour, N.S.V., Nisani, L. & Haghani, H. 2014. Comparing the effects of aromatherapy with Rose oils and warm foot bath on anxiety in the first stage of labor in nulliparous women. *Iranian Red Crescent Medical Journal*, 16(9): 1-5.

Namazi, M., Akbari, S. A., Mojab, F., Talebi, A. & Jannesari, S. 2014a. Effects of Citrus Aurantium (Bitter Orange) on the severity of first-stage labor pain. *Iranian Journal of Pharmaceutical Research*, 13(3): 1011-1018.

Namazi, M., Akbari, S. A. A., Mojab, F., Talebi, A., Majd, H. A. & Jannesari, S. 2014b. Aromatherapy with citrus aurantium oil and anxiety during the first stage of labor. *Iranian Red Crescent Medical Journal* 16(6): 18371-18371.

Rashidi-Fakari, F., Tabatabaeichehr, M., Kamali, H., Rashidi Fakari, F. & Naseri, M. 2015a. Effect of inhalation of aroma of Geranium Essence on anxiety and physiological parameters during first stage of labor in nulliparous women: a randomized clinical trial. *Journal of Caring Sciences*, 4(2): 135-141.

Rashidi-Fakari, F., Tabatabaeichehr, M. & Mortazavi, H. 2015b. The effect of aromatherapy by essential oil of orange on anxiety during labor: A randomized clinical trial. *Iranian Journal of Nursing & Midwifery Research*, 20(6): 661-664.

Tanvisut, R., Traisrisilp, K. & Tongsong, T. 2018. Efficacy of aromatherapy for reducing pain during labor: a randomized controlled trial. *Archives of Gynecology and Obstetrics,* 297:1145-1150.

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. *Crecent journal of medical and biological sciences,* 5(3):172-175.

Yazdkhasti, M. & Pirak, A. 2016. The effect of aromatherapy with lavender essence on severity of labor pain and duration of labor in primiparous women. *Complementary therapies in clinical practice,* 25:81-86.

ANNEXURE H: DECLARATION OF LANGUAGE EDITOR

Dr EG (Eddie) Bain
DLitt et Phil (UNISA)
SATI Reg. No: 1002582

93 Republic Street
Baillie Park
Potchefstroom
Mobile: 0824905009
Email:
eddie.e.bain@gmail.com

Dear Ralmarie van Rooyen

This serves to confirm that your dissertation has been submitted to me for language editing. The in-text edits have been made in "Track Changes". While I have suggested a limited number of changes in the margin of the script, I cannot guarantee that these have been implemented, nor can I take responsibility for any subsequent changes that may have been made.

Yours sincerely

Eddie Bain

8 December 2020