AROMATIC PLANTS AND ESSENTIAL OILS USED DURING LABOR WITH NOCICEPTIVE AND ANXIOLYTIC POTENTIAL

PLANTAS AROMÁTICAS E ÓLEOS ESSENCIAIS COM POTENCIAL NOCICEPTIVO E ANSIOLÍTICO UTILIZADOS DURANTE O TRABALHO DE PARTO

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Resumo: Aromatherapy is a practice applied in different sectors such as post-operative care, pain treatment and anxiety reduction. However, in Brazil, the legislation allows the use of aromatherapy by nurses since 2018, but the use of essential oils during labor is not regulated. The aim of the study was to analyze the records of the benefits of using aromatherapy during labor and the chemical components of aromatic plants that contribute to the reducing pain, duration of contractions, anxiety and stress effects resulting from childbirth. The integrative review carried out in the Scopus, MEDLINE / PubMed and Science Direct databases specified between 2010 and 2020, in Portuguese, English and Spanish. The PICo methodology (Population, Interest and Context) was used to construct the research question and select controlled and uncontrolled descriptors, which were combined with the Boolean operators "AND", "OR" and "NOT". The articles using aromatherapy during labor, individually or in conjunction with other therapies were selected due to scientific evidence. The most used essential oil by nurses was *Lavandula* spp., and the effects were related to the decrease in the pain of contractions and childbirth, followed by *Rosa x damascena* oil, although the effect of the plant is more related to the reduction in the parturient's anxiety and stress. Aromatherapy acts both on the physiological aspects of women in labor and on their subjectivity, in addition to providing a greater bond between the patient and the nursing professional. Chemical evidence supports the relationship between the major compounds present in the essential oils of the aromatic plants used in the study and the beneficial effects of aromatherapy in labor.

Keywords: Aromatherapy. *Lavandula* spp. Obstetrics.

Resumo: A aromaterapia é uma prática aplicada em setores como o pós-operatório, no tratamento da dor e na redução da ansiedade. Porém, no Brasil, a legislação só permitiu o uso da aromaterapia por enfermeiras a partir de 2018 e o uso de óleos essenciais durante o trabalho de parto não foi regulamentado. O objetivo do estudo foi analisar o uso da aromaterapia durante o trabalho de parto e relacionar com os componentes químicos das plantas aromáticas, que contribuem para a redução da dor, redução da duração das contrações, ansiedade e dos efeitos do estresse decorrentes do parto. A revisão integrativa foi realizada pela consulta as bases de dados *Scopus*, *MEDLINE / PubMed* e *Science Direct* nos anos de 2010 a 2020, nos idiomas português, inglês e espanhol. A metodologia PICo (População, Interesse e Contexto) foi utilizada para construir a questão da pesquisa e selecionar descritores, os quais foram combinados com os operadores booleanos "AND", "OR" e "NOT". Os artigos que avaliaram o uso da aromaterapia durante o trabalho de parto foram selecionados devido as evidências científicas. O óleo essencial mais utilizado pelos enfermeiros foi o de *Lavandula* spp. e os efeitos foram relacionados à diminuição da dor das contrações e do parto, seguido do óleo *Rosa x damascena*, cujo efeito esteve mais relacionado à redução da ansiedade e do estresse da parturiente, além de proporcionar maior vínculo entre a paciente e o profissional de enfermagem. A aromaterapia atua nos aspectos fisiológicos e na subjetividade da parturiente. As evidências químicas dão suporte aos efeitos benéficos do uso da aromaterapia no trabalho de parto.

Palavras-chave: Óleo essencial. *Lavandula* spp. Obstetrícia.

Introduction

Childbirth is a natural event for humans. The pain is a necessary process for birth to evolve. The woman in labor must be helped to better manage the pain, and she must trust her body and her ability to give birth. However, some women report that labor pain is the worst pain they have ever felt and greater than they expected (GAYESKI; BRÜGGEMANN, 2010).

Therefore, alternative therapeutic health treatments are used to combat this pain. Among them, aromatherapy is an Integrative and Complementary Therapy Practice (ICTP) that consists of the therapeutic use of essential oils that can be absorbed by topical use on the skin, by inhalation or by ingestion. The therapeutic purpose is to promote the patient's physical and mental well-being (BRASIL, 2006; PAVIANI; TRIGUEIRO; GESSNER, 2019). During pregnancy, the woman's sense of smell is more refined due to the increase in the vascularization of airways, conditioned by an increase in estrogen levels (LOWDERMIK; PERRY, 2009).

ICTPs were incorporated into Brazil's Unified Health System (SUS) through the National Policy of Integrative and Complementary Practices (NPICP) in Regulation No. 971 of May 3, 2006 (BRASIL, 2006), acting in accordance with the Prenatal and Birth Humanization Program

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(PHPN), stipulated in Regulation No. 569/GM/2000, with the objective of introducing a new culture in health care for pregnant women and newborns in the country (BRASIL, 2000).

Humanization in health means making a commitment to offering care that combine the best use of technology, receptivity, ethics and respect for the user. The obstetric nurse contributes to humanization and is supported by Resolution No. 500 of 2015 of the Federal Nursing Council (COFEN), which allows the professional to apply aromatherapy if he/she has taken a recognized course in the specific area, with a minimum of 360 hours of experience in a teaching institution or similar entity (COFEN, 2015).

Aromatherapy is as an important tool that uses essential oils as an alternative method to relieve pain during childbirth. It also affects the psychological perception of the parturient, who needs balance her feelings and emotions, because it is a time of regular and painful contractions caused by cervical dilation, as well as stress, fear, and anxiety (OSÓRIO; SILVA JÚNIOR; NICOLAU, 2014).

It is known that analgesics do not provide the necessary therapy to relieve the discomfort and pain caused by labor. Therefore, the use of essential oils in the parturition process is considered a way to promote comfort, without the need for sophisticated equipment, and they can be applied even by the woman's companion (SILVA *et al.*, 2019).

The practices use by the obstetric nursing professional has been playing a major role in the application of NPICP, in the provision of a kind welcome and in the development of the therapeutic bond (BRASIL, 2006), which demonstrates the need to use protocols based on scientific evidence, to evaluate its effects during labor. In addition, it is necessary to reinforce that the production and dissemination of this complementary therapy by the obstetric nurse is essential to assist in the careful and correct choice of aromas to be used in labor.

This article aims to analyze the records of the benefits of using Aromatherapy during labor and the chemical components of aromatic plants that contribute to the reducing pain, duration of contractions, anxiety and stress, effects resulting from childbirth.

Methods

This is an integrative literature review. The method allows the existing literature to be analyzed, providing a comprehensive understanding of a particular object of study. It can be applied to various topics and / or study designs, contributing to nursing practice based on scientific evidence. It provides an increase in evidence-based practice, which allows us to research, collect, categorize, evaluate, and synthesize the investigated results, focusing on the use of aromatherapy during labor (WHITTEMORE; KNAFL, 2005). In addition, the PRISMA guidelines (MELNYK; FINEOUT-OVERHOLT, 2011) were followed.

This integrative review has a descriptive and analytical function. Above all, it seeks to provide an overview of the use of aromatherapy and to examine what guidance exists on how to develop good practices.

For the study, the following steps were taken: problem identification; research question formulation; literature search; article evaluation; selection, by two reviewers, of the studies that would be part of the final sample; observation and comparison of the selected articles' findings; synthesis and elaboration of results, and integrative review description, adding a critical analysis of the academic literature (WHITTEMORE; KNAFL, 2005).

The guiding question for the research was "What is the scientific evidence in the last ten years (2010-2020) which demonstrates the effectiveness of aromatic plants and essential oils through aromatherapy during labor?". It was constructed with the aid of the PICo strategy, an acronym for the words P- Population (parturient); I- Interest (aromatherapy efficiency); Co- Context (labor), important in designing the research question (KARINO; FELLI, 2012).

The search and selection of scientific articles was carried out through the following databases: Scopus (Elsevier), Medical Literature Retrieval System online (MEDLINE / PubMed) and Science Direct.

The controlled descriptors, used in the search strategy, were selected in the DeCs (Health Sciences Descriptors) in three languages (English, Spanish and Portuguese), and uncontrolled descriptors were adopted to increase the number of related searches. The search methodology was adapted, following its search criteria. The Boolean operators "AND" and "OR" were used to combine the terms and "NOT" as a way of excluding articles on aromatherapy use in hospitals and for other purposes. The PICo methodology was applied and the search strategy in the databases used, as a model, descriptors in English, but those described in the other two pre-established languages were also used (Chart 1).

Chart 1 - Search methodology applied to Scopus, Medline / PubMed and Science Direct databases following the PICo strategy

Group	Descriptors	Types	Keywords
P- population	Parturients	CD	Pregnant women; Expectant mothers, Women
I- Interest	Aromatic plant efficiency	CD	Aromatherapy, Essential oils
		NCD	Medicinal plants, Herbal medicine
Co - context	Labor	CD	Labor; Labor stage
		NCD	Delivery, Childbirth

CD controlled descriptors; NCD- non controlled descriptors
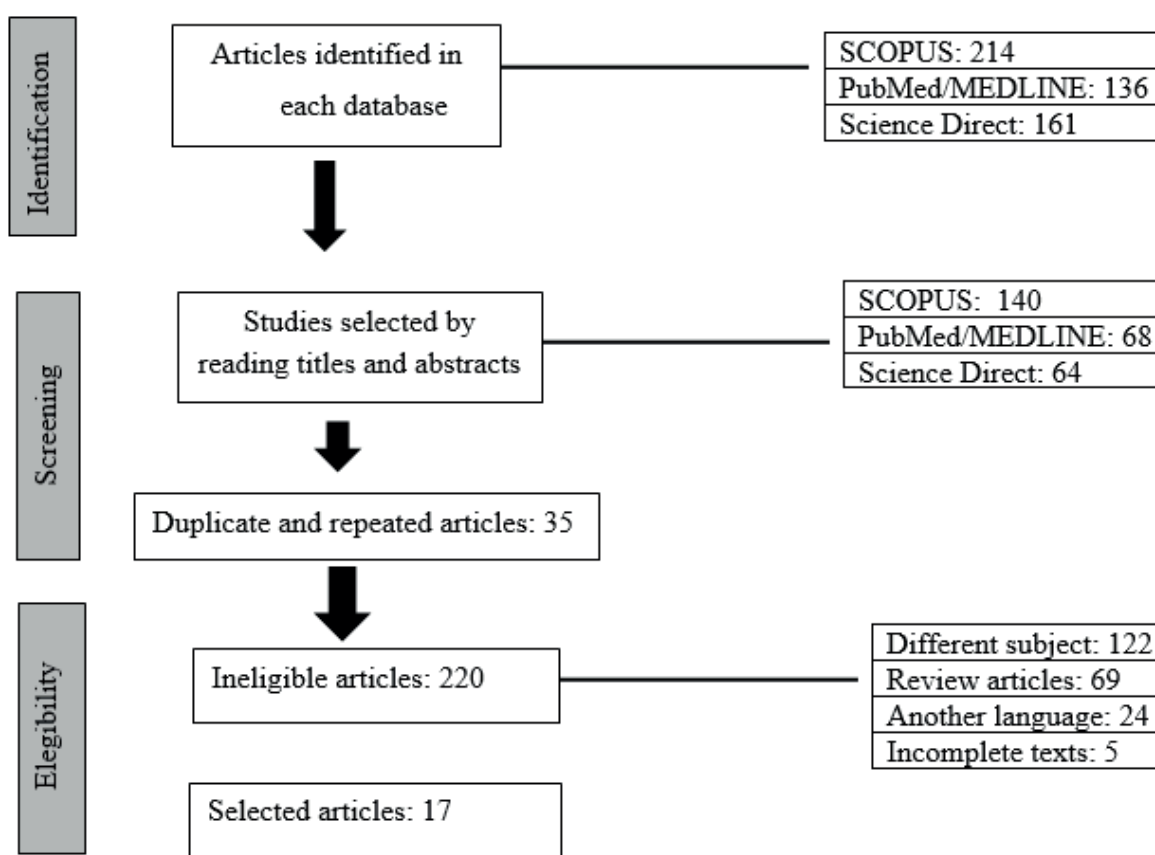
Search: Author.

As inclusion criteria, original articles published in full, available online in the databases, in Portuguese, English and Spanish, were selected. The evaluation of aromatic plants' effectiveness, aromatherapy and use of essential oils during labor, from 2010 to 2020 was included, with the purpose of discussing the scientific evidence of the Aromatherapy use, types of aromatic plants and chemical components of the essential oils used in labor in the last 10 years.

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Review articles, books, theses, dissertations, or articles without any relationship to the research objectives were excluded, by reading the title and abstract. Articles that did not specify the methodology correctly were also excluded. When the publication was selected, the reference manager "Mendeley Desktop" was used for storage and organization, as well as for the exclusion of duplicate articles.

After the identification, screening and eligibility steps, the sample consisted of 17 articles based in scientific evidence. Figure 1 shows a search flowchart and selection process for articles by database by PRISMA format.

Figure 1 - Flow diagram representing the identification, screening, and selection of articles to compose the integrative review (BUTLER; HALL; COPNELL, 2016; LIBERATI *et al.*, 2009)

Search: Adapted from BUTLER; HALL; COPNELL (2016) and LIBERATI *et al.* (2009)

After analyzing the selected data, the article identification (title, authors, year, database, the plant used and chemical composition), the method (approach, design, and interventions) and the results were used in the instrument of description. Tables were drawn up to express the results in a descriptive manner and to synthesize the evidence from each survey.

Results and discussion

Considering the pre-established criteria, 17 articles were selected, and the articles were characterized and classified according to levels of evidence found, and all presented level 2 (experimental) and 3 (quasi-experimental) (GALVÃO, 2006). The surveys were carried out by members of the midwifery nursing (11) and medical and obstetrical sciences departments (6). This demonstrates the nurse's strong role in the use of practice during labor.

Randomized clinical trials (RCTs) evaluated the intervention effect and effectiveness. In these studies, the experimental design presented different types of execution, but they followed the same parturient selection standard, without comorbidities and in the active phase of labor.

From these 17 articles, the information was organized and describes the applying aromatherapy method, research type and results meaning (Table 1). The data presentation was ordered starting with the most recent year of publication. English was the publication language, although 12 were from Iran, 4 from Indonesia and 1 from China.

Table 1 - Species of aromatic plants studied in the articles chosen for the review, highlighting the species name / popular name, aromatherapy application, the type of study, the results described and the references of each work

Species (Popular name)	Aromatherapy Application	Type of study	Main results	References
Lavandula spp. (Lavender)	Inhalation	Quasi-experimental research	The pain intensity was measured by a questionnaire (Numerical rating scale), in 15 parturients who underwent lavender treatment; the aromatherapy decreased the pain significantly compared to the control group ($P < 0.002$).	(NURSAHIDAH; NOVELIA; SUCIAWATI, 2020)
Plumeria spp. (Frangipani)	Massage	Quasi-experimental research	Frangipani EO (*Plumeria*) massage decreased the pain intensity during labor. The treatment was shown to decrease the pain intensity, making parturients feel more comfortable and less stressed. The method can be used as a non-pharmacological alternative.	(SRIASIH *et al.*, 2019)
Rosa x damascena Mill. (Damask rose) *Lavandula* spp. (Lavender)	Inhalation	Randomized clinical trial	The parturients exposed to different EO combinations (damask rose; lavender; damask rose + lavender) responded significantly as to the pain reduction in labor when compared to control group, either by individual or combined EOs.	(CHUGHTAI *et al.*, 2018)
Rosa x damascena Mill. (Damask rose)	Inhalation	Simple blind randomized clinical trial	*R. damascena* EO inhalation in primiparous women in the dilation stage above 4 cm decreased anxiety and severe pain during labor.	(HAMDAMIAN *et al.*, 2018)
Boswellia carterii Birdw. (Frankincense)	Inhalation	Randomized clinical trial	*B. carterii* EO inhalation decreased the pain intensity during labor first phase and can be used as an alternative method to reduce labor pains.	(ESMAELZADEH-SAEIEH *et al.*, 2018)

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Matricaria recutita L. (Chamomile)	Inhalation	Randomized clinical trial	In a trial developed with 130 primiparous women, the chamomile EO inhalation decreased the contraction intensity in the 5-7 cm dilation period, but it had no influence on the contraction number and duration.	(HEIDARI-FARD; MOHAMMADI; FALLAH, 2018)
Lavandula spp. (Lavender)	Inhalation	Pre- and post-test design with control group	Primiparous women were subjected to aromatherapy associated with massage and, after the intervention, the women's pain scale decreased and went from 7.25 to 5.25. Thus, there was a significant decrease (p <0.000) in the pain scale in the active labor phase.	(MURTININGSIH, 2018)
Lavandula spp. (Lavender) *Pelargonium graveolens* L´Hér. (Geranium) *Rosa x damascena* Mill. (Damask rose) *Citrus* spp. (citrus) *Jasmine officinale* L. (Jasmine)	Inhalation	Randomized clinical trial	Among the 106 selected women, 53 were treated with aromatherapy. 26 chose jasmine, 12 citrus, 9 geranium, 9 damask rose, and 5 lavender scent. Regardless of the aroma chosen by women, there were no significant differences between the control group and aromatherapy group, however, the women claim that aromatherapy was useful during labor.	(TANVISUT; TRAISRISILP; TONGSONG, 2018)
Lavandula stoechas Mill. (Lavender)	Inhalation	Simple blind randomized clinical trial	60 women in labor associating the breathing technique with lavender inhalation; the study demonstrated efficacy in reducing pain in the late labor stage (dilation from 9-10 cm) (p <0.038).	(VAKILIAN; KERAMAT; GHARACHEH, 2018)
Lavandula angustifolia Mill. (Lavender)	Inhalation	Quasi-experimental research	The work aimed to evaluate the duration of anxiety, fatigue and labor pain. Anxiety and labor fatigue did not represent significant results, but the average labor pain duration after the intervention went from 6.10 to 4.05 (p <0.000). Primiparous women reported less pain intensity with lavender aromatherapy.	(KARO *et al.*, 2017)
	Inhalation	Simple blind randomized clinical trial	60 primiparous women underwent treatment during labor, and after inhaling the EO during contractions demonstrated decreased labor pain intensity compared to the control group (P <0.001).	(YAZDKHASTI; PIRAK, 2016)
Pelargonium graveolens L´Hér. (Geranium)	Inhalation	Randomized clinical trial	In 50 nulliparous women who received aromatherapy treatment, there was a decrease in anxiety (P = 0.001). Among the physiological parameters evaluated, only blood pressure diastole decreased after inhalation of geranium EO.	(FAKARI *et al.*, 2015)
Salvia officinalis L. (salvia) *Jasminum officinale* L. (Jasmine)	Inhalation	Randomized clinical trial	Nulliparous parturients, 52 for each group (salvia, jasmine and control), were subjected to aromatherapy and the group that inhaled Salvia had a decreased duration of first and second phase labor (p = 0.001).	(KAVIANI *et al.*, 2014b)

Rose (s/e)	Inhalation	Randomized clinical trial	36 Nulliparous parturients were divided into 3 groups (aromatherapy; aromatherapy plus hot foot bath; control). The groups treated had decreased anxiety during labor compared to the control group (P = 0.001). The method was recommended as a complementary modality in supportive care.	(KHEIRKHAH et al., 2014)
Citrus aurantium L. (Bitter orange)	Inhalation	Randomized clinical trial	After the aromatherapy intervention, 63 primiparous women decreased their anxiety level scores and these were significantly lower than the control group (P <0.001).	(NAMAZI et al., 2014b)
Lavandula stoechas Mill. (Lavender)	Inhalation	Randomized clinical trial	The lavender EO effect during the first and second stage of labor was evaluated in 120 parturients and those who received aromatherapy along with the breathing technique, decreased the duration of each stage.	(VAKILIAN; KERAMAT, 2013)
Lavandula augustifolia Mill. (Lavander)	Massage	Controlled and randomized trial	60 nulliparous and multiparous parturients were divided into two groups: 1. received back massage with lavender EO and 2. only massage. It was found that the lavender EO massage significantly reduced the labor duration in the first and second stage (p = 0.001). The pain intensity during the three dilation phases (4-5; 6-7; 8-10 cm) decreased after the intervention.	(ZAHRA, 2013)

Search: author.

Among the selected works, 70.6% had a randomized clinical trial (RCT) design; 17.6% were quasi-experimental; 5.9% pre- and post-test with control group and 5.9%, simple-blind clinical test. The RCTs evaluate the effect and effectiveness of the intervention, with experimental designs that may vary in the forms of execution; however, in the selected articles, all followed the same selection parturient pattern, that is, those without comorbidities and in a labor active phase.

It was found that in 50.0% of the studies, the essential oil (EO) action in reducing the parturients' pain was verified: 31.5% were related to the use of aromatherapy and the relationship with the anxiety reduction in the labor women, and 18.5% showed a duration of labor phases significant decrease due to aromatherapy. The aromatherapy use evaluation aimed to investigate the action on anxiety, pain intensity during labor, labor phases duration, contraction intensity decreases and in blood pressure.

Lavender (*L. angustifolia* and *L. schoetas*) was the plant most evaluated (8), followed by damask rose (*Rosa × damascene*) (3), geranium (*P. graveolens)* (2), bitter orange (*C. aurantium*) (2), jasmine (*J. officinalis*) (2), frankincense (*B. carterii*) (1), roses (*Rosa* spp.) (1), frangipani (*Plumeria* sp) (1), chamomile (*M. recutita*) (1) and salvia (*S. officinalis)* (1). The part of the plant most used for the EOs extraction was the flowers, and the chemical composition was very variable (Table 2).

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Table 2 - The chemical compounds represented in the evaluated species with significant results both for decreasing pain and for reducing the anxiety and stress of parturients during labor

Species	Part of the plant	Chemical compounds	Reference
Lavandula angustifolia Mill.	Flowers	Linalol and linalool	(YUAN *et al.*, 2019)
Lavandula stoechas Mill.	Flowers	1.8-cineole, fenchone and camphor	(INSAWANG *et al.*, 2019)
Plumeria rubra L.	Petals	Acids 9-hexacosene and n-octadecanal	(LIU *et al.*, 2012)
Rosa x damascene Mill.	Petals	Citronellol and citronellol isobutyrate	(GEESI, 2018)
Matricaria recutita L.	Flowers	α-bisabolol B oxide and (*z*) spiroether	(TORRES *et al.*, 2020)
Boswellia carterii Birdw.	Resin	α-pinene, limonene, βfelandrene	(WOOLLEY *et al.*, 2012)
Pelargonium graveolens L´Hér.	Flowers	Citronellol and *cis*-mentone	(EL-KAREEM *et al.*, 2020)
Salvia officinalis L.	Leaves	Camphor and 1,8-cineole	(EL EUCH *et al.*, 2019)
Citrus aurantium L.	Bark	Limonene and β-mycrene	(ROWSHAN; NAJAFIAN, 2015)

Search: author

In order to evaluate and discuss the aromatic plants species studied, two categories were established: Species that decrease the pain intensity and duration; and species that reduce anxiety and stress in the labor phases.

The aromatic plants used in labor and the aromatherapy purpose will be compared between the studies and their results linked to the chemical profile, biological activity and plant EOs popular use.

Pain intensity and duration decrease (nociceptive potencial)

Physiological changes caused by labor pain are unavoidable, which can lead to hyperventilation, increased blood pressure, and/or decreased intestinal and bladder motility of the parturient. The process can stimulate catecholamines, which can interrupt uterine contractions and, depending on the severity, can even be fatal for the woman (NURSAHIDAH; NOVELIA; SUCIAWATI, 2020).

The EOs from species such as *L. augustifolia* (KARO *et al.*, 2017; YAZDKHASTI; PIRAK, 2016; ZAHRA, 2013), *L. stoechas* (VAKILIAN; KERAMAT, 2013; VAKILIAN; KERAMAT; GHARACHEH, 2018), *Plumeria* spp.(SRIASIH *et al.*, 2019), *R. damascene* (CHUGHTAI *et al.*, 2018; HAMDAMIAN *et al.*, 2018), *M. recutita* (HEIDARI-FARD; MOHAMMADI; FALLAH, 2018), *S. officinalis* (KAVIANI *et al.*, 2014a) and *B. carterii* (ESMAELZADEH-SAEIEH *et al.*, 2018) promoted an intensity and pain duration decreased during the first and second stages of labor, corresponding to the cervical dilation phase until 8-10 cm and the transition phase above 10 cm dilation.

Lavender EO used in labor is effective in reducing pain in primiparous women, assessed in the active labor phase, by using the pain scale, and measuring 30 minutes before and 30

minutes after the intervention. All aromatherapy results were significant, both when applied individually and when combined with breathing control or massage therapies (KARO *et al.*, 2017; MURTININGSIH, 2018; YAZDKHASTI; PIRAK, 2016).

During labor, breathing control and massage, associated with the lavender EO use, activate sensory stimuli through manipulation of the tissue, providing a decrease in respiratory symptoms. Inhalation promotes the trust bond between the professional nurse's and the parturient, causing relaxation, increasing blood flow and better oxygenation (SOUZA; GUALDA, 2016). The EO acts in muscle relaxation and as an analgesic (CHUGHTAI *et al.*, 2018). The analgesic power of lavender flower EO is related to its chemical composition, made up of 8% terpenes, including linalol acetate and lilanool, and 6% ketones. Monoterpene is a type of compound often found in lavender EOs and can contain 33-45% linalyl acetate and ≥ 1.5% lavandulil acetate (TARSIKAH; SUSANTO; SASTRAMIHARDJA, 2012).

Frangipani (*Plumeria* spp.) EO was evaluated, applied to women during labor through massage without dilution, directly on the skin, around the thoracic (10, 11, 12) and lumbar (1) vertebrae, which are related to uterus and cervix innervation. The women pain classification was experiencing was made using the following scale: no pain (0), low pain (1-3), moderate pain (4-6), severe pain (7-9) and very severe pain (10). After applying the questionnaire, 97.14% of women who were on the severe pain scale (7-9) before the intervention decreased to 45.71% after the massage, showing the *Plumeria* spp. analgesic potential associated with massage (SRIASIH *et al.*, 2019). This oil contains carboxylic acids 9-hexacosene and n-Octadecanal as major compounds, which are related to the EO analgesic actions, with the central pain receptors inhibition (VERMA, 2016).

The effect of pain inhibitory activity by EOs is due to multiple events that occur during the pain transmission in the Peripheral Nervous System, due to chemical mediators acting directly or indirectly. Metabolites such as prostaglandins and leukotrienes, peptides, serotonin, acetylcholine and cytokines are included. These mediators can be produced or released after pain stimulation (LENARDÃO *et al.*, 2015).

Primiparous women who had a cervical dilation in the range of 7-10 cm and received aromatherapy by inhaling *Rosa x damascene* EO, had decreased pain intensity 30 minutes after the intervention, going from the high pain scale (7-9) to moderate scale (4-6), demonstrating the EO efficacy in decreasing labor pain intensity (CHUGHTAI *et al.*, 2018; HAMDAMIAN *et al.*, 2018).

The *Rosa x damascene* analgesic action is related to the major compounds present in its EO, which are citronellol (20-34%), geraniol (15-22%) and nerol (5-12%) (NUNES; MIGUEL, 2017). A study with the alcoholic extract of the *Rosa x damascene* fruit administered via capsules containing 800 mg of extract, 15 minutes before elective cesarean sections, demonstrated a significant decrease in the analgesic medications use in the postoperative period (GHARABAGHI *et al.*, 2011).

Using aromatherapy with *M. recutita* EO, there was a significant decrease in the pain intensity generated by contractions in the dilation period of 5-7 cm in primiparous women.

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This effect was evidenced by applying the pain scale, demonstrating in the control women group (83.1%) differed from those who were intervention subjected (70.8%) on the severe pain scale (HEIDARI-FARD; MOHAMMADI; FALLAH, 2018).

The *M. recutita* capitulum-type flowers are rich in sesquiterpenes derived from bisabolol and guianolid lactones (procamazulene), and bisabolol oxides, in addition to EOs having a high concentration of polyphenols and flavonoids (AL-DABBAGH *et al.*, 2019). Some genus *Matricaria* species are present in borneol, a bi-cyclic monoterpenoid alcohol and α-felandrene, a cyclic monoterpene, giving them analgesic and nociceptive properties.

In nociception trials in mice with chamomile extract (abdominal contortions induced by acetic acid, formalin test, capsaicin test, glutamate test and carrageenan test), was identified the α-felandrene, also present in chamomile EO, and reduced inflammatory hypernociception in the 3, 6, 12, 25 and 50 mg/Kg concentrations, demonstrating the substance antinociceptive potential and the possible mechanisms involving the adrenergic and cholinergic systems (LIMA *et al.*, 2012).

In a study with 52 nulliparous parturients, the aromatherapy application by inhaling *S. officinalis* EO reduced the labor pains intensity 30 minutes after the intervention, demonstrating pain reducing effectiveness (KAVIANI *et al.*, 2014a). The *S. officinalis* EO major chemical constituents are camphor, α thujone and 1, 8 - cineole, and these major compounds have medicinal use as antiseptics, analgesics and sedatives (HUSSEN; EL-ANSSARY, 2019).

B. carterii EO was applied by inhalation to nulliparous women at different stages of cervical dilation to assess pain intensity before and after the intervention. In comparison to the control group, the pain intensity decreased significantly during labor (ESMAELZADEH-SAEIEH *et al.*, 2018).

The *B. carterii* EO antinociceptive action (frankincense) is related to the major compound's linalool, α-pinene and 1-octanol, which produce a swelling and pain effective reduction in animal models exposed to the formalin pain test, evidencing data consistent with the EO's anti-inflammatory and analgesic action. In addition, the linalool, α-pinene and 1-octanol combination exhibits a strong response to inflammation with the overexpression of enzyme COX-2, indicating the anti-nociceptive and anti-inflammatory properties when the EO is applied topically (TASHIRO *et al.*, 2016).

The findings demonstrate the benefits and the aromatic plants EO antinociceptive and analgesic effects and its effectiveness through the chemical constituent's characterization during the labor by nurses' application.

Anxiety and stress decrease (anxiolytic potential)

During the different stages of labor, the woman may be afflicted with anxiety, fear, stress and pain; the more anxious she is, the more sedatives are needed. Increased anxiety releases catecholamines and stimulates α receptors in the nervous system, which lead to vasoconstriction, increased blood pressure, loss of uterine contractions, metabolism increased and higher oxygen consumption (KHEIRKHAH *et al.*, 2014).

In practice, the pharmacological methods use in the parturient, the childbirth pain can be relieved in the physiological effects, but the woman emotional and psychological state is not always considered. Aromatherapy is a method without reported negative effects, and it can provide emotions and increase the well-being control in the women during labor (NURSAHIDAH; NOVELIA; SUCIAWATI, 2020). However, the EO effectiveness in reducing anxiety is controversial, since the pleasant aromas inhalation transmits messages to the olfactory receptors, which are then sent to the brain and affect memory, thinking and emotion. Olfactory memory occurs due to the neurotransmitter's response. Enkephalin reduces pain, endorphins reduce anxiety and awareness is linked to the noradrenaline release increased. This may justify the rose oil use associated with a footbath, a practice which is capable in reduce anxiety and thereby reduce sympathetic stimulation (KHEIRKHAH *et al.*, 2014).

Two aromatic plants species stood out in relation to the anxiety and stress reduction in parturient. Nulliparous women who inhaled *Rosa x damascena* EO, during periods of cervical dilation (4–7 and 8–10 cm; p <0.05), showed reduced anxiety. Women's anxiety was measured using the Spielberger questionnaire and the Visual Analogue Anxiety Scale (HAMDAMIAN *et al.*, 2018; KHEIRKHAH *et al.*, 2014).

Citrus aurantium was effective in reducing anxiety levels in primiparous women during the 3-4 and 6-8 cm dilation phases. Spielberger questionnaires were applied and since each item was scored as 1-4, the total anxiety score ranged between 20 and 80 (20-40, mild anxiety; 41-60, moderate anxiety; 61-80, severe anxiety) (NAMAZI *et al.*, 2014a).

The EOs major compounds founded are common and have anxiolytic action are terpenoid alcohols like linalool, geraniol and citronellol, and due the monoterpenes like limonene. The action occurs in the glutamate and GABA neurotransmitter systems modulation, which are involved in the mechanisms responsible for the sedative, anxiolytic and anticonvulsant properties of linalool and the EO containing linalool in significant proportions. Studies on anxiolytic effects have proven the therapeutic use of several EOs in aromatherapy (SILVEIRA E SÁ *et al.*, 2017). Of these constituents, linalool was reported for *L. angustifolia*, citronellol for *Rosa x damascena* and *P. graveolens*, and Limonene for *B. carterii* and *C. aurantium* (Table 2).

The anxiety generated by labor can be alleviated using EOs by nurses and midwifery professionals. The review showed that the EOs application during the labor active phase, alone or combined with other non-pharmacological techniques, can reduce stress and anxiety in parturient. This property of EOs is related to the volatile compounds direct action on the patient's central nervous system.

In the review carried out, it is evident that EOs have different therapeutic applications, which are related to the plant's chemical components. However, aromatherapy as an alternative non-pharmacological therapy during labor used by the nurses and obstetricians, providing the mind and body relaxation through aromatic compounds and causing neurological and physiological effects in the parturient body, should be used by trained nurses. The incorrect practice by a professional without appropriate training or using poor quality EOs generates risks for users, which reflects the lack of guidance regarding aromatherapy.

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Final considerations

Aromatherapy is an integrative practice that helps control pain and can decrease its duration during labor, in addition to reducing the inherent anxiety and stress. The plants whose EOs have shown effects on reducing pain and anxiety in the delivery stages are *Lavandula angustifolia*, *Lavandula stoechas*, *Plumeria* spp., *Boswellia carterii*, *Matricaria recutita*, *Pelargonium graveolens*, *Salvia officinalis*, *Jasminum officinalis*, *Rosa x damascena* and *Citrus aurantium*.

Aromatherapy can be applied by inhalation, massage or associated with other therapies, always considering the parturient individual needs. The aromatherapy use should be encouraged, as it generates a feeling of well-being in women during labor. The EOs applied by nurses must be selected according to the active compounds of the aromatic plant used, considering the proven purity and biological activity, considering the scientific evidence of each EO.

In addition, it is noteworthy that among the studies that evaluated the aromatherapy use during labor, none came from Brazil. Therefore, the review may be an incentive for future research aimed to analyzing and proving the aromatherapy efficiency use by nurses during patient's labor.

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