

“Massage and Inhalation Aromatherapy as Alternative Medicine in Pain Management of Primary Dysmenorrhea”

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Abstract

Many women suffering from dysmenorrhea would like to avoid pharmacological or invasive methods of pain management of their condition and this may contribute towards popular use of alternative methods such as aromatherapy. This review examined currently available evidence supporting the use of aromatherapy for pain management in dysmenorrhea. This paper aims to systematically review the existing knowledge on aromatherapy and its underlying philosophy and principles, pain-relief mechanisms as well as evidence supporting efficacy of aromatherapy for pain management in primary dysmenorrhea. Searches were performed using the Cochrane Database, CINAHL, ScienceDirect, PubMed and Google Scholars. Keywords were primary dysmenorrhea, aromatherapy, inhalation aromatherapy, massage aromatherapy, aromatherapy and nursing. There are 12 papers met the inclusion criteria. Some were excluded due to language of the publication used are non-English. It is concluded that massage and inhalation aromatherapy can be used in managing pain in dysmenorrhea and thus can be promoted as a self-care initiatives in alleviating the menstrual pain.

Keywords: aromatherapy, primary dysmenorrhea, pain management, essential oils.

INTRODUCTION

The trend is mankind is returning back to the beginning of history. There is a big turn and trend toward complimentary and alternative treatment. CAM is a broad and changing field defined by the National Center for Complementary and Alternative Medicine as “a group of diverse medical and health care systems, practices, and products that are not presently considered to be part of conventional medicine. Complementary medicine is used together with conventional medicine, and alternative medicine is used in place of conventional medicine.” (The National Center for Complementary and Alternative Medicine, 2011). Because specific CAM practices may in near future become widely accepted with sufficient evidence for their safety and effectiveness, the boundaries between specific CAM practices and conventional medicine might become less distinct. CAM approaches have long historical roots and have been practiced in many civilizations for centuries. More recently CAM has been gaining the favorable reputation in many parts of Western world as well (Herman et. al, 2012). In the United States, the 2007 National Health Interview Survey indicated that approximately 38% of adults were using one or more CAM modalities (The National Center for Complementary and Alternative Medicine, 2011). Accumulating evidence points to

diverse health benefits of many CAM practices for variety of conditions from general improvements in physical function, flexibility, and well-being to helping with pain management and ameliorating chronic conditions (Hemming & Maher, 2005; Pilkington, Rampes, & Richardson, 2006; Smith et. al., 2003; van der Watt, Laugharne, & Janca, 2008; Wahbeh, Elsas, & Oken, 2008). Systematic reviews also indicate that CAM can be cost-effective for some conditions (Herman, Craig, & Caspi, 2005; Herman et al., 2012).

Aromatherapy: Brief History

Aromatherapy was known to most of the ancient Eastern civilizations such as China, India and Egypt at least 6000 years back. Aromatherapy involves the use of essential oils from fragrant plants to help improve physical and psychological health. It is an ancient practice dating back centuries that was used in ancient China (as incense), in ancient Egypt (along with beauty treatments), and in Roman Empire (with baths). They used the method of infusion to extract the oils from the fragrant plants and these oils were then used for therapeutic and cosmetic purposes as well as embalming the dead (Herz, 2009). Greeks were also known to have used the aromatic oils for medicine and cosmetics. Hippocrates, popularly known as the Father of Modern medicine, studied the effects of essential oils on the body. He recommended daily use of aromatic oils in

bath and scented massage to improve good health (Herz, 2009).

The use of aromatherapy spread throughout history from the Eastern civilization to Western civilization, Egypt to Israel, Greece, Rome, and the entire Mediterranean world. Every culture developed practices of perfumery using oils, but with the Dark Ages, much of this knowledge was lost. A look at history shows that India is the only place in the world where this tradition was never lost. Ayurvedic (life-knowledge) medicine is the oldest form of medical practice using oils and has been in continuous use since its birth thousands of years ago (Herz, 2009).

During the 19th century the British and European scientists started doing research on the antibacterial effects of essential oils. Rene Maurice Gattefosse a French chemist began doing research to study the curative powers of essential oils, when he treated his burns by using lavender oils. He wrote a book on the healing powers of essential oils and used the term “Aromatherapy” for the first time. A French medical doctor, Jean Valnet started using the essential oils for therapeutic use and Margaret Maury started using these oils for massage and along with Valnet and Micheline Arcier. These medical practices developed into the present modern aromatherapy practiced worldwide (Herz, 2009).

In the Western countries aromatherapy began developing as a serious discipline in the 1980s stimulated by the interest in mind-body healing and psychoneuroimmunology (Butje et al., 2008). Aromatherapy is becoming a popular and accepted practice across the globe: for example, aromatherapy is formally taught in French medical schools, prescribed by many European physicians, reimbursed by health insurance in some European countries; it is also present in over half of children hospitals in Australia, and utilized in Japan to enhance productivity and prevent spread of airborne infections (Butje et al., 2008; Horowitz, 2011).

Philosophical Principles and Theories

Philosophical principles. The long history of aromatherapy is possibly grounded in the concept that the sense of smell is a form of communication in all species. The very early uses of plant aromatics were as incenses used in religious ritual and ceremony. It was probably recognized then that different fragrances would elicit different effects on

moods, feelings and states of mind during ritual practices. Perhaps, it is from this tradition of using specific aromatics or combinations for specific purposes would have gradually developed.

Broadly speaking, the philosophical approach of aromatherapy develops from love, wisdom and knowledge of a subject (Rhind, 2012). In fact, holistic philosophy is applied in the aromatherapy where there is a practice to develop the “individual prescription”, a holistic, synergistic blend of essential oils for an individual. Synergistic blending of essential oils is done where oils are selected to complement and enhance each other so that the effect of the blend will be greater than the sum of the effects of the individual components. A holistic approach that integrates the use of essential oils with massage, the beneficial effects of odor on both physical and emotional well-being and the great potential of essential oils a healing agents (Rhind, 2012).

Theoretical principles of aroma-therapy mechanisms. Aroma-therapy phenomenon is an empirical evidence of mind-body connection. With regards to the relation among sense of smell with human emotion and feelings, the aromas could impact both human mind and body. In fact, empirically, smells can change human’s feelings (Shahnazi, 2012). To date, investigations designed to discover mechanism of aromatherapy actions have resulted in formulating two primary hypotheses. The two are phar-macological hypothesis and psycho-logical hypothesis below as previously proposed (Herz, 2009).

Pharmacological hypothesis. In order to explain how aromatherapy might work, from a Western, scientific perspective, various mechanisms could be considered. These include the physical a physiological effects of essential oils via transdermal absorption, inhalation and olfaction, the effects of essential oils via the limbic system, and the physical, physiological and psychological effects of massage (Rhind, 2012).

Pharmacological hypo-thesis of aromatherapy action proposes that the effects on mood, physiology, and behavior attributable to aromas result from direct and intrinsic aroma ability to affect the autonomic nervous system, central nervous system, or endocrine system (Herz, 2009).

Absorption through the skin. One of the central beliefs in aromatherapy is that the skin is an important route for the application of essential oils (often with massage) as

essential oils applied to the skin are absorbed and enter the body fluids. More recent studies have investigated the potential of essential oils to decrease skin barrier resistance and enhance the skin penetration topical drugs and (Adorjan and Buchbauer (2010) this agrees with the suggestion made by Williams and Barry (2004) that essential oils could interact with the liquid crystals of skin lipids.

Inhalation. Supporters of the pharmacological hypothesis propose olfactory stimulation as the likely mechanism by which aromatherapy acts. Specifically, they believe that olfactory stimulation with aromas could result in direct, immediate, and unconscious interaction with neural substances producing changes in autonomic nervous system and brain wave patterns, as well as in sleep and arousal states. Essential oils are volatile, so their molecules can enter the body via inhalation and they can have direct effects on tissues via the respiratory tract. The molecules may be absorbed throughout the respiratory tract, ending at the alveoli, where they are easily transported into the bloodstream. Absorption via nasal epithelium could also be considerable because it is very thin and has an extensive capillary supply allowing rapid access to the circulation. According to this view, aroma molecules can bind to receptors and activate the release of neurotransmitters including serotonin, endorphins, and catecholamines, affect HPA axis, modulate immune system neuroreceptors causing alterations in mood, relieving anxiety, and interrupting the stress response (Herz, 2009; Kuroda et al., 2005).

Psychological hypothesis. The second proposed mechanism for aromatherapy actions, psychological, suggests that aromas can produce effects through expectations, conscious perceptions, or emotional learning. According to this hypothesis any effects due to aroma exposure, including physiological effects, are the consequences of the psychological-emotional responses elicited by the aroma (Herz, 2009).

Perceptual experience of the aroma might also play a critical role in shaping responses to aromatherapy. It has been shown that presence of ambient aroma can affect mood, which in turn can influence behavior. Such studies demonstrate that expectation of the aroma effect might override the chemical essence of the aroma (Herz, 2009).

Essential Oils Used in Aromatherapy

Essential oils are central to the practice of aromatherapy. Essential oils not only exert their effects on physical, physiological and psychological level but also on emotional and spiritual levels by absorption and via the olfactory tract, the sense of smell and the limbic system (Potts, 2009). The following are the most commonly used essential oils for pain management (Lawless, 2013):

1. Roman chamomile (*Chamaemelum nobile*):
2. Clary Sage (*Salvia sclarea*)
3. Fennel (*Foeniculum vulgare var. dulce*)
4. Geranium (*Pelargonium x asperum syn. graveolens*)
5. Ginger (*Zingiber officinale*)
6. Lavender (*Lavandula angustifolia*)
7. Neroli (*Citrus aurantium var. amara*)

Among the above-listed essential oils, English lavender (*Lavandula angustifolia*) is one of the most popular aromatherapy essential oils used for reduction of stress and anxiety and pain management (Cavanagh & Wilkinson, 2002; Cavanagh & Wilkinson, 2005; Perry, Terry, Watson, & Ernst, 2012). Not only is English lavender (further referred to as lavender) widely used for relaxation purposes, but it is also one of the most researched essential oils.

Aromatherapy in Nursing Profession

Nurses as aromatherapist. The debate is ongoing as to what is an acceptable level of aromatherapy training for nurses who wish to use aromatherapy (Tovey & Adams 2002). Aromatherapy is often misunderstood and consequently somewhat marginalized. Because of a basic misinterpretation, the integration of aromatherapy into hospitals is not moving forward as quickly as it might and little focus is given to the real clinical potential (Buckle, 2007).

Nurses and patients are increasingly using aromatherapy as part of the practice of holistic care. Therefore, due to the numerous implications for nurses wishing to incorporate aromatherapy into their practice including: the importance of adequate training; creation of evidence based guidelines; and permission from the employer, treating doctor and the patient. These factors will enable nurses to work within their scope of practice, in a competent and safe manner (Potts, 2009).

Nurses as subjects of aromatherapy. The use of aromatherapy in clinical setting has its

own challenges. Nurses experienced some negative attitudes among colleagues because they considered aromatherapy as not evidence based. This negative attitude developed despite the positive outcome of the study. This was a part of the report of a study done by Johannesse (2013). The purpose of this study was to gain an insight into nurses' experiences of incorporating aroma-therapy into the care of residents suffering from dementia, anxiety and disturbed sleep patterns. In the study, twenty-four residents and twelve nurses from four nursing homes participated in an action research study. The use of lavender *augustofolia* essential oil diffused nightly was perceived as an effective care modality reducing insomnia and anxiety in this patient cohort. It was concluded that nurses require greater access to evidence-based use of Aromatherapy, and further research is needed to study how smell can enhance dementia care.

Since workplace-related stress has become today's most serious occupational hazard, and aromatherapy is a simple, convenient and noninvasive method of stress relief, Chen, Fang & Fang (2015) conducted the effectiveness of lavender oil inhalation in reducing job stress-related symptoms among nurses. The 53 nurses in the experimental group pinned small bottles containing 3% lavender oil on the clothes of their right chests, whereas 57 participants in the control group pinned bottles with no lavender oil. Aromatherapy was shown to be effective in the reduction of the number of stress symptoms for 3 or 4 days. The stress symptoms of the experimental group significantly decreased after aromatherapy was carried out. This represented a significant decrease in stress, whereas the stress symptoms in the control group increased from 5.6 to 5.8. The aroma treatment was found effective in reducing anxiety levels.

Systematic Review Objectives

To systematically review the existing knowledge on aromatherapy pain management in primary dysmenorrhea:

- (1) To describe definition or aroma-therapy and its underlying philosophy and principles.
- (2) To describe the aromatherapy in nursing practice.
- (3) To identify evidence supporting efficacy of aromatherapy for pain management in primary dysmenorrhea

- (4) To describe pain-relief mechanisms of aromatherapy

METHODS

Searches were performed using the Cochrane Database, CINAHL, ScienceDirect, PubMed and Google Scholars. Keywords were primary dysmenorrhea, aromatherapy, inhalation aromatherapy, massage aromatherapy, aromatherapy and nursing. The time range for publication is 2010-2015. The search was limited to articles published in English. All the experimental studies including randomized control trials and quasi experimental were eligible for inclusion criteria.

RESULTS

Primary dysmenorrhea (PD) is one type of painful menstruation. Because of recent concerns about pharmacological therapy, several studies investigated the efficacy of numerous non pharmacological therapy for the relief of dysmenorrhea such as aromatherapy. Currently there is a lack of sound evidence regarding the appropriate use of aromatherapy for menstrual cramps. Therefore, a review was done to study the progress of research activities on the matter (see Table 1 for the summary of these studies).

A number of the articles were excluded because they were published in Korean and Chinese, and the full-text paper is unavailable (required payment).

Efficacy of Aromatherapy for Pain Management in Dysmenorrhea

Whether the addition of essential oils increases the pain-relieving benefits beyond an anxiety reduction value has yet to be demonstrated (Maddocks-Jenning, 2004). However, several more recent studies show that aromatherapy have some analgesic property.

Aromatherapy Massage. A study was carried out to assess the effectiveness of blended essential oils on menstrual cramps for outpatients with primary dysmenorrhea. But this particular study was done on the duration of the menstrual pain. The forty-eight outpatients were diagnosed with primary dysmenorrhea by a gynecologist and had 10point numeric rating scales that were more than 5. The patients were randomly assigned to an essential oil group (n = 24) and

a synthetic fragrance group ($n = 24$). All outpatients used the cream daily to massage their lower abdomen from the end of the last menstruation continuing to the beginning of the next menstruation. The duration of pain was significantly reduced from 2.4 to 1.8 days after aromatherapy intervention in the essential oil group (Ou et. al., 2012).

Another study on the effect of aromatherapy massage on dysmenorrhea was done among Turkish students. However, the study used a quasiexperimental design with the subjects as their own control. Every participant applied both aromatherapy massage with lavender oil and placebo massage with odorless liquid petrolatum [soft paraffin]. Out of the 438 midwifery and nursing students, 150 students suffered from dysmenorrhea used a visual analog scale to indicate their level of pain. Forty-four students volunteered to participate in the study. When the lavender massage and the placebo massage were compared, the result showed that massage was effective in reducing dysmenorrhea (Apay, Arslan, Akpınar & Celebioglu, 2012).

A study investigated the alleviating effects of aromatherapy massage and acetaminophen on menstrual pain in Korean high school girls. Subjects were divided into two groups: the aromatherapy massage (treatment) group and the acetaminophen (control) group. Aromatherapy massage was performed on subjects in the treatment group. The abdomen was massaged once using clary sage, marjoram, cinnamon, ginger, and geranium in a base of almond oil. The level of menstrual pain was assessed using a visual analogue scale at baseline and twenty-four hours afterward. The reduction of menstrual pain was significantly higher in the aromatherapy group than in the acetaminophen group. However, it could not be verified whether the positive effects derived from the aromatherapy, the massage, or both. Further rigorous studies should be conducted using more objective measures (Hur, Lee, Seong & Lee, 2012).

Marzouk, El-Nemer & Baraka (2013) studied the effect of aromatherapy massage on level and duration of menstrual pain and the amount of menstrual bleeding. A group of nursing students were randomized in a blind clinical trial of crossover design. In the first treatment phase, group 1 received aromatherapy abdominal massage once daily for seven days prior to menstruation using the essential oils (cinnamon, clove, rose, and lavender in a base

of almond oil). Group 2 received the same intervention but with placebo oil (almond oil). In the second treatment phase, the two groups switched to alternate regimen. The result of the study showed that the level and duration of menstrual pain and the amount of menstrual bleeding were significantly lower in the aromatherapy group than in the placebo group. A study was done to investigate the effect of self-aromatherapy massage on menstrual pain and anxiety. Subjects were non-randomly allocated into three groups: an experimental group who performed self-aromatherapy massage, a placebo group, and a no-treatment control group. Menstrual pain and anxiety levels were assessed using a visual analogue scale, and we assessed the menstrual pain 4 times during a short time period. The menstrual pain was significantly lower in the aromatherapy group than in the other two groups after 24 h. These findings suggest that self-aromatherapy massage of the abdomen using topically applied essential oils may be an effective treatment that decreases menstrual pain and the level of anxiety (Kim, 2011).

The next study (Sadeghi-Aval-Shahr, Saadat, Kheirkhah & Saadat (2014) was a randomised controlled trial study. The subjects were 75 students whose severity of pain was measured by visual analogue scale (VAS). Subjects were randomly divided into three groups: massage group with rose oil ($n = 25$) who applied self-massage with Rose damascene; a placebo group ($n = 25$) who performed self-massage with unscented almond oil and a no treatment control group ($n = 25$) who applied just self-massage. All three groups received the intervention in the first day of menstruation in two subsequent cycles. The severity of pain was self-reported by the students before and after intervention. All three groups were matched in demographic characteristics. The baseline pain reduced in the first cycle but this reduction was not significant in the groups ($p > 0.05$). In the second cycle, the menstrual pain was significantly lower in the rose oil group than in the other two groups after intervention (between massage with rose oil, almond oil $p = 0.003$ and massage with rose oil and just massage $p = 0.000$). Massage with aromatherapy reduces the severity of primary dysmenorrhoea, in comparison with massage therapy alone.

A study was carried out by Rizk (2013) to identify the effect of aromatherapy abdominal massage using peppermint versus ginger oils on primary dysmenorrhea among adole-scent

girls. The study was conducted at the Faculty of Nursing, Alexandria University in Egypt. The sample comprised a 120 eligible nursing students who were suffering of moderate to severe primary dysmenorrhea. The subjects were randomly assigned equally into 3 groups: Study group (1) had received aromatherapy massage by peppermint oil. Study group (2) had received aromatherapy massage by ginger oil. Control group (3) had received massage by almond oil. Each subjects in the three groups received 15 minutes of aromatherapy, once daily for five consecutive days prior to menstruation for two successive cycles using a randomized control clinical trial study design. Three tools were validated and used for data collection; basic data and menstrual history interview schedule, Visual Analogue pain intensity Scale (VAS) and Menstrual symptom questionnaire (MSQ). Results: The main study findings show that, before intervention there was no statistically significant difference between the study and control groups regarding the severity of primary dysmenorrhea and its associated symptoms. Yet, students who received aromatherapy massage with either peppermint or ginger oils showed significantly reduction on the severity of dysmenorrhea and its location as well as daily life activities than control group, one and two months after intervention. Duration of pain, anorexia, diarrhea and/or constipation and level of mood were significantly improved among study group who received aromatherapy massage with peppermint oil. On the other hand nausea /vomiting, dizziness/fatigue and headache were significantly improved among study group who received aromatherapy massage with ginger oil than the other two groups. The study concluded that aromatherapy by either peppermint or ginger oils is effective in alleviating menstrual pain and its location. Peppermint is effective in improving the duration of pain, anorexia, diarrhea and/or constipation and level of mood. While ginger is effective in relieving nausea /vomiting, dizziness/ fatigue and headache.

Han, Hur, Buckle, Choi & Lee (2006) carried out a study on the effect of aromatherapy on menstrual cramps and symptoms of dysmenorrhea. The study was a randomized placebo-controlled trial done on 67 female college students who rated their menstrual cramps to be greater than 6 on a 10point visual analogue scale, who had no systemic or reproductive diseases, and who did not use

contraceptive drugs. Subjects were randomized into three groups: (1) an experimental group (n =25) who received aromatherapy, (2) a placebo group (n=20), and (3) a control group (n=22). Aromatherapy was applied topically to the experimental group in the form of an abdominal massage using two drops of lavender (*Lavandula officinalis*), one drop of clary sage (*Salvia sclarea*), and one drop of rose (*Rosa centifolia*) in 5 cc of almond oil. The placebo group received the same treatment but with almond oil only, and the control group received no treatment. The menstrual cramps levels was assessed using a visual analogue scale and severity of dysmenorrhea was measured with a verbal multidimensional scoring system. The menstrual cramps were significantly lowered in the aromatherapy group than in the other two groups at both post-test time points (first and second day of menstruation after treatment). These findings suggest that aromatherapy using topically applied lavender, clary sage, and rose is effective in decreasing the severity of menstrual cramps.

Inhalation Aromatherapy. An experimental clinical trial study was done by Dehkordi, Baharanchi & Bekhradi (2014) to explore the effect of *Lavandula angustifolia* (lavender) inhalation on the symptoms of dysmenorrhea and the amount of menstrual bleeding in female students with primary dysmenorrhea. The subjects were 96 female students residing in dormitory at Tehran University of Medical Sciences and suffering from level two or three dysmenorrhea according to the verbal multidimensional scoring system. The inclusion criteria were as: being single, suffering from primary dysmenorrhea, having no genital organs disorder, having no systemic disease, having regular menstrual cycles, using no contraceptives, etc. The follow-up time was 4 menstrual cycles. The subjects were randomized into two groups: experimental ($n = 48$) who inhaled lavender based on sesame oil, and placebo ($n = 48$) who inhaled sesame oil only. The severity of dysmenorrhea symptoms was measured through a questionnaire, and the amount of menstrual bleeding was measured by sanitary towel usage.

Ordinal logistic regression and generalized estimating equation (GEE) were used to analyze the data. Results The symptoms of dysmenorrhea were significantly lowered in the lavender group compared to the placebo group ($p < 0.001$). The amount of menstrual

bleeding in the lavender group was reduced in comparison to the placebo group but the difference was not statistically significant ($p = 0.25$). No significant difference was observed for blood clot among the students ($p = 0.666$). This study showed that lavender inhalation was effective in alleviating dysmenorrhea symptoms, suggesting that it could be applied by midwives in a safe manner because of no side effects, simplicity and costeffectiveness for all patients.

Thus far, the only study that uses enzyme immunoassay method to measure the dependent variables was a study was done by Fukui, Toyoshima & Komaki (2011). The purpose of this study was to clarify the effects of saffron odor on symptoms unique to women, such as premenstrual syndrome (PMS), dysmenorrhea (menstrual pain) and irregular menstruation. The study involved thirty-five women with a normal sense of smell were exposed to saffron odor for 20 min. Saliva samples were then collected to measure levels of cortisol (C), testosterone (T) and 17- β estradiol (E) by enzyme immunoassay, and the State-Trait Anxiety Inventory (STAI) was administered as a psychological test. The result of the study shows that Saffron odor significantly decreased C levels after shortterm stimulation (20 min) in both follicular and luteal phases. E level after exposure to saffron odor was increased in both the follicular- and luteal-phase groups. STAI score decreased in the follicular and luteal phases in the saffron group. It was thus concluded that the present findings support the existence of physiological and psychological effects of saffron odor in women. Our results indicate that saffron odor exert some effects in the treatment of PMS, dysmenorrhea and irregular menstruation. This is the first report to suggest that saffron odor may be effective in treating menstrual pain. This is thus far, the only study that uses enzyme immunoassay method to measure the dependent variables.

DISCUSSION

Strengths and Weaknesses of Aromatherapy.

Several systematic reviews evaluating use of aromatherapy for several conditions indicated that the majority of the studies that assessed aromatherapy mechanisms or efficacy have been lacking scientific rigor (Herz, 2009; Lee et al., 2012). Specific criticisms and commonly reported weaknesses of previous

research included small sample sizes and lack of adequate control groups (Lee et al., 2012). Specifically, many published aromatherapy studies drew conclusions from samples that included fewer than 10 participants, and majority of these studies utilized either no control group or single control group (Yim, Ng, Tsang, & Leung, 2009). Another common criticism of aromatherapy literature is that many of the previous studies assessed aromatherapy effects using only subjective measures of anxiety, perceived stress, or depressive symptoms (Perry et al., 2012).

Though more recently published studies began using more rigorous designs, a few methodological problems still remain. First, a number of studies assessing effects of aromatherapy on different conditions utilized aromatherapy massage rather than using aromatherapy alone (Cooke et. al., 2007; Herz, 2009; Lee et al., 2012; Yim et al., 2009).

A randomized controlled trial study was done by Azima, Bakhshayesh, Kaviani, Abbasnia & Sayadi (2015) to compare the effect of massage therapy and isometric exercises on primary dysmenorrhea. The samples were randomly divided into massage, isometric exercises, and control groups. The first group received two consecutive cycles of effleurage massage with lavender oil. The second group had 8 weeks of isometric exercises. No intervention was performed for the control group. Pain intensity was measured and recorded using Visual Analogue Scale (VAS). Besides, duration of pain was measured in hours, and Spielberger's questionnaire was used for measuring the anxiety level. Pain intensity had significantly reduced in massage and exercises groups and the reduction was more significant in the massage group ($P < 0.001$). Moreover, the results revealed a significant difference among the three groups regarding the mean duration of pain after the third cycle ($P = 0.006$). However, no significant difference was found among the three groups concerning the mean level of anxiety. The results of intra-group comparisons only showed a significant reduction of anxiety level in the massage group after the third cycle ($P = 0.017$). It was concluded that it seems that massage therapy and isometric exercises were effective in reducing some symptoms of dysmenorrhea.

The latest study on massage intervention to alleviate menstrual pain was reported by Bakhtshirin, Abedi, YusefiZoj & Razmjooee (2015). The study was done to investigate the

effect of aromatherapy massage on the severity of primary dysmenorrhea in nursing and midwifery students of Islamic Azad University of Arsanjan, Iran. This study was performed using clinical trial method on 80 eligible students whose level of pain was measured by visual analogue scale (VAS) before the intervention. Each participant, in the first days of menstruation, randomly received two types of massage with lavender and placebo oil in two consecutive cycles of menstruation. Their level of pain was measured before and 30 min after the intervention. In this study, each group was considered as their self-control group in the next cycle. A significant decrease in VAS score after lavender massage was detected in comparison with placebo massage. There was a statistically significant difference between VAS scores after and before placebo massage. In addition, statistically the effect of lavender massage on the severity of primary dysmenorrhea was higher than that of placebo massage ($P < 0.001$). Findings of this study showed that lavender oil massage decreases primary dysmenorrhea and it can be used as an effective herbal drug (Bakhtshirin, Abedi, YusefiZoj & Razmjooee, 2015). This study will be used as an evidence-based practice for the promotion of self-care program that will be described in the next section.

Overall, the evidence is available to support both pharmacological and psychological mechanisms for producing therapeutic effects of aromatherapy. It is likely that the therapeutic effect of aroma arises from combined effects of the described mechanisms. It is likely also that different effects of aromatherapy are achieved through different mechanisms.

Physiology of Pain Relief

The exact mechanism of how aromatherapy relieves pain is not yet specified. The scientific theory is that aromatherapy is effective by two means of psychological and physiological effect. It is believed that the scent from aromas activates olfactory nerve cells, which result in limbic system stimulation. This is why aromatherapy is effective because it hypothetically works directly on the amygdala, the brain's emotional center. This has important consequences because the thinking part of the brain can't inhibit the effects of the scent, meaning one feels them instantaneously (see Figure 1). Depending on the kind of aromas the nerve cells release different neurotransmitters. These neurotransmit-ers

include enkephalin, endorphin, noradrenaline and serotonin (Kyle, 2006).

Previous neuroimaging studies have produced the evidence for involvement of the olfactory-trigeminal nerves and amygdala pathway in emotionally significant response to odor. However, the mechanism of action related to generating emotional response to aromas is not yet elucidated (Fonareva, 2013).

Scientists believe that molecules of aroma bind to the receptors and this combination with the receptors activate the release of neurotransmitters including serotonin, endorphins, and catecholamines, affect HPA axis through ascending pathway, then modulate neuroreceptors through descending pathway causing alterations in pain sensation as shown by Figure 1 below (Herz, 2009; Kuroda et al., 2005).

Conclusion and Recommendations

Since aromatherapy is one of the fastest growing and widely used complementary and alternative medicine (CAM) therapies in the world today, nurses use aromatherapy both in their working and private life for many purposes. Most aromatherapy was delivered through inhalation or massage. Aromatherapy aids in pain management, especially for a number of menstrual pain studies revealed that massage and inhalation intervention are effective in reducing pain, but more research are required to support these therapeutic claims.

Implications for nursing practice. Nurses need to have more initiatives to analyze, investigate and evaluate the knowledge about aromatherapy before transforming it into clinical practice. There is a significant shift of preference from conventional medicine to complimentary and alternative medicine. Much had been researched on the efficacy of aromatherapy and much has been done to show the benefits. However, there much remains to be done for the medical community to be convincingly positive about aromatherapy.

Furthering nursing knowledge and development. Future studies should use more objective physiological indices, such as blood pressure, heart rate or salivary cortisol concentration. Moreover, most studies have focused on the effectiveness of essential oils, but few on their side effects. Professional nurses should consider involving themselves in clinical research on aromatherapy so it can become a true complementary and alternative

medicine.

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