

The Effect of Aromatherapy (with Lavender) on Dysmenorrhea: A Systematic Review and Meta –Analysis

Kaveh Mousavi Kani¹, Zakieah Mirzania², Fereshteh Mirhaghjoo³, Robabeh Mousavi nezhad⁴, Samaneh Akbarzadeh⁵, *Mahdiah Jafari⁶

¹Head and Neck Research Center, Facial Plastic Surgery Division, Tehran University of Medical Science, Tehran, Iran. ²Department of Anesthesiology, Mashhad University of Medical Sciences, Mashhad, Iran. ³MSc, Biotechnology, Department of Biotechnology, Bangalore University, Bangalore, India. ⁴Department of Pediatrics, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran. ⁵Department of Obstetrics and Gynecology, Mashhad University of Medical Sciences, Mashhad, Iran. ⁶Assistant Professor of Anesthesiology, Department of Anesthesiology, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

Abstract

Background

Dysmenorrhea is an important disease that affects physical, social and psychological functioning such as social, emotional and health performance. The lavender essential oils are being used in both combined and mere forms. The purpose of this meta-analysis is to investigate the effects of lavender alone and in combination with other aromatic plants on the attenuation of dysmenorrhea.

Materials and Methods

The previously published articles were searched on only English databases of Medline, Cochrane library and scouts. Headings (MeSH) using the main keywords of (Lavandula OR lavender) AND (Dysmenorrhea) since inception until March 15 2019. We also searched all Iranian Databases with the same English keywords.

Results

Meta-analysis of lavender alone ‘showed that dysmenorrhea intensity was lower in patient treated with lavender in comparison to control: standardized mean difference [SMD] = -1.17, 95% confidence interval: -1.72 to -0.629. Heterogeneity was 85% and significant ($p < 0.001$). Our meta-analysis showed dysmenorrhea intensity was lower in patients treated with compound containing lavender in comparison to control: SMD = -1.04; ($p < 0.001$).

Conclusion

Given the patient's interest in complementary medicine and the low cost of this therapeutic approach, this technique can be used as a useful way to improve dysmenorrhea. The findings of these studies should be interpreted with caution because of the high heterogeneity between studies and the small number of studies and small sample size.

Key Words: Aromatherapy, Dysmenorrhea, Effect, Systematic review.

*Please cite this article as: Mousavi Kani K, Mirzania Z, Mirhaghjoo F, Mousavi nezhad R, Akbarzadeh S, Jafari M. The Effect of Aromatherapy (with Lavender) on Dysmenorrhea: A Systematic Review and Meta-Analysis. *IntJPediatr* 2019;7(7):9657-66. DOI: [10.22038/ijp.2019.39624.3378](https://doi.org/10.22038/ijp.2019.39624.3378)

*Corresponding Author:

Mahdiah Jafari (M.D), Department of Anesthesiology, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

Email: jafarimh@mums.ac.ir

Received date: Jan.16, 2019; Accepted date: Mar.22, 2019

1- INTRODUCTION

The term dysmenorrhea refers to menstrual cramps that often begin during ovulation in the year after the menarche about 1-2 years after the first menstrual period, which is one of the most common complaints in women's diseases (1, 2). Primary dysmenorrhea is a painful bleeding in the absence of confirmed pelvic disorders, often associated with nausea, vomiting, headache, bruising, and a general feeling of being unwell. The pain may last from two days prior to onset for 1-3 days (3). The prevalence of dysmenorrhea is different throughout the world (3), and is between 20 to 90% in adolescents and young women, accounting for 72% of girls and women in Iran (4).

The causes of primary dysmenorrhea can be attributed to uterine contraction, vasoconstriction, inflammation and release of inflammatory mediators. Reducing the progesterone level at the late luteal phase leads to the activation of cyclooxygenase and the biosynthesis of prostaglandin. Increasing the prostaglandin production results in increased uterine potency and contractions, and then dysmenorrhea occurs (5). The dysmenorrhea is an important disease that affects physical, social and psychological functioning such as social, emotional and health performance (6), as well as quality of life (2, 7-9). Unfortunately, non-steroidal anti-inflammatory drugs (NSAIDs) have been ineffective in 10 to 20% of patients with primary dysmenorrhea. Many of these drugs have been banned for various reasons, or have been reported inappropriate due to complications such as headache, nausea, dizziness, kidney failure, fatigue, edema, irritation and gastrointestinal bleeding. The dysmenorrhea may be alleviated effectively by other therapies, such as thermotherapy, acupuncture or transcutaneous electrical nerve stimulation (TENS), as well as complementary

medicine, including the use of dietary supplements, vitamins, aromatherapy, herbal remedies, homeopathy, acupressure, exercise and massage. Herbal remedies and supplements have recently attracted further attention because of greater acceptability and tolerability, as well as fewer side effects (10). Different herbal remedies have been used to treat dysmenorrhea, including fennel (11), ginger (12), valerian (13), cinnamon (12), and thyme (14). One of the common and major compounds of these herbs is flavonoids that are phenylalanine-derived herbal pigments (15). Multiple studies have documented that the analgesic properties of herbals, such as passion flowers (16), *Bauhinia microstachy* (17) and *Tribulus terrestris* (18) are due to flavonoids. These compounds appear to apply analgesic properties with antiprostaglandin effects (15).

Regarding the fact that any drug in addition to unwanted side effects has a beneficial effect, it is preferable to choose a drug with the least side effects. Today, there is a great tendency to use complementary and alternative medicine (CAM), and medicinal herbs in the treatment of diseases, especially primary dysmenorrhea, and one of the applications of the CAM is the treatment of primary dysmenorrhea. Aromatherapy from the extract of plants has a special usage in the CAM, which utilizes essential oils possessing specific compounds (19). Different plant-derived compounds are used as essential oils in the aromatherapy, including mandarin, valerian, orange spring, tea tree, geranium, rose, peppermint, sage, lemon and lavender (19). The lavender essential oils are being used in both combined and mere forms. The purpose of this meta-analysis is to investigate the effects of lavender alone and in combination with other aromatic plants on the attenuation of dysmenorrhea.

2- MATERIALS AND METHODS

2-1. Search strategy

The previously published articles were searched on only English databases of Medline, Cochrane library and Scopus. Headings (MeSH) using the main keywords of (Lavandula OR lavender) AND (Dysmenorrhea) since inception until March 15 2019. Additionally, the references listed in the found articles were manually reviewed to find more literature. This study is a systematic review. In a systematic review, searching terms are used as a searching strategy in data collection. A search term is a set of MeSH terms and text terms using the Boolean operator, which includes populations, intervention, comparator, outcome (PICO). An extensive search was performed on the Medline, EMBASE, Scopus, Cochrane, and Web of Science until March 2019. The search query in Medline (via PubMed) is shown in **Table.1**. In addition, a manual search was conducted in Google motor engine, Google Scholar, and bibliography of related articles and reviews. Detailed search terms for the systematic literature review and patients, intervention, comparator, and outcome (PICO) were as follows:

Participants

The populations (patients) in the study consisted of girls and women who experienced menstrual pain, excluding those with any genital, chronic, or mental diseases, as well as those with hypersensitivity to aromatherapy.

Intervention

For the study, the aromatherapy intervention studies selected consisted of those that applied inhalation therapy using lavender.

Comparators

For the comparators, studies included in this review when they met these criteria

that compared other interventions with aromatherapy, used a control group with no treatment of any kind, or used a placebo group that used placebo oil.

Outcome

Studies were included in this review if they identified the effects of aromatherapy with lavender on menstrual pain in comparison to a placebo.

Table-1: Search strategy for Medline (via PubMed).

Search Terms
("lavandula"[MeSH Terms] OR "lavandula"[All Fields]) OR ("lavandula"[MeSH Terms] OR "lavandula"[All Fields] OR "lavender"[All Fields]) AND ("dysmenorrhoea"[All Fields] OR "dysmenorrhea"[MeSH Terms] OR "dysmenorrhea"[All Fields]) OR ("dysmenorrhea"[MeSH Terms] OR "dysmenorrhea"[All Fields] OR ("menstrual"[All Fields] AND "pain"[All Fields]) OR "menstrual pain"[All Fields]) AND ("odorants"[MeSH Terms] OR "odorants"[All Fields] OR "aroma"[All Fields]) OR ("aromatherapy"[MeSH Terms] OR "aromatherapy"[All Fields])

2-2. Inclusion Criteria

Inclusion criteria were all randomized clinical trials (RCTs) evaluating the effect of aromatherapy with lavender in comparison to a placebo.

2-3. Data extraction

Two separate reviewers studied the searched articles for the inclusion criteria, extra references, and the data required for the meta-analysis. Any disagreement was discussed and resolved via consensus.

2-4. Quality Assessment and Data Extraction

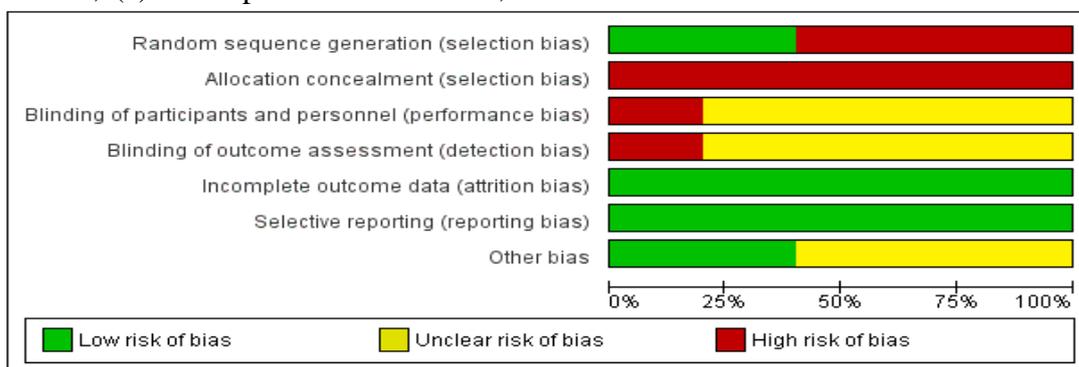
After conducting the search and eliminating duplicated reports, two independent researchers screened the title and abstracts of the studies, and then potentially relevant studies were selected. Any disagreement was solved by discussion. Data related to the design of

the study, the name of the first author, the year of publication, age of participants, study design, number of participant intervention/ control, and type of intervention were recorded (Table.2) (Please see the table at the end of paper). The quality of the studies was assessed using Cochrane's proposed guidelines (20). The risk of bias of the included studies was assessed by two authors independently using the criteria of the Cochrane Handbook for Systematic Reviews of Interventions that evaluated: (a) random sequence generation; (b) allocation concealment; (c) blinding of participants and personnel; (d) blinding of outcome assessment; (e) incomplete outcome data; (f) selective reporting; and (g) other bias.

In this assessment, each item was graded as 'low', 'high' or 'unclear' risk of bias (Figure.1).

2-5. Statistical analysis

The Comprehensive Meta-Analysis software was used to analyze the acquired data. In addition, I^2 and Cochran's Q tests were applied to compute the heterogeneity index, which accordingly fixed or random effect models were employed to calculate the effect size of lavender influence on the dysmenorrhea using 95% confidence interval (95% CI), and the forest plot.



	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Amiri Farahani et al., 2012	+	+	?	?	+	+	?
Azima et al., 2015	+	+	+	+	+	+	?
Bakhtshirin et al., 2015	+	+	?	?	+	+	?
Davari et al., 2014	+	+	?	?	+	+	+
Nikjou et al., 2016	+	+	?	?	+	+	+

Fig.1: Assessment of risk of bias through eligible studies.

3- RESULT

Figure.2 shows how studies were included in systematic review. **Table.2** revealed some baseline and clinical characteristics (*Please see the table at the end of paper*). We combined five of these findings of studies (21-25) that assessed the effect of compound containing lavender and lavender alone, in a meta-

analysis. Our meta-analysis showed dysmenorrhea intensity was lower in patient treatment with compound containing lavender in comparison to control: Standardized Mean Difference (SMD) = -1.04; (p<0.001), 95% CI: -1.48 to -0.603). Heterogeneity was 83% and significant (p<0.001) (**Figure.3**).

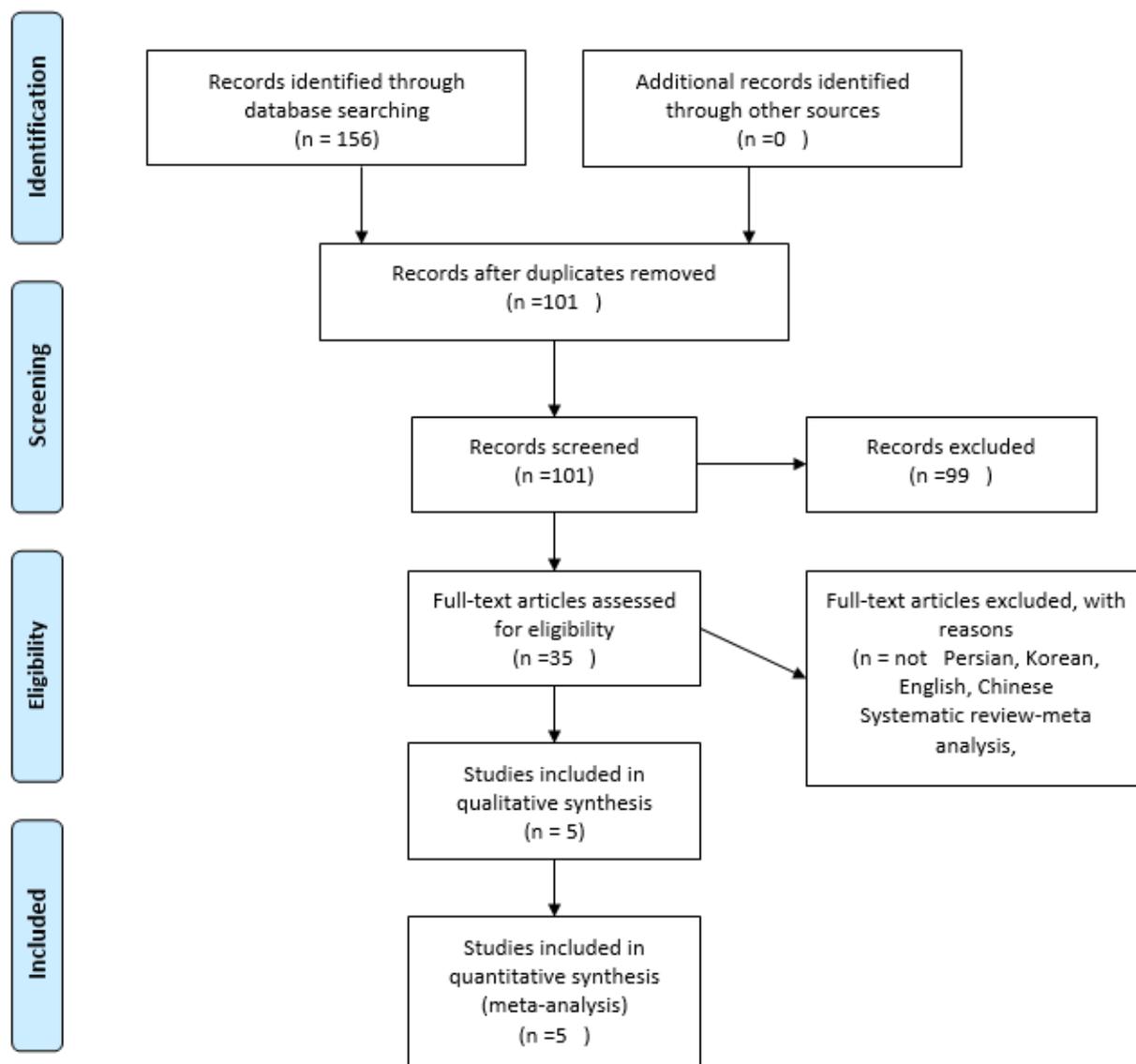
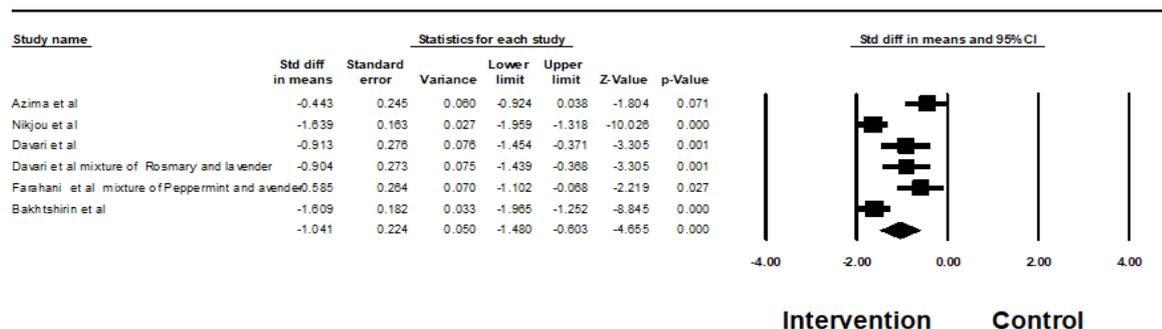


Fig.2: PRISMA flowchart of present study.

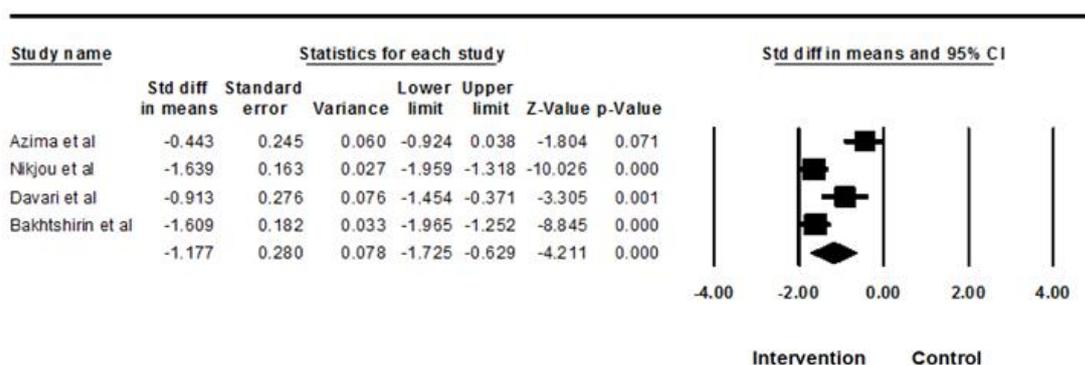


Meta Analysis

Fig.3: Effects of compound containing lavender on severity of dysmenorrhea. ♦, combined overall effect of treatment.

Meta-analysis of lavender alone (21-23, 25) showed that dysmenorrhea intensity was lower in patients' treatment with lavender in comparison to control: SMD = -1.17, 95% CI: -1.72 to -0.629. Heterogeneity was 85% and significant

($p < 0.001$) (Figure.4). We conducted sensitivity analysis which showed that Nikjou et al.'s study (22) causes a high heterogeneity. Heterogeneity reached to 38% that was insignificant ($p = 0.204$).



Meta Analysis

Fig.4: Effects of lavender alone on severity of dysmenorrhea. ♦, combined overall effect of treatment.

4- DISCUSSION

According to literature review, we designed the current meta-analysis for the first time to investigate the influences of lavender-mediated aromatherapy on the dysmenorrhea. Our findings revealed that the dysmenorrhea was significantly improved by the aromatherapy with or without merely massage or integrated with herbal medicines when comparing with the

control group. These essential oils are used in combination and alone form. It is entirely accepted that the effects of a mixture of more than an essential oil are more than the effects of an essential oil alone, which is called synergistic effect. These findings were not confirmed by current meta-analysis. Our meta-analysis results showed that aromatherapy with lavender (SMD = -1.01) had more potent

effects than meta-analysis with two studies on lavender (21-23) with mint (24) and lavender or rosemary (23). The essential oil of this plant contains geraniol, citronellol, terpineol and alcohols, which have medicinal effects such as anti-inflammatory, analgesic, anti-oxidant activities (26). One of these interventions is massage therapy, which is the most common type of medicine. Massage has a soothing effect for physical and personal problems, so that this method increases the threshold of pain and reduces the perception of pain by increasing the level of oxygen and endorphins. In addition, increasing dopamine and serotonin can reduce the level of stress, anxiety and depression associated with the position. The massage through the improvement of blood-to-lymph flow not only reduces muscle stiffness, but also causes interstitial fluid inactivity or stagnation, which accelerates the clearance of materials from blood and lymph, which raises the level of oxygen in the blood and supplies more oxygen and nutrients to the cells. Another mechanism of action of massage therapy is the stimulation of peripheral sensory receptors that cause sedation and soothing effects on central nervous system through increased pain threshold or inhibited pain perception (27).

The aromatic oils are able to decrease the level of stress hormones, elevate the level of β -endorphin, and attenuate the level of anxiety and the intensity of pain. Accordingly, various studies used these oils to alleviate the pain and anxiety. However, the isometric exercises group in our study showed no significant reduction in the level of anxiety (22). Aromatherapy can be used in different ways in the form of an inhalation, or as an essential oil with massage, or in bath water. The olfactory sense has a powerful effect on the body and mind and, on the other hand, is one of the most unknown senses. This is due to the fact that the sense of smell is a mental

phenomenon that cannot be easily verified in lower animals. Inhalation takes place with a complex mechanism between the olfactory system and the brain; so that the chemicals in the aroma move to the brain through the olfactory cells as an electrical signal, and then this information is processed in the limbic system (a region in the brain that affects mood and memory). The sense of smell has more pleasant and unpleasant emotional traits than the sense of taste. That is why the sense of smell is probably more important than the sense of taste in choosing food (27). Studies have shown that lavender and its main derivatives, Linalyl acetate and Linalool, had localized analgesic effects in laboratory animals, and Aceto-linalool had antispasmodic properties and was able to increase local blood flow (24).

4-1. Study Limitations

There was a report on the possible bias in the therapy (prolongation of the recommended duration of therapy) because of free self-inhalation by the study subjects (23). There is a need for further research with crossover design to explore obvious impacts of lavender inhalation on the dysmenorrhea. We assessed the quality of the methodology in some studies and found that the quality of them was low due to the lack of random allocation, the lack or poor reporting of blindness, and the small sample size.

5- CONCLUSIONS

Women have an effective role in family and community functioning and dysmenorrhea can impair their activities. Lavender alone or in combination with other herbs can relieve primary dysmenorrhea. Given the patient's interest in complementary medicine and the low cost of this therapeutic approach, this technique can be used as a useful way to improve dysmenorrhea. The findings of these studies should be interpreted with

caution because of the high heterogeneity between studies and the small number of studies and small sample size.

6- CONFLICT OF INTEREST: None.

7- REFERENCES

1. Rahnama P, Montazeri A, Huseini HF, Kianbakht S, Naseri M. Effect of Zingiber officinale R. rhizomes (ginger) on pain relief in primary dysmenorrhea: a placebo randomized trial. *BMC complementary and alternative medicine*. 2012;12(1):92.
2. Shewte M, Sirpurkar M. Dysmenorrhoea and quality of life among medical and nursing students: a cross-sectional study. *Nat J Comm Med*. 2016;7:474-9.
3. Unsal A, Ayranci U, Tozun M, Arslan G, Calik E. Prevalence of dysmenorrhea and its effect on quality of life among a group of female university students. *Upsala journal of medical sciences*. 2010;115(2):138-45.
4. DavdabadyFarahani M, SeyyedzadehAghdam N. Comparison of ginger and valerian on the severity of primary dysmenorrhea: a randomized triple blind clinical trial. *Complementary Medicine Journal of faculty of Nursing & Midwifery*. 2013;3(2):494-503.
5. Vincenzo De Sanctis M, Soliman A, Bernasconi S, Bianchin L, Bona G, Bozzola M, et al. Primary dysmenorrhea in adolescents: prevalence, impact and recent knowledge. *Pediatric Endocrinology Reviews (PER)*. 2015;13(2):465-73.
6. Shewte MK, Sirpurkar MS. Dysmenorrhoea and Quality of Life among Medical and Nursing Students: A Cross-Sectional Study. *National Journal of Community Medicine*. 2016;7(6):474-9.
7. Emem EAE, Hassan HE. Correlation between Quality of Life and Dysmenorrhea among Nursing Schools Students. *International Journal of Nursing Science*. 2017;7(6):123-32.
8. Al-Jefout M, Seham A-F, Jameel H, Randa A-Q, Luscombe G. Dysmenorrhea: prevalence and impact on quality of life among young adult Jordanian females. *Journal of pediatric and adolescent gynecology*. 2015;28(3):173-85.
9. Habibi N, Huang MSL, Gan WY, Zulida R, Safavi SM. Prevalence of primary dysmenorrhea and factors associated with its intensity among undergraduate students: a cross-sectional study. *Pain Management Nursing*. 2015;16(6):855-61.
10. Javanmardi M, Momtazpour M, Shahtalebi MA, Araban M. The effects of Zinc Acetate capsule on the intensity of primary dysmenorrhea: A randomized double-blind placebo-controlled clinical trial. 2016.
11. Delaram M, Forouzandeh N. The effect of Fennel on the primary dysmenorrhea in students of Shahrekord University of Medical Sciences. *Jundishapur Scientific Medical Journal*. 2011;10(170):80-8.
12. Shirvani MA, Motahari-Tabari N, Alipour A. The effect of mefenamic acid and ginger on pain relief in primary dysmenorrhea: a randomized clinical trial. *Archives of gynecology and obstetrics*. 2015;291(6):1277-81.
13. Mirabi P, Dolatian M, Mojab F, Majd HA. Effects of valerian on the severity and systemic manifestations of dysmenorrhea. *International Journal of Gynecology & Obstetrics*. 2011;115(3):285-8.
14. Salmalian H, Saghebi R, Moghadamnia AA, Bijani A, Faramarzi M, Amiri FN, et al. Comparative effect of thymus vulgaris and ibuprofen on primary dysmenorrhea: A triple-blind clinical study. *Caspian journal of internal medicine*. 2014;5(2):82.
15. Havsteen BH. The biochemistry and medical significance of the flavonoids. *Pharmacology & therapeutics*. 2002;96(2-3):67-202.
16. Zarei M, Mohammadi S, Asgari Nematian M. Evaluation of the antinociceptive effect of methanolic extract of *Passiflora caerulea*.L in adult male rat. *Armaghane danesh*. 2014;19(1):56-66.
17. Gadotti VM, Santos AR, Meyre-Silva C, Schmelting LO, Machado C, Liz FH, et al. Antinociceptive action of the extract and the flavonoid quercitrin isolated from *Bauhinia*

microstachya leaves. *Journal of pharmacy and pharmacology*. 2005;57(10):1345-51.

18. Toker G, Küpeli E, Memisoğlu M, Yesilada E. Flavonoids with antinociceptive and anti-inflammatory activities from the leaves of *Tilia argentea* (silver linden). *Journal of Ethnopharmacology*. 2004;95(2-3):393-7.

19. Amiri Farahani L, Heidari T, Roozbahani N, Attarha M, Akbari Torkestani N, Bekhradi R, et al. Effect of aromatherapy on pain severity in primary dysmenorrhea. *Arak Med Univ J*. 2012;15:1-9.

20. Higgins JP, Altman DG, Gøtzsche PC, Juni P, Moher D, Oxman AD, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *Bmj*. 2011;343:d5928.

21. Azima S, Bakhshayesh HR, Kaviani M, Abbasnia K, Sayadi M. Comparison of the effect of massage therapy and isometric exercises on primary dysmenorrhea: a randomized controlled clinical trial. *Journal of pediatric and adolescent gynecology*. 2015;28(6):486-91.

22. Nikjou R, Kazemzadeh R, Rostamnegad M, Moshfegi S, Karimollahi M, Salehi H. The effect of lavender aromatherapy on the pain severity of primary dysmenorrhea: A triple-blind randomized clinical trial. *Annals of*

medical and health sciences research. 2016;6(4):211-5.

23. Davari M, Reihani M, Khoshrang N. The aromatherapy effect of rosemary and lavender on primary dysmenorrhea: A clinical controlled trial. *Journal of Isfahan Medical School*. 2014;32(290):929-37.

24. Amiri fl, Heidari T, Roozbahani N, Attarha M, Akbari Tn, Bekhradi R, et al. The Effect Of Aromatherapy On Pain Severity In Primary Dysmenorrhea. 2012.

25. Bakhtshirin F, Abedi S, YusefiZoj P, Razmjooee D. The effect of aromatherapy massage with lavender oil on severity of primary dysmenorrhea in Arsanjan students. *Iranian journal of nursing and midwifery research*. 2015;20(1):156.

26. Sajjadi M, Bahri N, Abavisani M. Aromatherapy Massage with Geranium Essence for Pain Reduction of Primary Dysmenorrhea: A Double Blind Clinical Trial. *The Iranian Journal of Obstetrics, Gynecology and Infertility*. 2018;20(12):50-7.

27. Saadat E. The effect of aromatherapy with rose oil on primary dysmenorrhea. *Complementary Medicine Journal of faculty of Nursing & Midwifery*. 2014;4(2):787-97.

Table-1: Characteristics of five studies included in our systematic review.

Authors/ Country/ Year, Reference	Type of Studies	Dose, route of administration and duration	Age, year	Type of intervention	Control	Number of subjects in intervention/control	Drop out, %	Result
Davari et al., Iran, 2014 (23)	Controlled clinical trial	Aromatherapy alone	21-24	Rosemary and Lavender Lavender + Rosemary	Placebo	Rosemary =29 Lavender =28 Lavender + Rosemary =29 Placebo=30	3	Mean score of pain decreased significantly in comparison with placebo.
Amiri Farahani et al., Iran, 2012 (19)	Lavender and Peppermint n=21, Massage alone =21	Lavender 2%, and Peppermint 2%	---	Lavender and Peppermint	Massage alone	30/30	17	Intervention group showed a better effect than control group.
Azima et al., Iran, 2015 (21)	Controlled clinical trial	Lavender extract based on olive oil with 10% purity, two consecutive cycles.	21	First group: Lavender, Second group: 8 weeks of isometric exercises	No treatment	34/34/34	11	Pain indicated a significant decrease in lavender than no intervention.
Nikjou et al., Iran, 2016 (22)	Controlled clinical trial	10 ml Lavender/ two cycle for two months	19-29	Lavender	Placebo	100/100	0	Pain indicated a significant decrease in lavender than placebo.
Bakhtshirin et al., Iran, 2015 (25)	Controlled clinical trial	Massage with lavender and placebo	18-24	Lavender 2%	Massage with lavender oil	Massage: 80 placebo: 80	All Lavender subjects completed the study	Massage with lavender was more effective than placebo.