The Effect of Aromatherapy Massage with Lavender Oil on the Severity of Primary Dysmenorrhea among University Students: A Randomized Clinical Trial

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ARTICLE INFO	ABSTRACT
Article type: Original article *Article History:* Received: 16-Dec-2021 Accepted: 24-Aug-2022 *Key words:* Aromatherapy Message Lavender Dysmenorrhea	***Background & aim:*** Dysmenorrhea is one of the most common problems among women, and researchers are looking into treatment modalities using herbal methods. This study aimed to determine the effect of aromatherapy massage with lavender oil on the severity of primary dysmenorrhea among university students. ***Methods:*** This randomized clinical trial was performed on 71 students with primary dysmenorrhea who were recruited from dormitories of Mashhad University of Medical Sciences, Mashhad, Iran and were randomly assigned to three groups. Questionnaires for demographic and menstrual-related data and a visual analogue scale (VAS) were used to collect data. The intervention was a 15-minute massage at the top of the symphysis pubis on the first day of menstruation and for the next three cycles. The first group used 2% lavender oil (2 ml), the second group used 1% odorless paraffin oil (2 ml), and the third group just did massage. The subjects measured and recorded their pain intensity before and 30 minutes after the intervention using VAS. Analysis was done with SPSS version 16 software. ***Results:*** The average pain score changes in three groups in repeated observations over time were different, so the time effect (p=0.009), the group effect (p≤0.001), and the time-group interaction effect (p≤0.001) were statistically significant. Pain score changes between groups and at different times had different patterns, and the most changes were observed in the massage group with lavender oil. ***Conclusion:*** Massage with lavender oil is effective in reducing dysmenorrhea and suggested to be used in the management of dysmenorrhea.

Introduction

One of the most common medical problems in women is dysmenorrhea, which is known along with crampy and periodic pains in the lower part of the abdomen (1-2). Dysmenorrhea is categorized into primary and secondary based on the anatomical or pathological conditions causing it. (3) Primary dysmenorrhea is menstrual pain that is not caused by a problem in the pelvis. The second type is painful periods caused by a problem in the pelvis (4).

Primary dysmenorrhea is more common between the ages of 13 and 19 and usually starts to decrease after the age of 30 to 35 (5). Symptoms associated with dysmenorrhea occur from the first day of menstruation or a little later (48-72 hours) and include cramps, nausea, vomiting, and weakness, loss of appetite,

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diarrhea, and headache (6). The prevalence of primary dysmenorrhea in the world is estimated to be 50% to 90% (7). In Iran, the prevalence of primary dysmenorrhea is reported to be between 71% and 89.9% (8). The prevalence of dysmenorrhea is influenced by social status, occupation, and age. Moreover, factors such as premature puberty, heavy and long-term bleeding, alcohol consumption, obesity, and no history of childbirth are associated with an increase in the prevalence and severity of dysmenorrhea (9, 10). In research conducted in Iran, it was found that 15% of girl's miss school for 1 to 7 days a year due to symptoms of dysmenorrhea (11). According to estimates in the United States, about 600 million working hours are wasted per year due to dysmenorrhea (12). Due to more use of contraceptive methods, women experience more periods than in the past (13). On the other hand, in today's world, women have a strong social presence in the society; therefore, if they do not treat this problem, they miss between 1 and 3 days a month and become inactive (14).

The cause of primary dysmenorrhea is increased production of endometrial prostaglandin (15). So far, various drugs, including ovulation inhibitors, prostaglandin inhibitors, non-steroidal anti-inflammatories (NSAIDs), and vitamins, have been suggested for the treatment of dysmenorrhea (16-17). The first effective treatment is ovulation inhibitor pills, but many women and teenage girls suffer from the side effects of these pills, such as nausea, vomiting, breast sensitivity, and spotting (18). The second-line treatment is prostaglandin inhibitors, whose long-term use is associated with side effects such as ulcers, kidney necrosis, and increased liver enzymes (19). Due to the complications and side effects of chemical drugs, their high price, and the young girls' reluctance to use hormonal drugs, researchers decided to use non-medicinal and herbal methods to find a cure for this problem (20).

Today, there is a great tendency toward medicinal plants, complementary and alternative treatments in the treatment of diseases, especially primary dysmenorrhea (21, 22). In many countries, non-drug treatments such as exercise, nutrition, TENS, acupressure, acupuncture, yoga, massage, and aromatherapy are used to reduce the severity of primary

dysmenorrhea (23). Aromatherapy massage is one of the most common forms of complementary and alternative medicine (CAM) that improves physical and mental health by using essential oils separately or in combination (24) and is used in the treatment of primary dysmenorrhea (21-22). One of the essential oils widely used in aromatherapy is lavender (25). Lavender is a plant from the mint family with the scientific name Lavandula (20). Lavender oil consists of linalool, linalyl acetate, cineol, lavender, geraniol tannin, and flavonoids and has antifungal, antimicrobial, antibiotic, and antidepressant properties (26). The main constituents of the essential oil of lavender are linalool and linalyl acetate, which have anti-anxiety, calming, and soothing properties (27). Lavender oil has analgesic effects, and by local absorption, it can relieve smooth muscle spasms (such as uterine muscles), increase local blood flow, and reduce muscle tone (26).

The results of various studies show that massage therapy causes physical relaxation, reduces hypoxia and anxiety, improves blood and lymph flow, releases endorphins, and relieves pain. The best way to use lavender is to administer it through inhalation, incense, bath, and massage (28). However, its absorption rate is higher by massage (29). Through the skin, oil molecules are quickly absorbed into the bloodstream and can have a healing effect (30). In the study by Raisi Dehkordi et al. (2014), a statistically significant difference was observed between massage with lavender oil and massage with placebo (26). In addition, Nikjo et al. (2016) showed that the use of lavender aromatherapy is effective in alleviating the intensity of primary dysmenorrhea pain in students at Ardabil University of Medical Sciences (31). Bakht Shirin et al. (2015) showed that massage with lavender oil reduced the severity of primary dysmenorrhea in nursing and midwifery students of Arsanjan Islamic Azad University (14). In a study done by Biranvand in 2015, a massage with lavender essential oil significantly reduced the pain intensity and other symptoms of dysmenorrhea (8).

It is noteworthy that the high prevalence of dysmenorrhea as well as its negative effects on the personal and social lives of women, as well as the side effects of synthetic medications,

women's tendency has been increased towards using of herbal medicine due to safety of non-pharmacological methods a being more economical.

Also, given the dearth of research on how individual massage with herbal oils helps pain relief in cases of dysmenorrhea in consecutive cycles, and the controversy in the results in the previous studies, we conducted a study to determine the effect of aromatherapy massage with lavender oil on the severity of primary dysmenorrhea in students living in the dormitories at Mashhad University of Medical Sciences in 2015.

Materials and Methods

The present study was a randomized clinical trial. The project was approved by the Research Ethics Committee of Mashhad University of Medical Sciences under the ethics code of 900107 and was also registered in the Iranian randomized Clinical Trial Center under the code of IRCT2017061134465N1. Based on the results of previous studies (32), the sample size for each of the three groups was at least 17 individuals, and a total of 51 individuals were assigned to the three groups. The calculation of this sample size was based on the mean and standard deviation of the reported pain intensity in the mentioned study, and it was calculated based on the difference in the mean test. In this way, the mean of pain reduction in two treatment groups has been compared with each other. The target power was 80% and the type I error was 0.05. Finally, due to possible dropout, the sample size was set at 72, and the subjects were divided into three groups of 24. Subjects from five dormitories of Mashhad University of Medical Sciences were chosen by convenience sampling, and they were randomly allocated to three intervention groups. The first person was assigned to the massage group with lavender oil, the second person was assigned to the massage group with paraffin oil (placebo), and the third person was assigned to the massage group alone. Random allocation of the sample into groups and the order of the first to third groups was done by one of the researchers for the project.

The inclusion criteria of the research included: being Iranian, being single, living in the dormitory of Mashhad University of Medical Sciences, having regular menstrual periods (21–35 days), and menstrual pain intensity should be 60 or more using a visual analog scale (VAS) on the first day of the cycle. Exclusion criteria included: unwillingness to continue participating in the study, history of uterine problems (fibroids, ovarian cysts, excessive bleeding), history of genital surgery, history of abnormal ultrasound of the uterus and ovaries, taking hormonal drugs at least three months before or during the study period, having a special diet, having mental and emotional stress during the last six months, having a body mass index above 30, being active in sports continuously, taking medicatios continuously, and suffering from endocrine diseases.

The tools used to collect data included a demographic profile questionnaire with eight questions, a menstrual-related data form with twelve questions, and a 10-point VAS for pain. The content validity was used for the demographic questionnaire and the menstrual information form. So these forms were given to 10 members of the academic staff of Mashhad Nursing and Midwifery Faculty to confirm their validity. VAS consists of a 10 cm long horizontal line. It is standard, and its validity ($r = 0.9$) and reliability ($r = 0.88$) have been measured in other studies (33-34).

The questionnaire of demographic information and menstrual cycle information was given to the individuals, and the intensity of pain was measured by a VAS three months before starting of the intervention. To determine the intensity of pain, the subjects were asked to indicate the level of pain on one of the scales from zero to ten with a sign. The left end of the line showed no pain, and the right end showed the most severe pain. This range classified into three categories of mild (1-3), moderate (3-6), and severe (6-10).

On the first day of the first cycle in all three groups, the subjects showed their pain intensity using the VAS at the beginning and before the intervention. Then the intervention was performed in the first group with 2% lavender oil (2 ml), in the second group as a massage with 1% odorless paraffin oil (made by Ashtad Mehr Company), and in the third group, massage was performed alone as the intervention, and after the intervention, a VAS was used to measure the

pain intensity of subjects. The lavender essential oil used in this research is a compound extract of blue lavender 2% in an almond oil base, which was prepared by the pharmacy department of Mashhad University of Medical Sciences and in the research garden of medicinal plants of this university.

The intervention was performed only once on the first day of the menstrual cycle and continued in the same way during the next two consecutive cycles. Subjects were taught how to perform the massage following the instructions. In all three groups, massage was performed in the first cycle by the researcher and in the next two cycles by the subjects on the first day of menstruation for 15 minutes. First, the pain intensity on the first day of menstruation was recorded using VAS, then the massage was performed, and the pain intensity was recorded again after 30 minutes. The massage was given in such a way that on the first day of the menstrual cycle, after washing and drying the hands, in a quiet room with a temperature of 24–26 degrees Celsius. The subject was placed in a supine position and a cushion was placed under their knees to relax the abdominal muscles. The massage was given in the upper part of the symphysis pubis, where the pain is greatest. In the first cycle, the researcher used the right hand to give the massage with 2 ml of lavender oil, paraffin, or massage without aromatherapy on the upper area of the symphysis pubis in a clockwise direction. Then she would put her left hand on her right hand without putting any pressure on the stomach of the subject. Each massage lasted at least 15 minutes, and pain intensity was recorded after 30 minutes of massage. The follow-up was done by phone in the next two cycles by the researcher after the subjects had done the massage. To comply with the ethical issues of the research, after providing sufficient information about the objectives of the research, written consent was obtained from the individuals in order to participate in the study. We asked subjects to let us know if they needed to use other pain treatment methods because those who used other methods to reduce pain were excluded from the final analysis Also, it should be noted that before entering the study, lavender oil was used on the arms of the study

subjects, as much as the size of a finger, so that they would be removed from the study in case of local sensitivity.

During the study, only one person from the massage group withdrew from the study due to unwillingness to cooperate and the final analysis was conducted on 71 subjects (Figure1). To analyze the data, SPSS version 16 software was used, and to compare the mean of quantitative variables in three groups, the One-way Anova test was used. Also, variance in repeated measurements, paired t-tests, Chi-square and Friedman tests were used for other analyses.

Results

The average age of the subjects was 21.92 ± 2.69 years, and the average menarche age was 13.39 ± 1.28 years. 75% (n=54) of the subjects were undergraduates and the others were graduate students. The largest number of subjects (20%) were in the fourth semester of study. Moreover, the comparison showed that these three groups have no significant statistical difference in terms of demographic variables and menstrual history, such as menarche age (p=0.978), length of menstrual period (p=0.165), and menstrual intervals (p=0.693) and they are homogeneous (Table 1).

The results of the study showed that the average pain score after the intervention compared to before the intervention decreased in all three cycles and all three groups. However, only in the intervention group of massage with lavender essential oil, a statistically significant difference was observed (p≤0.001). According to the results of the study, comparing the average pain score in treatment groups in repeated observations over time shows the effect of time (p=0.009), the effect of group (p≤0.001), and the time-group interaction effect (p≤0.001) is statistically significant. In post-hoc pairwise comparisons of the effect of time, while there was a statistically significant difference between the average pain score of the first and third cycle (p=0.001), this difference was not observed between the first and second cycle (p=0.166) and between the second and third cycle (p= 0.122). Furthermore, in the post-hoc pairwise comparisons of the group effect, a statistically significant difference was observed between the average pain score in the lavender group, the groups of massage alone, and massage with

paraffin (p≤0.001). whereas there was no statistically significant difference between the massage group alone and the massage group with paraffin (p=0.271).

The significance of the interaction effect shows that the changes in the pain score of the study subjects in the three groups under investigation and over time had different patterns, so in the analysis of the changes in the pain score of the groups over time, no statistically significant difference was observed in the massage group alone at different times.

On the other hand, in the massage group with paraffin, a statistically significant difference was observed only between the first and third cycles (p=0.014). Whereas, in the massage group with lavender oil, a statistically significant difference was observed between the average pain in the first and second cycles (p=0.013), between the first and third cycles (p≤0.001), and between the second and third cycles p=0.011).

Moreover, examining the difference in the average pain score of the groups under investigation at different times showed that in the first cycle, there was a statistically significant difference between the lavender group with the group of massage alone (p≤0.001) and massage with paraffin oil (p=0.007).
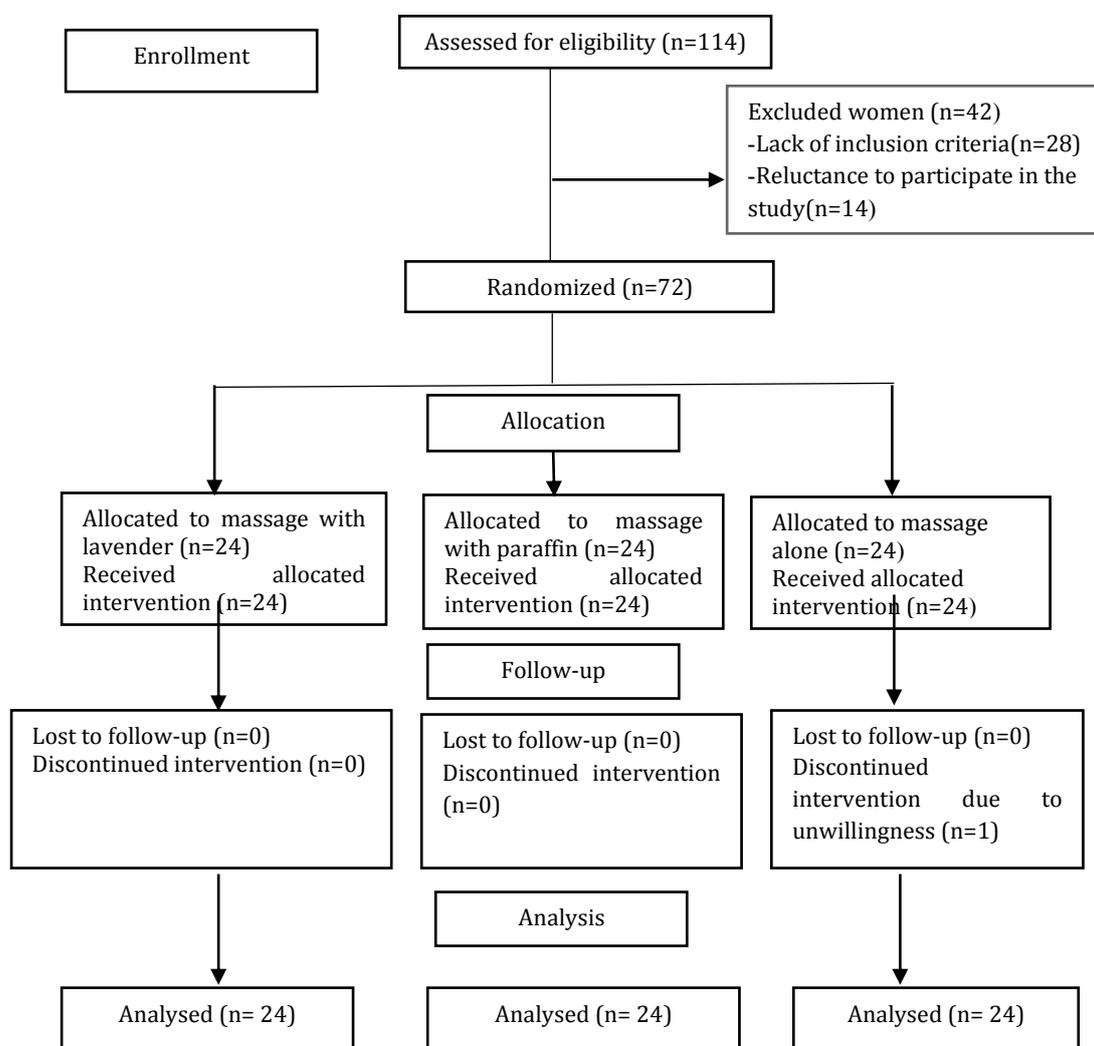
Figure 1. The CONSORT flow diagram of intervention in the three group

Table 1. Demographic and menstrual-related characteristics of study subjects

Variable	Massage with lavender (N=24) Mean ± SD	Massage with paraffin (N=24) Mean ± SD	Massage alone (N=23) Mean ± SD	F	P-Value
Age (Years)	21.68±1.73	21.30 ± 2.16	22.86±3.72	2.024	0.141
Age at first menstruation (years)	13.42±1.35	13.42±1.28	13.35±1.27	0.022	0.978
Interval between each menstruation (days)	28.04±1.55	28.08±1.35	28.43±2.17	0.369	0.693
Menstrual bleeding duration (days)	6.75±0.99	6.08±1.28	6.26±1.42	1.853	0.165

Table 2. Comparison of pain intensity before and after massage between the three groups during three cycles based on the VAS

Type of intervention	First cycle		Second cycle		Third cycle		Time effect		Intervention effect		Effect of time-intervention	
	Before	After	Before	After	Before	After						
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	F	P-Value	F	P-Value	F	P-Value
Massage with lavender	13.40± 76.88	62.75± 10.11	76.71 ± 12.25	59.38 ±7.45	11.48± 76.29	55.92 ± 8.54						
Massage with paraffin	10.78± 76.25	10.29± 71.83	10.36 ±77.58	12.21 ±70.67	76.83± 9.92	68.88 ±10.30	4.926	0.009	13.15	≤0.001	5.953	≤0.001
Massage alone	13.72± 77.39	74.91± 13.38	76.83 ±12.16	11.73 ±73.35	77.83 ± 12.38	72.96 ± 11.63						

In the same way, in the second and third cycles, there was a statistically significant difference between the lavender group with the group of massage alone (p≤0.001) and massage with paraffin oil (p≤0.001). However, this difference was not observed between the groups of massage alone and massage with paraffin in any of the cycles. The average intensity of menstrual pain that was measured with the VAS in all three groups, before the intervention, and after the intervention, is shown in Table 2 for the first, second, and third cycles, separately.

In this study, no side effects related to the use of lavender oil or paraffin oil were observed. The rate of using pain relievers in all study units was 75% (n=54) in the first cycle, 65.3% (n=47) in the second cycle, and 62.5% (n=45) in the third cycle. The highest rate of decrease in using pain relievers was in the aromatherapy group, from 86.7% in the first cycle to 76.8% in the third cycle.

Discussion

We conducted a study to determine the effect of aromatherapy massage with lavender oil on the severity of primary dysmenorrhea in students living in the dormitories of Mashhad University of Medical Sciences. According to the results, the average severity of dysmenorrhea was reduced among the three groups. The study by Biranvand et al. (2014) on 60 students with primary dysmenorrhea showed that aromatherapy massage with lavender reduces the severity of pain and menstrual symptoms

(8). Their results are consistent with the results of the present study. They had had two groups: the massage group with 2 drops of lavender essential oil in 2.5 ml of almond oil and the placebo group with 2.5 ml of almond oil only, 48 hours before and after menstruation. The present study consisted of 3 groups. In the test group, massage with lavender essential oil based on almond oil was given only once, on the first day of the menstrual cycle. The tool for pain measurement and massage duration of 15 min were the same in both studies.

Sadeghi et al. (2015) investigated the severity of dysmenorrhea in 72 students using the VAS in two menstrual cycles. The average pain intensity was reduced in the intervention group (massage with rose oil), the massage group with unscented almond oil, and the massage group alone (35). The similarity between the study by Sadeghi et al. and the present study was that there were three groups in both studies.

In a study, they examined the intensity of pain in one menstrual cycle and on the first and second days of the menstrual cycle. The results showed that the average pain intensity in the intervention group, which included massage with rose oil, sage, geranium, and ginger, was significantly lower than the massage group with almond oil and the group without intervention (29). Apay et al., who performed massage with lavender on 44 nursing students suffering from primary dysmenorrhea, concluded that its analgesic effects were more effective than the group that was massaged with paraffin oil. In this study, the results were examined in three consecutive cycles, and they indicated the greater effect of aromatherapy combined with massage on reducing the intensity of menstrual pain (36). The current study also showed the synergistic effects of aromatherapy combined with massage in pain relief. In addition, the study of Bakht Shirin et al. (2015) looked for the effect of aromatherapy with lavender oil on primary dysmenorrhea. In a clinical trial on 80 students with an age range of 18-24 years in Arsanjan, they investigated this issue. Finally, the results of the study showed that the group that was massaged with lavender oil had significantly less pain intensity than the group that was massaged with a placebo (14). In study by Bakht Shirin consisted of two groups, the

students randomly received a placebo in two consecutive menstrual cycles on the first days of menstruation in both the lavender oil massage intervention group and the control group. The mean age of menarche (13 years), the pain measurement tool VAS, and the massage duration of 15 minutes were the same in both studies. The average age of the subjects in study by Bakht Shirin et al. was 20 years, and in the present study, it was 21 years.

Valiani et al. (2010) conducted a study to reduce dysmenorrhea due to endometriosis. They showed that after massaging with a placebo, pain intensity were significantly reduced, which is similar to the results of the present study. In the current study, after massaging with a placebo (paraffin oil), the pain was reduced too (37). In aromatherapy with massage reducing the intensity of menstrual pain, the study by Yip and Tse (2006) can also be mentioned. After eight sessions of acupressure with aromatic lavender oil, they reported the average pain intensity in this group to be 4.91±1.89 and in the acupressure group without aromatherapy to be 5.12±2.18 (38).

The results of the study by Nikjo et al. (2016) showed that using lavender aromatherapy for two months may be effective in reducing the severity of primary dysmenorrhea (31). The sense of smell, as the most sensitive of the five senses, has the strongest effect on the body and mind. On the other hand, it is one of the most unknown senses (39). In the study by Nikjo et al. (2016), students at Ardabil University of Medical Sciences were randomly divided into two intervention (lavender) and control (placebo) group. The study was three-blind, and in the intervention group, the subject's smelled lavender for 30 minutes a day for two consecutive menstrual cycles on the first three days of menstruation. However, in the present study, 71 students were randomly assigned to three groups, and the massage was combined with aromatherapy. The pain measurement instrument VAS was the same in both studies. The average age of the subjects in the study by Nikjo was 13 years, and in the present study was 21 years.

In the present study, as more time passed since using lavender oil, its analgesic effects increased, so that in the first cycle the average

pain intensity was 62.75 ± 10.11 and in the third cycle it was 55.92 ± 8.54. This indicates that aromatherapy pain-relieving effect increase with prolonged use.

Valiani et al. (2010) also concluded that the effect of massage and aromatherapy six weeks after the intervention are greater than the immediate effects after starting (37). As the results of the present study show, before the intervention, even with no intervention, the mean intensity of menstrual pain in both groups decreased, i.e., those who had aromatherapy and those who received massage with placebo or massage alone. However, in the study by Bakht Shirin et al. (2015), no change in pain intensity was observed after one month of using a placebo massage (14). Among the reasons for this difference, we can mention the difference in the massage method too. In their study, the pressure was superficial and mild, whereas, in the present study, deep pressure was applied to certain points above the suprapubic region. In the research that has been done, no difference has been seen between massage and lavender essential oil inhalation in reducing menstrual pain. However, therapists prefer the oil method to inhalation (40). Wang et al. (2010) did a large study with 1092 female students in Malaysia. In the survey, 60% of those with dysmenorrhea reported that oil was used with massage and that they preferred that method (41).

Various studies have shown that fragrances can affect the creation, cognition, physiology, behavior, and performance of people, and this effect can be different according to the culture, experience, gender, and personality of people, and each person reacts to the fragrances differently (42). One study showed that aromatherapy is not only effective in reducing dysmenorrhea but also reduces the need for medications and synthetic analogs that alleviate pain. Therefore, people who previously had a history of taking medicine to reduce pain did not mention the need for medicine after the intervention (16). In the present study, the results showed that the need to take medicine in the lavender massage group increased from an initial 75% of the study population in the first cycle to 62.5% in the third cycle.

The study by Ahmadi et al. (2022) on 60 students with primary dysmenorrhea showed that the Ginger-Lavender capsule reduces the pain of primary dysmenorrhea and is more effective than Mefenamic Acid (43). Their results are consistent with the results of the present study. In study by Ahmadi was triple-blind.

One of the strengths of this study was that the intervention was done in three consecutive cycles so that the results would be more accurate and reliable. During the second and third cycles, the person getting the massage did it himself, so there was no need for a third party. The lack of careful massage monitoring in the subjects was a limitation of this study because the menstrual cycles of the subjects differed during the days and nights, which made monitoring impossible. Another limitation was that, due to the specific characteristics of the intervention, it was not possible to blind the subjects. The results of this research can be a basis for further studies in the future. It is suggested that more research be done on how to manage dysmenorrhea using different essential oils by different methods of prescriptions, such as inhalation, or on other groups of women.

Conclusion

According to the results obtained, lavender oil is more effective than paraffin oil and only massage in reducing the pain of students with primary dysmenorrhea. The essential oil of lavender can be used as a reference in alternative and complementary medicine for the management and treatment of primary dysmenorrhea.

Acknowledgements

Conflicts of interest

Authors declared no conflicts of interest.

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