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Original Article

Effect of Lavender Aromatherapy on the Pain Level after Cesarean Section

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Abstract

Background and Aim: Cesarean section is the most common and painful surgical procedure throughout the world. The aim of this research was to evaluate the effect of lavender aromatherapy on the pain level after cesarean section.

Materials and Methods: The present study is a double-blind clinical trial conducted on 110 eligible women undergoing cesarean section. The samples were randomly divided into two groups, namely groups A and B. A lavender extract intervention was given to the group A, and a placebo intervention to the group B. Cotton swabs were impregnated with five drops of 100% lavender extract for the intervention group and with five drops of distilled water in the placebo group. It was inserted in their facial oxygen mask and inhaled for three minutes in 4, 8 and 12 hours after the surgery, and then pain score was measured 30 minutes after the intervention. Data were collected using a demographic questionnaire and the visual analog scale. Data analysis was conducted by Wilcoxon's test and Mann-Whitney's U-test to compare the severity of pain before and following the intervention in both groups and its variations. Generalized estimating equations (GEE) with an appropriate linear link function were used to examine the effect of lavender on the severity of pain. The significance level was considered 0.05.

Results: The severity of pain had a higher level in the lavender group, while pain intensity showed significant distinction between the two groups only on the second (P=0.039) and the third (P=0.011) interventions. Overall, the variations in pain before and after the intervention were similar in the lavender and placebo groups and showed no significant differences.

Conclusion: The results of the present study indicated that lavender extract could be effective in the reduction of the pain of cesarean section in the later hours. Hence, lavender extract could be a suitable alternative complementary medicine for the pain of cesarean section. After adjusting for the confounding variables, the multivariate analysis also showed that lavender had no noticeable positive effect on the severity of pain.

Keywords: Lavender, Pain, Caesarean section

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Introduction

Cesarean section is among the most common surgical procedures throughout the world (1, 2). Total cesarean rate was (46%), (36%) and (34%) in China, Vietnam and Thailand respectively (3). A report by the Ministry of Health in Iran showed that the rate of cesarean is increasing in this country and is 44% nationwide and 55-65% in large cities, which is 20% higher than the global statistics (1, 2, 4). According to a report by WHO, the cesarean rate should not exceed 10-15% in any region (5). Sistan and Baluchistan province (13.6%) and Gilan Province (64.3%) had the lowest and the highest rates of cesarean section in Iran (6). One of the main challenges confronted by patients after surgery is a pain (1, 2, 7). The failure to properly manage and control post-cesarean pain can have negative effects on various body systems and lead to the inability to discharge from the respiratory system or the digestive system and the urinary tract, ileus, increased blood pressure, a prolonged rest period and ultimately the increased risk of deep vein thrombosis (8, 9-11). Another adverse effect of pain is interferences in blood and oxygen flow, which delay wound healing and disrupt the hemodynamic and catabolic states of the body resulting in ischemia in vital body organs (12).

Pain relief is currently a major concern in the United States (13). Although the administration of analgesics is the most potent remedy for pain relief, it is not the only method available. The benefits of non-pharmacological methods include alleviating the feeling of weakness, stress, and anxiety, removing the focus on pain, and reducing the need for analgesics, ultimately resulting in reduced side effects (14).

Many physicians use complementary therapies such as aromatherapy more than other pharmacological therapies (15, 16). Aromatherapy is the practice of using volatile oils or aromas extracted from fragrant herbs in different ways, such as through massage, inhalation and the oral route (17). The aroma released in aromatherapy stimulates the olfactory receptors and transmits olfactory messages to the limbic system (18). These neurotransmitters are endogenous matters commonly known as opioid peptides that inhibit the transmission of the pain message through receptors associated with these peptides in the brain stem (19).

One of the oils with a great application in aromatherapy as a complementary medicine is the oil extracted from lavender (1, 20). The reported therapeutic properties of lavender oil include sedative, anxiolytic, antibacterial, antifungal, anti-flatulence, antispasmodic, anti-inflammatory and anti-histaminic properties (15, 20). The linalool and linalyl acetate contained in this plant can stimulate the parasympathetic system, with linalyl acetate having narcotic properties and linalool acting as a sedative (21). The analgesic properties of the lavender extract are attributed to its effect on inflammatory processes (22). Lavender can also induce analgesia by inhibiting nitric oxide synthesis (23). The aroma and compounds in essential oils enter the bloodstream and cause psychological and physiological reactions so that they directly interact with tryptophan and help with relaxation responses (24). Nonetheless, lavender had no pain–relieving effect after open-heart surgery (25). Given the high rate of cesarean section in Iran and the severe pain experienced after this surgery, and the restrictions on the administration of chemical analgesics after cesarean section due to breastfeeding, this complementary substance appears to be beneficial. Pain relief is of high significance in post-cesarean patients and could cause complications during the patients' recovery. Moreover, analgesics are not the only method of pain management, and the administration of opioids results in the emergence of certain side effects. Hence, non-pharmacological methods could be used in conjunction with analgesics or even as their alternatives for pain relief (26). Previous studies have reported different results with regard to the impact of lavender extract on the severity of pain (1, 7, 20, 25). Furthermore, the use of lavender in conjunction with other forms of medication therapies, rather than its separate use as a single remedy, for post-cesarean pain relief has been recommended by certain researchers as a comprehensive pain relief method. Accordingly, the present study was carried out to examine the impact of aromatherapy with lavender on the severity of pain in post-cesarean patients.

Materials and Methods

The research project was approved by the ethical committee of the Guilan University of Medical Sciences (Ethical Code: IR.GUMS.REC.1395.109).

This research is a double-blind clinical trial conducted on 110 eligible women undergoing cesarean section at Al-Zahra Teaching Hospital of Rasht in 2016. Sampling was based on the gradual admission of pregnant women for cesarean section. Random blocks were selected based on the Random Allocation software. According to the inclusion criteria, they were divided into groups A and B according to the sequence of blocks selection. The sample size of this study was determined with 95% confidence interval and 90% test power to expect at least 25% percentage of the expected clinical difference of the two groups based on a low sampling formula with 45 women per group. Given the 10% drop in the study, two groups of 55 were considered.

The first woman was assigned to the intervention group by the toss of a coin. A lavender extract intervention was given to the group A and a placebo intervention to the group B. The study inclusion criteria consisted of a score higher than 3 on the Visual Analog Scale (VAS), the use of spinal anesthesia in the surgery, the use of one type of anesthetic, no concurrent surgeries, the surgery lasting less than 90 minutes, term pregnancy, no history of allergy to medicinal plants and no olfactory disorders, migraine, chronic headache, coagulation disorders, polyhydramnios, diabetes, and preeclampsia or twin pregnancies. The exclusion criteria were nausea and vomiting and sensitivity to and a dislike for aromatherapy after the administration of the first dose. Data were collected using a two-part instrument completed through interviews. The first part was a researcher-made demographic questionnaire (with items on age, education, height, and weight), pregnancy-specific information (parity and history of miscarriage), vital signs (systolic and diastolic blood pressure, pulse rate and respiratory rate) and requests to receive analgesics (frequency and dose). The second part measured the severity of pain using the VAS.

After providing the necessary explanations to the patients and obtaining their consciously written consent, the first and second parts of the questionnaire were completed using the patients' records and statements. A skin allergy test was performed on the wrist surface of all the participants to ensure lavender sensitivity. Those with no signs of sensitivity (redness, rash, and itching) were included in the study. None of the samples showed skin sensitivity to lavender. To maintain the homogeneity of the groups, distilled water was tested on the placebo group. The intervention was then performed as follows. Cotton swabs were impregnated with five drops of 100% (27) lavender extract for the intervention group (27) and with five drops of distilled water in the placebo group. Subsequently, they were inserted in their facial oxygen mask and inhaled for three minutes 4, 8 and 12 hours after the surgery (7). All the stages of the intervention were performed by the researcher.

For data collection, a colleague who was an expert interviewer assisted the researcher in order to maintain the double-blind quality of the study. The participants were not separated due to the similarity between the two forms of lavender and placebo as well as the amount of drops used.

Necessary training was provided to the interviewer before beginning the interviews. The severity of pain was measured in both groups using the VAS before each intervention. The subjects' pulse and respiratory rate were also counted for a full minute and recorded. The blood pressure of all the participants was also measured in the supine position by the researcher. Since the absorption of the extract and the metabolism of lavender in the blood to reach the required therapeutic level take 30 minutes on average, the interviewer measured the subjects' severity of pain using the VAS 30 minutes after the intervention. If the participants requested chemical analgesics such as Diclofenac suppository (100 mg) for pain relief as per the ward routine, the frequency of requests and their doses were recorded.

Data were analyzed in SPSS-16. The normal distribution of the quantitative variable (the severity of pain) was assessed using the Kolmogorov-Smirnov test. Since the severity of pain before the intervention and its variations were not normally distributed, we used Wilcoxon's test in order to make a comparison between the severity of pain before and after the intervention in both groups. Furthermore, Mann-Whitney's U-test was used to compare the two groups in terms of their severity of pain and its variations. Generalized estimating equations (GEE) with the linear link function was used to assess the effect of lavender on the severity of pain.

Results and Discussion

The mean age of the participants was 30.43±5.94 years, and the majority (63.6%) were in the 25-35 age groups. According to the results obtained, 39.1% of the participants had less than a high school diploma, 39.1%, 26.4% had a history of miscarriage, and 55.5% were obese (BMI>30). According to independent t-test and Chi-square test, the two groups had no significant differences in terms of age, education, BMI, parity and

Table 1: Comparison of pain in the two groups separately measure time.

Group Statistics							
variable	group	Mean	Std. Deviation	Median	IQR	Mean Rank	P*
Pain before first intervention	lavender	6.96	1.98	7.00	3.00	56.56	0.723
	placebo	6.85	1.9	7.00	3.00	54.64	
Pain after first intervention	lavender	5.85	2.41	6.00	4.00	56.63	0.709
	placebo	5.69	2.36	6.00	3.00	54.37	
Pain before second intervention	lavender	5.11	2.06	5.00	3.00	56.55	0.725
	placebo	4.95	1.51	5.00	2.00	54.45	
Pain after second intervention	lavender	4.51	2.01	4.00	3.00	60.86	0.073
	placebo	3.87	1.66	4.00	2.00	50.14	
Pain before third intervention	lavender	3.89	1.74	4.00	2.00	58.79	0.271
	placebo	3.60	1.66	3.00	3.00	52.21	
Pain after third intervention	lavender	3.31	1.84	3.00	3.00	62.91	0.013
	placebo	2.56	1.75	2.00	1.00	48.09	

* Mann–Whitney test

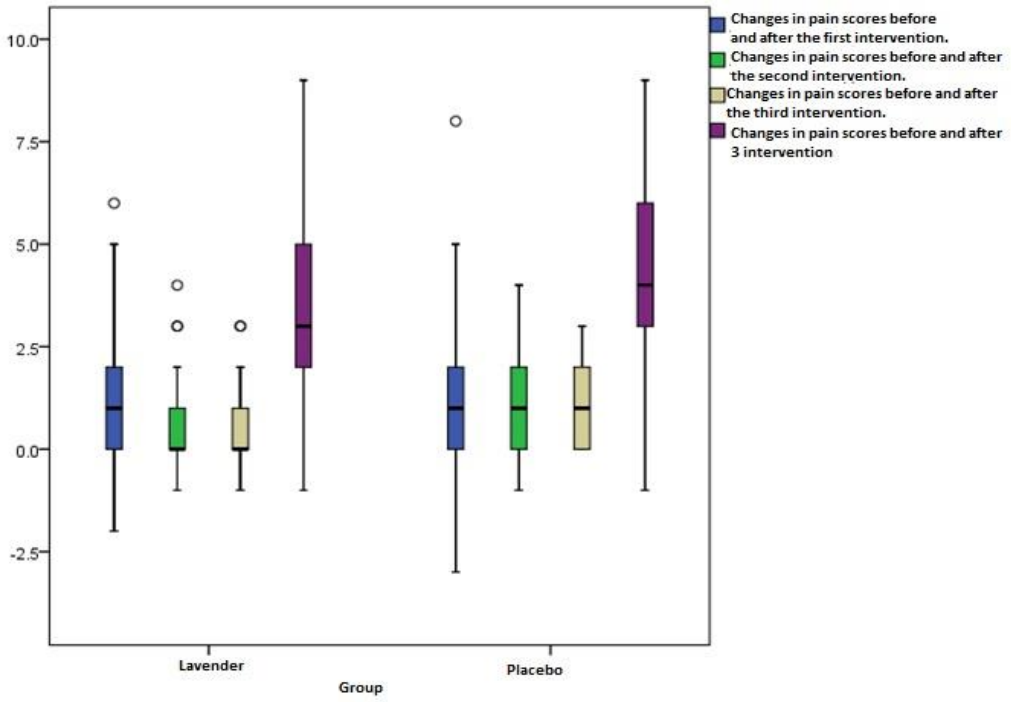

Figure 1. Compare 95% confidence interval Mean pain scores in the two groups separately stages.

Table 2: Comparison of pain intensity in the two groups separately measure time.

variable		group				P*
		lavender		placebo		
		number	%	number	%	
Pain intensity before first intervention	none	0	0.0	0	0.0	0.387
	mild	1	1.8	0	0.0	
	moderate	20	36.4	25	47.3	
	severe	34	61.8	30	52.7	
	Mean Rank	57.76		53.24		
Pain intensity after first intervention (4 h)	none	0	0.0	0	0.0	0.540
	mild	11	20.0	10	18.2	
	moderate	19	34.5	25	45.5	
	severe	25	45.5	20	36.4	
	Mean Rank	57.23		53.77		
Pain intensity before second intervention	none	0	0.0	0	0.0	0.345
	mild	11	20.0	9	16.4	
	moderate	30	54.5	40	72.7	
	severe	14	25.5	6	10.9	
	Mean Rank	57.95		53.05		
Pain intensity after second intervention (8 h)	none	0	0.0	0	0.0	0.039
	mild	16	29.1	25	45.5	
	moderate	28	50.9	25	45.5	
	severe	11	20.0	5	9.1	
	Mean Rank	61.23		49.77		
Pain intensity before third intervention	none	0	0	0	0.0	0.078
	mild	23	41.8	32	58.2	
	moderate	28	50.9	21	38.2	
	severe	4	7.3	2	3.6	
	Mean Rank	60.25		50.75		
Pain intensity after third intervention (12 h)	none	3	5.5	7.1	7.1	0.011
	mild	26	47.3	39	70.9	
	moderate	23	41.8	10	18.2	
	severe	3	5.5	2	3.6	
	Mean Rank	62.24		48.76		

* Mann–Whitney test

miscarriage (P>0.05).

Table 1 compares the mean level of pain in the two groups by measurement occasion and reveals a significant difference between the two groups only on the third measurement occasion (P=0.013), as the severity of pain had a higher ordinal mean in the lavender group (62.91) compared to the placebo group (48.09). Table 2 presents the severity of pain before and after the intervention by measurement time and reveals significant differences between the two groups only on the second (P=0.039) and third (P=0.011) measurement time (the post-intervention severity of pain had a higher ordinal mean in the lavender group compared to the placebo group on both times). There were no significant differences between the two groups on the first measurement time, i.e. four hours after the

surgery, at which the groups were similar (P=0.372). On the second measurement time, i.e. eight hours after the surgery, the mean variations in pain were higher in the placebo group (ordinal mean: 64.4) compared to the lavender group (ordinal mean: 46.60), making for a statistically significant difference (P=0.002). On the third measurement occasion, i.e. 12 hours after the surgery, the mean reduction in pain was significantly higher in the placebo group (ordinal mean: 63.42) compared to the lavender group (ordinal mean: 47.58), making for a statistically significant difference (P=0.006). Overall, the variations in pain before and after the intervention were similar in the lavender and placebo groups and showed no significant differences (Table 3).

Table 4 presents the effect of lavender on the severity of pain after adjusting for the confounding effects of the personal-demographic and fertility variables and reveals that the only variables that significantly affected the severity of pain were age (P=0.032), education (P=0.033), the use of analgesics (P<0.0001), pre-intervention pain (P<0.0001) and the time of intervention (P<0.0001), as the severity of pain decreased with the age and time of the intervention, while requests for analgesics before the intervention and the variable of education positively affected the severity of pain. To conclude, just as was the case in the univariate analysis, after adjusting for the confounding variables, the multivariate analysis also showed that lavender had no noticeable positive impact on the severity of pain. Figure1 compares the mean pain scores in the two groups in separate stages, and figure 2 shows the comparison of the change in the mean pain scores between the two groups (lavender and placebo). The placebo group had slightly lower mean pain scores without any significant differences.

Post-cesarean pain and complications can highly affect the process of recovery in patients, and analgesics are not the only method of pain management. In fact, since the consumption of opioids results in the emergence of certain side effects, it is beneficial to use non-pharmacological methods of pain relief in conjunction with analgesics. In this study, there were no significant difference between the two groups in terms of age, education, BMI, parity, and miscarriage.

The lavender and placebo groups were not significantly

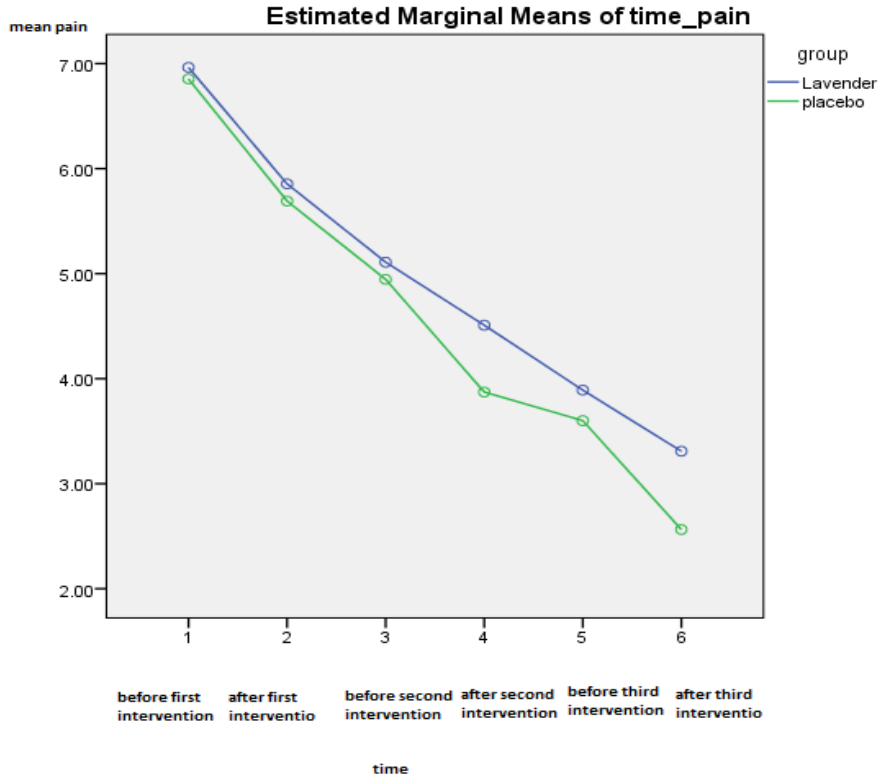

Figure 2. Comparison of change in mean pain scores between the two groups (lavender and placebo).

Table 3: The effects of lavender on pain synchronization and fertility effects of demographic variables based on the model of generalized intervention by Generalized estimating equations (GEE).

variable	Group	Number	Mean Rank	P*	Mean. Std. Deviation
Changes In Pain in The First stage of intervention	Lavender	55	52.78	0.372	1010± 1.67
	Placebo	55	58.13		
	Total	110			
Changes in pain in the second stage of intervention	Lavender	55	46.60	0.002	0.6± 0.93
	Placebo	55	64.40		
	Total	110			
Changes in pain in the third stage of intervention	Lavender	55	47.58	0.006	0.58± 0.87
	Placebo	55	63.42		
	Total	110			
Changes in general pain from beginning to end of the study	Lavender	55	51.64	0.200	3.65± 2.12
	Placebo	55	59.36		
	Total	110			

* Mann–Whitney test

Table 4: The effects of lavender on pain synchronization and fertility effects of demographic variables based on the model of generalized intervention by Generalized estimating equations (GEE).

			95% Confidence Interval for Difference		Statistic test		
Variable	**β**	**Std.Error**	**Lower**	**Upper**	**Wald**	**df**	**P**
constant	1.771	0.9814	-0.153	3.694	3.256	1	0.071
Lavender VS Placebo	-0.181	0.4525	-1.068	0.706	1.60	1	0.689
age	-0.317	0.148	-0.607	-0.027	4.596	1	0.032
Education	0.213	0.0 998	0.017	0.409	4.559	1	0.033
BMI	-0.004	0.1367	-0.272	0.264	0.001	1	0.978
Gravida	0.097	0.1143	-0.127	0.321	0.724	1	0.395
Abortion	-0.098	0.2398	-0.568	0.372	0.166	1	0.684
Using drug	1.941	0.2031	1.543	2.339	91.291	1	0.000
Pain before intervention	0.446	0.0449	0.358	0.534	98.501	1	0.000
Time	-1.026	0.1258	-1.272	-0.779	66.482	1	0.0000
interaction time and group	0.208	0.2096	-0.203	0.618	0.982	1	0.322
(Scale)	2.384						

* Generalized estimating equations

different in terms of the post-cesarean severity of pain on the first (four-hour post-surgery) and second (eight-hour post-surgery) measurement time, as no pain relief was achieved with the inhalation of lavender. In the study conducted by Olapour; however, there was a significant difference between the two groups on the first and second measurement time and pain abated after using lavender (7). In another study, Niaz-Hadi *et al*. showed that the inhalation of lavender extract reduces post-cesarean pain (2). Moreover, in the present study, the severity of pain was significantly higher in the lavender group compared to the placebo group on the third measurement occasion (12-hour post-cesarean), while in Alapour's study, the severity of pain was significantly lower in the lavender group compared to the placebo group on the third measurement occasion, i.e. 12-hour post-cesarean (7). Despite the similarity of the interventions (in terms of measurement time), the present findings disagree with the results obtained by Alapour. This disparity that may be due to the different durations of lavender extract inhalation (three minutes

in the present study and five minutes in Alapour's) necessitates further studies. As in the present study, Fang *et al*. did not report relief in post-arthroscopy pain following aromatherapy with lavender (17). In a similar study, lavender had no direct analgesic effect on humans (28). Moreover, in a study conducted by Salamati *et al*. on the effect of the inhalation of lavender extract on the pain following open-heart surgery, the mean severity of pain was 5.6±2.26 before aromatherapy and 4.98±2.29 after the inhalation of lavender, which suggests the lack of significant differences and the inhalation of lavender extract resulting in the lack of any significant pain relief after open-heart surgery (25).The assessment of the effect of lavender on the severity of post-cesarean pain showed more severe pain in the lavender group (45.5%) compared to the placebo group (36.4%) on the first measurement occasion (four-hour post-cesarean), while on the second measurement occasion (eight-hour post-cesarean), moderate pain was the most frequent severity of pain observed (50.9% in the lavender group and 45.5% in the placebo group). On the third measurement occasion (12-hour post-cesarean), moderate pain was more frequent in the lavender group (41.8%) compared to the placebo group (18.2%). The severity of pain was statistically significant in the two groups only on the second (P=0.039) and third (P=0.011) measurement time, and the severity of pain had a higher mean ordinal in the lavender group compared to the placebo group on both occasions and lavender was less effective in abating pain. Metawi showed similar results and moderate pain was observed in 70% of the lavender group and only 18% of the placebo group (1). Shahnazi also did not observe any significant difference between the lavender and placebo groups in terms of the severity of IUD insertion pain, and lavender did not reduce the severity of pain in these women (20). Soltani *et al*. reported no significant reduction in the severity of pain following the tonsil surgery (29). In the study by Fang *et al*., although no significant differences were observed between the aromatherapy and placebo groups in terms of the severity of pain 15 minutes and four, eight, 24 and 48 hours after the intervention, this severity was significantly lower in the aromatherapy group 72 hours after the intervention (17). Unlike the present study, a research by Sheikhan showed a significant difference in the severity of pain between the two groups four hours and five days after episiotomy (15). The disparity of findings in different studies may be due to the number of drops used, measurement occasion and the percentage of lavender used. In the present study, five drops of 100% lavender extract were used on three measurement time and the severity of pain was assessed 30 minutes after the intervention, while in the cited studies, Metavi used 1 cc of lavender oil and Shahnazi measured the severity of pain only on one occasion, i.e. immediately after IUD insertion. Since the severity of pain is often much higher immediately after surgery and the patient recovers over time, the disparity of findings can be justified. For example, Fang *et al*. reported pain relief 72 hours after aromatherapy, which may suggest that aromatherapy with lavender can be effective in the long-term. Limitations of this study included the use of the VAS for measuring pain severity. It has been stated that the use of VAS in clinical practices is not convenient. Moreover, the use of VAS results in a higher failure rate compared to other scales such as the verbal rating scale and the numerical rating scale.

Conclusion

The results of this research revealed that lavender has no significant positive effects on the severity of pain. However, since the subjects did not report any side effect, aromatherapy can be considered as an effective and safe management for pain after cesarean section. Since various mechanisms may control uterine contractions and their pain, further physiological studies are required on this subject. In the present study, various reasons such as receiving routine pain relief and its possibility of interfering with the process of aromatherapy, differences in the threshold and perception of pain in women and their mental-psychological status and personality traits, which can affect their response to the questionnaire items, and also the subjective nature of pain may have led to an inaccurate measurement of pain. These items can be considered the limitations of this study.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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