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Original Research

The Effects of Aromatherapy by Lavender Oil on Agitation and Hemodynamic Parameters in Mechanically Ventilated Patients in ICU

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Abstract

Patients receiving mechanical ventilation, due to stress, anxiety and stimulations of tracheal intubation, experience agitation that threatens the process of mechanical ventilation and also can cause dyspnea, confusion and asthenia. Agitation control by the medications and physical restraints, brings unpleasant side effects as well. Therefore, this study was performed to determine the effect of aromatherapy with lavender oil on agitation and hemodynamic parameters in mechanically ventilated patients.

This quasi-experimental study was performed over 40 patients under mechanical ventilation. All patients who met inclusion criteria, were recorded their hemodynamic parameters and agitation severity before the intervention and then two drops of 2% lavender essential oil were added to 200 ml of distilled water and the aromatherapy was done within one hour. Hemodynamic and agitation parameters recorded every 15 minutes during the first hour and every 30 minutes during the second and third hours. Agitation severity and hemodynamic parameters were compared before and after aromatherapy and were analyzed by statistical methods [descriptive and inferential].

The findings showed that the scores of agitation and hemodynamic parameters, before and after aromatherapy with lavender were significant ($P < 0.001$).

According to the results of this study, aromatherapy with lavender oil is effective on agitation and hemodynamic parameters in patients undergoing mechanical ventilation; therefore, it is suggested to be used as one of the non-drug and uncomplicated interventions in independent nursing duties to control patient's agitation

Keywords: Aromatherapy, Lavender oil, Agitation, Hemodynamic parameters, Mechanical ventilation, Intensive care unit (ICU)

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Introduction

Every year more than 6 million adults experience acute illnesses [1]. Many of these patients in the intensive care unit, require mechanical ventilation to maintain adequate oxygenation and protection of the airway [2]. Mechanical ventilation is a major factor in the care of patients in critical conditions that is used to create better conditions for gas exchange at the alveolar surface and tissue through improvement and facilitating the entry and exit of the air [3]. Although mechanical ventilation therapy is crucial, but brings different experiences of physical and psychological stress for the patient as well. Pain, stress and anxiety are of the most important stressors in these patients which affect the quality of their life [4]. Performing invasive procedures such as tracheal intubation, routine care like endotracheal tube suctioning, wound dressing, unrelieved pain, fear and feeling of dependency, trouble in communication, sleep disorder, hypoxia and poor ventilation, drug and alcohol deprivation, immobility, increased environmental stimuli (light, noise and alarm sounds), and limiting organs by tying them are the main causes of stress and agitation in the patients admitted to intensive care unit [ICU].

Agitation is a visible sign that comes with extreme stress, delirium, or impaired brain function [1]. Surveys conducted on critically ill and agitated patients admitted to the ICU unit shows that stress and agitation in patients with long-term residence in ICU, causes some problem such as: increased duration of mechanical ventilation, endotracheal tube unanticipated exits, exit venous and arterial routes, increased oxygen demand, increased metabolic needs, hospital costs and disruption in therapeutic interventions [6].

Agitation leads to intolerance mechanical ventilation, increased heart rate and respiration, which ultimately leads to damage of the lungs [7].

According to some research, agitation is associated with sympathetic activity. When sympathetic nervous system is overactive, increasing in levels of serum catecholamines decrease cognitive ability and agitation also increase blood pressure and arrhythmia [8].

An important goal of nursing cares is trying to achieve comfort and convenience in patients under mechanical ventilation [9]. Usually to deal with of patients' agitation in intensive care and prevent injury of themselves and extubation, the physical and chemical inhibitors [drugs] can be used. Evidence shows that the use of restrictive means on patients under mechanical ventilation, are not effective and appropriate act and may cause more problems [5]. ICU nurses and physicians to improve these symptoms and help to respiratory of these patients rely on sedatives and drugs [10]. If continuous infusion of sedatives reduces pain and agitation of patients, but it increased immobility time and inability to evaluate the mind of the patient, the patient's lack of cooperation in diagnostic and therapeutic procedures and finally increase costs [11]. Also the use of sedatives or drugs is known as a risk factor for formation and promotion of delirium [12]. Given that the effectiveness of sedative drugs to control agitation is not perfect, the use of sedatives alone cannot control the agitation of patients under mechanical ventilation [13]. Due to the potential effects of sedatives, the use of non-drug treatments and complementary medicine with sedative drugs can enhance the effectiveness of both treatments and minimize sedatives and analgesics consumption while have the same efficacy [14]. One of the treatments that its use compared to other complementary medicine treatments in relation to stress in most countries has grown substantially in recent years is aromatherapy [15]. This treatment among nurses is the second treatment of complementary medicine that most widely used in clinical setting[16]. Today, this treatment has been introduced as part of holistic nursing from the State Board of America. In England, this type of treatment is accepted as a component in nursing care

[14]. The essential oil of lavender [*Lavandula angustofolia* from Lamiaceae] has been used in aromatherapy [17-18]. It is an aromatic and evergreen herbaceous plant. Lavender has anti-stress, sedative, analgesic, antihistaminic effects and relieve sleep disorders [19]. Lavender essential oil contains linalool, linalyl acetate, limonene, camphor, caryophyllene, lavandulyl acetate and etc. Linalyl acetate has narcotic properties and its linalool acts as a sedative. The lavender oil effectively reduces pain, inflammation, stress and depression and it is hypnotic and prevents muscle spasms [17]. Also, linalool and Linalyl acetate existing in the plant is capable of stimulating the parasympathetic system which thus reduces the heart rate and create relaxation [20]. Essential oils that are inhaled reduce physiological stress and serum cortisol levels, thus reduce blood pressure [15]. Despite the above advantages, one of the limitations of using lavender is its short-term effect; so we should consider exactly to choose the kind of patients, methods and amounts used. Also, in rare cases it may increase calming and hypnotic effect of drugs that debilitate central nervous system, if consumed at the same time [21]. The effects of lavender oil in several studies has been confirmed; such as reducing stress and depression in patients admitted to the CCU [15], reducing the agitation of dementia [8], reducing anxiety and improving sleep quality in ICU patients [22], reducing stress in patients candidate for open heart surgery [23], reducing stress in patients with myocardial infarction [20], decreasing stress and pain, stress and depression in the elderly [24], reducing pain after cesarean section [25], decreasing stress before surgery [26], reducing the symptoms of dysmenorrhea [27], reducing anxiety and physiological parameters in patients who underwent angiography and coronary artery bypass graft [28], reducing stress before angiography [29], labor pain relief [30], reducing anxiety of patients undergoing PCI [31], improving quality of sleep and reducing anxiety in patients undergoing hemodialysis [32], reducing stress and depression in students of dormitory [33].

However, the O'Connor study on the treatment of restless and agitated behaviors in dementia patients showed aromatherapy with lavender had no effect on agitation and disturbed behaviors in patients with dementia [34]. Salamati et al. concluded in their study that inhalation of lavender is not effective in decreasing pain after open heart surgery [17]. The study that Beyk Moradi et al. performed on stress and vital signs in patient after CABG showed that aromatherapy with lavender has no effect on stress and the vital signs [except hypertension] [35]. Given the importance of mechanical ventilation as a therapy in ICU and the importance of patient comfort during use of it to get to the outcome of treatment and also due to the side effects of sedative drugs that are most widely used strategy in this area, it seems absolutely necessary to use proper methods with minimal side effects to control agitation in patients under mechanical ventilation [5]. Therefore, this study was designed to determine the impact of aromatherapy with lavender oil on agitation and hemodynamic signs of mechanically ventilated patients in the intensive care unit.

Methods

This is a quasi-experimental, before-and-after study that was performed on 40 patients undergoing mechanical ventilation in the ICU units of the selected affiliated hospitals of Sabzevar University of Medical Sciences in North-east of Iran. This study has been verified in the committee of Islamic Azad University of Medical Sciences by code NO. IR.IAU.TMU.REC.1395.1. Mechanical ventilation systems used in the study were Dragger and EVT4. The patients age ranged 18 to 56 years. At least the level of consciousness of patients according to Glasgow coma scale was 7. The patients should not have an addiction to opiates or strong painkillers. They should not have

a history of hypertension and consuming of sedatives 3 hours before the intervention. The major criterion for inclusion in study was obtaining of agitation scores in the range of +2 to +4 from scale of Agitation - Drowsiness Richmond which was assessed by a nurse. It should be noted that due to the prevention of the effects of other possible causative factors of agitation, as soon as the patients became agitated, the primary actions of nursing were done such as: rearranging sheets and removing any wrinkles in it, putting the patient in a comfortable position,

Control of airway and ventilator-air transfer tubes for the passage of air correctly, suctioning of secretions, pain relief, control of feeding, defecation, urination patient and checking ventilator settings and if the agitation continued, according to above scores, the patients were included in study.

Exclusion criteria were also cases such as to calm down the patients after doing the primary actions of nursing, separating from the device during the study, revealing any allergic reaction, systolic blood pressure less than 95 mmHg and higher than 180 mmHg, extubation by restless patients during intervention and any problems with patient who require opioid analgesics prescribe by his treating physician. Eligible patients were selected for the study.

After explaining the process of study and completing the consent form to participate in research by the patient's proxies, if the patient already had used sedatives after drug clearance time and ensure that he is not affected by any sedative, was enrolled in the study.

These examples of eligible patients were enrolled in the study. Agitation and hemodynamic parameters were measured before the intervention that scale of Richmond Agitation – Drowsiness was used. To measure blood pressure, breathing, heart rate, temperature and oxygen saturation were used a monitoring device bedside patient that recorded in patient record in the same way by personnel. Then 2 drops of lavender essential oil 2% with 200 ml of distilled water were added inside Humidifier device and nebulous for one hour. Hemodynamic parameters and the level of agitation were recorded every 15 minutes during the first hour and then checked every 30 minutes during the second and third hours and recorded in the table.

The data collection tool included a three-part questionnaire. The first part included demographic variables [age, sex, length of stay in ICU, the number of days connected to the ventilator, etc.]. The second part is the registration table of hemodynamic parameters [BP, HR, RR, T, Spo2] that were recorded every 15 minutes in the first hour and the second and third hours every half hour. The third part was scale of Richmond agitation - drowsiness [from +4 to -5], which was performed in three successive stages of observation, response to auditory stimulation and response to physical stimulation. The reliability and validity of Richmond's tools has been confirmed by Sessler and colleagues [2002] at the University of Arkansas in adult's intensive care unit [36]. The validity and reliability of these instruments evaluated in Iran by Tadrisi and colleagues [2010] at the University of Baqiyatallah and has been announced as a suitable tool for measuring the status of relaxation in Persian language patients admitted in ICU unit [37]. Nobahar et al., [5], Saadatmand and colleagues [14] and Aghayi et al., [38] have confirmed using this scale to determine agitation of patients in special care units.

It is noteworthy that because of observation of moral considerations, we obtained permission from Ethics Committee of the University's Vice Chancellor for Research and Technology. Finally, the obtained data were analyzed using SPSS version 19 and descriptive statistic tests for demographic characteristics and analysis of variance was used for repeated measures in order to evaluate in-group effects in independent variables.

Results

In this study, of 40 patients 65% (n = 26) were male and 35% (n = 14) were female. The average age of men was 49.72 and the average age of women was 49. Minimum and maximum age of the patients was 18 and 65 years old, respectively. Highest percentage of people had neurological disease (32.5 %) and GCS 7 and 8 (25%), respectively (Table 1).

The majority of patients [72.5%] had no history of hospitalization in the ICU (Table 1). The average number of days of hospitalization in ICU was 6 days and the average number of days of under mechanical ventilation was 5 days. Hemodynamic parameters (heart rate, respiratory rate, systolic blood pressure, diastolic blood pressure, temperature and oxygen saturation) and agitation were recorded in four stages (before, during the first hour of aromatherapy, second hour after aromatherapy and the third hour after aromatherapy).

Table 1: Baseline demographic characteristics

Categories		N [%]
Gender	female	14 [35%]
	Male	26 [65%]
Diagnosis	Internal	7 [17.5%]
	Respiratory	10 [25 %]
	Neurology	13 [32.5%]
	After surgery	10[25%]
GCS	7	10 [25 %]
	8	10 [25 %]
	9	7[17.5 %]
	10	5 [12.5 %]
	11	8 [20 %]
Prior ICU admission	yes	11 [27.5%]
	NO	29 [72.5%]
Age	20-29	8 [20%]
	30 -39	4 [10%]
	40-49	5 [12.5%]
	50-59	13 [32.5%]
	60-69	10 [25%]

Results showed that the average variance of heart rate, respiration, systolic blood pressure, diastolic blood pressure, temperature, oxygen saturation and restlessness before and after aromatherapy record was significant in four stages of record ($P < 0.001$). (Tables 2, 3)

Table 2. Mauchly sphericity test for difference of means with aromatherapy

Within subjects Effect	Mauchly s W	Approx Chi-Square	df	P .value
Heart rate	0.32	33.11	5	0.00=0
Respiration rate	0.52	19.14	5	0.002
Systolic blood pressure	0.44	24.02	5	0.000
Diastolic blood pressure	0.53	18.49	5	0.002
Temperature	0.22	44.24	5	0.000
Oxygen saturation	0.66	12.18	5	0.032
Agitation	0.30	35.47	5	0.000

Table 3. Test of within-subject's effects

	df	Mean Square	F	P.value	Partial Eta Squared
Heart rate	1.95	826.07	25.26	0.000	0.45
Respiration rate	2.26	275.78	60.73	0.000	0.66
Systolic blood pressure	2.24	1392.30	24.78	0.000	0.44
Diastolic blood pressure	2.32	960.20	29.90	0.000	0.49
Temperature	1.75	0.24	20.72	0.000	0.40
Oxygen saturation	2.59	3.03	16.39	0.000	0.34
Agitation	2.37	8.83	53.91	0.000	0.63

Aromatherapy by lavender oil affects agitation and hemodynamic parameters in patients under mechanical ventilation. Also according to the tables and graphs, the greatest reduction in heart rate and temperature can be seen in minute of 90^{th}, the greatest reduction in breathing, systolic and diastolic blood pressure at the 120th minute, the highest increase in oxygen saturation at 90^{th} minute and the greatest reduction in agitation was in minute of 180th. (Figures 1-7)

According to the evidence presented in this study can be concluded as long as aromatherapy with lavender continues it is visible effects of it. But as soon as aromatherapy stops minimum and maximum average length of its effect on hemodynamic parameters is 30 minutes and 60 minutes respectively and on control of agitation

is at least 120 minutes. This reflects the short-term effect of lavender (Figures 1-7)

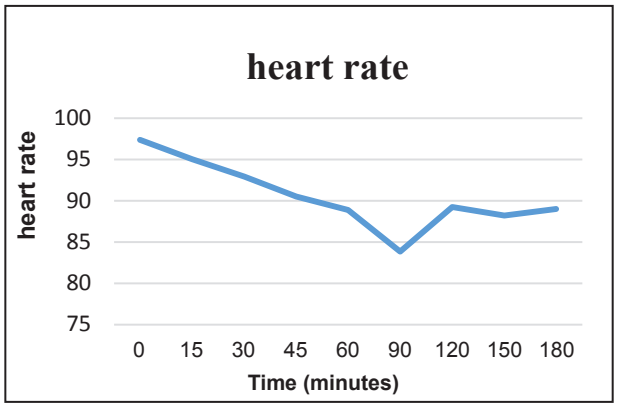

Figure 1: average heart rate

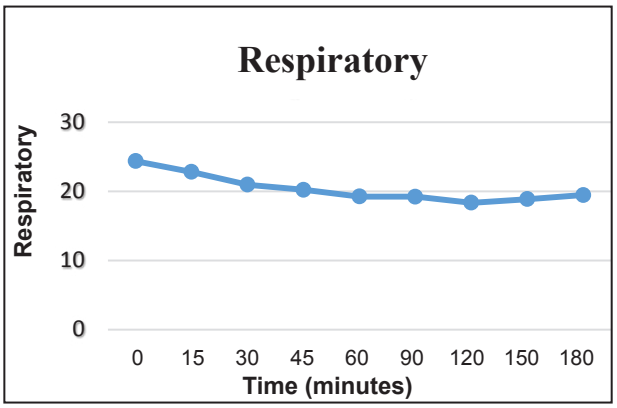

Figure 2: average Respiratory

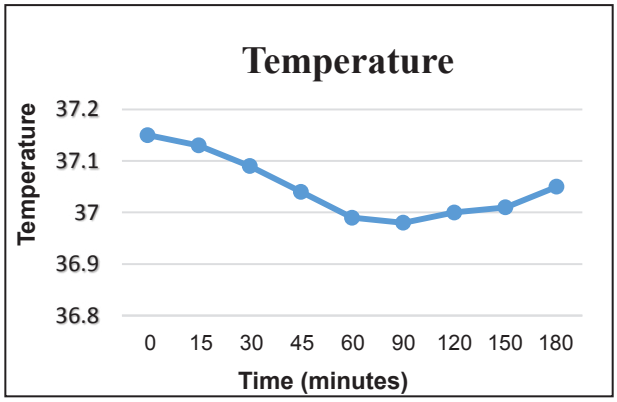

Figure 3: average Temperature

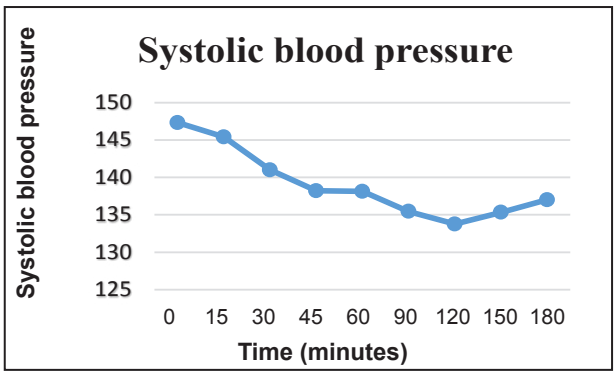

Figure 4: average Systolic blood pressure

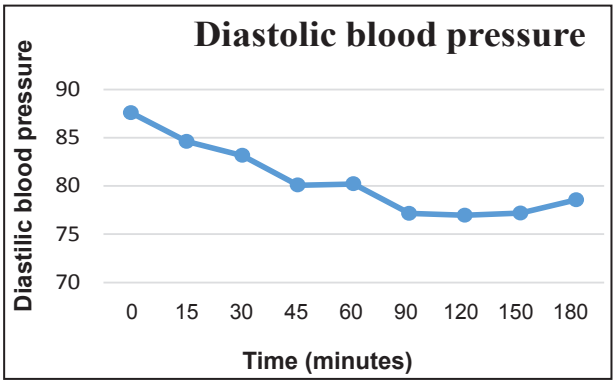

Figure 5: average Diastolic blood pressure

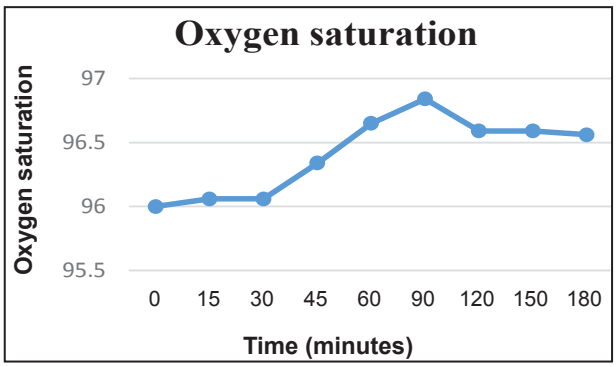

Figure 6: average Oxygen saturation

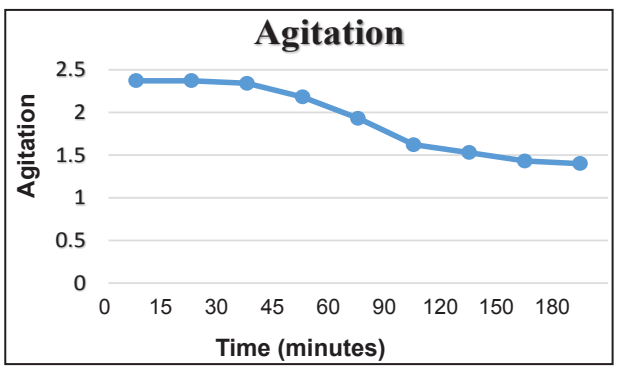

Figure 7: average Agitation

Paired comparison test showed that the mean differences is significant in the stage of before aromatherapy with the first hour during aromatherapy and the second and third hours after Intervention, also it is significant the first hour during aromatherapy to other stages and just, mean differences (except temperature) in two stages, the second and the third hour after the intervention is not significant (Table 4).

Table 4: bonferroni post hoc test

		P-value Heart rate	P-value Respiratory	P-value Systolic BP	P-value Diastolic BP	P-value Temperature	P-value Oxygen saturation	P-value Agitation
Before Aromatherapy	The first hour	0.000	0.000	0.004	0.000	0.000	023.0	001.0
	The second hour	0.000	0.000	0.000	0.000	0.000	000.0	000.0
	The third hour	0.000	0.000	0.000	0.000	0.000	000.0	000.0
The first hour	Before Aromatherapy	0.000	0.000	0.004	0.000	0.000	023.0	001.0
	The second hour	0.002	0.000	0.000	0.000	0.001	012.0	000.0
	The third hour	0.025	0.004	0.028	0.025	1	23.0	000.0
The second hour	Before Aromatherapy	0.000	0.000	0.000	0.000	0.000	000.0	000.0
	The first hour	0.002	0.000	0.002	0.000	0.001	012.0	000.0
	The third hour	1	1	1	1	0.043	28.0	85.0
The third hour	Before Aromatherapy	0.000	0.000	0.000	0.000	0.001	000.0	000.0
	The first hour	0.025	0.004	0.028	0.025	1	23.0	000.0
	The second hour	1	1	1	1	0.043	28.0	85.0

Discussion

Agitation in mechanically ventilated patients is one of the challenges posed in the intensive care units that Its control is important medically. The results of the study to determine the impact of aromatherapy on agitation and hemodynamic parameters in patients undergoing mechanical ventilation showed that aromatherapy with lavender reduces the amount of agitation. Despite we found no similar study, but the results are comparable to some of the studies which we mention them below. Cho et al. [2013] found that aromatherapy decreases anxiety level and blood pressure of patients in the intensive care unit and increases the quality of sleep [39].

In another study by Ju et al. (2013) was performed at the University Hospital Ayuljy Dajyun, showed that massage of aromatherapy has been effective in lowering blood pressure and increasing the quality of sleep in middle-aged women with hypertension [40].

Nategh et al., (2015) conducted a study titled "The effect of aromatherapy with lavender on anxiety, depression and physiological parameters of patients admitted to the cardiac intensive care unit". In the intervention group, two drops of lavender essential oil were dropped along his collar and the patient was asked to be slow breathing for 20 minutes. Between one and nine hours later, anxiety and depression in patients were investigated by a standard questionnaire HADS (Hospital Anxiety and Depression measurement scale). Systolic and diastolic blood pressure and heart rate were measured, 7 times before, during and after the intervention.

Multiple measurements during the study showed that lavender's aroma can significantly reduce patients' anxiety and depression [15]. Heidari et al (1392) in their study showed that inhaling

lavender extract can be used as an effective, affordable in terms of cost and time to reduce anxiety and systolic and diastolic blood pressure in patient's candidate for open heart surgery [28].
In a study by Seifi and colleagues performed in 2014 on the effect of aromatherapy with lavender on anxiety level of patients undergoing open heart surgery, concluded that Lavender had no significant effect on vital signs, except for systolic blood pressure [23].
In another study by Little et al [2014] on the effects of aromatherapy with lavender on vital signs and sleep quality of patients in ICU, showed that in the aromatherapy group compared to the control group, we observed a significant increase in sleep quality and decrease in blood pressure during 6 hours after treatment but have not been affected on the other hemodynamic parameters [41].
Among the demographic variables and basic information using Pearson and Spearman correlation test, only two variables GCS and number of admission days in ICU had an impact on the amount of agitation in patients. This means that amount of agitation is also enhanced by increasing the GCS and it reduced by increasing the number of days of hospitalization in ICU.
There was no significant difference in terms of gender and age in this study. In a study by Nobahar et al [1393] amount of agitation decreased significantly in men than in women and it was more in older patients [5]. According to the above conflicting results we offer in future studies examined the relationship between age and agitation with more samples.

Conclusion

The obtained results of study emphasized the impact of aromatherapy on agitation and hemodynamic parameters and aromatherapy were reported without loss. The results also showed that aromatherapy is effective on agitation and hemodynamic parameters in patients undergoing mechanical ventilation and reduces agitation, heart rate, breathing, blood pressure, temperature and oxygen saturation. Since the agitation is a common problem in mechanically ventilated patients admitted to the intensive care unit [34], this technique can be helpful as an uncomplicated, fast, simple and accessible procedure. Of course, individual differences such as thoughts, feelings and individual experiences of patients that are effective on occurrence or exacerbation of agitation during the study were the uncontrollable limits in this study. The majority of patients in this study aged 45-55 years and were under mechanical ventilation in the Intensive Care Unit which restricts generalizing the results to other sectors and patients. Therefore, it is suggested that similar studies done in other sectors and other age groups.
This study on the effects of aromatherapy with lavender on agitation and hemodynamic parameters in mechanically ventilated patients showed that aromatherapy decrease agitation and hemodynamic parameters. So, we can say that aromatherapy with lavender is not only effective but also perhaps a low-cost method to control this challenge in intensive care units.

Conflict of Interests

None.

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