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Original Research

Effectiveness of aromatherapy with inhaled lavender essential oil and breathing exercises on ECT-related anxiety in depressed patients

Zahra Emami Moghadam[a], Farideh Delmoradi[b], Seyedeh Zahra Aemmi[b,*], Saeed Vaghee[a], Hamidreza Behnam Vashani[a]

[a] Nursing and Midwifery Care Research Centre, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran
[b] Department of Nursing, Nursing and Midwifery School, Mashhad University of Medical Sciences, Mashhad, Iran

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ABSTRACT

Background and aims Electroconvulsive therapy (ECT) is considered a safe, effective, and significant treatment in patients suffering from a major depressive disorder. Anxiety caused by this invasive treatment may impose several side effects on patients. The purpose of this study was to evaluate the effectiveness of aromatherapy with inhaled lavender essential oil and breathing exercises on ECT-related anxiety in depressed patients.
Methods In this randomized controlled clinical trial, 90 depressed patients were selected and divided into three groups: aromatherapy, breathing exercise, and routine care using a random allocation method. Before undergoing ECT, the aromatherapy group was exposed to the inhaled lavender essential oil (n = 30), the breathing exercise group performed the breathing exercises (n = 30), and the routine care group received routine care (n = 30). Before (20 min) and after the intervention (30 min later), patients' anxiety was assessed using Beck Anxiety Inventory.
Results After the intervention, the results revealed that anxiety score changes were statistically significant among the three groups ($p < 0.001$). In addition, it was found that the patients' mean anxiety scores significantly decreased in the aromatherapy and breathing exercise groups compared to with the pre-intervention scores ($p < 0.001$).
Conclusion Aromatherapy with inhaled lavender essential oil and breathing exercises can be considered by clinical nurses as simple, applicable, and effective interventions to reduce ECT-related anxiety in depressed patients.

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Introduction

Major depressive disorder (MDD) is considered a severe mood disorder, the leading cause of disability, and a serious health condition affecting many people worldwide.[1] According to the World Health Organization's (WHO) report, more than 264 million people of all ages suffer from depression, leading to the death of 800,000 people by suicide annually.[2] The results of a systematic review and meta-analysis study revealed that the overall estimation of MDD prevalence was 4.1% in the general population with a higher incidence in women than in men (1.95 times).[3] As the most common mental illness and growing public health concern, this disorder can affect sufferers' individual, social, and professional lives, reduce their quality of life and increase their mortality rate.[3, 4]

The main symptoms and criteria needed to diagnose this disorder are mentioned in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5).[5] Due to the recurrent and lethal (suicidal thought and attempt) nature of this disorder, an effective, timely, and urgent intervention and treatment are required.[4] A number of effective and standard psychological and pharmacological treatments are suggested for this disorder. Behavioral activation, cognitive behavioral therapy, and interpersonal psychotherapy are among psychological treatments, and antidepressant drugs, such as selective serotonin reuptake inhibitors (SSRIs) and tricyclic antidepressants (TCAs), are classified under pharmacological treatments. Electroconvulsive therapy (ECT) is the first-line and fastest-acting antidepressant treatment in patients who are resistant to antidepressant drugs or psychotherapy, pregnant, or in the elderly.[2, 6, 7]

ECT is a simple, short, and invasive brain electrical stimulation technique performed under general anesthesia to produce a generalized seizure and alleviate symptoms caused by the most severe psychiatric disorders, such as depression or bipolar disorder. Despite the benefits of this technique, it is considered an unpleasant and dreadful intervention due to its invasive nature from the patients' and their families' perspectives. ECT recipients have to endure and experience ECT-induced side effects, including memory problems, cardiovascular changes, nausea, headache, muscle aches, and anxiety.[6, 8]

* Corresponding author.
E-mail address: aammiz1@mums.ac.ir (S.Z. Aemmi).

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Anxiety is defined as a common response and a feeling of fear that occurs when a person faces a threatening or stressful situation.[9] ECT–related anxiety is a highly prevalent phenomenon experienced by 14% to 75% of patients that often causes refusal or discontinuation of treatment.[10] From the patients' perspective, the main causes of ECT-related anxiety are general anesthesia, memory impairment, and electric current.[11]

There are non-pharmacological interventions to reduce ECT–related anxiety, such as the presence of a patient's relatives during the first stages of the procedure, relaxation techniques, movies, and media, face-to-face or multimedia education about ECT, animal-assisted therapy (AAT), and music therapy.[11-14]

In addition, aromatherapy with essential oils is one of the recommended non-pharmacological complementary and alternative medicine strategies applied in nursing for symptom clinical management such as anxiety alleviation in hospitalized patients.[15] The results of studies demonstrated that the therapeutic use of aromatic herbs, such as lavender, reduced the experience of anxiety in patients due to its calming effect and sedative properties and was associated with fewer adverse effects.[15-17]

The anxiolytic effect of the lavender is attributed to communicating signals to the olfactory system, stimulating the central nervous system to release neurotransmitters, such as encephalin, serotonin, and endorphins, and affecting the neurotransmitter pathways.[9, 15, 16] Furthermore, many other benefits, namely tranquilizing, anti-seizure and epileptic, anti-pain, neuroprotective action, anti-addictive, anti-bacterial, and anti-fungal features are reported for this valuable herb.[9] The result of a meta-analysis demonstrated that lavender essential oil had the best efficacy, compared with other essential oils (rose, citrus), in alleviating anxiety, especially temporary anxiety caused by diverse reasons.[9]

On the other hand, breathing is intimately linked with mental functions,[18] and clinical studies have suggested that the use of slow breathing techniques, Pranayama, can increase patients' comfort, relaxation, pleasantness, vigor, alertness, and performance and reduce symptoms of arousal, anxiety, depression, anger, and confusion in them.[18, 19]

Nevertheless, limited and scarce studies are providing clear information on the effectiveness of inhaled lavender essential oil alone or in comparison with other non-pharmacological interventions, such as breathing exercises, on ECT-related anxiety in depressed patients. Therefore, this study aimed to compare the effectiveness of aromatherapy with inhaled lavender essential oil and breathing exercises on ECT-related anxiety in depressed patients.

Methods

Study design, setting, and sampling

This randomized controlled clinical trial was conducted on 90 outpatients and inpatients with the confirmed diagnosis of depression. All the patients were candidates for ECT in Ibn-e-Sina psychiatric hospital from February 2019 to June 2019. Ibn-e-Sina psychiatric hospital is affiliated to the Mashhad University of Medical Sciences, Iran, and is a subspecialty teaching hospital. Due to the lack of a similar study, the largest sample size (30 patients in each group) related to anxiety was calculated based on effect size = 0.3, power = 0.8 and alpha value = 0.05, using PASS (Power Analysis and Sample Size) software for one-way analysis of variance (ANOVA).

Inclusion criteria included: age between 18 and 60 years old, diagnosed with depression, the Beck Anxiety Inventory (BAI) score greater than 7, no odor and hearing problems, no history of ECT treatment, ability to speak and understand Persian, no physical illness leading to cognitive impairment, no history of known anxiety disorders, drug abuse, or anti-anxiety medication intake 24 h before the study, and willingness to participate in the study. Patients allergic to lavender (symptoms such as burning, hives, itching, and redness) were excluded from the study.

A total of 92 depressed patients were selected consecutively and randomly divided into three groups of aromatherapy (n = 30), breathing exercise (n = 30), and routine care (n = 32) (Fig. 1). To avoid any possible exposure of the other two groups to the released scent of the aromatherapy group (diffusion effect), sampling for each group was performed in a separate room. The patients, who met the eligibility criteria, were assigned to the selected group based on a random number table. To reduce the bias, the randomization process was performed by an individual with no involvement in the interventions and evaluating the interventions' effectiveness.

Data collection tools

Patients' demographic information was obtained using a questionnaire. The questionnaire included information on the patient's age, gender, marital and employment status, place of residence, education level, and medication use. The BAI was used in this study to evaluate ECT–related anxiety in patients. This 21-item self-report instrument assesses the severity of clinical anxiety levels in adolescents and adults. Its scoring is based on a four-point Likert scale (0= not at all and 3= severe), and the total score range is between 0 and 63.

A higher total score indicates more severe anxiety symptoms, and the standardized cutoffs are as follows: 0–7: minimal anxiety, 8–15: mild anxiety, 16–25: moderate anxiety, and 30–63: severe anxiety.[20] The validity and reliability of the Persian version of BAI have been confirmed in studies conducted in Iran.[21, 22] In the present study, its correlation coefficient was 0.79 (inter-rater reliability).

Data collection process

In the aromatherapy group, the depressed patients inhaled two drops (0.1 ml per drop) of lavender essential oil 100% (produced by Barij Essence Co. Iran, Kashan). The aerial parts of the *Lavandula angustifolia* plant were used by this company, and its essential oil was taken by Clevenger. After GC (Gas Chromatography), the compounds were limonene, cineole, linalool, and linalyl acetate. A sterile gauze pad (5 * 5 cm) wetted with two drops of the lavender solution was pasted on the patients' shoulder, they inhaled it for 3–5 min before ECT.

The breathing exercise group was provided with a completely calm and quiet environment and exposed to minimized environmental stimuli (such as a dim room and limited commuting to the patient's room). Afterward, the researcher taught patients to do slow breathing techniques for 10 min before ECT. In this technique, the patients were asked to be in a comfortable position (sitting or lying down), count the numbers from 1 to 5 during inspiration and from 6 to 10 during expiration, and take a slow and deep inhalation through the nostril and exhalation through the mouth. Due to focusing on breaths, their respiratory rate was diminished and maintained at six breaths/min. Both inspiration and expiration were performed over 5 s.[23] In the routine care group, patients received routine care, including nothing by mouth (NPO), medication restrictions the night before, and nurse training about the ECT process.

Consequences

To assess the ECT-related anxiety, patients in all three groups completed the BAI before (20 min) and after the intervention (30 min later).

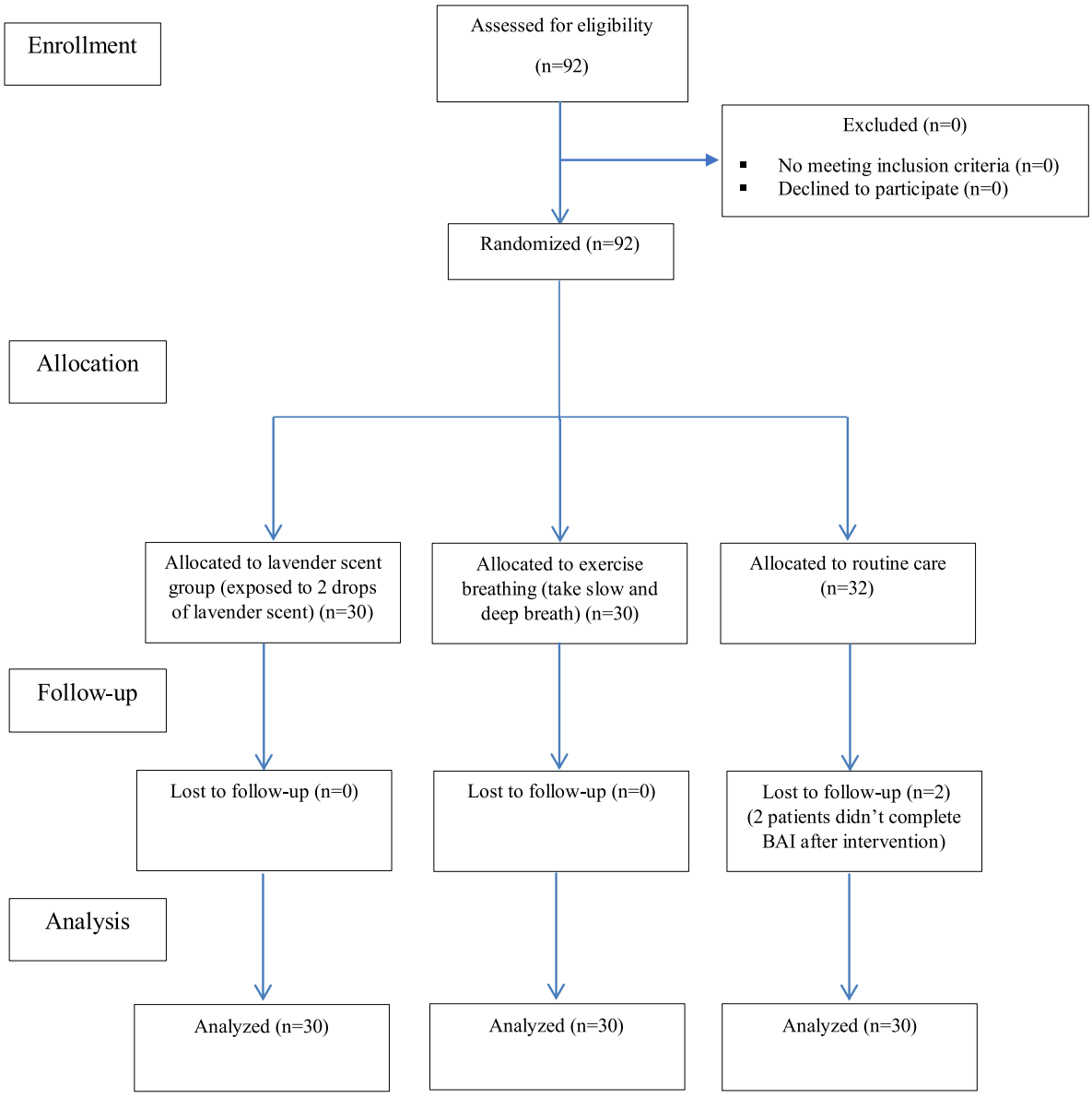

Fig. 1. The CONSORT flowchart of the enrolment, groups' allocation, interventions, follow-up, and final analysis.

Data analysis

SPSS version 20 (SPSS, Chicago, Illinois, USA) was used for data analysis, and the significance level was considered 0.05. Qualitative variables were analyzed by frequency and percentage; whereas, mean and standard deviation were used to analyze the quantitative variables. The normality of the data distribution was examined using the Kolmogorov-Smirnov test. We used the non-parametric tests for non-normally distributed data. In addition, a one-way ANOVA was used to compare the mean difference in anxiety scores among the three groups. Paired *t*-test was also employed to examine intragroup comparisons.

Finding

Baseline characteristics of the participants

Baseline demographic data and clinical features of the study participants are shown in Table 1. There was no significant difference among the three groups in terms of the basic characteristics ($p > 0.05$). The patients were aged between 18 and 60 years old. The mean age of patients was 35.3 ± 13.6 in the aromatherapy group, 37.9 ± 9.4 in the breathing exercise group, and 36.3 ± 10.1 in the routine care group. As shown in Fig. 1, two patients were subsequently excluded from the study due to the failure to complete the BAI after the intervention.

Clinical response and safety

According to Table 2, there was no significant difference among study groups regarding anxiety score changes at the start of the study ($P = 0.931$). After the intervention, however, the findings revealed that anxiety score changes were statistically significant among the three groups ($p < 0.001$). It was also found that the patients' mean anxiety scores in the aromatherapy and breathing exercise groups significantly decreased in comparison with pre-intervention scores ($p < 0.001$); however, it was not significant in the routine care group ($P = 0.102$). No major adverse effect was reported by the patients during the trial or follow-up.

Table 1
Demographic Data.[a]

Variable	Groups			P value*
	Inhaled lavender essential oil	Breathing exercises	Control	
Age (year)	35.3 ± 13.6	37.9 ± 9.4	36.3 ± 10.1	0.191
Gender				
Male	15 (50)	14 (46.7)	15 (50)	0.998
Female	15 (50)	16 (53.3)	15 (50)	
Marital status				
Single	9 (30)	6 (20)	6 (20)	0.419
Married	19 (63.3)	21 (70)	23 (76.7)	
Widow or divorced	2 (6.7)	3 (10)	1 (3.3)	
Education level				
Illiterate	5 (16.7)	1 (3.3)	6 (20)	0.149
Under diploma	8 (26.7)	11 (36.7)	12 (40)	
Diploma	8 (26.7)	9 (30)	10 (33.3)	
Higher education	9 (30)	9 (30)	2 (6.7)	
Employment status				
Housewife	7 (23.3)	6 (20)	11 (36.7)	0.345
Unemployed	7 (23.3)	4 (13.3)	8 (26.7)	
Employee	8 (26.7)	8 (26.7)	2 (6.7)	
Laborer	7 (23.3)	9 (30)	8 (26.7)	
Student	1 (3.3)	3 (10)	1 (3.3)	
Residence status				
City	25 (83.3)	28 (93.3)	19 (63.3)	0.103
Village	5 (16.7)	2 (6.7)	11 (36.7)	
Medications used				
Valproate	30 (100)	20 (66.7)	23 (76.7)	0.456
Quetiapine	19 (63.3)	18 (60)	19 (63.3)	
Sertraline	16 (53.3)	9 (30)	10 (33.3)	
Inderal	4 (13.3)	9 (30)	7 (23.3)	
Fluoxetine	11 (36.7)	4 (13.3)	6 (20)	
Fluvoxamine	8 (26.7)	3 (10)	3 (10)	
Other	19 (63.3)	10 (33.3)	3 (10)	

[a] Values are expressed as frequency (%) or Mean ± SD.
* Chi-square test was performed for sex, marital, residence and employment status, education level, and medications used, while Kruskal Wallis test was performed for age.

Table 2
The comparison of the levels of anxiety before and after the intervention.[a]

Variable		Groups			P value*
		Inhaled lavender essential oil (n = 30)	Breathing exercise (n = 30)	Control (n = 30)	
Anxiety	Before	29.0 ± 10.0	29.9 ± 9.6	29.3 ± 9.5	F = 0.1 P = 0.931
	After	18.3 ± 8.4	19.5 ± 8.8	28.4 ± 9.6	F = 11.9 P < 0.001
P-value**		t = 8.4 P < 0.001	t = 6.6 P < 0.001	t = 1.6 P = 0.102	

[a] Values are expressed as Mean ± SD.
* One-way analysis of variance.
** Paired t-test.

Discussion

To our knowledge, this is the first clinical trial that compared the effectiveness of aromatherapy with inhaled lavender essential oil and breathing exercises on ECT-related anxiety in depressed patients. The results of this study can add to the existing body of knowledge in the field of complementary therapies in the clinical setting, in favor of both patients and nurses. According to our results, both interventions, namely aromatherapy with inhaled lavender essential oil and breathing exercise, effectively decreased the ECT-related anxiety scores in depressed patients. The lower ECT-related anxiety scores in the aromatherapy group are clinically significant and valuable.

In line with the findings of the present study, the results of a systematic review and meta-analysis demonstrated that inhalation of lavender essential oil was an effective way to reduce anxiety levels and suggested this intervention as a simple, safe, and cost-effective treatment strategy in the clinical setting.[24] Additionally, the results of another systematic review revealed that Pranayama (slow breathing) could help reduce psychological problems, such as anxiety, in patients with cancer and cardiovascular disease.[25]

Most routine invasive procedures, such as ECT, can affect patients' psychological indices. Nurses have a crucial role in effectively preventing and managing patients' anxiety as the standard of care and a human right. Based on another research's findings, there are some non-pharmacological interventions to alleviate ECT-related anxiety in patients. A study in Iran demonstrated that educational methods, such as face-to-face (individual) and multimedia (through CD) training methods, effectively reduced the ECT-related anxiety in patients suffering from mood disorders. However, the decline in anxiety was higher in the face-to-face educational method.[13]

Furthermore, it was shown that the provision of supportive nursing care in the intellectual, emotional, and physical domains was effective in reducing the anxiety of patients receiving ECT.[26] The results of another study revealed that music therapy could significantly reduce anxiety levels in patients receiving ECT.[14]

Another technique suggested in studies to reduce ECT-related anxiety in affected patients is the provision of environmental intervention, such as AAT. A study showed that an aquarium in the waiting room before ECT could reduce patients' pre-treatment anxiety.[27] In another study, patients waiting for ECT had interaction with a therapy dog that led to a reduction of their fear by 37% and anxiety by 18%.[12]

There are some limitations in the present trial, one of which is that we assessed the anxiety using the self-administered questionnaire (physiological method), creating the potential for the overestimation of the anxiety by the patients. Physiological and hormonal methods for anxiety assessment are recommended for future studies. Another limitation of our study was the lack of control over individual differences among the patients (gender, etc.) that might also affect their anxiety scores. We used the random allocation and routine care group to minimize these differences.

Conclusion

The findings of the present study indicated that using aromatherapy with inhaled lavender essential oil and breathing exercises, as simple, inexpensive, and applicable nursing care, could reduce the ECT-related anxiety in depressed patients. However, a wide range of research is recommended and needed in this area. In addition to reducing anxiety, these non-pharmacological measures could increase the quality of nursing care and make this unpleasant experience more tolerable for patients.

Ethical considerations

The Research Ethics Committee of Mashhad University of Medical Sciences approved the study process (IR.MUMS.NURSE.REC.1398.013), and the protocol was registered by the Iranian Registry of Clinical Trials (No. 20190518043618N1). The research objectives and process were explained to all participants and their guardians, and written informed consent was obtained from the patient guardians. All of them were informed of voluntary participation and the right to withdraw from the study at any time.

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Authors' contribution

Study concept and design: Zahra Emami Moghadam, Farideh Delmoradi, Saeed Vaghee and Hamidreza Behnam Vashani; acquisition of data: Farideh Delmoradi; analysis and interpretation of data: Zahra Emami Moghadam, Farideh Delmoradi, Hamidreza Behnam Vashani, Seyedeh Zahra Aemmi; writing - original draft: Seyedeh Zahra Aemmi; critical revision of the manuscript for important intellectual content (review & editing): Seyedeh Zahra Aemmi; study supervision: Zahra Emami Moghadam.

Declaration of Competing Interest

The authors have no conflicts of interest to declare.

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