

Lavender Scent Inhalation and Anxiety in Type II Diabetes Patients: Effects, Examination and Analysis

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Abstract

Objective: The purpose of the current study was to comparatively study the effect of inhaling the scent of lavender essential oil on the anxiety levels of type II diabetic patients visiting the Parsian Diabetes Clinic in Tehran.

Method: The current study employed a double-blind, randomized clinical trial design with a research sample of 60 individuals visiting the diabetes clinic. Patients were divided into two anxiety treatment groups: inhaling lavender essential oil (intervention group) and paraffin (control group). Beck Anxiety Inventory (BAI) was used to measure anxiety before and after intervention and the follow-up period. The data was analyzed using SPSS version 26 software.

Results: The results of the study revealed that the average anxiety scores in the post-test and follow-up decreased compared to those of the pre-test ($F=26.615$, $P<0.05$). Furthermore, the findings indicated a significant difference in anxiety scores of the post-test and follow-up, compared to the pre-test, between the intervention and control groups ($F=56.14$, $P<0.05$).

Conclusion: the results of the study revealed that inhaling lavender essential oil can reduce anxiety in type II diabetes patients.

Keywords: Lavender, type 2 diabetes, anxiety, aromatherapy

INTRODUCTION

Type 2 diabetes is among the more prevalent health-related complications in Iran and the world, which is chronic, progressive and costly and leads to many other adverse consequences. It is one of the significant health challenges that widely affects the lives of patients and causes many physical diseases, including kidney [1], retina [2], and heart [3] diseases. Furthermore, it is shown to put excessive psychological pressure on the affected people, as they assume they have to deal with it for the rest of their lives. Sustained periods of mental pressure lead to various mental disorders, including depressive disorders [4] and anxiety disorders [5]. Evidence from the literature suggests that between 8 and 40% of people with diabetes are suspected of having a mental disorder [6].

Numerous studies have established that anxiety disorders are more prevalent in type 2 diabetes than in healthy people [7]. The most common type of anxiety disorder in this patient is generalized anxiety disorder (GAD). Although there is no difference in the prevalence of anxiety symptoms among type 1 and type 2 diabetic patients, it is more common in women than in men [8]. As such, conducting therapeutic interventions can be paramount to alleviating anxiety in diabetes patients.

Moreover, anxiety is a significant barrier that reduces treatment adherence, further exacerbating the medical challenges and endangering patients' health, sometimes even leading to premature death [9]. Therefore, maintaining mental health and controlling anxiety are paramount in such patients.

Thus far, studies have explored a plethora of non-pharmacological methods as complementary medicine to reduce anxiety for various diseases and conditions, including massage therapy [10], sports exercises [11], acupuncture [12], music therapy [13], and yoga [14]. Some of these methods, although promising, are plagued with limitations. Inhalation aromatherapy, on the other hand, is a method that has fewer restrictions and a higher realization capacity. Given the distinct features and limitations of diabetic patients, it can be readily employed in medical centers as a simple and cost-effective method. Aromatherapy uses plant and essential oils for physical and mental health [15].

Studies have frequently revealed that aromatherapy has positive effects in several ways, including antimicrobial, soothing, sedative, antispasmodic, anti-anxiety, and anti-depressive [16]. *Lavandula angustifolia*, more commonly known as lavender, is a flowering plant in the mint family, Lamiaceae. Its major phytochemicals are Linalool and Linalyl Acetate. Linalool acts as a sedative on gamma-aminobutyric acid receptors in the central nervous system [17]. Lavender itself has anti-bacterial, anti-fungal, anti-flatulent, muscle relaxant, analgesic [18], anti-anxiety [19], and anti-depressant [20] features, while improving heart function and stimulating blood circulation and mental relaxation [21]. It also has a high absorption rate; when used topically, it can be traced in the blood within the first 5 minutes. It proved to be not addictive and harmful in case of sustained periods of consumption. The American National Library of Medicine has reported that the effects of lavender medicinal capsules in reducing anxiety were equal to anti-anxiety drugs such as Lorazepam and paroxetine, which are selective serotonin reuptake inhibitors (SSRI) that are prescribed for generalized anxiety disorders [22]. Studies have shown that the effect of lavender aromatherapy on anxiety stems from the psychological effects of the aroma, along with the physiological effects of essential oils in the limbic system [23].

Nevertheless, studies have remained inconclusive on the effect of this plant on the anxiety and stress of patients. That is, Lehrner et al. [24] argued that aromatherapy using lavender essential oil significantly reduces the anxiety of patients, while Muzzarelli et al. [38] revealed that aromatherapy with lavender essential oil had no significant effect on the preprocedural anxiety of patients undergoing colonoscopy treatment procedure [25]. Likewise, Itai et al. [26] reported that lavender essential oil had no psychological effect on the stress levels of acute hemodialysis patients [26]. Sebai et al. [27] showed that lavender (*Lavandula stoechas* L.) essential oils attenuate hyperglycemia and protect against oxidative stress in alloxan-induced diabetic rats. As such, the purpose of the current research was to examine the effect of lavender aromatherapy on the anxiety of type 2 diabetic patients.

METHODOLOGY

The current study employed a double-blind, randomized clinical trial design on patients visiting the Parsian diabetes clinic. The research population consisted of all diabetic patients. The research sample was retrieved using the following inclusion criteria: diabetic patients willing to participate in the study, having a proper sense of smell, no smoking history, no history of respiratory diseases, asthma or allergies, no headaches, not being pregnant or breastfeeding, having a score of at least 8 in the Beck Anxiety Inventory (BAI). Participants who became unwilling to continue participating in the research and experienced stressful events that happened to them reported symptoms of sensitivity and allergy to the fragrance, drug addiction, death of the patient, or requiring surgery were excluded from the study. The participants were also required not to use perfume or cologne on the research days. The sample size was determined to be 60 participants based on Rivaz et al. [28], who were selected using purposive sampling and randomly assigned to intervention and control groups. The procedures of random selection and administration of lavender and placebo to patients were performed by a researcher other than the attending physician, hence the double-blind design. At first, 70 patients were included in the study, and five patients were excluded from each group during the follow-up period. Finally, the results obtained on 60 patients were analyzed using SPSS v. 26. The tools of the current study were demographic and medical information questionnaires and Beck Anxiety Inventory (BAI). The latter is a 21-item, 4-point Likert scale designed by Beck et al. [29] for measuring the level of anxiety, each item of which reflects one of the symptoms of anxiety. Symptoms are commonly experienced by two groups, namely (1) those who are clinically anxious and (2) those who are in anxiety-provoking situations. The participants should read the list of symptoms and score them quantitatively. The range of scores is 0 to 63.

High scores indicate more intense anxiety [30]. Beck et al. [29] calculated the internal consistency of the scale to be between 0.73 and 0.92. They reported similar reliability for the short version. Groth-Marnat [31] determined that the test-retest reliability of the BAI is between 0.48 and 0.86. In Iran, Cronbach's alpha coefficient for this questionnaire was determined to be 0.92 [30]. This questionnaire is designed to measure anxiety in teenagers and adults. Each item measures one of the common anxiety symptoms, i.e., mental symptoms, physical symptoms, and panic. Content validity, construct validity, concurrent validity, predictive validity, and factorial validity have

been measured for this test, all of which indicate the high efficiency of this tool in measuring the intensity of anxiety [31].

Table 1: BAI scoring range

Score range	Level of anxiety
0-7	None or negligible
8-15	Low
16-25	Medium
26-63	High

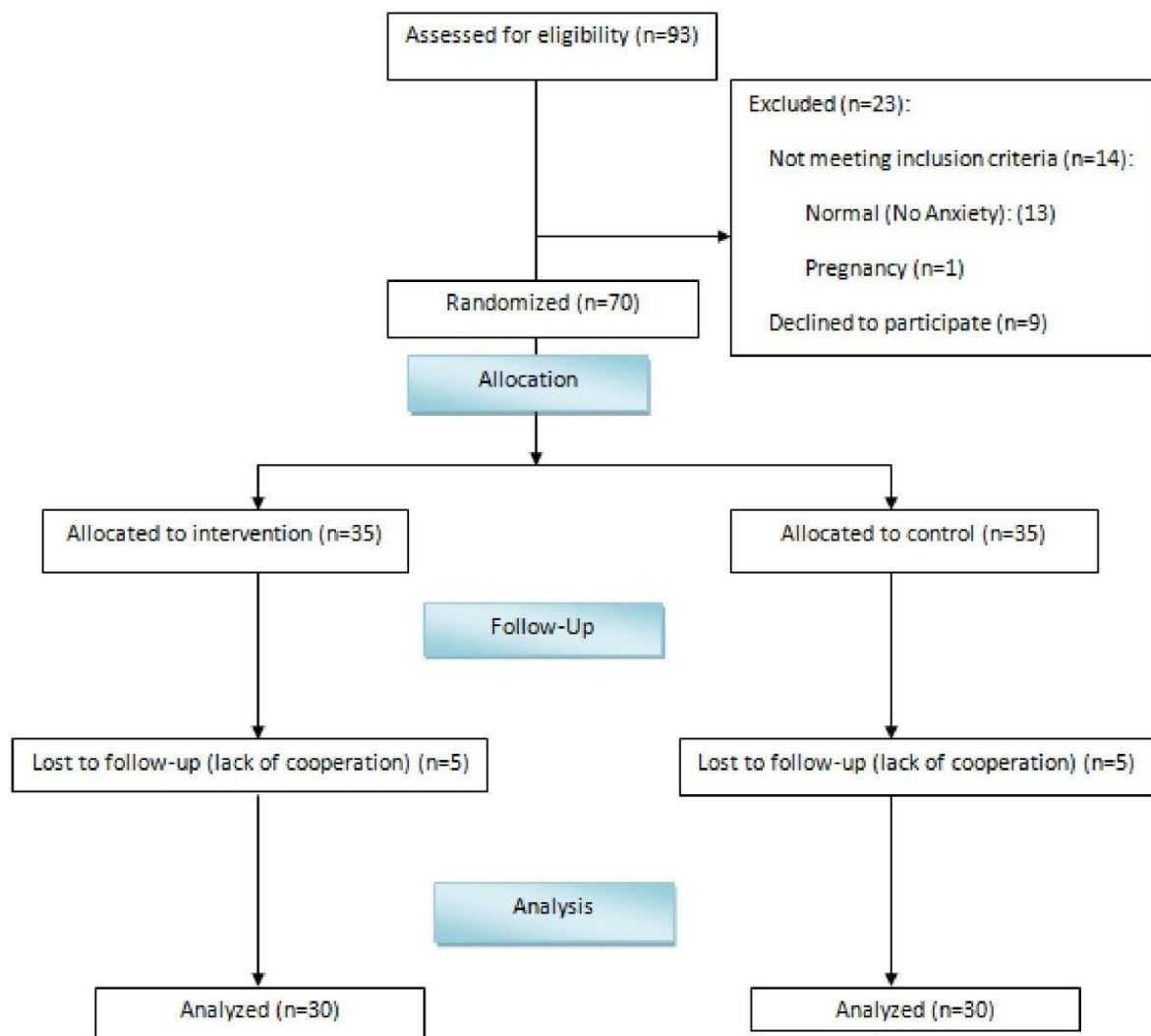


Figure 1: Random allocation of samples in experimental and control groups

Sampling was performed only after offering information regarding the procedures and methods of conducting the study and its objectives, obtaining written consent from eligible patients, and assuring them of the confidentiality of the information. BAI questionnaires were administered to both groups. Then the patients in the test group were subjected to aromatherapy using lavender essential oil prepared by Barij Essance Pharmaceutical Company, which a quality certificate of ISO 9001 ISO 17025 ISO/IEC. The intervention group patients received the treatment 3 days of the week, that is, once every Saturday, Monday and Wednesday, for 4 weeks [32]. To this end, a cotton ball soaked in 3 drops of lavender essential oil was attached to the neck collar of the patient and the patient was instructed to breathe normally for 15 minutes [32] and not use perfume before or during the intervention. All patients were placed in a semi-sitting position while inhaling the essential oil. Patients in the control group also inhaled liquid paraffin [33] as a placebo. The dose, duration and administration method for the paraffin inhalation group were the same as for patients in the lavender group. In the intervention group, patients who reported to be sensitive to any dose were excluded from the study. At the end of the fourth week, the BAI questionnaire was given to the patients like the pre-test, while the follow-up phase was performed two months after the. Descriptive statistics of mean, standard deviation and repeated-measures test were used to analyze quantitative data.

RESULTS

The results of the present study showed that the experimental and control groups were similar in terms of demographic variables such as age, gender, marital status, history of diabetes, educational qualification, and occupation, which are summarized in Table 3. The mean (standard deviation) of anxiety during the pre-test, post-test, and follow-up periods were respectively 30.30 (9.58), 23.73 (8.73), 21.83 (10.57) for the experimental group and 30.70 (7.92), 29.93 (8.85), 29.33 (9.47) for the control group (Table 4). Findings from Table 5 confirm the homogeneity of correlation coefficients of the variables, as the resulting F-value is not statistically significant at the $p < 0.05$ level, hence, the homogeneity of the covariance matrix. Table 6 further reveals that the error variance is homogeneous in the studied groups, as the resulting F-value is not statistically significant at the $p < 0.05$ level for this test. According to Table 7, the assumption of the equality of covariances has been rejected ($P < 0.05$). Considering that among the main assumptions of repeated measure analysis, two criteria, namely Mbox and Levene's criteria, and the local sphericity are violated, the Huynh-Feldt test is used to analyze the data related to this research, the results of which are shown in Table 8. According to the results of repeated variance analysis of anxiety scores (Table 8), the effect of time ($F=26.615 < 50.0$) and the interaction effect of groups and time are significant ($F=14.560 < 50.0$). These results indicate that lavender essential oil inhalation treatment scores significantly change during post-test, pre-test, and follow-up periods. Bonferroni post-hoc test was used to identify these changes, the result for which is summarized in Table 9. The findings indicate that there is a significant difference between the pre-test and post-test ($P < 0.05$) and between the pre-test and follow-up, but there is no significant difference between the post-test and follow-up ($P = 0.055$).

Also, the findings indicate that lavender essential oil inhalation treatment significantly reduced anxiety in the experimental group compared to the control group ($P < 0.05$), which is evident from Table 10. The data were analyzed using pairwise comparison through the Bonferroni post-hoc analysis, summarized in Table 11. Also, the interaction effect of group and time showed that lavender essential oil inhalation treatment could significantly reduce anxiety in the experimental group compared to the control group in the post-test and follow-up compared to the pre-test ($F=14.56$, $P < 0.05$). Details are plotted in Figure 2.

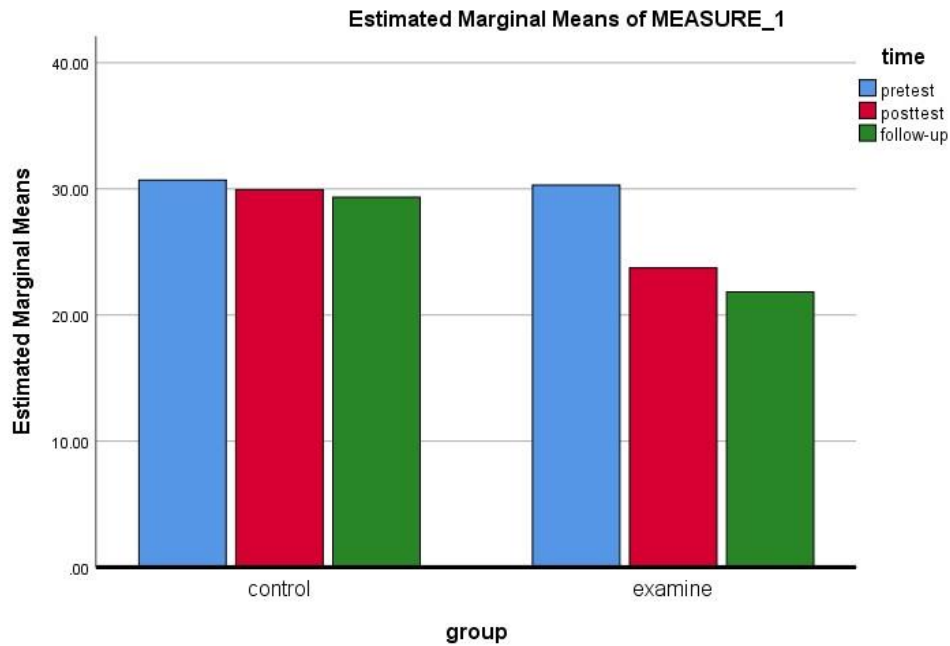


Figure 2: The interaction effect of group and time

Table 3: Demographic information of research participants

Variable	Levels	Group		Chi-Square	p
		Control	Experimental		
Age	18-25	2	4	3.015	0.55
	26-35	3	5		
	36-45	5	7		
	46-55	8	4		
	56-65	12	10		
Sex	Female	19	23	1.27	0.26
	male	11	7		
Marital status	married	21	25	1.49	0.22
	single	9	5		
Employment status	employed	22	20	0.317	0.57
	unemployed	8	10		
Medical History of diabetes	3-7	12	11	0.751	0.86
	8-12	10	8		
	13-19	6	8		
	Upper 19	2	3		
Education level	Diploma	8	10	1.86	0.6
	B.S	15	11		
	M.S	5	8		
	PhD	2	1		

Table 4: Descriptive Statistics

	Group	Mean	Std. Deviation	N
Pre-test	Control	30.7000	7.92269	30
	Intervention	30.3000	9.58141	30
	Total	30.5000	8.71877	60
Post-test	Control	29.9333	8.85490	30
	Intervention	23.7333	8.73729	30

	Total	26.8333	9.26478	60
Follow-up	Control	29.3333	9.47350	30
	Intervention	21.8333	10.57676	30
	Total	25.5833	10.64893	60

Table 5: Box's M test results

Box's M	F	df1	df2	sig
5.944	0.935	6	24373.132	0.468

Table 6: Levene's Test of Equality of Error Variances

		Levene Statistic	df1	df2	Sig.
pre-test	Based on Mean	.110	1	58	.741
Posttest	Based on Mean	.270	1	58	.605
Follow-up	Based on Mean	.163	1	58	.688

Table 7: Mauchly's Test of Sphericity

Within-Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon		
					Greenhouse-Geisser	Huynh-Feldt	Lower bound
time	.548	34.306	2	.00	.689	0.712	0.500

Table 8: Tests of within-subjects effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta squared
time	783.611	1.42	550.277	26.615	.00	0.315
time * group	428.700	1.42	301.047	14.560	.00	0.201
Error(time)	1707.689	82.59	20.676			

Table 9: Pairwise Comparisons

(I) time	(J) time	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
pretest	posttest	3.667	.628	.000	2.118	5.215
	Follow-up	4.917	.901	.000	2.695	7.139
posttest	pretest	-3.667	.628	.000	-5.215	-2.118
	Follow-up	1.250	.515	.055	-.020	2.520
Follow-up	pre-test	-4.917	.901	.000	-7.139	-2.695
	posttest	-1.250	.515	.055	-2.520	.020

Table 10: Tests of between-subjects effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	137503.472	1	137503.472	608.354	.000	.913
group	994.050	1	994.050	4.398	.040	.070

Error	13109.478	58	226.025			
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Table11: Pairwise Comparisons

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
control	examine	4.700*	2.241	.040	.214	9.186
examine	control	-4.700*	2.241	.040	-9.186	-.214

DISCUSSION

The results of the current study revealed that administering lavender inhalation treatment effectively reduces anxiety. The results further illustrated that the experimental group had a significant decrease in their anxiety scores in the post-test and follow-up compared to the control group.

In this regard, considering that there are no studies on the effect of lavender on reducing anxiety in type 2 diabetic patients, the research findings can be compared with similar studies. As such, Kasar et al. [34] examined the effect of inhalation aromatherapy on pain, anxiety, comfort, and cortisol levels during trigger point injection in 66 patients. They concluded that aromatherapy is cost-effective, non-invasive treatment that can be used for people with myofascial pain syndrome during trigger point injections, as it alleviates anxiety and stress.

Babatabar Darzi et al. [35] examined the effect of aromatherapy with rose and lavender on anxiety, surgical site pain, and extubation time after open-heart surgery in a double-center randomized controlled trial. They reported that Aromatherapy with rose and lavender led to a significant difference in anxiety among the studied groups.

Zaremobini [36] examined the effects of lavender oil inhalation on the level of anxiety during the first stage of labor in primigravida women and showed that lavender treatment significantly reduces anxiety in rats in the early stages of their pregnancy. These studies are consistent with the findings of the current study.

In explaining these findings, it can be said that Lavender can reduce anxiety in various diseases by acting on the GABA neurotransmitter [17].

Nevertheless, the results of the current study were inconsistent with those of some other similar studies [37, 38]. The perceived lack of effect therein can be attributed to numerous factors. Different dosages, concentrations of the essential oil, and duration of drug inhalation in those studies compared to the current study.

CONCLUSION

The results of the current study indicated the effect of aromatherapy using a lavender essential oil on reducing the anxiety of type 2 diabetic patients. Since lavender aromatherapy is cost-effective, safe, and simple, it can be used as a complementary treatment for alleviating the anxiety and pain of type II diabetic patients.

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