Original Article

The effect of aromatherapy with lavender essential oil on sleep quality in patients with major depression

Zahra Samadi[1], Yadollah Jannati[1], Angela Hamidia[2], Reza Ali Mohammadpour[3], Ali Hesamzadeh[4]

[1]Department of Psychiatric Nursing, Nasibeh Faculty of Nursing and Midwifery, Mazandaran University of Medical Sciences, [3]Department of Biostatistics, Health Sciences Research Center, Addiction Institute, Medical School, Mazandaran University of Medical Sciences, [4]Department of Community Health Nursing, Behshahr Faculty of Nursing, Mazandaran University of Medical Sciences, Sari, [2]Social Determinants of Health Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran

ORCID:
Zahra Samadi: 0000-0001-8472-6922;
Yadollah Jannati: 0000-0001-7574-5873

Abstract

Context: Depression is one of the most common psychiatric disorders, and poor sleep quality is a risk factor for it.

Aims: This study aimed at determining the effect of aromatherapy with lavender essential oil on sleep quality of patients with major depression.

Settings and Design: This single-blinded randomized clinical trial in Psychiatric Clinic in Yahya Nejad Hospital, Babol, Iran, during 2019.

Materials and Methods: Eighty major depressive patients with sleep disorder were recruited from those referred to Psychiatric Clinic in Babol City, Iran. They were assigned into intervention and control groups (forty participants in each group). The intervention group inhaled lavender essential oil and the control group received almond oil as placebo. Sleep quality of the participants was measured before and after the intervention.

Statistical Analysis Used: Data analysis was performed employing statistical tests including Chi-square, Kolmogorov–Smirnov, ANCOVA, independent t-test, and paired t-test.

Results: The intervention and control groups were homogeneous in terms of demographic characteristics and the mean score of sleep quality before the intervention ($P > 0.05$). The patients in the intervention group had a better quality of sleep comparing to that in the control group, and the difference was statistically meaningful ($P = 0.001$).

Conclusion: Aromatherapy with lavender essential oil has positive effects on sleep quality in depressed patients. It can be used as a noninvasive complementary method to improve sleep quality in patients with major depression.

Keywords: Aromatherapy, Depression, Herbal medicine, Lavender essential oil, Sleep quality

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INTRODUCTION

Depression is a global health problem and the leading cause of inability and mental diseases.[1] Depression leads to mental and physical tensions in individuals and society and results in declined life of quality, disability, and even death.[2] It is estimated that the prevalence of depression in general population is between 15% and 25%.[3] Similarly, about 15%–25% of the population in Iran suffers from mild-to-severe depression.[4] One of the well-known features of depression is sleep disorder, that is, frequent unfavorable changes in sleep such as trouble in falling asleep, maintaining asleep, and early wake-up in the morning.[5,6] These symptoms can be seen in 75% of the depression patients.[7] There is a reciprocal relationship between depression and sleep quality disorder; low sleep quality is a great risk factor for depression and vice versa.[8] Sleep quality is a subjective measure related to sleep experience consisting of sleep satisfaction and feeling fresh upon awakening.[9] It consists of factors such as sleep quality, sleep onset latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction.[10] Due to widespread sleep complaints and sleep inadequacy, sleep quality is of great importance as a measure for many diseases impact on the health.[11] Its relationship with suicide occurrence makes it more important in depressive patients.[12]

There are various treatment for sleep disorder, and sleeping medications such as benzodiazepines are considered as the first-line treatment and a safe drug group, though they are not advised for insomnia treatment for long time due to chance addiction.[13] Moreover, benzodiazepines have some side effects such as prolonged sleep period with low sleep quality, symptoms of sleep discontinuation at abrupt stoppage, and sometimes it aggravates the sleep disorder.[14] Therefore, complementary medicine, which is a safe, economic, and easy treatment with few side effects, has been employed as a priority in many treatment centers and nursing care units.[15]

Depression is among the top ten, for which complementary medicine is used.[16] For example, it is used for the treatment of about 53.6% of patients with depression in the United States.[17] Aromatherapy is an alternative medicine which has been increasingly used in comparison to other medications during the recent years. It has also been extensively used for depression.[18,19] Aromatherapy is the use of volatile oils or extracted essence from fragrant plants to prevent or help relieve patients, decrease the life problems, and improve the quality of life by influencing the mind, body, and soul.[20] These oils are used and absorbed through massages, compresses, baths, inhaling, essential oil capsules, and food or medication spices.[20-23] One of the volatile fragrant plant oils which has been used in aromatherapy in traditional medicine is the lavender essential oil. Lavender is an herbaceous perennial aromatic plant in the mint family, Lamiaceae, having antifungal, antibacterial, laxative, antibloating, and sedative properties.[24] It mostly consists of linalool and linaloyl acetate. Linalool is a tranquilizer affecting gamma-aminobutyric acid receptors in the central nervous system, whereas linaloyl acetate has narcotic effects.[14] Some studies have been done on the effect of lavender essence aromatherapy on sleep quality and found that it has positive effects on sleep quality,[25-29] However, some other research have demonstrated that aromatherapy with lavender essence has no effect on sleep quality of intensive care unit (ICU) patients and angiography candidates.[30,31]

Although herbs have been used to treat different types of diseases according to traditional medicine, scant information exists to approve their positive effects. Lavender is one of the plants assumed to have effects on depression symptoms, though no research was found to prove it. Therefore, this study aimed to determine the effects of aromatherapy with lavender essential oil on sleep quality of depressive patients.

MATERIALS AND METHODS

Design study and sampling

In this single-blinded randomized clinical trial with pretest/posttest design, eighty major depressive patients with sleep disorder were recruited from those referred to Psychiatric Clinic in Yahya Nejad Hospital, Babol, Iran, from April to August 2019. Inclusion criteria included the following: giving written and oral informed consent, having age between 18 and 60 years, being literate, having sound smelling sensation, using Selective Serotonin Reuptake Inhibitors medications for <3 weeks, having the score of 10–17 in Hamilton Depression Rating Scale (HAMD-17), getting score 5 or more in Pittsburgh sleep quality index (PSQI). The exclusion criteria consisted of taking alcohol, being smoker, using opium, having allergic rhinitis, asthma, and respiratory diseases, using known traditional/alternative medicine that affects sleep quality, getting score of two or more from the suicide section of HAMD-17, having history of allergic to any aromatic material and lavender essential oil, having experience of unpredicted events (such as divorce, death of the close relative, travelling, and any other crisis) during the past 6 months, being hospitalized during intervention, being pregnant, having history of migraine or chronic headache, and being absent in the study for more than 3 days.

Sampling was done with 95% confidence interval with 5% margin of error according to the findings of the study conducted by Lee *et al*. Therefore, 34 participants were supposed to be in each group. Given to 10% probability of attrition, forty individuals were recruited in each group.[32] First, 105 depressed patients referring to the clinic were selected according to convenience sampling method. Then, eighty eligible patients were assigned into intervention and control groups according to age (two age groups of 18–40 and 41–60) [Chart 1].

The intervention
The researcher explained the research purposes and the procedures to participants. Then, they were allocated in the intervention group or the control group, randomly. Therefore, they were arranged to blocks of 4 and each group consisted of four individuals in six conditions (AABB, BBAA, ABAB, BABA, ABBA, and BAAB). Each participant was designated as A (aromatherapy) or B (placebo). Both groups were taught how to do aromatherapy each night based on their sleep pattern. They were asked to do it 1 h before sleeping between 21:00 and 24:00 in bed in a dark room with mild temperature, proper ventilation, and away from any fragrance or scent.[33] Aromatherapy continued for 14 consecutive nights with 10% lavender essential oil (Barij Essence Pharmaceutic Corporation, Kashan, ISO 9001, ISO/IEC1725).[34,35] The participants were asked to stain a 2 cm × 2 cm cotton gauze with two drops of lavender essential oil and fix it to their collars with 20 cm distance from their nose and breathe naturally. Then, they had to detach it in the morning as soon as they wake up.[14,35] The dilute base dissolution of the lavender was almond essential oil.

The control group used almond essential oil (Barij Essence Pharmaceutic Corporation) as the placebo for aromatherapy. The researcher made telephone call the participants every 2 days to control intervention procedure.

The instruments
The study tools included demographic information questionnaire (age, gender, marital status, graduation,
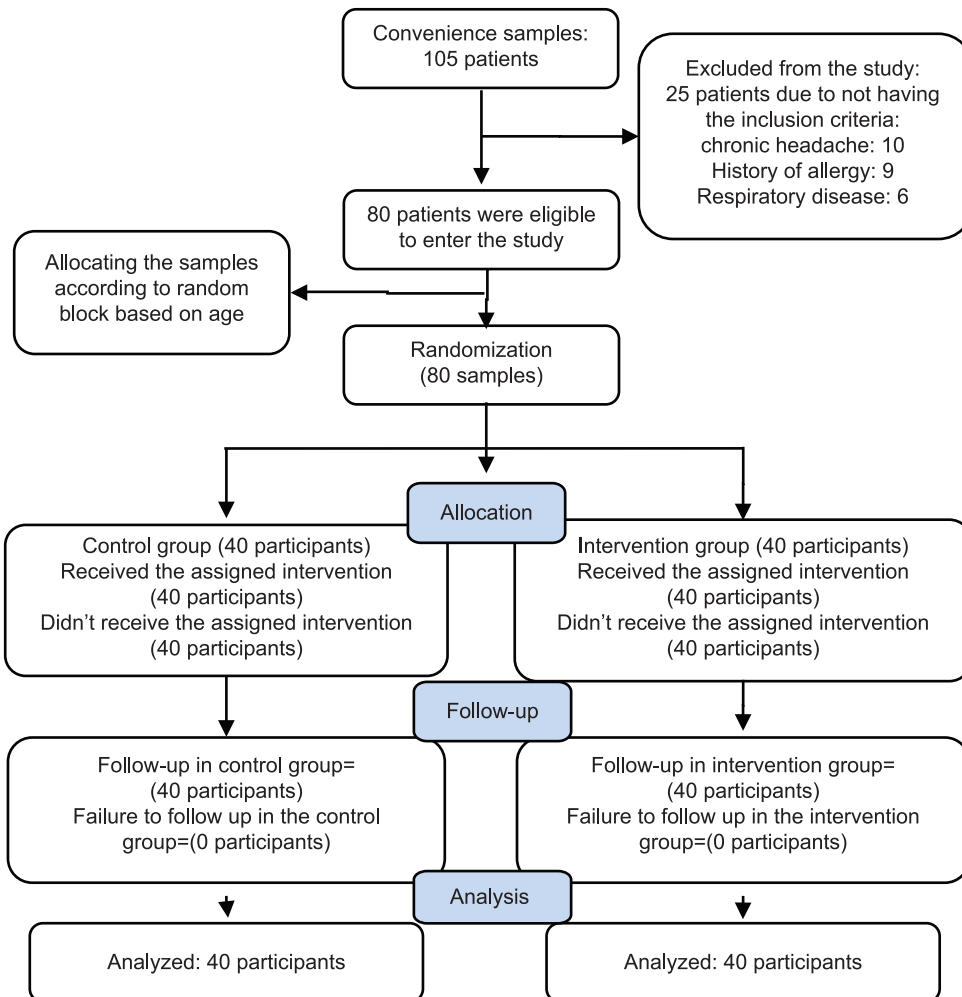

Chart 1: Consort of random allocation of the participants in the two intervention and control groups

occupation, residence, known underlying disorders, and history of depression), PSQI which was completed before the intervention and 1 day after the intervention by all the participants and HAMD-17 to assess the depression severity. A score of 0–9 is considered normal, a score between 10 and 13 indicates mild depression, a score between 14 and 17 is related to those with moderate depression, while the score higher than 17 indicates severe depression.[36,37] Reliability coefficient and validity of this index in the Iranian version is 85% and 89%, respectively.[37,38] Cronbach's alpha in this study was calculated as 82%.

To assess sleep quality of the participants, PSQI was applied as a standard questionnaire for determining self-reported sleep quality within the last month. This questionnaire consists of nine questions in seven components (subjective sleep quality, sleeps onset latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction). The global PSQI score ranges from 0 to 21. Each component in the questionnaire has a score of 0–3 (0 showing good condition, 1 for almost a good condition, 2 shows almost bad condition, and 3 is used for bad condition). The higher the score is, the worse the sleep quality will be. A score smaller than 5 shows good quality of sleep, while a score of 5 and greater indicates undesirable sleep quality.[10] The validity of PSQI has been approved in Iranian population with a sensitivity of 10%, specificity of 93%, and Cronbach's alpha of 89%.[39] In this study, Cronbach' alpha was found to be 72%, showing an acceptable internal consistency.

Ethical considerations
The Ethics Committee of Mazandaran University of Medical Sciences approved the study (REC. MAZUMS.1397.2701). This research was registered in the Iranian Registry of Clinical Trials (IRCT20180924041109N2). All participants signed consent form to participate in the study. The necessary information on the objectives, background, and methods of the intervention was provided to the participants. They were also ensured that their personal information would be kept secret. Moreover, the participants were informed that they can leave the intervention whenever they decide without any possible negative consequences.

Data analysis
To examine the normality of the data distribution, Kolmogorov–Smirnov test was employed, and to determine the homogeneity of the groups and omitting the confounding variables before the intervention, ANCOVA test was utilized. Data were analyzed by SPSS version 23 (SPSS Inc., Chicago, IL) using descriptive statistics of mean and standard deviation, and inferential statistics of Chi-square, independent *t*-test, and paired *t*-test. *P* value of smaller than 0.05 was considered significance level.

RESULTS

The participants' age ranged from 18 to 60, 50% of them in each group were between 18 and 40 years and 50% were 41–60 years. Among those in the intervention group, 70% had reported moderate fatigue and 30% complaint of severe fatigue. In contrast, 72.5% of those who were allocated in the control group reported moderate fatigue and 22.5% complaint of severe fatigue. Both groups were homogeneous regarding demographic information and fatigue severity, and the difference was not statistically significant [Table 1].

Kolmogorov–Smirnov test displayed a normal distribution for sleep quality variable; therefore, parametric tests were employed for statistical analysis ($P > 0.05$). Independent *t*-test revealed that no significant difference could be observed between the two intervention and control groups before the intervention ($P = 0.12$). However, after the intervention, the mean score of the sleep quality in the intervention group was 12.27 ± 2.11 and in the control group was 15.60 ± 2.36. The patients in the intervention group had a better quality of sleep comparing to that in the control group, and the difference was statistically meaningful ($P = 0.001$). Paired *t*-test indicated a significant difference between the sleep quality of the intervention group before and after the intervention ($P = 0.001$), as well, while in the control group, the difference was not statistically significant ($P = 0.14$) [Table 2].

To determine the homogeneity of the groups and eliminating the confounding variable before the intervention, ANCOVA test was utilized. After adjusting pretest scores, there was a within-group significance ($F = 103.451$) with significance level of $P = 0.001$ ($P < 0.05$). It was revealed that the mean score was significantly higher among the sleep quality of the intervention group in comparison to those allocated in the control group. Moreover, the square Eta (0.45) indicated a strong relationship between aromatherapy (independent variable) and sleep quality (dependent variable), in other words, about 45% of the sleep quality variance is explained by aromatherapy [Table 3].

DISCUSSION

The findings revealed that aromatherapy with lavender essential oil for 2 weeks brought about improvement in sleep quality of patients with depression. Chien and coll. (2012) revealed that the total score of sleep quality increased among

Table 1: Demographic information of the participants in intervention and control groups

Variable	Characteristics	Frequency (%)		Significance level (*P*)
		Intervention groups	Control group	
Gender	Female	35 (87.5)	34 (85)	0.745*
	Male	5 (12.5)	6 (15)	
Education	Illiterate	0 (0.0)	0 (0.0)	0.968*
	Primary/secondary school level	15 (37.5)	16 (40)	
	High school diploma	16 (40)	15 (37.5)	
	Higher education	9 (22)	9 (22)	
Marital status	Single	6 (15)	5 (12.5)	0.343*
	Married	31 (77.5)	35 (87.5)	
	Widow	1 (2.5)	0 (0.0)	
	Divorced	2 (5)	0 (0.0)	
Employment	Unemployed	1 (2.5)	1 (2.5)	0.833*
	Worker	3 (7.5)	5 (12.5)	
	Employee	6 (15)	3 (7.5)	
	Housewife	22 (55)	25 (62.5)	
	Self-employed	6 (15)	3 (7.5)	
	Other	2 (5)	1 (2.5)	
History of depression	Yes	19 (47.5)	17 (42.5)	0.653*
	No	21 (52.5)	23 (57.5)	
Underlying diseases	Healthy	18 (45)	19 (47.5)	0.189*
	Cardiovascular diseases	3 (7.5)	7 (17.5)	
	Thyroid	2 (5)	5 (12.5)	
	Cholesterol	2 (5)	2 (5)	
	Diabetes	3 (7.5)	1 (2.5)	
	Digestive diseases	4 (10)	1 (2.5)	
	Musculoskeletal diseases	2 (5)	1 (2.5)	

*Chi-square test

Table 2: Comparing the mean and standard deviation of sleep quality before and after the intervention in both intervention and control groups

Sleep quality	Groups, mean±SD		Independent *t*-test	*P*
	Intervention	Control		
Before	16.63±1.98	15.87±2.31	1.57	0.12
After	12.27±2.11	15.60±2.36	6.63	0.001
Paired *t*-test	12.31	1.507		
P	0.001	0.14		

SD: Standard deviation

the intervention group that had smelled lavender essential oil in comparison to the study onset, whereas no difference was observed in the control group during the same period.[40] The study conducted by Stevens *et al.* showed that herbal supplement containing lavender essential oil was effective on the several mental parameters of sleep quality among the participants with mild-to-moderate insomnia.[41] Although the findings are in agreement with that of our study, they used lavender oral capsule for healthy adults, while we worked on depressed patients who smelled lavender essential oil. Muz and Taşcı, conducted a study to investigate the effect of aromatherapy on the sleep quality and fatigue of hemodialysis patients. The intervention group received the intervention containing aromatherapy with lavender essential oil and sweet tangerine every night before sleeping during 1 month. On the other hand, those in the control group just received the routine treatment. The findings indicated that aromatherapy improved the sleep quality and fatigue in hemodialysis patients,[27] which is compatible with the present

research. A study conducted by Lee *et al.* investigated the effect of aromatherapy on sleep disorder, sleep satisfaction, and fatigue among hemodialysis patients, it was revealed that aromatherapy with lavender lessened the fatigue and increased the sleep satisfaction in these patients,[32] which is consistent with the present study results. Karadag *et al.* performed a research aiming at probing the effect of lavender on sleep quality and anxiety of patients hospitalized in ICU. The intervention group received aromatherapy with two drops of lavender essential oil before sleeping. The control group received nothing. Sleep quality and anxiety of the patients were assessed after 15 days. The findings revealed that lavender essential oil leads to improvement in sleep quality and decreases the anxiety of the patients with coronary artery disease,[35] which is line with the present study findings. Najafi *et al.* conducted a study to find out whether lavender essential oil affects the sleep quality of hemodialysis patients. The intervention group received lavender aromatherapy for 7 days. The findings indicated that aromatherapy with lavender essential oil led to improvement on the sleep quality of the hemodialysis patients and can be used as a cheap, easy, and noninvasive method for treating sleep disorders in patients.[14] The abovementioned study results are also compatible with the present study findings. Otaghi *et al.* worked on the effect of lavender essential oil on the sleep quality of angiography candidates in cardiac care unit. The results revealed that lavender essential oil did not have any effects on the patients' sleep quality,[30]

Table 3: ANCOVA for investigating the effects of aromatherapy on sleep quality by eliminating the effect of pretest in intervention group and control group

Dependent variable	Source of deviations	SS	df	MS	Significance level (*P*)	F	Eta squared PES
Sleep quality	Pretest	177.17	1	177.17	0.001	63.62	0.452
	Group	288.05	1	288.05	0.001	103.45	0.573
	Error	214.40	77	2.78			
	Total	612.68	79				

SS: Sum of the squared deviations, df: Degree of freedom, MS: Mean of squared deviations, PES: Partial eta squared

which is not compatible with the present study and can be due to the different research population and data collection tools. Park *et al.* also conducted a study to investigate the effect of aroma hand massage technique on the fatigue and sleep quality of the patients. Lavender essential oil and 1% bergamot were rubbed to each hand of the patient for 5 min before sleep. The findings showed that the intervention did not have any significant effect on fatigue lessened and sleep quality,[31] which is not in line with the present study findings and it can be due to the different methodology. Shamsikhani *et al.* conducted a study to investigate the effect of aromatherapy with lavender essential oil on sleep quality of the nursing students. The results revealed that there was not any significant improvement in the sleep quality of the students.[2] The finding is not in line with the findings of our study which may be because of different statistical population and different methodology.

Study limitations

As the intervention was done in the patients' home, some factors (such as environmental sounds) might have affected the participants' sleep quality. Moreover, the patients' sleep habits can affect their sleep quality that could not be controlled.

CONCLUSION

The findings of this study revealed that aromatherapy with lavender essential oil improves the sleep quality of depressed patients. Therefore, it can be used as a cheap and easy method in patients with mild-to-moderate depression who frequently suffer sleep disorder. It seems that this method can be used as a complementary treatment for medical treatments such as hypnotic drugs with high side effects for the patients with mild-to-moderate depression.

Conflicts of interest

There are no conflicts of interest.

Authors' contribution

Z.S designed, carried out the experiment and wrote manuscript with scientific support from Y.J., Angela H., R. M. And Ali H.Moreover Y.J., Angela H. R. M. And Ali H. supervised the project. Y.J and Z.S. conceived the original idea. Angela H. contributed to sample preparation. R.M performed analyzing data.

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