



## Effects of aromatherapy with lavender essential oil on sleep quality among retired older adults

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### Introduction

Poor sleep quality is one of the most common problems among older adults. With aging, some changes occur in the circadian rhythm of sleep along with subsequent reductions in sleep quality. Beside physiological factors, psychological factors such as depression and anxiety, environmental factors, pain, and physical discomfort have roles in the sleep quality in older adults [1]. A study by Tardy et al. showed that about 42% of older adults have difficulties in the beginning or maintaining sleep [2]. Older adults spend more time in bed than

### Abstract

Poor sleep quality is one of the most common problems among older adults. Non-pharmacological interventions are considered as a better choice for treatment of sleep problems in older adults. The aim of the present study was to examine the effects of aromatherapy with lavender essential oil on sleep quality in older adults. This single-blind randomized controlled clinical trial was conducted on 100 retired older adults. Participants were divided into two groups using simple random sampling. The intervention group received 2 drops of lavender essential oil and the control group received 2 drops of placebo in a glass of water, during bedtime, for 7 nights. All participants filled out the Pittsburgh sleep quality index before and after the intervention. There was no statistically significant difference between the groups in terms of socio-demographic characteristics and sleep quality score before intervention. A significant difference in sleep quality was observed in the group receiving lavender essential oil compared to the control group 7 nights after intervention. Lavender essential oil has a positive effect on improving older adults' sleep quality.

**Keywords:** Aromatherapy, Lavender Oil, Older Adult, Sleep

younger people do, but they have less duration of sleep. Based on studies conducted in Iran, sleep problems affect 67% of older adults [3]. Research has shown that poor sleep quality is the third largest problem after headaches and digestive disorders in older adults [2]. If sleep disorder continues for a long time, it can lead to a chain of unpleasant consequences such as decreased cognitive performance, increased risk of falls, daytime fatigue, mood disorder, decreased immune function, cardiovascular diseases and ultimately, increased risk of

mortality [4,5]. According to Tardy et al, the use of benzodiazepines and barbiturates will increase insomnia up to 50% and can lead to poor sleep quality, drug dependency, and increased tolerance and recurrence of insomnia [2]. Given the problems of insomnia as well as side effects of the prescribed sedative drugs, it seems absolutely necessary to start non-pharmacological treatment for the control of insomnia in older adults [6]. Research on palliative, safe, and non-pharmacological interventions with minimal side effects is possible. Non-pharmacological interventions have recently been considered as a better first-line treatment for sleep problems in older adults [7]. Aromatherapy has been used widely for modification of mood disorders and sleep problems.

A research showed that the scent of lavender and chamomile makes the mind of people ready for sleep [8]. Main ingredients of lavender essential oil include Linalyl acetate and Linalool. Sedative properties of lavender essential oil have been mentioned in the relevant literature [9]. Reports indicate that lavender essential oil may induce sedative effects by affecting GABAA receptors [10]. Lewith et al. and Goel et al. showed that aromatherapy with lavender essential oil improved sleep quality in people suffering from insomnia [11,12]. However, other studies have not reported the effects of lavender essential oil on sleep quality [13,14]. The available studies do not provide sufficient evidence to prove the hypnotic or sedative properties of lavender essential oil [15-18]. As there is no study conducted on the effect of inhalation of this scent on the sleep quality in older adults, as well as due to the preference of drug interactions to relieve sleep problems, this study was conducted to examine the effects of aromatherapy with lavender essential oil on sleep quality in retired older adults.

## Method

This randomized, single-blind, controlled clinical trial was conducted on 100 older adults in 2017. In this study, the participants were unaware of the type of intervention

given to every participant (single blinding). The sample size was calculated based on data obtained from a study by Moeini et al. [18]. The minimum sample sized with confidence level of 0.95% and power of 90% was determined as 10 persons for each group. The researcher referred to the research setting (educational retirement center in kashan city, Southeast of iran) and used non-probability-convenience sampling to evaluate all older adults for inclusion criteria. The retirement center had 240 members among whom 130 met the inclusion criteria. 21 persons refused to participate in the study. Finally, 109 participants were selected for the study and randomly were assigned into two groups. 9 participants refused to continue the participation in study. Therefore, data analysis was performed on 100 participants. In the next step, written informed consent was obtained and a socio-demographic questionnaire and Pittsburgh Sleep Quality Index were completed by the participants.

After obtaining permission from the Ethics committee of Kashan university of medical sciences and registration of the present study in the Iranian registry of clinical trials (code: IRCT2013062013722N1), the study was started. Participants who met the inclusion criteria were provided with sufficient information about the procedure. Written informed consent was obtained from all participants who had announced their cooperation.

The inclusion criteria were age of 60 or above, being able to communicate either by speaking or by writing, no history of asthma, and no olfactory disorders. In addition, older adults who obtained a score above 5 from the Pittsburgh questionnaire were included in the study.

Older adults with no history of mental disorders, no use of herbal remedies, no use of alternative medicine in the past one week, and those who obtained a score of 24 or above from the questionnaire of Mini Mental State Examination (MMSE) were included in the study. The MMSE is a reliable and easy questionnaire to evaluate cognitive function in

older adults. The exclusion criteria were having allergy to flowers and plants and having olfactory disorder.

The Pittsburgh Sleep Quality Index (PSQI) was used to examine sleep quality. PSQI is a self-rated instrument frequently used to measure the quality and patterns of sleep in older adults. The total index score is between 0 and 21. A total score of 5 or greater indicates a “poor” quality of sleep [16]. Reliability of PSQI in a study in older adults was calculated using Cronbach’s alpha internal consistency coefficient that was reported as 0.80 [17]. In the present study, the reliability of tools was reviewed using Cronbach’s alpha and its value was calculated as 0.87.

The lavender essential oil was used in the intervention group and distilled water as placebo in the control group. Prior to going to bed, the participants poured two drops of the lavender or distilled water on a piece of cotton and then put it under the outer cover of the pillow [18]. The intervention was carried out for 7 nights. The participants were informed that the sleep environment should be quiet with lowest noise and light. Lavender essential oil and placebo were prepared by Barij Essence Pharmaceutical Company in Kashan. Bottles of distilled water and lavender essential oil were completely

similar in appearance (odor, color, and shape). To ensure that whether or not participants used lavender essential oil and placebo, they were followed up by daily calls. Seven nights after the intervention, all participants filled out the sleep quality questionnaire again. The day before the participants were to complete the questionnaire, a phone call was made to remind them.

The data were analyzed using SPSS-16. The normality of the quantitative data was evaluated using Kolmogorov–Smirnov test. Sleep quality score was normal before and after the intervention. Independent t-test, Chi-square, and Fisher’s exact test were used to study the homology of the study groups. Independent t-test was used to compare the mean scores of quality of sleep before the intervention between the groups. The level of significance was considered below 0.05 at all tests.

## Results

Socio-demographic characteristics of the participants in the intervention and control groups are provided in Table 1. The results showed that there were no statistically significant differences between the two groups regarding age, gender, marital status, education,

**Table 1** *Socio-demographic characteristics of the participants in the intervention and control groups*

Variable	Lavender Essential oil (n=50) n(%)	Placebo (n=50) n(%)	p-value
Gender			
Male	32(64)	33(66)	0.86*
Female	18(36)	17(34)	
Marital status			
Married	46(92)	48(96)	0.72*
Alone (widowed, divorced, single)	4(8)	2(4)	
Education			
Illiterate	6(12)	4(8)	0.11**
Elementary education	23(46)	18(36)	
Diploma	15(30)	24(48)	
Academic education	6(6)	4(4)	
Intake of hypnotic drugs			
Yes	23(46)	22(44)	0.4*
No	27(54)	28(56)	
Age	Mean ±SD 68.94±5.9	Mean ±SD 68.34±5.09	0.13***

\*Fisher exact test

\*\*Chi-squared test

\*\*\*Independent t test

and history of taking sleeping pills and the two groups were homogeneous (Table 1).

There was a significant difference in the mean score of sleep quality in the group

**Table 2** Comparison of mean scores of sleep quality in the study groups before and after intervention

Sleep quality	Before intervention	After intervention	Paired t- test
	Mean $\pm$ SD*	Mean $\pm$ SD	
Essential oil	11.12 $\pm$ 2.7	22.2 $\pm$ 9.60	p= 0.001 (t=5.48, df=49)
Placebo	11.14 $\pm$ 2.6	11.24 $\pm$ 2.6	p= 0.09 (t=-0.742, df=49)
Independent t- test	p=0.971 (t=0.037, df=98)	p=0.001 (t=3.415, df=98)	----

receiving Lavender essential oil before and after intervention (Table 2).

At the end of the intervention, a positive effect was observed on sleep quality in 64% of the patients in the group receiving Lavender essential oil. There was also a negative effect

on sleep quality scores in 14% of the patients while 22% of the patients showed no certain changes in their quality of sleep. In the control group, 56% of the participants experienced no change in sleep quality than before, but there was a negative impact in 24% of the patients

**Table 3** Comparison of sleep quality frequency and mean score in the study groups

7 Nights after intervention	Lavender essential oil (frequency and mean)	Placebo (frequency and mean)	p-value
Positive effect	32(64)	10(20)	0.001*
Negative effect	7(14)	12(24)	
No change	11(22)	28(56)	
Total	50(100)	50(100)	

\*Chi-squared test

and a positive effect in 20% of the patients in terms of sleep quality (Table 3).

## Discussion

The results of the present study showed that there was a significant difference in the mean sleep quality between the intervention group receiving aromatherapy with lavender essential oil and the group treated with distilled water. Similar to this finding, the results of a pilot study conducted by Lewith et al. on ten volunteers showed that aromatherapy with lavender essential oil in the intervention group improved the mean sleep quality scores on the PSQI questionnaire. While, no significant changes were observed in the control group using sweet almond essential oil as a placebo [12]. Chien et al. [19] also came to similar results. Moeini et al. studied the effects of lavender essential oil on the sleep quality of patients in the Coronary Care Unit (CCU) and the results demonstrated a statistically significant difference in sleep quality between the control and case

groups after aromatherapy with lavender essential oil [18]. In a pilot study, aromatherapy with lavender essential oil increased the time of night sleep and stopped or discontinued taking sedative drugs in two older adult patients with dementia during the night. In a study on three older adult patients with chronic insomnia, inhalation of lavender essential oil showed to be a good alternative to previous sedative drugs (sleeping pills) and patients reported better sleep quality compared to their quality of sleep when they were taking previous medications. Meanwhile no adverse effects were reported [20]. In line with this finding, in a controlled clinical trial on older adult patients with acute medical problems, 72% of patients who received aromatherapy with lavender essential reported a good quality of sleep. Furthermore, 79% of these patients reported that they had a good day after receiving aromatherapy at night.



The value was 26% in the control group [21]. It is believed that lavender essential oil exerts its psychological effects through the limbic system, particularly through amygdala and hippocampus. Although mechanism of the effect of this plant is unclear at cellular level, several studies suggest that lavender has probably a function similar to benzodiazepines and causes an increase in GABA in the amygdala. After conducting a study, Re et al. concluded that linalool in lavender causes the release of acetylcholine and ionic performance changes in the neuromuscular junction point [22]. Linalyl acetate has narcotics function and linalool acts as a sedative drug. This function explains the sedative properties of lavender [22]. Nowadays aromatherapy is considered as a holistic nursing care and the use of complementary therapies such as aromatherapy is a part of professional activities of nurses [23]. On the other hand, complementary therapies, in addition to being cost-effective, in most cases have no serious adverse effects and drug interactions; and they are well accepted by patients [24]. Studies show that adverse effects of aromatherapy with lavender essential oil are very limited. Only two cases of headache and dizziness have been reported [25]. Consistent with the results of most studies, in the present study no special adverse effect was observed. Given the undeniable effect of environmental conditions on the quality of sleep and with regard to the fact that mental state of a person is effective on answering the questions, it is recommended that in future research polysomnography (a type of sleep study, is a multi-parametric test used in the study of sleep and as a diagnostic tool in sleep medicine) be used as a gold standard in the sleep-related disorders to confirm the effectiveness of aromatherapy with lavender essential oil in improving sleep quality of older adults.

As the aging population is rising throughout the world, sleep quality improve in this age group should be considered further. However, further studies are needed to clarify the effects of aromatherapy on sleep disturbances of older adults.

## Conclusion

Aromatherapy whit lavender essential oil as a

non-pharmacological intervention improved sleep quality in older adults.

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## Authors' contributions

Study design: DA, FI

Data collection and analysis: DA, HA, NMA

Manuscript preparation: FI, NMA

All authors have read and approved the final version.

## Conflicts of Interest

"The authors declare that they have no competing interests."

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## Availability of data and materials

The datasets used and/or analyzed during this study are available from the corresponding author on reasonable request.

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