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Effects of Aromatherapy With Jasmine Essential Oil on the Sleep Quality of Hemodialysis Patients

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ABSTRACT

Introduction: Poor sleep quality is a common problem among hemodialysis patients. Aromatherapy has few complications and is an effective approach to this problem.

Objective: The present study aimed to assess the effect of aromatherapy with jasmine essential oil on the sleep quality of hemodialysis patients.

Materials and Methods: This double-group clinical trial was conducted on 54 patients undergoing hemodialysis with poor sleep quality living in Sabzevar City, Iran, in 2021. The patients were divided into the intervention and control groups (21 in the intervention and 25 in control group) using the random allocation method with permuted blocks. The study data were collected using a demographic questionnaire and the Pittsburgh Sleep Quality Index (PSQI), completed at the beginning of the study. The patients in the intervention group inhaled a piece of cotton smeared with jasmine essential oil every night for one month. The concentration of jasmine extract was 70%, the duration of inhalation was about 7 hours, and the distance between the place of cotton soaked in jasmine and the patient's nose was 30 cm. Afterwards, the PSQI was completed again. Data analysis was performed using descriptive indices, the Chi-square test, the independent t-test, paired t-test, the Fisher exact test, and univariate analysis of variance. P Values less than 0.05 were considered significant.

Results: The patients were 18-70 years old. Comparing demographic data between the two study groups showed no significant difference in terms of age, gender, marital status, employment status, and education. In the intervention group, the Mean±SD of sleep quality decreased from 9.90±2.70 to 6.16±2.15 after aroma therapy. In the control group, the score decreased from 8.48±2.98 to 8.16±2.68. The analysis of variance for overall sleep quality after the intervention by modulating the effect of overall sleep quality before the intervention showed a significant difference among the groups in terms of overall sleep quality after the intervention (the effect size=0.24, P=0.001).

Conclusion: According to the results, aromatherapy with jasmine essential oil could enhance the sleep quality and sleep duration of the patient's undergoing hemodialysis.

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Highlights

- Poor sleep quality is one of the most common complications among hemodialysis patients.
- Complementary medicine is effective in improving the quality of sleep.
- Linalyl is the active ingredient in jasmine, which has a sedative effect.
- Linalyl in jasmine oil, similar to anti-anxiety drugs and benzodiazepines, may affect sleep quality.

Plain Language Summary

One of the most common complications among hemodialysis patients is poor sleep quality. For its treatment, various pharmacological and non-pharmacological methods are used. Because of the low complication of non-pharmacological treatments, these methods can be a good option to improve the sleep quality of these patients. Among non-pharmacological treatments, complementary medicine has recently been recommended. One of the methods of complementary medicine is the use of aromatherapy. This study assessed the effect of aromatherapy with jasmine essential oil on the sleep quality of hemodialysis patients. In this study, 54 patients with hemodialysis were divided into control and intervention groups. The patients in the intervention group inhaled a piece of cotton smeared with jasmine essential oil every night for one month. The control group received routine care. Before the intervention, there was no significant difference between the two groups in terms of sleep quality, but after the intervention, aromatherapy with jasmine essential oil enhanced the sleep quality and sleep duration of the patient's undergoing hemodialysis.

Introduction

Patients undergoing hemodialysis commonly experience declined sleep quality, often manifested as insomnia, restless leg syndrome, and daytime sleepiness [1]. These complications are reported in 50%-80% of hemodialysis patients, with insomnia considered the most prevalent [2]. Furthermore, these patients experience sleepiness, fatigue, and general dysfunction during the day, significantly decreasing the quality of their personal and social life [1, 3]. In addition to the quality of life, sleep disorders also intensify the major risk factors for chronic kidney disease (CKD), such as hypertension, type II diabetes, and obesity, and may indirectly decline the renal function of hemodialysis patients [4]. Therefore, adopting a proper strategy for treating these disorders is vital [5]. The treatment of sleep disorders involves medication with sedatives and tranquilizers. According to a study conducted in China, such medications have no significant effect on the quality of life of hemodialysis patients with sleep disorders [6]. On the other hand, the issue of renal inability to metabolize drugs received in CKD patients is very important. Also, given that these patients receive multiple medications, they should be carefully monitored for drug interactions before receiving a new medication [7].

Moreover, dependence is also significant in medication therapy for sleep disorders. Given the limitations of medication therapy and the potentially life-threatening side effects of medications in patients with CKD, non-pharmacological therapies have attracted great attention [8]. These treatments, such as cognitive-behavioral therapy, physical activity, acupuncture, and complementary medicine, have been used to treat sleep disorders [5]. Aromatherapy is a branch of complementary medicine [9], which has proven to be an effective nursing intervention owing to its cost-efficiency, minimum complications compared to pharmacological treatments, and overall benefits. Moreover, these methods are often simple, require no specific equipment, and positive outcomes can be expected quickly [10]. Lavender essential oil is reported to have a significant positive impact on improving sleep quality [11]. Linalyl acetate and linalool are key constituents of lavender essential oil, and a study in this regard showed that linalyl acetate similarly affects glutamate receptors to anxiolytics and tranquilizers [12]. Linalyl has also been shown to be one of the main constituents of jasmine, and linalyl acetate has narcotic effects, such as analgesics, hypnotics, and anti-anxiety drugs [13]. Jasmine or jessamine are members of the genus *Jasminum*, which belongs to the family Oleaceae.

This plant is known as Yasmin in Arabic. Lonicera japonica is generally known as "Yass" or "Gole Yass" among Iranians. The fragrant flower is white or yellow, or blue. The scent of the jasmine flower activates parasympathetic nerves. Its leaf has been effective in an animal model in controlling seizures [14].

A study has shown that the scent of jasmine tea has a calming effect on the activity of the autonomic nerves and mood. Linalool, benzyl alcohol, benzyl acetate, (Z)-3-hexenyl benzoate, indole, methyl anthranilate, and α-foreseen are major volatile combinations of jasmine tea [15]. However, the aromatherapy effects of jasmine may be related to psychological mechanisms and the effect on brain wave activity [16]. Another research regarding the therapeutic effects of jasmine essential oil indicated that aromatherapy with jasmine essential oil could decrease depression and enhance the temperament of the subjects [17]. Furthermore, Widayati et al. investigated the sleep disorders caused by aging and physiologic atrophy in elderly participants, reporting that aromatherapy with jasmine essential oil increased the sleep duration of these subjects [18]. Another study highlights the need for further research into the effects of aromatherapy is a simple and available treatment with few side effects to improve the sleep quality of hemodialysis patients as they are restricted in medication use [19]. Given a lack of similar studies in the current literature, the present study aimed to assess the effect of jasmine aromatherapy on the sleep quality of these patients.

Materials and Methods

This randomized clinical trial was conducted with a pretest-posttest design. The study population consisted of patients with CKD who received hemodialysis at the two dialysis centers in Sabzevar City, Iran. Sampling was performed from April to June 2021. Based on the study by Najafi et al. [19], the minimum required sample size was considered 48 subjects with a confidence level of 95% and a test power of 85%, according to the μ1=7.39, μ2=13.50, SD1=3.48, and SD2=4.24. Considering 10% attrition, the sample size was determined to be 54. Random allocation was performed by permuted block randomization method with 14 blocks of 4. Finally, 27 participants in the intervention group and 27 in the control group participated until the end of the study.

A list of the sample was initially prepared via convenience sampling based on the inclusion and exclusion criteria. The inclusion criteria of the study were as follows: the age range of 18-70 years (most adult dialysis patients are in this age range), minimum hemodialysis duration of 6 months, undergoing hemodialysis at least twice per week (minimum of 3 hours each), complete consciousness, and Pittsburgh Sleep Quality Index (PSQI) score of ≥5. The exclusion criteria were as follows: explicit auditory and verbal disorders; definitive respiratory disorders (e.g., asthma), olfactory disorders, definitive psychiatric disorders, and substance addiction. Withdrawal criteria were not doing the intervention more than twice during the study, unwillingness to continue, and death (Figure 1).

The study data were collected using a demographic questionnaire and the PSQI in a self-report manner and by the researcher via interviews to determine the sleep quality score of the patients. The patients with a PSQI score of ≥5 (with sleep disorders based on this questionnaire) were enrolled in the study.

The validity of the demographic questionnaire was confirmed based on qualitative content validity method. To this end, the questionnaire was developed by reviewing relevant articles and references and modified based on expert feedback.

The PSQI is a standard scale of sleep quality in the last month, consisting of 9 items and 7 components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Each component is scored from 0 to 3, with lower scores indicating better sleep quality.

The score of sleep quality is obtained by adding up the scores of the domains from 0 to 21. Scores 0-5 indicate favorable sleep quality and scores ≥5 show poor sleep quality [20]. In Iran, Farrahi et al. confirmed the validity and reliability of the PSQI [21]. The stability and consistency of the scale were also evaluated by determining internal consistency. In this process, the PSQI was completed by 10 subjects, and Cronbach α was estimated at 0.8. To ensure accurate intervention, the researcher telephoned participants twice a week, and they were excluded from the study if they did not attend the intervention more than twice during the study.

The patients in the intervention group were trained by the researcher in aroma therapy, which had to be implemented every night for one month [19] using jasmine essential oil.

The essential oil was provided by Talay-e Tabiat Co. (Iran). The product is extracted from the white flowers

Table 1. Comparing the quantitative contextual variables in the intervention (n=21) and the control (n=25) groups

Groups	Mean±SD	
	Age (y)	Duration of Dialysis (mo)
Intervention	54.48±14.19	49.95±16.32
Control	49.96±14.97	31.24±24.02
P*	0.30	0.14

* The Independent samples t-test.

Table 2. Frequency of qualitative contextual variables in the intervention and control groups

Variables	Characteristics	No. (%)		P
		Intervention (n=21)	Control (n=25)	
Sex	Women Men	8(38.1) 13(61.9)	9(36) 16(64)	0.88*
Marital status	Single Married Widow	2(9.5) 18(85.7) 1(4.8)	5(20) 20(80) 0(0)	0.32**
Employment status	Employee Self work Daily Student Housewife Retired	1(4.8) 1(4.8) 0(0) 1(4.8) 7(33.3) 11(52.4)	1(4.0) 4(16) 1(4) 1(4) 5(20) 12(48)	0.82**
Education rate	Illiterate Primary Diploma Upper diploma	4(19) 14(66.7) 0(0) 3(14)	4(19) 12(48) 4(16) 6(24)	0.21**
Resident staty	Urban Rural	15(71.4) 6(28.6)	21(84) 4(16)	0.47**
Adequacy of dialysis	Low Good	9(42.9) 12(57.1)	11(44) 14(56)	0.94*
Anemia	yes No	6(28.6) 15(71.4)	5(20) 20(80)	0.49*
Cause of chronic renal failure	Diabetes Blood pressure Polycystic kidney Other causes	14(66.7) 2(9.5) 0(0) 5(23.8)	14(66.7) 6(24) 3(12) 7(28)	0.11*
Existence of caregiver	Yes No	1(4.8) 20(95.2)	1(4) 24(96)	0.99**
Activity and exercise	High Medium Low	1(4.8) 13(61.9) 7(33.3)	1(4) 20(80) 4(16)	0.38**

The data are presented as No.(%). *The Chi-square test; **Fisher exact test.

Table 3. Comparing mean score of sleep quality in the intervention (n=21) and control (n=25) groups between group and within groups

Group	Mean±SD		P*
	Before the Intervention	One Month After the Intervention	
Intervention	9.90±2.70	6.16±2.15	0.001
Control	8.48±2.98	8.16±2.68	0.55
P**	0.1	0.01	

*Paired t-test; **The Independent t-test.

of jasmine with a concentration of 70%, which is prepared with a combination of 30% sunflower and sesame oil at a temperature of 70°C for 45 days, and 24 hours using the bain-marie method. Sunflower and sesame oils are used as a base solvent and are odorless.

In the present study, the patients or their companions were provided with an eyedropper containing five drops of jasmine essential oil (10 mL) and instructed to smear the oil on a piece of cotton, and attach the cotton to the pillow of the patient every night, and detach and dispose of the cotton after waking up. Notably, we did not use a placebo, as the aroma of any placebo oil, might have affected the quality of sleep in the patients of the control group, and this group received standard routine care during the study. The intervention was performed at night while the patients were sleeping, and the hemodialysis time of the patients was at a certain time of the day, which minimized contact with the control group.

After one month, the PSQI was used to calculate the sleep quality scores of the intervention and control groups again. In addition, a demographic questionnaire was used to collect data on age, gender, occupation status, marital status, education level, and residence of the patients. Other data were extracted from the medical records of the patients, including the duration of hemodialysis, hemodialysis frequency per week, duration of hemodialysis per session, use of sedatives, daily physical activity, use of beverages affecting sleep (e.g. tea, coffee), and smoking habits.

In our study, the statistician was blinded to the allocation of the patients to the intervention and control groups by assigning codes A and B to the study groups. Data analysis was performed in SPSS software, version 25, using the Shapiro-Wilks test, descriptive indices, the Chi-square test, independent t-test, paired t-test, Fisher exact test, and univariate analysis of variance. The P-value of less than 0.05 was considered significant.

Results

Participants were 46 patients undergoing hemodialysis (21 in the intervention group and 25 in control group). The patients were 18-70 years old, and no significant difference was observed in terms of age between the intervention and control groups. In addition, no significant difference was observed between the two groups regarding the mean duration of hemodialysis (Table 1). Other demographic information variables are listed in Table 2.

According to the results of the paired t-test, the mean score of sleep quality significantly differed before and after aromatherapy in the intervention group (P=0.001). However, the mean sleep quality score of the patients in the control group showed no significant difference before and after the intervention. The t-test results also indicated no significant difference in the mean sleep quality score of the intervention and control groups before aromatherapy, while such a difference was observed after the intervention (Table 3).

Table 4. Univariate analysis of variance by modulating the confounding effect of overall sleep quality before the intervention

Dependent Variable	Source	Type III Sum of Squares	df	Mean Square	F	P	Partial Eta Squared
Overall sleep quality after the intervention	Overall sleep quality before the intervention	54.01	1	54.01	10.927	0.002	0.20
	Group	68.17	1	68.17	13.789	0.001	0.24

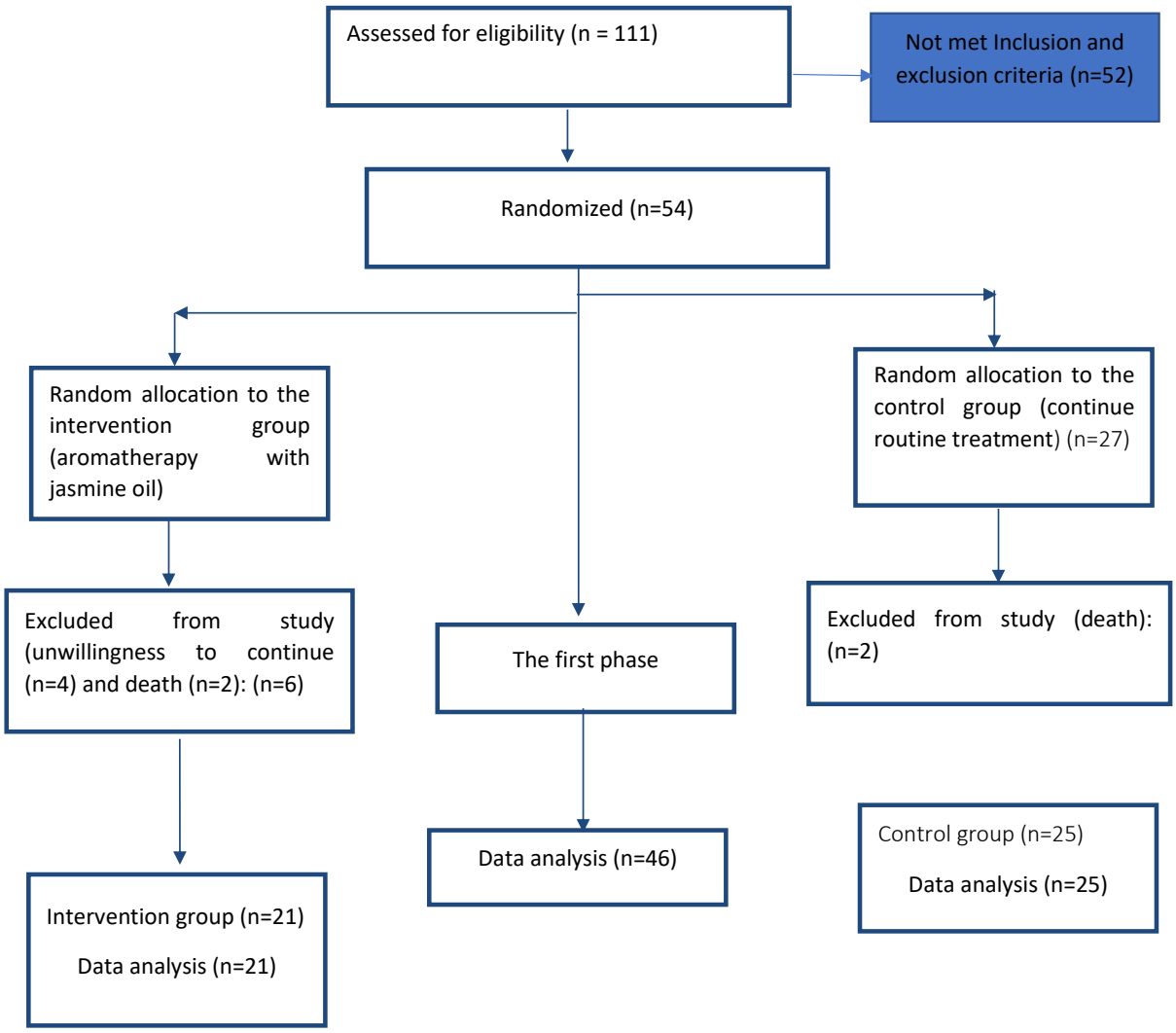

Figure 1. Participants flow diagram (CONSORT)

The analysis of variance (Table 4) for overall sleep quality after the intervention by modulating the effect of overall sleep quality before the intervention showed a significant difference among the groups in terms of overall sleep quality after the intervention (the effect size=0.24; P=0.001).

Discussion

According to the results of the present study, aromatherapy with jasmine essential oil could enhance the sleep quality of patients undergoing hemodialysis. Our findings were compared with the study by Widayati et al. to determine whether aromatherapy with jasmine essential oil could improve sleep quality in the elderly. According to the obtained results, the intervention could improve the need for sleep quantitatively and qualitatively [18]; the results of the present study are in line with the results of the Widayati study. One of the main components of jasmine oil is linalool. Studies have shown that linalool acts as an anti-anxiety and sedative on glutamate receptors. This substance reduces the heart rate and creates relaxation [15]. In another study, the effect of jasmine tea odor on the autonomic nervous system was investigated. The results showed that low-intensity odor increases the activity of the parasympathetic nervous system [22]. According to the results of the present study, it seems that activation of the parasympathetic system with the smell of jasmine causes the body to relax and improve sleep quality. A study assessed that the odorants in Chinese jasmine green tea scented with jasmine flowers (Jasminum sambac) were separated from the infusion by adsorption to Porapak Q resin. Sixty-six compounds in these plants were separated, that linalool in jasmine flowers and Chinese jasmine green tea was considered a key aroma [23].

In this study, olive and sunflower oil were used to prepare jasmine oil as base solvents. In this regard, a Thai study compared the volatile ingredients and odor preference of *Jasminum sambac* extracts prepared based on spermaceti wax, olive, sunflower, and rice bran oils. Results showed that linalool, benzyl acetate, and α-farnesene were the main volatile combinations in the jasmine extracts [24]. This outcome suggests that the main ingredient that improves patients' sleep is probably linalool in jasmine, and olive and sunflower oil do not play a role.

The main limitation of our study was inability to recruit a placebo group. Due to the COVID-19 pandemic, data collection was also challenging, and the stress caused by the pandemic might also have affected the sleep quality of the patients.

According to the results, aromatherapy with jasmine essential oil could enhance the sleep quality of the patient's undergoing hemodialysis. Therefore, this method could be used as a simple and complication-free approach to improving sleep quality in patients undergoing hemodialysis. Notably, this research could be repeated under different circumstances than COVID-19 to eliminate the possible effect of this confounding variable. On the other hand, the comparison of lavender and Jasmine essential oils in terms of their impact on the sleep quality of hemodialysis patients are recommended. Similar studies could also be conducted on different populations with sleep disorders.

Ethical Considerations

Compliance with ethical guidelines

This study was registered in Iran Clinical Trial Center (Code: IRCT20210217050396N1). The study protocol was approved by the Ethics Committee of Sabzevar University of Medical Sciences (Code: IR.MEDSAB.REC.1399.196). The patients' information remained confidential throughout the study and written informed consent was obtained for participation. In addition, participation in the research was voluntary, and the patients were not coerced by physicians, nurses, and researchers into any cases.

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Authors' contributions

Conceptualization and data collection: Alemeh Sultani, Zahra Mirhosseini, Mostafa Rad; Data analysis: Sedigheh Rastaghi; Writin-original draft: Alemeh Sultani, Mostafa Rad; Writing-review & editing the final version: All authors.

Conflict of interest

The authors declared no conflict of interest.

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