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The Effect of Aromatherapy on Sleep and Quality of Life in Menopausal Women with Sleeping Problems: A Non-Randomized, Placebo-Controlled Trial

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Keywords
Menopause · Sleep quality · Quality of life · Aromatherapy · *Lavandula angustifolia*

Abstract
Introduction: Menopause is the termination of menstruation and fertility. Women commonly experience sleeping problems during the menopausal period. Aromatherapy is among the complementary therapies used to remedy sleeping problems. ***Methods:*** This study aims to investigate the effects of lavender oil on sleep and quality of life of menopausal women through steam inhalation. This study was quasi-experimental with pre-test/post-test placebo control groups. It was conducted with 57 women, 27 of whom were subject to aromatherapy and 30 to a placebo. Data were collected using the Questionnaire Form, the Pittsburgh Sleep Quality Index (PSQI) and the Menopause-Specific Quality of Life Questionnaire (MENQOL). ***Results:*** For the intervention group, the PSQI median scores after the administration of aromatherapy were found to be significantly lower than those before the administration ($p < 0.001$) and those of the placebo group ($p < 0.001$). Similarly, for the intervention group, the total median MENQOL scores after the administration of the aromatherapy were found to be significantly lower than the scores prior to the administration ($p < 0.001$) as well as the scores of the placebo group ($p < 0.001$). ***Conclusion:*** It was found that aromatherapy involving lavender-scented steam inhalation increased sleep quality and quality of life in women with sleep deprivation problems during menopause.

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Auswirkungen der Aromatherapie auf die Schlaf- und Lebensqualität menopausaler Frauen mit Schlafproblemen: Eine nicht randomisierte, placebokontrollierte Studie

Schlüsselwörter
Menopause · Schlafqualität · Lebensqualität · Aromatherapie · *Lavandula angustifolia*

Zusammenfassung
Einleitung: Die Menopause ist das Ausbleiben der Menstruation und das Ende der Fruchtbarkeit. Viele Frauen haben in dieser Lebensphase Schlafprobleme. Aromatherapie ist einer der komplementären Behandlungsansätze, die zur Abhilfe bei Schlafproblemen verfolgt werden. ***Methoden:*** Das Ziel dieser Studie ist es, die Auswirkungen von Lavendelöl in Form von Dampfinhalationen auf die

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Schlaf- und Lebensqualität menopausaler Frauen zu beurteilen. Die Studie war quasi-experimentell aufgebaut, mit Prä-Test-/Post-Test-Untersuchungen und einer Placebo-Kontrollgruppe. Sie wurde mit 57 Frauen durchgeführt, von denen 27 eine Aromatherapie erhielten und 30 eine Placebobehandlung. Die Datenerhebung erfolgte mit dem Pittsburgh Sleep Quality Index (PSQI), dem Menopause-Specific Quality of Life Questionnaire (MENQOL) und einem selbstentwickelten Patientenfragebogen. ***Ergebnisse:*** In der Interventionsgruppe waren die medianen PSQI-Scores nach Anwendung der Aromatherapie signifikant niedriger als vor der Anwendung (p < 0,001) und als in der Placebogruppe (p < 0,001). Ebenso waren in der Interventionsgruppe die medianen MENQOL-Gesamtscores nach Anwendung der Aromatherapie signifikant niedriger als vor der Anwendung (p < 0,001) und als in der Placebogruppe (p < 0,001). ***Schlussfolgerung:*** Die Autoren gelangten zu dem Schluss, dass die Aromatherapie mittels Dampfinhalation mit Lavendelduft die Schlafqualität und Lebensqualität von Frauen mit Schlafmangel in der Menopause signifikant verbesserte.

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Introduction

According to the World Health Organization, menopause is the permanent termination of menstruation as a result of the loss of ovarian activity. It is considered a very important period in women's lives, especially due to its effects on quality of life [1, 2]. The age at which most women reach menopause varies between 43.8 and 53 years in the world [3]. The most commonly observed symptoms of menopause that affect the quality of living are vasomotor changes, sleeplessness and fatigue [3, 4]. Hot flashes are experienced by more than 75% of women in the menopausal period [5]. Along with hot flashes, sleeplessness is reported as a major complaint during the menopausal period [5].

The prevalence of sleeping difficulties varies demographically, with an overall range between 12 and 79% of women in the world [6–11]. Night-time sleep disorders cause daytime somnolence or feelings of excessive daytime sleepiness, reduced ability to concentrate and fluctuations in mood, all of which combine to influence overall life quality. Additionally, sleep disorders increase the risk of coronary heart disease by affecting physiological functions, such as metabolic flexibility and insulin resistance [12]. It has also been reported that the use of sleeping pills increases from 5.8 to 11.2% among the population during menopause [10].

In the past, women were encouraged to undergo hormone replacement therapy (HRT) to reduce frequently observed menopausal symptoms such as those resulting from vasomotor changes and sleep disorders [13, 14]. However, many concerns have been raised surrounding the use of HRT, including its correlation with breast cancer [15, 16]. In addition to the risk of turning benign breast diseases into breast cancer, HRT is also linked to endometrial cancer due to the single use of oestrogen, increased cardiovascular and thromboembolism risk when HRT is initiated a long time after menopause, and an increase in gall bladder diseases causing pain and resulting in sleep disorders [17, 18]. For these reasons, alternative methods are currently recommended to reduce menopausal symptoms. In recent years, complementary and alternative medicine (CAM) methods have become widely recommended [19, 20].

The prevalence of the use of CAM varies across countries, based on diverse cultural and social background factors [21]. A systematic review included 51 reports from 49 studies in 15 countries, and the estimates of CAM use over 12 months ranged from 9.8 to 76% of the population in these studies [22]. CAM practices were reported as being used by 38% in the USA, 26% in the UK and 52% in Australia [22]. Among studies on national samples, the 3 highest rates of CAM use were reported in East Asian countries: Japan with 76%, followed by South Korea with 75% and Malaysia with 56% [22]. As for Turkey, reported CAM use ranges from 14.3 to 61% [23–27], especially in studies conducted on cancer patients. It is noteworthy that in Turkey, the development of complementary and traditional treatment methods has increasingly been receiving official support [28]. While aromatherapy is not a distinct discipline in the country, it is practiced as a subfield of phytotherapy [29].

Aromatherapy is one of the most widely used complementary therapies around the world [30]. In fact, a systematic review by Posadzki et al. [31] found that herbal medicine was the most popular type of CAM, followed by homeopathy, aromatherapy, reflexology and relaxation. Aromatherapy has been used by women for health reasons for a long time [32]. During menopause, in particular, many types of essential oils, such as geranium, rose, clary sage, fennel, cypress, angelica and lavender oil, have been used for aromatherapy [33].

One type of essential oil used in aromatherapy is lavender oil [32, 34, 35]. Known in the scientific world as *Lavandula angustifolia*, lavender is a member of the mint family. Its active ingredients are linalyl acetate and linalool, which acts as a tranquilizer, affecting the aminobutyric acid receptors in the central nervous system [36]. The resulting sedative effects of lavender oil help reduce stress-related tension, irritability, insomnia and depression [32, 34, 35]. Lemon oil (*Citrus limon*) also has many positive effects, such as providing mental refreshment and a sense of stability and comfort [32, 35]. Aromatherapy studies focusing on menopausal symptoms have shown that lavender aromatherapy has an alleviating effect [34, 37]. On

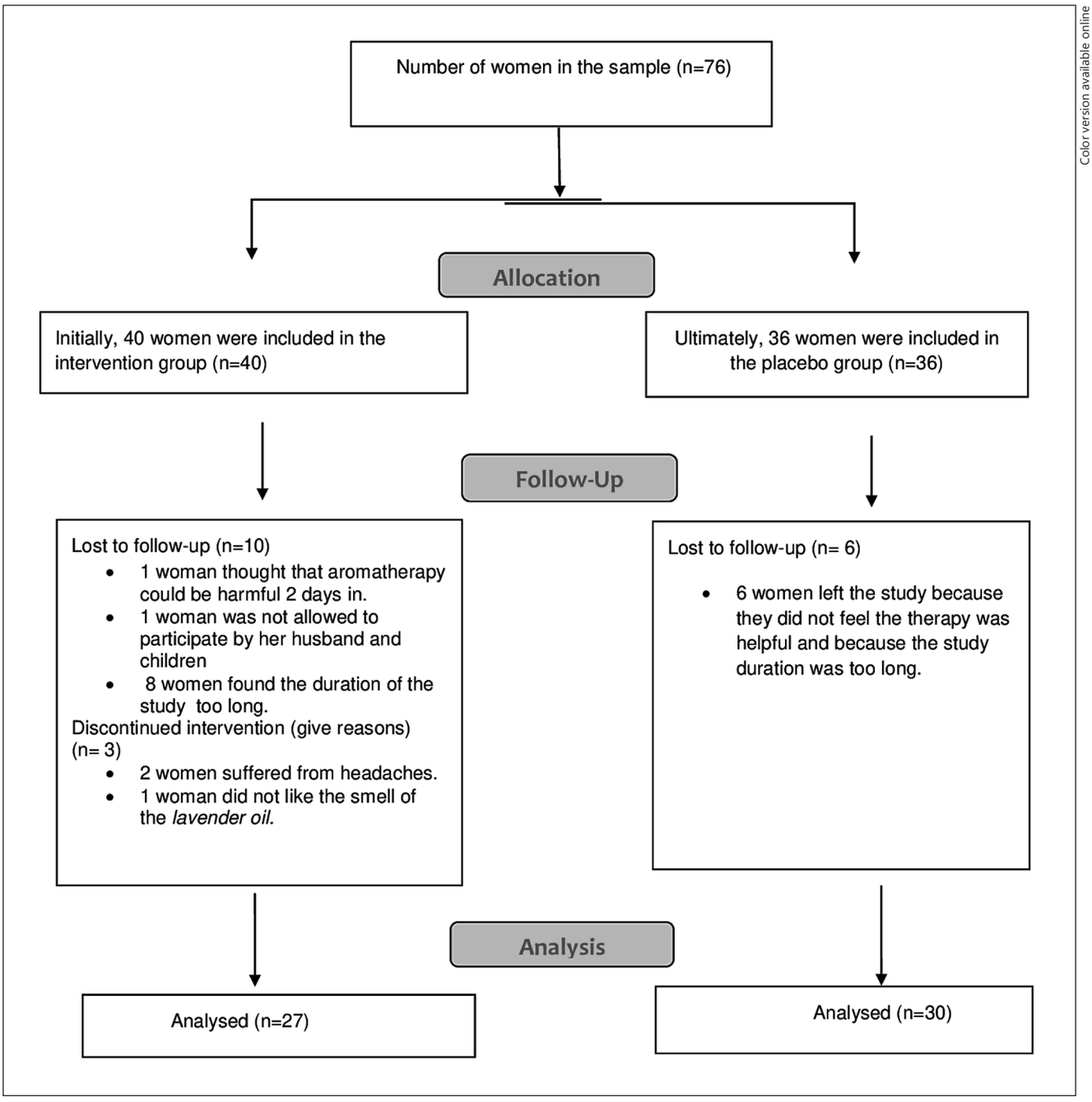

Fig. 1. Flow chart of study participants.

the other hand, studies on aromatherapy's effects on middle-aged women's autonomic nervous system have found that it effectively accelerates the first phase of sleep, aids comfortable REM sleep and increases total sleep quality and duration [38]. Lavender aromatherapy has also been observed to help with the reduction of sleep disorders [39] and to increase the overall quality of sleep [40]. While there is a large number of studies published on the medical effects of lavender oil [37, 38, 40–42], despite all of our efforts, we have not found any studies on the effects of lavender aromatherapy via steam inhalation on women's sleep and quality of life during the menopausal period. This study aims to remedy this shortcoming.

Study Hypotheses

Hypothesis 1. Aromatherapy applied to women with sleeping problems during menopause increases their sleep quality.

Hypothesis 2. Aromatherapy applied to women with sleeping problems during menopause increases their quality of life.

Material and Methods

Trial Design

This study was quasi-experimental with pre-test and post-test placebo control groups.

Study Settings

The study was conducted in a province of the central Anatolian region of Turkey, between December 15, 2015, and December 23, 2016.

Sample Size

The study population was made up of 1,471 women aged 45–59 years, registered at a local Family Healthcare Centre. The number of individuals to be included in the sample groups was determined based on the sample sizes used in similar studies [34, 38, 43–47]. Therefore, the aim at the beginning of the study was to reach 60 women, 30 for the intervention group and 30 for the placebo group. However, taking into account the possibility of losses, the intervention group was increased to 40 women and the placebo group to 36 women, all complying with the research criteria. The women to be included in the study from the Family Healthcare Centre were recruited using a snowball sampling method (Fig. 1).

The 2 groups were not studied simultaneously to prevent them from influencing each other. Instead, the study with the intervention group was conducted first, followed by that of the placebo group. The intervention group initially included 40 women. However, several of these women left the study later, citing headaches or claiming the research period was too long to complete. For these reasons, the intervention group was ultimately completed with a total of 27 women (Fig. 1). The placebo group (subject to plain steam inhalation) began with 36 women. However, 6 of the women later left, claiming the study duration was too long. In the end, the placebo group completed with a total of 30 women (Fig. 1).

At the end of the study, statistical power analysis was carried out based on the data collected from the sample groups during the study. Taking the Pittsburgh Sleep Quality Index (PSQI) and the Menopause-Specific Quality of Life Questionnaire (MENQOL) as our base reference points, the statistical power was estimated at 99.9%, with $\alpha = 0.05$ in the study. According to the result of the power analysis, we decided that the sample size was appropriate for our research.

Eligibility Criteria for Participants

To be eligible for inclusion in the study sample, women were required to have been in their menopausal period for 1–5 years, have a PSQI score of 5 or higher, not to have been undergoing HRT, have no allergies to aromatherapy products and be able to read and write.

In addition, women were ineligible to participate in the research if they had a known allergy to the essential oils to be applied in the study; had any sight-, hearing- and smelling-related or mental disabilities; had low tolerance for the essential oil to be used or found its scent displeasing; were undergoing various complementary and supporting therapies or treatments, such as yoga, meditation, and massage; were suffering from any type of respiratory disorders, such as asthma or chronic obstructive lung disease, or any kind of heart disease, hypertension and/or diabetes; had been using sleeping pills; had a mental disorder or were suffering from serious psychological problems; were unable to perform inhalation as recommended or had been experiencing problems related to inhalation, such as allergic reactions, breathing abnormalities, cough, nausea, etc.

Interventions

Aromatherapy

Lavender oil has a sedative effect that helps reduce the adverse effects of stress-induced tension, irritability, insomnia and depression [32, 34, 35]. On the other hand, lemon oil has refreshing effects that aid psychological relief and offer a sense of stability [32, 35]. Due to these effects, these essential oils were recommended for the study by an aromatherapy expert, in line with the academic literature on the subject [35, 48].

Expert opinion was taken into consideration in terms of the method of administration for aromatherapy in this study [35]. Steam inhalation is deemed to be the fastest and easiest way to maximize the effects of essential oils [33] and is one of the most commonly used methods for aromatherapy. Not only does it not require specialized equipment, this method also increases the solubility of oil [30, 33, 41]. For these reasons, steam inhalation of oils was the technique opted for in our study.

Procedures Applied to the Intervention Group

During the first interview with each participant, the aim of the study was explained, and written and verbal consent were obtained. The Questionnaire Form, PSQI and MENQOL were filled in by the researcher; pulse rate and blood pressure were taken; and the Inhalation Guide was explained followed by a demonstration of the aromatherapy administration method. No recommendations were made regarding the participant's bedtime routines, but explicit instruction was given that inhalation should be performed just before going to bed.

For the intervention group, the 2 oils (*L. angustifolia* and *C. limon*) were given to the participants in separate bottles without being mixed. The inhalation was carried out in line with the literature and the expert advice [35, 43–45]. Accordingly, 200 mL of boiling water was to be poured into a bowl (a non-plastic medium-sized bowl, which could easily be found in any home in women's homes). Two drops of lavender oil and 2 drops of lemon oil, kept in their own separate bottles, were to be added to boiling water to infuse the steam. The participants were asked to inhale the steam through the nose and exhale through the mouth for 5 min with their heads under a cover, 30 cm from the bowl. The inhalation procedure started on the first day after the initial interview and was carried out daily over 30 days. To ensure that the participants did not face any problems during the implementation and for the sake of the continuity of their participation, we had a motivational phone conversation with them every evening.

Procedures Applied to the Placebo Group

Based on the advice of the aromatherapy expert, only plain, boiling water was administered to the placebo group, without any oils [35]. Therefore, the women were asked to inhale plain steam, prepared following the above-mentioned steps; i.e., excluding any essential oils, through the nose, and exhale from the mouth 30 cm from the bowl for 5 min, under a cover. The inhalation procedure started on the first day after the initial interview and was performed daily over 30 days. The daily phone calls intended to sustain participant motivation throughout the duration were similarly made to the members of the placebo group by a researcher.

Participants from both groups were told to close their eyes during inhalation and to perform the administration in the same way throughout the duration of the study. The women's vital signs were checked during the initial and final interviews.

Table 1. Descriptive characteristics of the participants

Characteristics	Intervention group (n = 27)		Placebo group (n = 30)		p[a]
	M (Q1–Q3)	mean rank	M (Q1–Q3)	mean rank	
Age, years	53.00 (51.00–55.00	29.07	53.00 (50.00–55.00	48.93	0.974
Age at of menopause onset, years	51.00 (46.00–52.00)	28.24	50.00 (48.00–52.00)	29.68	0.739
Duration of menopause, years	3.00 (1.00–4.00)	30.35	3.00 (2.00–3.00)	27.78	0.552
	n	%	n	%	p[b]
Marital status					
Married	24	88.9	20	66.7	0.061
Single	3	11.1	10	33.3	
Educational status					
Literate/primary school graduate	13	48.1	11	36.7	
Secondary school graduate	5	18.5	9	30.0	0.547
High school graduate and above	9	33.3	10	33.3	
Occupational status					
Employed	5	18.5	5	16.7	0.854
Unemployed	22	81.5	25	83.3	
Income level					
Low	4	14.8	3	10.0	
Moderate	20	74.1	25	83.3	0.707
High	3	11.1	2	6.7	
Body mass index					
<25 (normal)	3	11.1	8	26.7	
25–30 (overweight)	10	37.0	14	46.7	0.109
≥30 (obese)	14	51.9	8	26.6	

M, median; Q1, 25th percentile; Q3, 75th percentile. [a] Mann-Whitney U test. [b] χ^2 test.

Data Collection

In this study, the data were recorded by the researcher during face-to-face interviews with the participants in the participants' own homes, each lasting 10–15 min. The daily routines of the women were not interfered with at any point in the study. The Questionnaire Form, the PSQI and the MENQOL scales were filled in for the members of both the intervention and the placebo groups as pre-test, and their pulse rate and blood pressure were taken and noted down. One month after the beginning of the study, the women were asked to respond to the PSQI and MENQOL scales once again, and their pulse rate and blood pressure were taken by the researcher. Moreover, to ensure consistency in the implementation, the participants were called daily on their personal phones.

Outcome Measures

The data for this study were collected through face-to-face interviews using the Questionnaire Form, the PSQI and the MENQOL.

Questionnaire Form. This form was developed by the researchers in accordance with the existing literature on the topic [7, 8, 49] and consisted of 14 questions related to sociodemographic and obstetric features as well as the age and height of the participants. The participants' blood pressure and pulse rate, which were taken by the researcher, were also recorded in this form. The form was completed by means of face-to-face interviews.

Pittsburgh Sleep Quality Index. The PSQI was developed in 1989 by Buysse et al. [50]. The reliability and validity studies were conducted by Ağargün et al. [51] (1996) in Turkey, and Cronbach's α was found to be 0.80. The scale consisted of 18 items and 7 component scores. Each component was assigned a value between 0 and 3 for evaluation. The total of these points yielded the total score of the scale, which ranged from 0 to 21. A high score (5 or above) indicated poor sleep quality. Sleep quality was classified as good (0–4) and poor (5–21). Given that one of the study criteria was the use of sleeping pills before and during the study, the subdimension of the use of a sleeping pill (component 6) was not used for calculation [51].

Menopause-Specific Quality of Life Questionnaire. This questionnaire was developed by Hilditch et al. [52] in 1996 to gather information about menopause-specific quality of life with psychometric features based on women's experiences and was adapted to Turkish society by Kharbouch and Sahin [53] in 2005, ensuring its reliability and validity. The scores for each sub-section of MENQOL range from 1 to 8. In the questionnaire, 1 point indicates that no problems related to menopause are experienced, 2 points indicate the existence of mild problems but not enough to cause distress, and 3–8 points denote increasing severity in the associated problems. The questionnaire consists of 4 parts corresponding to different aspects of the problem: vasomotor, psycho-social, physical and sexual. The vasomotor section (Questions 1–3) evaluates whether and to what degree a participant suffers from feelings of intense or uncomfortable body heat and night sweats during menopause. The psycho-social section (Questions 4–10) includes questions regarding the participants' sense of well-being by assessing feelings of lack of contentedness with one's own life, stress-related tension, dysmnesia, depression, grief, exhaustion, intolerance towards others, feelings of insufficiency and a desire for solitude. The physical features section of the Questionnaire Form

Table 2. PSQI sub-dimension medians and differences in the intervention and placebo groups before and after aromatherapy application

PSQI sub-dimensions	Intervention group (n = 27)		Placebo group (n = 30)		p^b
	M (Q_1–Q_3)	mean rank	M (Q_1–Q_3)	mean rank	
Subjective sleep quality					
Before	2.00 (2.00–2.00)	24.78	2.00 (2.00–3.00)	32.80	**0.029**
After	1.00 (1.00–1.00)	14.00	2.00 (2.00–2.00)	42.50	**<0.001**
Difference	1.00 (1.00–1.00)	39.48	0.00 (0.00–0.25)	19.57	**<0.001**
p^a	**<0.001**		**0.008**		
Sleep latency					
Before	3.00 (3.00–3.00)	30.44	3.00 (3.00–3.00)	27.70	0.203
After	2.00 (1.00–2.00)	17.33	3.00 (3.00–3.00)	39.40	**<0.001**
Difference	1.00 (1.00–2.00)	40.65	0.00 (0.00–0.00)	18.52	**<0.001**
p^a	**<0.001**		0.480		
Sleep duration					
Before	3.00 (3.00–3.00)	26.72	3.00 (3.00–3.00)	31.05	0.064
After	2.00 (1.00–2.00)	16.78	3.00 (3.00–3.00)	40.00	**<0.001**
Difference	1.00 (0.00–1.00)	40.24	0.00 (0.00–0.00)	18.88	**<0.001**
p^a	**<0.001**		0.317		
Habitual sleep efficiency					
Before	3.00 (3.00–3.00)	27.26	3.00 (3.00–3.00)	30.57	0.126
After	3.00 (2.00–3.00)	23.13	3.00 (3.00–3.00)	34.28	**<0.001**
Difference	0.00 (0.00–1.00)	33.94	0.00 (0.00–0.00)	24.55	**0.006**
p^a	**0.002**		0.257		
Sleep disturbances					
Before	2.00 (2.00–2.00)	30.67	2.00 (2.00–2.00)	27.50	0.311
After	2.00 (1.00–2.00)	25.28	2.00 (1.75–2.00)	32.35	0.052
Difference	0.00 (0.00–1.00)	34.22	0.00 (0.00–0.00)	24.30	**0.005**
p^a	**0.001**		0.414		
Daytime dysfunction					
Before	2.00 (2.00–3.00)	29.87	2.00 (2.00–2.25)	28.22	0.638
After	1.00 (1.00–2.00)	19.85	2.00 (2.00–2.00)	37.23	**<0.001**
Difference	1.00 (1.00–1.00)	39.11	0.00 (0.00–0.00)	19.90	**<0.001**
p^a	**<0.001**		**0.014**		
PSQI total					
Before	15.00 (14.00–15.00)	26.04	15.00 (15.00–16.00)	31.67	0.177
After	10.00 (8.00–11.00)	14.22	15.00 (14.00–1500)	42.30	**<0.001**
Difference	5.00 (4.00–600)	43.69	0.50 (0.00–100)	15.78	**<0.001**
p^a	**<0.001**		**0.014**		

PSQI score differences were calculated by subtracting the last follow-up score from the beginning score. Bold p values are statistically significant ($p < 0.05$). PSQI, Pittsburgh Sleep Quality Index; M, median; Q1, 25th percentile; Q3, 75th percentile. [a] Wilcoxon t test. [b] Mann-Whitney U test.

(Questions 11–26) evaluates general symptoms, such as flatulence and pain, pain in the muscles and joints, fatigue, sleeping difficulties, head and neck pain, reduced physical power, energy and endurance, dry skin, weight gain, increase in facial hair, changes in appearance, flexibility and/or skin colour, distension, backaches, polyuria and urinary incontinence while coughing or laughing. The sex-related section of the Questionnaire Form (Questions 27–29) involves questions about symptoms such as changes in sexual desire, vaginal dryness during intercourse and sexual abstinence. Cronbach's α values for the assessment were α = 0.73 for the vasomotor section, α = 0.84 for the psychomotor section, α = 0.88 for the physical section and α = 0.84 for the sexual section [53].

Inhalation Guide for the Intervention Group. This guide was prepared by the researchers in line with the existing academic literature [33, 43] and the aromatherapy expert's opinion [35], in order to explain the steps related to the inhalation and other points to be considered. The guide included instructions for preparing the hot water mixture containing the essential oils (*L. angustifolia* and *C. limon*), the method and duration of application, and what to do after the administration. This guide was given to the women in the intervention group after the steps were demonstrated (section Procedures Applied to the Intervention Group).

Inhalation Guide for the Placebo Group. The inhalation guide for the placebo group was prepared by the researchers, similarly drawing on the existing literature [33, 43] and the expert's opinion [35]. As with the intervention group, the guide was given to the participants in the placebo group once the inhalation steps had been clearly explained and demonstrated.

The Instrument for the Blood Pressure Measurement. A calibrated, semi-automatic blood pressure monitor (Microlife BP-3BTO-H), which measures from the upper arm, was used to take blood pressure.

Table 3. MENQOL sub-dimension medians and differences in the intervention and placebo groups before and after the application of aromatherapy

MENQOL sub-dimensions	Intervention group (n = 27)		Placebo group (n = 30)		p^b
	M (Q_1–Q_3)	mean rank	M (Q_1–Q_3)	mean rank	
Vasomotor symptoms					
Before	14.00 (13.00 to 16.00)	22.83	19.00 (14.00 to 22.00)	34.55	**0.007**
After	12.00 (11.00 to 13.00)	17.65	18.00 (14.75 to 21.00)	39.22	**<0.001**
Difference	2.00 (1.00 to 3.00)	39.48	0.00 (–1.00 to 1.00)	19.57	**<0.001**
p^a	**<0.001**		0.407		
Psychosocial symptoms					
Before	39.00 (31.00 to 41.00)	25.89	39.50 (35.75 to 43.00)	31.80	0.179
After	38.00 (31.00 to 41.00)	25.50	40.00 (34.75 to 43.00)	32.15	0.130
Difference	0.00 (0.00 to 1.00)	30.37	0.00 (–0.25 to 1.00)	27.27	0.517
p^a	0.368		0.662		
Physical symptoms					
Before	84.00 (77.00 to 90.00)	33.17	78.00 (69.75 to 85.50)	25.25	0.072
After	77.00 (70.00 to 80.00)	26.09	79.00 (72.50 to 85.00)	31.62	0.209
Difference	6.00 (5.00 to 10.00)	41.74	0.00 (–1.00 to 0.25)	17.53	**<0.001**
p^a	**<0.001**		0.488		
Sexual symptoms					
Before	19.00 (15.00 to 21.00)	32.11	16.00 (3.00 to 21.00)	26.20	0.176
After	19.00 (15.00 to 21.00)	32.11	16.00 (3.00 to 21.00)	26.20	0.176
Difference	0.00 (0.00 to 0.00)	29.00	0.00 (0.00 to 0.00)	29.00	1.000
p^a	1.000		1.000		
Total					
Before	152.00 (144.00 to 161.00)	29.96	149.50 (137.50 to 164.00)	28.13	0.678
After	142.00 (131.00 to 155.00)	24.63	151.00 (137.50 to 161.25)	32.93	0.059
Difference	8.00 (7.00 to 13.00)	41.91	0.00 (–2.00 to 1.00)	17.38	**<0.001**
p^a	**<0.001**		0.887		

Questions related to sexual symptoms were not answered by women who did not have a partner. MENQOL score differences were calculated by subtracting the last follow-up score from the beginning score. p values in bold are statistically significant ($p < 0.05$). MENQOL, Menopause-Specific Quality of Life Questionnaire; M, median; Q1, 25th percentile; Q3, 75th percentile. [a] Wilcoxon t test. [b] Mann-Whitney U test.

Statistical Analysis

The data were assessed using IBM SPSS 20.0 (Statistical Program for the Social Sciences). The descriptive statistics were given as number of units (n), percentage (%) and median (Q_1–Q_3). The concordance of the numerical data to the normal distribution was evaluated by means of the Shapiro-Wilk test. The homogeneity of the variances was checked using the Levene test. The comparison of categorical variables was made using χ^2 analysis. The comparison of the 2 independent groups was made using the Mann-Whitney U test, and the evaluation of 2 consecutive measurements was done using the Wilcoxon test. In these comparisons, a value of $p < 0.05$ was taken as statistically significant.

Results

In the intervention group, the median age of the women was 53.00 (51.00–55.00) years, the median age at the onset of menopause was 51.00 (46.00–52.00) years, and the median menopause duration was 3.00 (1.00–4.00) years, while in the placebo group, the median age of the women was 53.00 (50.00–55.00) years, the median age at the onset of menopause was 50.00 (48.00–52.00) years, and the median menopause duration was 3.00 (2.00–3.00) years. Age, marital status, educational level, occupational status and income level, as well as age at the onset of menopause and menopause duration, were found to be similar in both groups (Table 1; $p > 0.05$). The vital signs of the women were found to be within normal values before and after the administration of aromatherapy.

Before the administration, the median PSQI score was determined to be 15.00 (14.00–15.00) in the intervention group and 15.00 (14.00–16.00) in the placebo group. Before the administration, median scores were received for all sub-dimensions of the PSQI scale except for the subjective sleep quality sub-dimension, and total median scores were found to be similar for both groups (Table 2; $p > 0.05$). After the administration, the PSQI median score was determined to be 10.00 (8.00–11.00) in the intervention group and 15.00 (14.00–15.00) in the placebo group (Table 2; $p < 0.001$). The total PSQI score decreased by 4 points for the intervention group and 1 point for the placebo group following 30 days of the administration of aromatherapy ($p < 0.001$). After the administration, a sig-

nificant difference was found between the intervention and placebo groups in terms of the median scores of all sub-dimensions and the total PSQI median scores (Table 2; $p < 0.05$).

Before the administration, the MENQOL total median score was found to be 152.00 (144.00–161.00) in the intervention group and 149.50 (137.50–164.00) in the placebo group (Table 3; $p > 0.05$). Before the administration, the median scores for all sub-dimensions of the MENQOL scale, except for the vasomotor symptoms sub-dimension, and the total mean scores were measured to be similar for both groups (Table 3; $p > 0.05$). After the administration, the total MENQOL median score was found to be 142.00 (131.00–155.00) in the intervention group and 151.00 (137.50–161.25) in the placebo group (Table 3; $p < 0.001$).

After the administration, no significant differences were found between the 2 groups in the total median score of the MENQOL and in the median scores of all its sub-dimensions, except for vasomotor symptoms (Table 3; $p > 0.05$). However, a statistically significant difference between before the administration and after the administration was found between the 2 groups in the total median score of the MENQOL and in the median scores of all its sub-dimensions, except for psychosocial and sexual symptoms (Table 3; $p < 0.001$).

Discussion

This study aimed to determine the effects of aromatherapy on the sleep quality and the overall quality of life of women who suffer from poor sleep quality during the menopausal period. At the end of our study, we saw that the PSQI scores of the intervention and placebo groups were similar before the administration of the aromatherapy, indicating poor sleeping quality in both groups (Table 2; $p > 0.05$). With the exception of sleep disturbances, all other sub-dimensions of the PSQI and the total scores increased after the administration in both the intervention and the placebo group; however, the sleep quality of the women in the intervention group improved more than that of the placebo group and at a significant level (Table 2; $p < 0.001$). The total median PSQI score of the intervention group was found to have decreased by 4 points after the administration of aromatherapy. This decrease in the PSQI score of the women in the intervention group supports the hypothesis that "aromatherapy applied to women with sleeping problems during menopause increases their sleep quality." It was also found that steam inhalation without essential oils also increased sleep quality via the placebo effect, though the increase was not as significant as that in the intervention group. The total median PSQI score of the placebo group decreased by 1 point.

In recent years, aromatherapy has become a preferred method for eliminating the unfavourable symptoms that accompany menopause. In the existing academic literature, there are studies demonstrating the positive effects of aromatherapy on vasomotor symptoms [33, 37], psychological symptoms [46] and abdominal fat and waist circumference reduction [42]. However, studies on the use of aromatherapy to alleviate sleeping problems during the menopausal period are not as widely available in the literature. There are some studies that show an increase in sleep quality when aromatherapy is used in general. In this limited number of studies, sleep quality is shown to be better in aromatherapy intervention groups than in placebo groups [11, 38, 40, 44, 45]. But there may be differences in terms of the level of effect on sleep quality between the studies [38, 44, 54] conducted using only lavender oil and the current study, which was conducted using a combination of lavender and lemon oil.

In this study, inhalation aromatherapy administered to the intervention group was found to significantly decrease vasomotor and physical symptoms along with the total MENQOL score (Table 3). In a study by Hur et al. [34], it was found that aromatherapy through massage significantly reduced hot flashes, which are considered to be a major menopausal symptom. In a study conducted by Darsareh et al. [37] which compared the impacts of aromatic oil and regular oil massage, it was found that the menopausal symptom scores of the group to which aromatic oil was administered were significantly lower than those of the placebo group. Finally, in a study conducted by Taavoni et al. [47], it was observed that a massage with aromatherapy decreased the psychosocial sub-dimension score during the menopausal period more than a massage without aromatherapy. Our study findings are similar to those in the literature.

A study by Kazemzadeh et al. [55] also found that inhaling steam with lavender oil significantly decreased menopausal hot flashes in the intervention group compared to the placebo group, while Choi et al. [56] found that aromatherapy using orange blossom oil alleviated menopausal symptoms and increased quality of life [56]. Our findings seem to be in line with these findings in the existing literature. The decrease in the total MENQOL scores of our participants in the intervention group supports our hypothesis that "aromatherapy applied to women with sleep problems during menopause increases their quality of life."

Eight women in the intervention group and 6 women in the control group (together making up 32% of the initial sample) left the study because they found the required duration of the administration of aromatherapy too long. We thought that the participants found the study especially challenging because aromatherapy was performed through the steam-inhalation method. Thus, we suggest

that similar studies should be done with more practical methods in the future (e.g., putting drops of oil on a cloth to smell).

Limitations

Randomization was not implemented in this study. Therefore, there is the potential of observer bias.

Conclusion

Lavender inhalation aromatherapy improves sleep quality and quality of life in women with sleeping problems during menopause.

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Statement of Ethics

Ethical principles were taken into consideration at all stages of the study. Ethical approval was obtained from the Nevşehir Hacı Bektaş Veli University Interventional Clinical Research Ethics Committee (Decision No. 2014.12.03) in addition to written consent from the Turkish Public Health Agency Presidency (Decision No. 67350377/770). Prior to beginning the study, the aims of the study were explained to the individuals who met the inclusion criteria of the study, and the written consent of all women who agreed to participate was obtained using the Voluntary Informed Consent Form, which clearly states that participation in the study is voluntary and that each participant retains the right to refuse to participate in the study or leave at any time; that lack of participation will have no bearing on her treatment and care; that she will not be held responsible for any pecuniary liability; that no payment will be made to the participant; and that any information collected will only be used in the present study and will be kept strictly confidential.

Disclosure Statement

The authors have no conflicts of interest to declare.

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Author Contributions

M.G., A.K. and M.B. designed the study. M.G. collected the data. M.G. and A.K. analysed the data. M.G., A.K. and M.B. prepared the manuscript. We confirm that all listed authors meet the authorship criteria, and all authors agree with the content of the manuscript.

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