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# Effect of lavender aromatherapy on pruritus, anxiety, and sleep quality of patients undergoing hemodialysis: a randomized controlled trial

**Tuğba Menekli[1], Yadigar Çevik Durmaz[1]**

[1]Department of Internal Medicine Nursing, Malatya Turgut Özal University Faculty of Health Sciences, Malatya, Turkey. [2]Department of Pyscology, Munzur University, Tunceli, Turkey.

***Corresponding to:** Tuğba menekli, Malatya Turgut Özal University Faculty of Health Sciences, 44280, Malatya, Turkey.

***Competing interests***
The authors declare no conflicts of interest.

***Abbreviations***
SAI: State Anxiety Inventory; RCSQ: Richard Campbell Sleep Questionnaire; CKD: Chronic Kidney Disease; RRT: Renal replacement therapies; HD: Hemodialysis.

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## Abstract

**Background:** Patients undergoing hemodialysis experiences some symptoms. Pruritus, anxiety, and sleep quality are three of the most common symptoms. Even though some pharmacological treatments use to cope with these symptoms, they are still experienced by the patients at a high level. **Aim:** This study aimed to determine the effect of lavender oil aromatherapy on pruritus, anxiety, and sleep quality of patients undergoing hemodialysis. **Method:** This randomized controlled study was carried out between December 2019 and March 2020. Eighty of 895 eligible patients were included in the study. Aromatherapy inhalation and massage together applied to the patients for six weeks. 5D-Itch Scale, State Anxiety Inventory (SAI), and Richard Campbell Sleep Questionnaire (RCSQ) were used for data collection. IBM SPSS 25.0 were used for statistical analysis. Mann-Whitney U, Wilcoxon signed-ranks test, and repeated measures-ANOVA tests were used to compare the difference between the groups and simple regression analysis to investigate the relationship between the dependent and independent variables. **Results:** Most of the patients were male (57.5%) and aged between 41 and 55 years (52.5%). There was significant difference in the mean scores of SAI (Pretest: 44.02±5.33, Post-test: 35.40±4.52, $P$=0.003), 5D-Itch scale (Pretest: 9.80±2.04, Post-test: 7.00±2.31, $P$=0.001), and RCSQ (Pretest: 17.11±40.30, Post-test: 58.55±33.74, $P$=0.002) within time in the intervention group. There was a statistically significant difference between the groups regarding the mean scores of SAI (Intervention: 35.40±4.52, Control: 46.84±4.62, $P$=0.003), 5D-Itch scale (Intervention: 7.00±2.31, Control: 8.96±2.05, $P$=0.004), and RCSQ (Intervention: 58.55±33.74, Control: 19.93±28.36, $P$=0.001) after the intervention. **Conclusion:** After six-weeks intervention, lavender aromatherapy was found an effective way to reduce pruritus, anxiety and to improve the sleep quality of patients undergoing hemodialysis.

**Key Words:** patients undergoing HD; aromatherapy; lavender oil; pruritus; anxiety; sleep quality.

***Highlights***

Lavender aromatherapy is effective to reduce the pruritus of the patients undergoing hemodialysis.

Lavender aromatherapy is effective to reduce the anxiety of the patients undergoing hemodialysis.

Lavender aromatherapy is an effective way to improve sleep quality of patients undergoing hemodialysis.

## *Introduction*

Chronic Kidney Disease (CKD) is a common health problem in Turkey and even around the world, affecting the kidney's function of adjusting fluid-solute balance, showing chronic and progressive deterioration in metabolic endocrine function, decreasing quality of life, and increasing the mortality rates [1, 2]. Renal replacement therapies (RRT) are the main therapies for the treatment of CKD, and hemodialysis (HD) is the most common type of RRT. Even though they are undergoing HD treatment, CKD patients are experiencing various problems such as chronic pain, pruritus, anxiety, cramps and fatigue, and sleep disorders [3, 4].

Uremic pruritus is an itch in end-stage renal failure regardless of any other factor. This itch may affect up to 13% of the patients and the lifetime prevalence of the itch is about 35% [5]. It is an unpleasant feeling that often appears on the back, abdomen, head, and arms before dialysis, not life-threatening, creating itching and scratching on the skin. It is also a symptom that drops an individual's quality of life [6]. Because of the aforementioned effects, it is a symptom that affects the patient negatively in terms of biopsychosocial and should be taken under control [1–3]. Krajewski et al. (2020) reported that the most common drugs used for itch in hemodialysis patients are the immunosuppressant drugs and 96.4% of the patients in the study were using glucocorticosteroids [5]. It was clear in the literature that immunosuppressant drugs, especially glucocorticosteroids, have many side effects on the patients [7]. On the other hand, several studies suggest that non-pharmacologic methods decrease the need for drug use related to itching and also decrease the severity of itching [3, 8–11]. It is reported in the literature that the frequency of sleep disorders is at a high level (50–83%) among HD patients, which causes poor quality of life [12, 13]. The adverse effects of pharmacological methods that are using for improving the sleep quality of patients with chronic diseases have led to the use of non-pharmacological methods [11, 14–16]. People with a chronic disease such as CKD experience severe social (relationships with friends and family), economic (financial difficulties, treatment costs, leaving work, etc.) and psychological (mental depression, depression, anxiety) problems [17–19]. It is very

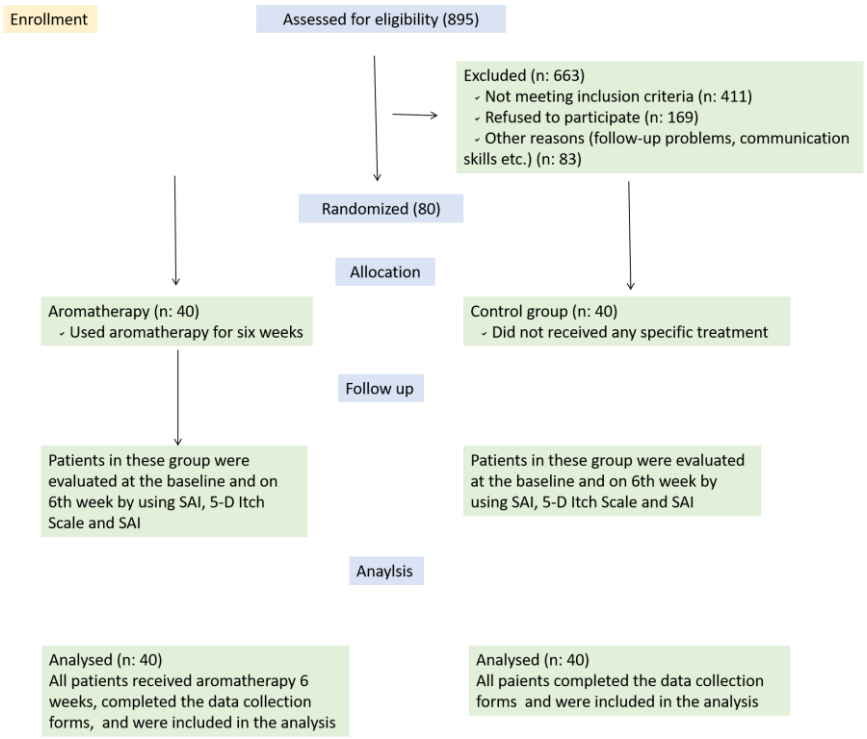


**Figure 1. Flow Diagram of the Research.**

important to reduce anxiety in these patients. To cope with this problem, some drugs have commonly been used worldwide. However, since most of the drugs have an addiction risk, patients apply to alternative methods [20–22].

Previous studies have shown that patients experience a lot of side effects of drugs used to cope with pruritus, sleep and anxiety problems [12, 19, 23, 24]. Therefore, because of the long-term treatment process, the use of complementary therapies is recommended to reduce complications of such chronic diseases and conditions. To reduce these problems of patients who undergo HD, patients and health care professionals should be encouraged, informed, and increase awareness about non-pharmacological treatment and symptom management, and their use [13, 14, 16]. It has been reported that many HD patients turn to complementary medicine in the management of sleep, itching, and anxiety symptoms [6, 25]. Aromatherapy is one of the most common types of complementary medicines and refers to the use of herbal extracts obtained from the leaves, fruits, flowers, roots, seeds, and stems of plants. [12, 19, 24, 26] In aromatherapy, the two most popular ways are massage aromatherapy and inhalation aromatherapy [23, 27, 28]. Both uses of aromatherapy are in the most popular complementary medicines in nursing which are non-invasive, non-expensive, and simple to use [6, 25, 27].

The use of aromatherapy in nursing practice has started to become widespread [1, 4]. The use of oils obtained from aromatic plants to provide mind, body, and soul integrity is defined as aromatherapy [6, 29]. Oshvandi et al. (2021), in their recent studies, investigated the effect of aromatherapy prepared with lavender oil and sweet orange on the restless leg syndrome. [30] In another study conducted by Ajorpaz et al. (2020), it was reported that glycerin oil and lavender oil massages were effective in the management of restless leg syndrome. [31] Moreover, few studies have focused on the oral use of complementary medicines can be dangerous due to decreased glomerular filtration rate in CKD patients [3, 4, 27]. Therefore, nurses should be able to evaluate the effects of complementary medicine on the patient's health [1, 13]. Health professionals, especially nurses as a part of their advisory role, should recommend individuals, who are experiencing these problems (pruritus, anxiety, and sleep quality), to look for all alternatives including complementary therapies, and choose the most suitable methods for himself/themselves [2, 6, 8]. Each of these problems has been discussed separately by a great number of studies in the literature [3, 10, 12, 13, 19, 20]. The aim of the study was to evaluate the effectiveness of aromatherapy using lavender oil on pruritus, anxiety, and sleep quality in patients undergoing HD.

The hypotheses of the research:

H1. Lavender Aromatherapy decreases the Pruritus of Patients undergoing HD

H2. Lavender Aromatherapy decreases the Anxiety of Patients undergoing HD

H3. Lavender Aromatherapy increases the Sleep Quality of Patients undergoing HD

## *Materials and methods*

### Design

This research was designed as a randomized controlled study.

### Study Settings

The data were collected between December 2019–March 2020 in the HD unit of a public hospital in Turkey.

### Sample/Participants

A total of 895 patients were undergoing dialysis in the center. Two hundred and thirty-two of these patients were meeting the inclusion criteria and agreed to participate in the study. Cohen's d criteria were followed to determine the minimum required sample size for the study. The minimum required the number of participants was determined as 80, 40 for aromatherapy, 40 for control (CI: 95%, $\alpha = 0.05$, Power= 0.80, and dz= 0.41). Therefore 80 of 232 patients were divided into two groups by using computer-assisted randomization.

Inclusion criteria were the following:

1. Aged between 18–65 years old.
2. Patients were undergoing HD for at least 6 months.
3. Patients were receiving three- to five-hour HD treatment (at least) three times a week.

4. Had 5 or higher scores on the pruritus scale.
5. Had no dermatological problem other than uremic pruritus.
6. Had 25 or lower scores in RCSQ.
7. Had 20 or higher scores in SAI.
8. Had no smelling problem.
9. Did not using any medications for anxiety, pruritus, or sleep disorders.

The patients who have any communication problems (visual or auditory), respiratory problems, history of any allergy to smell were excluded from the study.

### Data Collection

The data were collected from the patients who were undergoing HD between December 2019 and March 2020 and who met the inclusion criteria of the research via face-to-face interview. Only one researcher collected the data to prevent interobserver differences. Patient Information Form, 5-D Itch Scale, Richard-Campbell Sleep Questionnaire (RCSQ), and The State Anxiety Inventory (SAI) were used for data collection.

On the first day (baseline) and 6$^{th}$ week, data were collected from the patients in both the control and intervention groups by using all data collection tools to determine the baseline level of anxiety, sleep quality, and pruritus.

### Patient information form

This form was developed by the research team by considering the related literature [13, 20, 21, 32]. The form contained 5 questions on socio-demographic features such as marital status, age, gender, occupation, education, and 3 questions on disease such as disease duration, the onset of hemodialysis (in years), number of sessions per week.

### 5-D Itch Scale

The 5D-itch scale was developed to measure duration, degree, direction, disability, and distribution. Three domains of the scale (duration, degree, and direction) contain one item each, while the one domain (disability) has four items to evaluate the effect of itching on daily life activities, and its score was calculated by using the highest score of these four items. In the distribution domain, patients can select the body parts affected by pruritus. Thus, participants can select all parts they experience itching on. The score for this domain is calculated by considering the number of affecting parts; 0–2 body parts 1 point; 3–5 body parts 2 points, 6–10 body parts 3 points, 11–13 body parts 4 points, and 14–16 body parts 5 points. The overall score of the 5D-itch scale was calculated by summing all the five domains, 5 points in the scale indicates no pruritus, while 25 points indicate severe pruritus [9]. The Turkish validity and reliability research of the scale was conducted by Altınok Ersoy and Akyar (2018) [9]. The Cronbach Alpha coefficient was found to be 0.608 for the Turkish version of the scale [9]. In the current study, the Cronbach Alpha coefficient was determined as 0.697.

### Richard-Campbell Sleep Questionnaire (RCSQ)

This is a visual analog scale and was developed by Richards in 1987. The questionnaire provides self-reported scores on "depth of sleep", "ease of falling asleep", "frequency of awakening", "ease in return to sleep", and "quality of sleep". The questionnaire is evaluating the individual's sleep via a 100 mm line with words describing "the poorest possible sleep (0 mm)" to "the best possible sleep (100 mm)". A total of five-item provides the total score of quality of sleep. "0–25" points indicate "very bad sleep", "76–100" points "very good sleep". It is thought that as the scale score increases, the sleep quality of the patient also increases. The Chronbach's alpha coefficient of the Turkish version of the scale was reported as 0.91 [33]. In this research, the Cronbach Alpha coefficient was determined as 0.895.

### The State Anxiety Inventory (SAI)

This inventory was developed by Spielberger et al (1970). It was reported that the Cronbach's alpha value of SAI was between 0.83 and 0.87. The SAI consist of 20-item on the individuals' feelings at the moment. The scores in SAI range between 20 and 80 [34, 35]. Higher scores represent a higher level of anxiety. The validity and reliability of the scale for Turkish society were assessed by Oner and Le (1983). The Cronbach's Alpha was reported between 0.94 and 0.96 for the Turkish version of the inventory [35]. In our research, the Cronbach's Alpha coefficient was determined as 0.922.

### Aromatherapy practice

Preparation of lavender oil: according to the relevant literature review, lavender oil was diluted with distilled water (2% lavender oil and 98% distilled water) [3, 12, 13]. This diluted lavender oil was used both for massage and inhalation interventions. The pH of the solution was examined just after it prepared and the pH was determined as 6.5 by using pH indicator strips (Merck 109535.0001, Merck KGaA, 64271 Darmstadt, Germany).

Aromatherapy was applied to the intervention group patients by two methods. In the first method, to remove the waste from the hands surface, the researcher washed his/her hands first. Then, the researcher gently massages the pruritus area by using lavender oil. This procedure takes approximately 7–15 minutes per patient and is repeated for the patients each time when they underwent to HD. All participants performed a skin test before the intervention to ensure that they didn't have a lavender allergy. No patients in the intervention group had a lavender allergy.

The second method of aromatherapy was the inhalation of lavender oil. In this method, lavender oil was provided to the patients and the patients were instructed on how to use it. The 2% lavender oil was provided as 15-mL lightproof blue bottles to protect the oil from sunshine and a strict lid was used to prevent the release of the packaged oil into the air. Alongside the lavender oil, a package of cotton and a small box were provided to the patients. Before the intervention, a researcher instructed the patients to drop 2 drops of solution on the cotton 30 minutes before sleep and put this cotton in the box which is placed 15-20 cm away from the patient's pillow. The use of a new box and new cotton pieces for each procedure (each night) were also instructed by the researcher to the patients. The patients repeated this procedure every night throughout the study period (six weeks) [3, 12, 13, 19–21]. Patients were directed to breathe normally.

### Control Group

For the patients in the control group, there wasn't any special intervention and routine practices of the HD unit were followed. In the HD unit, routinely, staff suggested patients wash the area that pruritis experienced on. Patients did not use any drug for anxiety, sleep problems, and pruritis throughout the six weeks.

### Data Assessment

Descriptive data of the study are shown with the number (n), percentage (%), mean and standard deviation. The Mann-Whitney U test was used to determine differences between interventions before and after the intervention. Wilcoxon Signed-Ranks Test was used to determine the differences between groups before and after the intervention. Simple regression analysis was used to summarize the data obtained from the research. Repeated Measures-ANOVA was used to determine differences between groups within time. G-Power software version 3.1.9.4 was used for sample determination. Statistical analyzes were made with the IBM SPSS 25.0 software and the level of significance was considered as 0.05 (*P*-value).

### Ethical Considerations

All necessary permissions were obtained from Inonu University Non-Interventional Clinical Research Ethics Committee (Date: 13.11.2019; Decision Number: 2019-29/3), the Inonu University hospital (Date: 20.11.2019) and the participants. Patients' voluntary to join were explained for the research. Written and verbal permission were obtained from all participants. All the principles of the Declaration of Helsinki were followed at every stage of the study.

***Results***

It was determined that in the intervention group, 57.5% were male, 52.5% were in the age group of 41 to 55 years, 77.5% were married, 62.5% were graduated from high school and 75.0% were unemployed; 55.0% of the individuals in the control group were male, 57.5% were in the age group of 41 to 55 years, 72.5% were married, 70.0% were graduated from high school and 70.0% were unemployed. In terms of their disease-related characteristics, it was determined that 42.5% of the individuals in the intervention group and of 52.5% of individuals in the control group were diagnosed with CKD for 5 to 10 years, the duration of HD in 60.0% of the individuals in the intervention group and of 57.5% of those in the control group was 1–5 years and the number of sessions in 82.5% of individuals in the intervention group and 75.0% of those in the control group was 3 per week. There wasn't any statistically significant difference between the groups regarding the sociodemographic and disease-related characteristics (Table 1).

There were statistically significant differences in RCSQ (*p:* 0.002), SAI (*P:* 0.003) and 5-D Itch Scale (*P:* 0.001) mean scores of the patients in the intervention group before and after the intervention. There wasn't any statistically significant difference in RCSQ (*P:* 0.251), SAI (*P:* 0.840) and 5-D Itch Scale (*P:* 0.291) mean scores of the patients in control group. There were no significant differences between the groups in terms of the mean scores of RCSQ (*P:* 0.680), SAI (*P:* 0.419), and 5-D Itch Scale (*P:* 0.170) at baseline while there were significant differences between the groups in terms of the mean scores of RCSQ (*P:* 0.001), SAI (*P:* 0.003) and 5-D Itch Scale (*P:* 0.004) after the intervention.

According to the regression estimates, aromatherapy variable has a negative and significant effect on SAI and 5-D Itch Scale scores while it has positive and significant effect on RCSQ (Table 3).

A two-way repeated-measures ANOVA was used to compare the effect of aromatherapy on Pruritus, Anxiety, and Sleep Quality score changes before and after the intervention within time. A significant difference was found within the time for the intervention group regarding RCSQ, SAI, and 5-D Itch Scale mean scores ($P < 0.05$) while there wasn't any significant difference within the time for the control group (Table 4).

**Table 1. Distribution of Descriptive and Disease-Related Characteristics in Groups (n= 80)**

| Characteristics | Intervention Group (n = 40) | | Control Group (n = 40) | | Test *p* |
|---|---|---|---|---|---|
| | n | % | n | % | |
| **Age** | | | | | |
| 26-40 | 11 | 27.5 | 10 | 25.0 | $x^2$=0.865 |
| 41-55 | 21 | 52.5 | 23 | 57.5 | *P.* 0.612[a] |
| 56 and over | 8 | 20.0 | 7 | 17.5 | |
| **Gender** | | | | | |
| Male | 23 | 57.5 | 22 | 55.0 | $x^2$=0.455 |
| Female | 17 | 42.5 | 18 | 45.0 | *P.* 0.500[a] |
| **Marital Status** | | | | | |
| Married | 31 | 77.5 | 29 | 72.5 | $x^2$=2.478 |
| Single | 9 | 22.5 | 11 | 27.5 | *P.* 0.781[a] |
| **Education Level** | | | | | |
| Primary school | 6 | 15.0 | 7 | 17.5 | $x^2$=1.062 |
| High school | 25 | 62.5 | 28 | 70.0 | *P.* 0.171[a] |
| University and higher | 9 | 22.5 | 5 | 12.5 | |
| **Occupation** | | | | | |
| Unemployed | 30 | 75.0 | 28 | 70.0 | $x^2$=0.351 |
| Employed | 10 | 25.0 | 12 | 30.0 | *P.* 0.134[a] |
| **Disease Duration** | | | | | |
| 6 months to 5 years | 9 | 22.5 | 8 | 20.0 | $x^2$=1.945 |
| 5-10 years | 17 | 42.5 | 21 | 52.5 | *P.* 0.234[a] |
| 11 y and longer | 14 | 35.0 | 11 | 27.5 | |
| **Onset of Hemodialysis (in years)** | | | | | |
| < 1 | 6 | 15.0 | 7 | 17.5 | $x^2$=1.020 |
| 1 - 5 | 24 | 60.0 | 23 | 57.5 | *P.* 0.539[a] |
| 5 or more | 10 | 25.0 | 10 | 25.0 | |
| **Number of sessions** | | | | | |
| 2 per week | 7 | 17.5 | 10 | 25.0 | $x^2$=2.082 |
| 3 per week | 33 | 82.5 | 30 | 75.0 | *P.* 0.777[a] |

Note. a=Chi-Square

**Table 2. RCSQ, SAI, and 5-D Itch scale mean scores at the baseline and after the intervention**

| Groups | RCSQ | | | SAI | | | 5-D Itch Scale | | |
|---|---|---|---|---|---|---|---|---|---|
| | Pretest | Posttest | *p* | Pretest | Posttest | *p* | Pretest | Posttest | *p* |
| Intervention | 17.11±40.30 | 58.55±33.74 | 0.002* | 44.02±5.33 | 35.40±4.52 | 0.003* | 9.80±2.04 | 7.00±2.31 | 0.001* |
| Control | 16.60±30.47 | 19.93±28.36 | 0.251 | 45.64±5.07 | 46.84±4.62 | 0.840 | 9.13±1.98 | 8.96±2.05 | 0.291 |
| *P* | 0.680 | 0.001** | | 0.419 | 0.003** | | 0.170 | 0.004** | |

*Mann-Whitney U Test, **Wilcoxon Signed Rank Test

**Table 3. Regression Estimates on the efffects of aromatherapy on pruritus, anxiety and sleep quality**

| Model | Variable | Variables | B | S.error | β | t | p |
|---|---|---|---|---|---|---|---|
| 1 | RCSQ | Constant | 65.890 | 0.736 | | 31.051 | 0.001* |
| | | Aromatherapy-Control R=0.859 | 46.727 | 1.119 | 0.808 | -15.230 | 0.001* |
| | | Adjusted $R^2$=0.795 F=130.065 | | | | | |
| | | *P*=.001* | | | | | |
| 2 | SAI | Constant | 94.335 | 1.048 | | 57.448 | 0.001* |
| | | Aromatherapy-Control R=0.911 | -61.072 | 0.369 | -0.913 | 26.094 | 0.001* |
| | | Adjusted $R^2$=0.859 F=220.997 | | | | | |
| | | *P*=.001* | | | | | |
| 3 | 5-D Itch Scale | Constant | 4.113 | 0.407 | | 12.369 | 0.001* |
| | | Aromatherapy-Control R=0.894 | -1.539 | 0.233 | -0.673 | -8.037 | 0.001* |
| | | Adjusted $R^2$=0.837 F=256.066 | | | | | |
| | | *P*=.001* | | | | | |

Note. *$P$ < 0.001, Simple regression analysis

**Table 4. Changes in RCSQ, SAI, 5-D Itch Scale mean scores within time**

| Variable | Group | n | Mean difference 6 weeks | *P*-value | | |
|---|---|---|---|---|---|---|
| | | | | Time | Group | Effect Size |
| RCSQ | Intervention | 40 | 11.82 | 0.005* | 0.733 | 1.789 |
| | Control | 40 | -0.31 | 0.103 | | |
| SAI | Intervention | 40 | -2.06 | 0.001* | 0.599 | 1.204 |
| | Control | 40 | 0.29 | 0.167 | | |
| 5-D Itch Scale | Intervention | 40 | -0.24 | 0.002* | 0.660 | 0.913 |
| | Control | 40 | -0.10 | 0.118 | | |

Mauchly's Test of Sphericity was done (*P*-value < 0.001)

## *Discussion*

Although HD prolongs patients' life, it causes numerous social, mental, and physical problems in the patients [2, 8]. Considering the costs of the management of complications in patients undergoing HD; aromatherapy can be used as a cost-effective and complementary or alternative treatment to reduce the most common symptoms of HD such as pruritus, anxiety, sleep problems [2, 13, 36]. In this research; the effect of lavender aromatherapy on symptoms of anxiety, sleep problems, and pruritus.

A significant difference was found between the baseline and after the intervention, regarding the anxiety, sleep, and itching scale scores in the intervention group. However, we found that no statistically significant difference was found between pre- and post-intervention anxiety, sleep, and itching level in the control group.

Pruritus is one of the most common symptoms among patients undergoing and also most disturbing symptom [15, 18]. Although the pruritus is not hazardous by only itself, it causes many physical and mental problems such as insomnia, chronic fatigue, social isolation, psychological disorders and decrease the self-esteem, self-efficacy, and quality of life [3, 9, 10]. Although pruritus is a common symptom and leads to many problems in patients, there isn't any explicit and efficient treatment reported in the literature even if some beneficial interventions are reported [11, 27, 37]. Our results demonstrated that lavender aromatherapy is significantly effective in reducing pruritus. When the studies conducted in the literature to determine the effect of aromatherapy on pruritus are examined; the patients in the intervention group - aromatherapy massage using lavender oil - three times a week for four weeks and at the end of the research [37]. They also reported that after four weeks, the pruritus scores of the patients in the intervention group lower than baseline and there was a statistically significant difference between the control group and intervention group [37]. In the research conducted by Khorsand, et al. (2019), it was found that the patients' pruritus was significantly relieved as a result of the aromatherapy massage with a mixture of lavender, peppermint, and tea tree oil for five weeks [10]. In another research, it was reported that patients undergoing HD, as a result of lavender aromatherapy for six weeks, had lower pruritus scores compared to the mean scores of the patients in the control group, and the difference between the groups was statistically significant [38].

Sleep disturbance is a very common health problem in patients undergoing HD. Many types of treatments have been used in the management of sleep disorders. In recent years, complementary medicines have begun to be used in addition to medical treatment. One of these remedies is the use of Lavender oil. The findings are directly in line with previous findings. In research by Ahmady et al. (2019), lavender oil was reported as an effective method to improve patients' sleep quality [8]. In the research by Sentürk and et al. (2018) reported that the patient's sleep quality improved significantly after one-week lavender aromatherapy [22]. Muz and Tascı (2017), in their study that they compare aromatherapy and control groups, reported that lavender aromatherapy is an effective intervention to improve sleep quality of the patients undergoing HD [15]. Cheraghbeigi et al. (2019) stated that massage with lavender oil had positively affecting the sleep quality of the patients in intervention group [13]. In this respect, our findings reflect the literature.

The mental health of patients undergoing HD is adversely affected due to the changing lifestyle, treatment method, and functional reasons. One of these mental health problems is anxiety. Anxiety complicates the life of the patient undergoing HD, and as a result, dealing with anxiety becomes very important. It was reported in the literature that the use of lavender oil, which is one of the complementary medicines, has yielded positive results in reducing anxiety. In the current study, the results confirm that the use of lavender oil is a good choice to reduce anxiety in patients undergoing HD. Sentürk et al. (2018) reported that there was a significant decrease in the anxiety of the patients in the intervention group while there wasn't any difference in control group [22]. Bagheri-Nesami et al. (2017) reported that after one month of lavender aromatherapy patients' anxiety level decreased significantly in their study [17]. Karadag & Baglama (2019) reported that aromatherapy, 2–3 times a week for one month, was effective to reduce patients' anxiety [39]. Our

findings are similar to relevant literature in this respect.

**Research Limitations**

The research has some limitations; the research was conducted in a single HD unit and there wasn't any blinded group in the study, neither the patients nor the investigators. So, the results cannot be generalized for different groups. There were no laboratory evaluations were conducted to ensure the safety of lavender oil.

## *Conclusion*

As a result, we conclude that after aromatherapy with lavender oil, pruritus and anxiety decreased (H2 and H3 hypothesis were accepted), sleep quality increased (H1 hypothesis was accepted) in the patients. As a conclusion, we can recommend the extensive use of aromatherapy and we believe that this is possible via informing HD nurses about complementary medicine practices. Besides, to have an effective place in nursing care, it may be recommended to include aromatherapy in undergraduate and graduate curricula and to conduct studies for a long term in larger groups in different regions. Further studies on the subject need to be carried out with various disease groups and in different societies.

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