

Lavender Oil Aromatherapy as a Nursing Intervention for Anxiety in Hemodialysis Patients

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### **Abstract**

This literature review explores the impact of lavender oil aromatherapy via inhalation on anxiety levels amongst patients with chronic kidney disease undergoing hemodialysis treatment. In recent years, the use of aromatherapy has become more prominent in hopes of decreasing undesirable symptoms such as stress/anxiety and improving other aspects such as sleep. Moreover, many patients, whether in-patient at a hospital or out-patient at a clinic, experience some level of anxiety when going to receive their care. The question to be addressed is does lavender oil aromatherapy via inhalation have an impact on anxiety levels in patients with chronic kidney disease undergoing hemodialysis treatment? To answer this question, a literature review was conducted, and many studies showed that lavender oil aromatherapy has a positive influence on anxiety levels.

*Keywords:* lavender oil aromatherapy, anxiety, hemodialysis

## Introduction

Patients with end-stage renal disease (ESRD) experience a multitude of life-changing factors that impact their mental health such as debilitating changes in physical function, dietary changes, and frequent hospitalizations (Semaan et al., 2018). Although underdiagnosed, in ESRD, between 12% to 52% of patients experience symptoms of anxiety throughout their course of treatment (Semaan et al., 2018). Anxiety is defined as a feeling of apprehension or dread partnered with an involuntary physiological response (Ackley & Ladwig, 2014, p. 137). More importantly, anxiety can have negative psychological consequences on an individual, thus impacting their quality of life (Semaan et al., 2018). To combat anxiety in hemodialysis patients, many studies have researched the effects of aromatherapy application via inhalation. According to a systematic review analyzing the impact of aromatherapy on hemodialysis complications such as anxiety, the use of lavender oil aromatherapy was found to have both significant and insignificant impacts on anxiety levels (Bouya et al., 2018). In another study examining the relationship between essential oils and mood disorders, researchers identified possible therapeutic impacts of lavender oil on symptoms of depression, anxiety, and stress (Fung et al., 2021). Aromatherapy is the application of essential oils, extracted from nature, via inhalation, massage or direct skin contact resulting in the release of endorphins and noradrenaline (Bouya et al., 2018). Endorphins are hormones released in response to physiological stress to create an analgesic effect. To induce its analgesic effect, essential oils most commonly impact the olfactory and respiratory pathways (Fung et al., 2021). Furthermore, due to its connection with the limbic system, the olfactory pathway can exhibit a strong impact on a person's frame of mind. On the other hand, the respiratory pathway allows for molecular diffusion into the bloodstream allowing for a route to the brain (Fung et al., 2021). The purpose of this literature

review is to describe current evidence on the effects of lavender oil aromatherapy via inhalation on anxiety levels in patients with chronic kidney disease undergoing hemodialysis treatment.

### **Methods**

To explore current nursing literature regarding aromatherapy among hemodialysis patients, databases utilized include the Cumulative Index of Nursing and Allied Health Literature (CINAHL) and PubMed (MEDLINE). Search terms used in both databases were hemodialysis, lavender aromatherapy, and anxiety. Under CINAHL's advanced search, the journal subset was core nursing and publication dates were set between the years of 2017 and 2022. In PubMed, filters included publication years between 2017 and 2022 and article type was set to randomized controlled trials. To ensure that the articles appeared within scholarly nursing journals, the International Nursing Academy of Nursing Editors' (INANE) nursing journal directory was referenced. Under these original search parameters, three randomized controlled trials relating to the impact of lavender oil aromatherapy on anxiety in hemodialysis patients were found. To acquire more research, search terms were broadened to encompass all patient groups rather than solely hemodialysis and studies were not limited to randomized controlled trial criteria. Following the new criteria, more articles were found regarding other patient subgroups in relation to various procedures and surgeries.

### **Literature Review**

#### **Hemodialysis Patients**

Multiple studies have investigated the impact of aromatherapy on hemodialysis complications. For example, Şentürk and Kartın (2018) conducted a randomized controlled experimental study aiming to discover the effects of lavender oil aromatherapy via inhalation on anxiety and sleep quality among hemodialysis patients. The sample size of the study was 34

patients (17 each in the intervention and control group) from two hemodialysis centers in Kayseri province in Turkey; the groups were homogenous. Individuals were selected on whether they have experienced issues with sleep and symptoms of anxiety. The intervention group was taught to apply two drops of lavender oil on a piece of cotton 30 minutes prior to bedtime and placing it 15 to 20 centimeters away from their pillow for a duration of a week; the control group received routine hemodialysis care. Moreover, the hemodialysis treatments between the two groups were conducted three times a week on alternating days. Şentürk and Kartın collected data using a questionnaire, Pittsburgh Sleep Quality Index (PSQI), Visual Analog Scale (VAS) and Hamilton Anxiety Scale (HAM-A) through face-to-face interviews. HAM-A scale reliability was demonstrated by  $\alpha = .94$ . The data were analyzed using Shapiro-Wilk normality tests, independent-samples/paired t-tests, Mann-Whitney U-test, and Fisher exact  $X^2$  analysis. Further, in the intervention group, HAM-A first and second follow up mean scores decreased with a mean difference of  $5.82 \pm 2.55$  displaying a statistical significance of  $p = .000$ ; participants experienced relief of anxiety. In the control group, HAM-A first and second follow up mean score increased with a mean difference of  $-2.70 \pm 3.77$  displaying a statistical significance of  $p = .009$ ; participants experienced more anxiety. Some limitations highlighted by Şentürk and Kartın included restricted sample size due to institution approval difficulties, subjective rather than objective assessment data and unattained inter-rater reliability for other researchers in the study could not be reached. Possible implications also include implementation of aromatherapy in nursing education and inpatient settings.

Similar in study design, Karadag and Baglama (2019) conducted a randomized controlled study to examine the impact of lavender oil aromatherapy on levels of fatigue and anxiety among hemodialysis patients. Their study included two hypotheses in response to lavender oil

inhalation: (1) fatigue severity scale (FSS) pretest/posttest mean scores will display a significant difference and (2) Beck Anxiety Inventory (BAI) pretest/posttest mean scores will display a significant difference. BAI reliability was demonstrated by  $\alpha = .93$ . The study's sample comprised of a random selection of 60 individuals (30 each in the intervention and control group) undergoing hemodialysis treatment. The intervention group received aromatherapy, whereas the control group received routine care. Separate hemodialysis sessions were also conducted to ensure that the groups did not interact with one another. In the intervention group, a two-by-two gauze pad with two drops of lavender oil was placed on the patient's chest, approximately 10 centimeters away from their nose, about two to three times a week for 30 days. Chi-square analysis and independent/paired t-tests were applied to determine differences amongst mean scores and characteristics of the two groups; intervention and control groups were found to be homogenous. Mean BAI pretest and posttest scores in the intervention group were as follows respectively: 49.43 and 33.20 with a difference of 16.23. In the control group, mean BAI pretest and posttest scores were 48.26 and 49.76 respectively with a difference of -1.50. Both the intervention and control groups displayed a statistical significance amongst pretest and posttest BAI scores with a value of  $p = .001$ . In the intervention group, participants experienced a decrease in anxiety levels, whereas the control group experienced an increase in these levels. Limitations included the absence of a placebo control group and inability to generalize the study since only one hemodialysis unit was used to examine lavender oil aromatherapy's short-term effects. Moreover, implications include further research regarding the possibility of enhanced therapeutic effects using different aromatic oils.

In the third study regarding hemodialysis related anxiety, Şahin et al. (2021) also conducted a randomized controlled trial to study the impact of lavender oil aromatherapy via

inhalation on anxiety and pain after needle insertion in hemodialysis patients' fistulas. The study's sample size consisted of 74 participants with 38 in the placebo group and 36 in the intervention group. The placebo group consisted of patients undergoing hemodialysis treatment in the morning, whereas the intervention group consisted of patients undergoing treatment in the afternoon. Aromatherapy was applied during three hemodialysis sessions in one week for five minutes during the last hour of each of those sessions. In the placebo group, olive oil was applied in place of lavender oil for it has no therapeutic effects. On the other hand, in the intervention group, five drops of lavender oil essence were mixed with 200 milliliters of water for the patients to inhale from 30 centimeters away. After the aromatherapy application, data measure scales such as the Numeric Rating Scale (NRS) for pain and State-Trait Anxiety Inventory (STAI) were applied to both the placebo and intervention groups. Data reliability was demonstrated using Minitab Statistical Software displaying a confidence level of  $\alpha = .05$ . In addition, data was analyzed using the Statistical Package for the Social Sciences (SPSS), Shapiro-Wilk, Kolmogorov-Smirnov, and parametrical tests. In the placebo group, State Anxiety scores were  $45.665 \pm 0.53$  (first follow up) and  $43.08 \pm 11.22$  (second follow up), and Trait Anxiety scores were  $37.382 \pm 0.65$  (first follow up) and  $36.60 \pm 1.25$  (second follow up). No statistical significance was noted between the first and second follow-ups in the STAI ( $p = .713$  for state anxiety and  $p = .554$  for trait anxiety) scales amongst the placebo group. Further, in the intervention group, State Anxiety results were  $47.891 \pm 0.44$  (first follow up) and  $39.12 \pm 6.71$  (second follow up), while Trait Anxiety scores were  $39.096 \pm 0.78$  (first follow up) and  $30.04 \pm 1.39$  (second follow up). Unlike the placebo group, the intervention group displayed statistical significance in the STAI ( $p = .001$  for state anxiety and  $p = .043$  for trait anxiety) scales between the first and second follow ups. A limitation of this study includes that the intervention and



control group did not consist of the same number of participants which could slightly skew the data. Implications from this study's research could include the implementation of lavender oil aromatherapy via inhalation as a nursing intervention in the hemodialysis patient setting to help control pain and anxiety levels. Data from these studies suggests lavender oil aromatherapy as a method to provide patients with a therapeutic response to anxiety.

<b>Anxiety Scale Results- Hemodialysis Patients</b>					
<i>Source</i>	<i>Scale Type</i>	<i>Group</i>	<i>Pre-Intervention</i>	<i>Post-Intervention</i>	<i>Statistical Significance</i>
<i>Şentürk and Kartın (2018)</i>	HAM-A	Intervention	11.11 ± 3.85	5.29 ± 2.59	<i>p</i> = .000
		Control	15.35 ± 5.55	18.05 ± 5.42	<i>p</i> = .009
<i>Karadag and Baglama (2019)</i>	BAI	Intervention	16.00 ± 9.48	12.93 ± 7.70	<i>p</i> = .001
		Control	12.23 ± 6.12	13.00 ± 6.54	<i>p</i> = .123
<i>Şahin et al. (2021)</i>	STAI	Intervention	47.891 ± 0.44 (State Anxiety)	39.12 ± 6.71 (State Anxiety)	<i>p</i> = .001
			39.096 ± 0.78 (Trait Anxiety)	30.04 ± 1.39 (Trait Anxiety)	<i>p</i> = .043
		Control	45.665 ± 0.53 (State Anxiety)	43.08 ± 11.22 (State Anxiety)	<i>p</i> = .713
			37.382 ± 0.65 (Trait Anxiety)	36.60 ± 1.25 (Trait Anxiety)	<i>p</i> = .554

### **Preoperative Patients**

Not only can lavender oil aromatherapy be applied to hemodialysis patients, but it can be applied to other patient subgroups as well. Koehler (2021) conducted a study measuring lavender oil aromatherapy's impact on preoperative anxiety. The study consisted of 44 participants from the preoperative unit in a trauma county hospital. Participants were notified of the study beforehand. Individuals were asked to hold a lavender oil infused inhaler three to four inches from their nose for a minimum of 20 minutes. Following application of the intervention, data

was collected utilizing the Visual Analog Scale (VAS). VAS reliability from paired t-test results was demonstrated by a confidence interval of 95%. Of the 44 participants, 23 individuals reported a decrease in their anxiety. Mean VAS scores displayed a reduction from 4 centimeters to 3.2 centimeters (-0.86-centimeter difference) indicating a statistical significance ( $p = .022$ ) when comparing the pre and post intervention scores. Further, variability was a major limitation of this study for some participants may have utilized the inhaler for the entire study time, while others may have just used it for 20 minutes. The variability between the distance from the nose also plays a factor in how strong the lavender scent can be perceived. Another limitation was the absence of a control group which limits the conclusiveness of the data.

### **Coronary Intensive Care Unit (ICU) Patients**

Another patient subgroup aromatherapy can benefit includes patients in critical conditions. Karadag et al. (2017) conducted a randomized controlled trial examining the impact of lavender oil aromatherapy on sleep and anxiety in coronary ICU patients. The study consisted of 60 participants equally divided and randomly selected to create a control and intervention group. Data collection methods included a sociodemographic and disease characteristics questionnaire, and administration of BAI and PSQI scales before and after lavender oil application in the intervention group and no intervention application in the control group. BAI reliability was demonstrated by Cronbach's  $\alpha = .98$ . Data was analyzed using SPSS software,  $X^2$  test, and independent/paired t-tests. The intervention group was asked to inhale two drops of 2% lavender infused on a two-by-two-centimeter gauze at a distance of 12 inches from their nose for 20 minutes over a period of 15 days. In the intervention group, BAI pretest and posttest scores decreased from  $16.00 \pm 9.48$  to  $12.93 \pm 7.70$ . A statistical significance was noted between the pretest and posttest scores of the BAI ( $p = .001$ ) in the intervention group. On the other hand, in

the control group, pretest/posttest BAI scores were  $12.23 \pm 6.12$  and  $13.00 \pm 6.54$  respectively. No statistical significance was noted in the BAI ( $p = .123$ ) scores of the control group. In addition, results from the sociodemographic and disease characteristics questionnaire indicated homogeneity between the intervention and control groups. Further, a limitation mentioned in study was that the short term rather than long term effects of lavender oil aromatherapy was measured on sleep and anxiety.

### **Bone Marrow Biopsy Patients**

In relation to other procedures, aromatherapy can be used to help ease anxiety amongst bone marrow patients. Abbaszadeh et al. (2020) conducted a double-blind clinical trial consisting of 80 patients who were referred for bone marrow biopsies at Vali-e-Asr hospital. The participants were divided equally into a control and intervention group; both groups were homogenous in regard to their demographics. Selection for groups was randomized utilizing Reliability, Availability, and Serviceability (RAS) software. Data was collected using the Visual Anxiety Scale (VAS) and was analyzed using SPSS software. Reliability for this study's results was not reported. In the control group, participants were provided a cotton ball infused with three drops of distilled water placed at a distance of seven to ten centimeters from their nose for 15 minutes. In the intervention group, participants were given three drops of 10% lavender oil on a cotton ball to be held at a distance of seven to ten centimeters for 15 minutes. For both groups, the VAS scale was administered immediately after the biopsy procedure. Mean VAS scores for the control group were  $6.3 \pm 1.92$  and  $3.75 \pm 1.05$  for the intervention group. The VAS revealed a statistical significance between the control and intervention group with statistical value of  $p < .001$ ; the intervention group displayed lower anxiety scores. A limitation of the study was patient preconceived opinions from past experiences with bone marrow biopsy, which could

impact anxiety levels. Another limitation was that this experiment also studied the short term rather than long term impact of lavender oil aromatherapy via inhalation. Further, the absence of reliability reporting for this clinical trial limits the study's display of ability to replicate results.

### **Chemotherapy Patients**

In relation to chemotherapy related anxiety, two studies were found examining lavender oil aromatherapy's impact. Özkaraman et al. (2018) conducted a randomized controlled trial examining the impact of lavender oil aromatherapy on chemotherapy patients' sleep and anxiety levels. The study consisted of 70 patients divided into one control group and two intervention groups. The control group consisted of 20 participants, the tea tree oil intervention group consisted of 20 participants, and the lavender oil intervention group consisted of 30 participants. Data retrieval tools include the PSQI and STAI scales. Reliability was demonstrated by Cronbach's  $\alpha = .94-.96$  for State Anxiety and  $\alpha = .83-.87$  for Trait Anxiety. Data was analyzed using the Shapiro-Wilk test, Analysis of Variance (ANOVA), SPSS model guidelines, and Pearson chi-square analysis. Individuals in the intervention groups were provided with three drops of lavender or tea tree oil on a cotton pad to be placed about ten inches below the nose. The study was further divided into two stages, with one intervention stage occurring during the chemotherapy session and the other occurring at night at home. During the first stage, participants were evaluated using the STAI and PSQI scales before and after the chemotherapy session. In the second stage, participants were asked to smell the assigned oil for five minutes at home nightly at nine in the evening for a month. State Anxiety results for the lavender oil, tea tree oil and control groups between the first and second follow ups were as follows respectively:  $41.4 \pm 1.49$  to  $42.36 \pm 1.53$ ;  $45.3 \pm 1.82$  to  $45.3$  to  $1.88$ ;  $42 \pm 1.82$  to  $42.4 \pm 1.88$ . Trait Anxiety results for the lavender oil, tea tree oil and control groups between the first and second follow

ups were as follows respectively:  $44.8 \pm 1.27$  to  $40.833 \pm 1.123$ ;  $45.4 \pm 1.556$  to  $45.25 \pm 1.376$ ;  $45.4 \pm 1.556$  to  $45.25 \pm 1.376$ . Furthermore, the results showed a statistical significance in the STAI scores for the lavender group ( $p < .001$ ). A limitation of this study was the inability to keep the blind aspect of the experiment, for patients were able to decipher the lavender aromatherapy scent. Further, the specific and small sample size limits the ability to generalize the study's results.

Similarly, Yayla and Ozdemir (2019) conducted a quasi-randomized controlled pilot study to examine the impact of aromatherapy inhalation on procedural pain and anxiety in chemotherapy patients undergoing the insertion of a venous port catheter. The study consisted of 123 chemotherapy patients in an outpatient unit of the oncology hospital in Ankara, Turkey. Data was collected using the Visual Analog Scale (VAS) and STAI-I scales. Data was analyzed using SPSS software,  $X^2$  categorical data analysis, the Kolmogorov-Smirnov test, independent t-test, and Tukey's Honest Significant Difference test. Reliability for this pilot study was not reported. The participants were equally divided into a control group and two intervention groups. One intervention group was provided with lavender oil, and the other group was provided with eucalyptus oil. The control group had no intervention. In both groups, the intervention was applied before the catheter needle insertion. Further, in the aromatherapy intervention groups, three drops of either lavender or eucalyptus oil were placed on a cotton pad ten centimeters from the participant's nose. Mean VAS scores for the lavender, eucalyptus and control groups were as follows respectively:  $2.37 \pm 1.62$ ;  $3.9 \pm 1.80$ ;  $3.69 \pm 1.55$ . When comparing the lavender intervention group to the control group, VAS scores showed a statistical significance ( $p < .05$ ). On the other hand, even though the eucalyptus group displayed lower VAS scores compared to the control group, the results were not statistically significant ( $p > .05$ ). Moreover, STAI-I mean

scores for the lavender, eucalyptus and control groups were as follows respectively:  $37.24 \pm 8.35$ ;  $35.24 \pm 8.43$ ;  $37.73 \pm 9.09$ . Regarding the STAI-I scores, results showed no statistical significance between all three groups ( $p = .387$ ). Like the prior study, limitations included inability to determine the long-term impact of aromatherapy along with ungeneralizable results due to the specific patient population. Absence of reliability reporting also fails to display replicability of results.

### **Breast Surgery Patients**

As concluded from the previous studies, many patients undergoing procedures or surgeries experience some level of anxiety. Beyliklioğlu and Arslan (2019) conducted a randomized controlled trial examining the impact of lavender oil aromatherapy via inhalation in patients undergoing breast surgery. The study consisted of 80 participants from a university hospital surgery clinic in Adana, Turkey. The participants were equally divided into a control and intervention group. Data was collected using the STAI scale and was analyzed using the SPSS software and Shapiro-Wilk test. Reliability for pretest/posttest State Anxiety scores was demonstrated by Cronbach's  $\alpha = .90$  and  $\alpha = .89$  respectively. Reliability for Trait Anxiety was reported by Cronbach's  $\alpha = .77$ . The intervention group was provided a gauze bandage infused with three to four drops of lavender oil to inhale for 20 minutes; the control group had no intervention. STAI scales were administered prior to and after the application of lavender oil aromatherapy as an intervention. In the intervention group, STAI mean pretest scores were  $43.00 \pm 11.48$  and posttest scores were  $37.28 \pm 9.93$  indicating a statistical significance of  $p = .003$ . In the control group, STAI mean pretest scores were  $44.6 \pm 11.45$  and posttest scores were  $42.43 \pm 11.48$  indicating no statistical significance with a value of  $p = .109$ . Moreover, a limitation of this study includes the absence of a distance away from the nose for inhalation, which could cause

variations within the results. Another limitation, as mentioned in multiple previous studies, was the specific patient population limiting the generalizability of the research.

<b>Anxiety Scale Results- Other Patient Subgroups</b>						
<i>Source</i>	<i>Patient Subgroup</i>	<i>Scale Type</i>	<i>Group</i>	<i>Pre-Intervention</i>	<i>Post-Intervention</i>	<i>Statistical Significance</i>
<i>Koehler (2021)</i>	Preoperative Patients	VAS	Intervention	4 cm	3.2 cm	$p = .022$
<i>Karadag et al. (2017)</i>	Coronary ICU Patients	BAI	Intervention	16.00 ± 9.48	12.93 ± 7.70	$p = .001$
			Control	12.23 ± 6.12	13.00 ± 6.54	$p = .123$
<i>Abbaszadeh et al. (2020)</i>	Bone Marrow ICU Patients	VAS	Intervention	N/A	3.75 ± 1.05	$p < .001$ (Between groups)
			Control	N/A	6.3 ± 1.92	
<i>Özkaraman et al. (2018)</i>	Chemotherapy Patients	STAI	Intervention:			$p < .001$ (Trait Anxiety Lavender Group Difference)  $p = .320$ (State Anxiety between all 3 groups)  $p = .294$ (Trait Anxiety between all 3 groups)
			Lavender Oil	41.4 ± 1.49 (State Anxiety)	42.36 ± 1.53 (State Anxiety)	
				44.8 ± 1.27 (Trait Anxiety)	40.833 ± 1.123 (Trait Anxiety)	
			Tea Tree Oil	45.3 ± 1.82 (State Anxiety)	45.3 ± 1.88 (State Anxiety)	
				45.4 ± 1.556 (Trait Anxiety)	45.25 ± 1.376 (Trait Anxiety)	
			Control	42 ± 1.82 (State Anxiety)	42.4 ± 1.88 (State Anxiety)	
<i>Yayla and Ozdemir (2019)</i>	Chemotherapy Patients	VAS and STAI-I	Intervention:	N/A		$p < .05$ (VAS lavender compared to control group)  $p > .05$ (VAS eucalyptus compared to control group)  $p = .002$ (VAS between all groups)
			Lavender Oil		2.37 ± 1.62 (VAS)	
					37.24 ± 8.35 (STAI-I)	
			Eucalyptus Oil		3.9 ± 1.80 (VAS)	
				35.24 ± 8.43 (STAI-I)		

			Control	N/A	3.69 ± 1.55 (VAS)	<i>p</i> = .387 (STAI-I between all groups)
<i>Beyliklioğlu and Arslan (2019)</i>	Breast Surgery Patients	STAI (Mean Scores)	Intervention	43.00 ± 11.48	37.73 ± 9.09 (STAI-I)	<i>p</i> = .003
			Control	44.6 ± 11.45	42.43 ± 11.48	<i>p</i> = .109

### Discussion

As reviewed throughout the literature, many patients experience some level of anxiety when undergoing various health treatments. Approximately after a year of dialysis treatment, 45.7% of renal disease patients reported symptoms of anxiety (Semaan et al., 2018). Often, anxiety is underdiagnosed for its likelihood of being seen as an accepted side-effect to hemodialysis treatment (Semaan et al., 2018). The studies included in this literature review have contributed research to remedy this situation.

Many of the studies included in the literature review conducted randomized controlled trials which are a strong, level two research method testing the effectiveness of an intervention (Grove & Gray, 2019). More specifically, Şentürk and Kartın (2018), Karadag and Baglama (2019), and Şahin et al. (2021) all conducted randomized controlled trials examining the impact of lavender oil aromatherapy on anxiety amongst hemodialysis patients. In these experiments, a statistical significance among anxiety scale results from the intervention group indicated that lavender oil aromatherapy was effective in decreasing anxiety levels among hemodialysis patients (Şentürk & Kartın, 2018; Karadag & Baglama, 2019; Şahin et al., 2021). In agreement, a systematic review conducted by Bouya et al. (2018) also concluded an association between lavender oil aromatherapy and a decrease in anxiety levels in hemodialysis patients, thus positively impacting mental health and quality of life. Moreover, it was found that some control groups receiving routine care in the studies displayed a significant increase in anxiety as



hemodialysis treatment progressed, thus highlighting the effectiveness of aromatherapy application in the intervention group (Şentürk & Kartın, 2018; Karadag & Baglama, 2019). As previously mentioned, a major difference among these studies was the length in which the study was conducted and frequency of aromatherapy application, which could be due to funding issues. Karadag and Baglama (2019) asked participants to apply lavender oil aromatherapy two to three times a week for 30 days, whereas Şahin et al. (2021) applied aromatherapy three times over the course of one week. Additionally, Şentürk and Kartın (2018) asked participants to apply lavender oil aromatherapy nightly for a week. Ultimately, results among these studies supported the therapeutic effects of aromatherapy on anxiety.

Furthermore, other studies regarding the impact of lavender oil aromatherapy on other patient subgroups were included, for anxiety is a subjective symptom that can be experienced by anyone in response to a stressor. In the other patient subgroups, lavender oil aromatherapy was also found to have a statistical significance on the decrease of anxiety levels in the intervention groups post intervention (Karadag et al., 2017; Özkaraman et al., 2018; Beyliklioğlu and Arslan, 2019; Yayla and Ozdemir, 2019; Abbaszadeh et al. 2020; Koehler, 2021). Like hemodialysis patients, the other patient subgroups in this literature review were undergoing a procedure or treatment that led to a feeling of apprehension or anxiety. Moreover, similar to the hemodialysis studies, lavender oil aromatherapy was applied through inhalation of an aroma infused inhaler, cotton pad, or gauze.

Based on the results of the studies included in the literature review, lavender oil aromatherapy via inhalation can be used as a holistic, cost-effective treatment to treat anxiety in hemodialysis patients as well as other patient subgroups. Although the studies varied in lengths of the experiments, lavender oil aromatherapy still showed a positive impact on anxiety levels by

decreasing anxiety scores post-intervention. Another variation between these studies included the anxiety scales used which varied from the VAS, HAM-A, BAI, and STAI. These variations can be used to show that even though the methods were not identical throughout the research, anxiety is a subjective patient symptom that often decreases in response to lavender oil aromatherapy via inhalation. Due to its subjectiveness, variability amongst patient reporting should be taken into consideration. Inconsistency on strength of lavender oil between the studies should also be considered for it can alter results due to aroma variability.

In addition to anxiety, some studies showed that lavender oil aromatherapy had a positive impact on other variables such as pain, sleep quality, and fatigue. Şahin et al. (2021) showed that the intervention group's mean NRS scores decreased after the application of lavender oil aromatherapy via inhalation, indicating that participants experienced a degree of pain relief. Regarding PSQI scores, patients in the intervention groups reported better sleep quality after using lavender oil aromatherapy (Karadag et al, 2017; Özkaraman et al., 2018; Şentürk and Kartın, 2018). Further, lavender oil aromatherapy also displayed a therapeutic impact on fatigue in hemodialysis patients (Karadag and Baglama, 2019). Along with anxiety, lavender oil aromatherapy via inhalation can be used to help combat symptoms such as pain, sleep quality, and fatigue.

When reviewing the studies, many of the experiments analyzed the short-term rather than long term impacts of lavender oil aromatherapy on anxiety. With this said, further research can be done to examine the long-term impacts of lavender oil aromatherapy on anxiety. An example of long-term impacts could include increased patient satisfaction with their treatment and related symptoms. Research can also be done on the impact of lavender oil aromatherapy in hemodialysis patients, for only three articles were found matching the criteria of this literature

review. Further, there is room to explore the impact of different aromas such as eucalyptus or orange on the symptom of anxiety. Additionally, more research examining the impact of aromatherapy via inhalation on other aspects such as pain or sleep can be done. To help make research more generalizable, studies with larger sample sizes can be conducted.

### **Nursing Implications**

Nurses can use lavender oil aromatherapy via inhalation to help combat anxiety experienced amongst hemodialysis patients and other patient subgroups. Aromatherapy is a non-invasive intervention that is within the nurse's scope of practice, for it treats patient symptoms and does not require a doctor's order. Further, it is something that can be purchased over the counter and can be done in the comfort of the patient's home after discharge. The use of aromatherapy can readily be available if the unit has the appropriate supplies. For instance, some hospital units currently carry aromatic fragrances that can be placed near the skin of the nostrils to help minimize odors. Further, patients can decide whether they would like to try aromatherapy to attempt to alleviate symptoms or to provide more patient comfort. If the patient wants to try lavender oil aromatherapy, the nurse can integrate this holistic practice into their patients' care plans to try to ease symptoms such as anxiety, fatigue, and pain. To assess the impact of aromatherapy on these aspects, nurses can use some of the various scales mentioned in these studies such as the VAS to rate anxiety scores, NRS to rate pain scores, or FSS to rate fatigue levels. In addition, lavender oil aromatherapy may offer a more affordable intervention in comparison to pharmacological therapy. This is not to say that lavender oil aromatherapy should replace medical therapy for these symptoms but can rather be used adjunctly to help promote therapeutic effects. Oftentimes patients will experience anxiety right before a procedure and aromatherapy may offer a quick solution to help ease these feelings of apprehension. As

evidenced by research, lavender oil aromatherapy can be used as a holistic treatment to help improve these symptoms.

### **Conclusion**

The purpose of this literature review was to describe evidence on how lavender oil aromatherapy inhalation affects anxiety levels among hemodialysis patients. Multiple randomized controlled trial studies evaluating the impact of lavender oil aromatherapy on anxiety levels amongst this patient group were selected. Results in these studies highlighted lavender oil aromatherapy inhalation as an effective nursing intervention in reducing anxiety among hemodialysis patients (Şentürk & Kartın, 2018; Karadag & Baglama, 2019; Şahin et al., 2021). Since anxiety is a generalizable symptom, other patient subgroups were included, and results were in agreement with the hemodialysis studies. The purpose of this paper was met, for there was available research examining the impact of lavender oil aromatherapy via inhalation on anxiety in patients undergoing hemodialysis treatment. Additionally, lavender oil aromatherapy can become a non-invasive and cost-effective nursing intervention to provide patients with a therapeutic effect for anxiety and other symptoms such as pain, sleep quality and fatigue.

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