The effects of lavender essential oil aromatherapy on anxiety and depression in haemodialysis patients

Masoumeh Bagheri-Nesami1, Seyed Afshin Shorofi1,2, Attieh Nikkhah3,4,*, Fatemeh Espahbodi5

1Traditional and Complementary Medicine Research Center, Mazandaran University of Medical Sciences, Sari, Iran
2Adjunct Research Fellow, Flinders University, Adelaide, Australia
3Antimicrobial Resistant Nosocomial Infection Research Center, Mazandaran University of Medical Sciences, Sari, Iran
4Student Research Committee, Golestan University of Medical Sciences, Gorgan, Iran
5Department of Nephrology, School of Medicine, Mazandaran University of Medical Sciences, Sari, Iran

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Abstract
This study was intended to examine the effects of lavender essential oil aromatherapy on anxiety and depression in haemodialysis patients. This randomised clinical trial was conducted on 72 haemodialysis patients divided into control and experimental groups. The control group only received the routine care. The experimental group received aromatherapy with 3 drops of lavender essential oil 5% for 10 minutes every time they underwent haemodialysis for a period of one month. Anxiety and depression were measured in both groups at baseline and by the end of the second and fourth weeks during the first hour of a dialysis session. The rANOVA showed no significant difference between the two groups in terms of the severity of anxiety before the intervention and by the end of the second and fourth weeks (p = 0.783). However, the rANOVA revealed a significant difference with respect to the severity of depression between the two groups (p = 0.005). Current research suggests that we need various concentrations of lavender essential oil to relieve anxiety compared to depression. In sum, future studies are required to investigate different concentrations of lavender essential oil at different times during haemodialysis sessions to obtain specific doses for lavender essential oil to be used on haemodialysis patients suffering from anxiety and depression.

Keywords: Aromatherapy, lavender, anxiety, depression, haemodialysis

Introduction
Anxiety is one of the disorders found in dialysis patients, which is associated with behavioral, psychological, physical and mental symptoms. Illness and changes in professional, marital, family and social life cause anxiety in these patients. Most dialysis patients constantly suffer from anxiety and distress about their financial issues, sexual dysfunction, family responsibilities, and lack of independence (1). The prevalence of anxiety disorders varies in dialysis patients, with different figures having been reported in relevant studies. A study by Cukor et al. reported 27% of haemodialysis patients had a current major anxiety disorder (2). In Iran studies have reported the prevalence of anxiety disorders in haemodialysis patients to be about 52% (3,4). Studies indicate anxiety disorders to be one of the contributing factors to suicidal behaviors in these patients and suggest a strong relationship between anxiety and reduced quality of life (5,6).

Depression is another disorder found in haemodialysis patients. Depression is associated with anhedonia, sorrow, helplessness, espair, guilt, sleep disturbances, decreased appetite, and sexual desire disorders (7). The prevalence of depression is higher among dialysis patients than the general population (8). In Iran, the prevalence of depression in haemodialysis patients is reported to be about 65% (3, 4). Factors associated with depression include transplant history, duration of haemodialysis, level of income, and occupation (3). Depression could reduce health-related quality of life (9) and increase risk of mortality in hemodialysis patients (10). Antidepressants can cause a number of complications in haemodialysis patients, as these medications can bind to proteins, do not have a favorable renal clearance and can produce toxic metabolites (11). In addition, some antidepressants, such as tri-cyclics can cause cardiovascular complications, including dysrhythmias, prolongation of QT interval and orthostatic hypotension (12). Due to concerns about drug-induced side effects in these patients, alternative non-pharmacological interventions need to be considered. A review of literature revealed that some of these interventions include exercise therapy (13,14) and
behavior therapy (15). Aromatherapy is a complementary therapy, which benefits from essential oils to manage some problems related to haemodialysis (16-18). One of the essential oils used in aromatherapy comes from lavandula, more commonly known as lavender. This flowering plant is from the Lamiaceae family (19). Linalool and linalyl acetate found in lavender can stimulate parasympathetic system that influences mood states, resulting in feeling better and fresher, and being more active and relaxed (20). Shaw et al. showed that inhaled linalool has anxiolytic properties in mice (21). Various studies have been conducted on the medicinal properties of lavender essential oil, including sedative effects (22), sleep-inducing property, anxiolytic (23) and anti-fatigue effects (24,25). The duration of treatment and lack of supportive systems lead to patients’ inability to cope with anxiety and depression. In addition to negative effects on quality of life, anxiety and depression also increase treatment costs incurred by patients. The present study thus aims to examine the effects of lavender essential oil aromatherapy on anxiety and depression in haemodialysis patients.

Materials and method

This is a randomized clinical trial conducted in two hospitals affiliated to Mazandaran University of Medical Sciences in Sari, Iran. The study population consisted of haemodialysis patients who entered the study if they met the following eligibility criteria: be willing to participate in the study, be treated with dialysis for a minimum of 6 months (26), be undergoing dialysis 3 times a week, be of 18 years old and over, be conscious, have the ability to verbally communicate, have an uncompromised sense of smell (27), not experienced stressful events in the last 6 months (including the death of a loved one), not prescribed tranquilizers, and have no history of hospitalization due to psychiatric disorders (26). Exclusion criteria include patients with a history of allergies and acute respiratory diseases, kidney transplant candidates, pregnant women, and women intending to get pregnant during the time of the trial (27). The sample size was calculated as 76 (38 in each group) according to the mean and standard deviation of trait anxiety before (44 ± 9.7) and four weeks after (36.8 ± 7.9) the intervention found in a study conducted by Kanaani et al. (26), and 95% of the confidence coefficient, with consideration of the likelihood of patient drop-out during the study. Eligible patients were randomly allocated in two groups using the Excel RANDBETWEEN function.

The procedure and the purpose of the study were initially explained to the participants. Written consent was consequently obtained from eligible patients and they were also assured of anonymity and confidentiality of personal data. Sociodemographic characteristics and medical factors were collected using a questionnaire, which included age, gender, marital status, underlying diseases and history of haemodialysis. The Hospital Anxiety and Depression Scale (HADS) were used to assess the presence and severity of anxiety and depression in haemodialysis patients. HADS is a screening tool to identify emotional distress (28). This scale has been used in several studies to measure the severity of anxiety and depression in haemodialysis patients (29-32). The scale has 14 items, including two subscales, anxiety and depression. Each subscale contains 7 items (anxiety- items 1, 3, 5, 7, 9, 11 and 13; depression- items 2, 4, 6, 8, 10, 12 and 14) (33). Items are scored on a 4-point scale ranging from 0 to 3, with a total score of 21. The scores are categorized as normal (0-7), borderline (8-10), and abnormal (11-21) (34). The validity and reliability of the HADS scale has been established in a number of studies. For instance, Montazeri et al. found the internal consistency of the HADS scale to be 0.78 for anxiety and 0.86 for depression using Cronbach’s alpha coefficient (35).

The experimental group underwent aromatherapy with lavender (angustifolia) essential oil procured from the Barij Essence Pharmaceutical Company, lab accreditation ISIR-ISO/IEC 17025. The experimental-group patients inhaled lavender essence on their dialysis days over a period of 4 weeks. A cotton ball infused with 3 drops of lavender essential oil 5% (diluted 1:20 with sweet almond oil) was attached to the patients’ collar and they were then asked to breathe normally for 10 minutes (36). The control-group patients only received routine care. Anxiety and depression were measured at baseline and by the end of the second and fourth weeks (26) during the first hour of a dialysis session. The collected data were coded and statistically analyzed with SPSS (Statistical Package for Social Science, v.20) using descriptive statistics (mean, percentage, standard deviation) and analytical tests [independent-samples t-test, repeated measures analysis of variance (RANOVA) and Chi-square test]. P values less than 0.05 were considered as significant.

Results

The mean age of the patients was 61.48 ± 14.40 years (range, 57 years) for the experimental group and 58.91 ± 12.84 years (range, 55 years) for the control group. The independent-samples t-test did not show a significant difference between the two groups in terms of the mean age of the patients (p = 0.42). In addition, the majority of experimental (65.70%) and control (75%) groups were men. According to the Chi-square test (p = 0.504), no significant differences were observed between the two groups for gender. The mean duration of chronic renal failure was 72.14 ± 12.13 months for the experimental group and 77.67 ± 9.71 months for the control group. Moreover, the mean duration of dialysis was 39.54 ± 5.64 months for the experimental group and 42.62 ± 4.37 months for the control group. The independent-samples t-test
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revealed that there were no significant differences between the two groups for the duration of chronic renal failure ($p = 0.35$) or the duration of dialysis ($p = 0.71$). The socio-demographic and clinical characteristics of the participants are presented in Table 1.

The range of anxiety and depression score with HADS scale was frequently between 0 to 7 in each group before the intervention (Table 2). The mean anxiety score was $4.42 \pm 4.04$ in the experimental group and $4.75 \pm 4.39$ in the control group at baseline (before the intervention). The independent-samples t-test showed no significant difference between the two groups in their level of anxiety ($p = 0.742$) at baseline. The experimental group had a lower level of anxiety ($3.71 \pm 3.95$) in comparison to the control group ($4.55 \pm 4.19$) two weeks after the intervention. However, the experimental group had a higher level of anxiety ($3.77 \pm 4.1$) compared to the control group ($3.69 \pm 4.14$) four weeks after the intervention. Moreover, the rANOVA demonstrated that the differences between the two groups in their level of anxiety before, two and four weeks after the intervention were not statistically significant (Table 3).

The mean depression score was $4.54 \pm 4.11$ in the experimental group and $4.05 \pm 4.48$ in the control group before the intervention. The independent-samples t-test showed no significant difference between the two groups in their level of depression at baseline ($p = 0.631$).

The experimental group had a lower level of depression ($3.69 \pm 4.14$) compared to the control group ($4.15 \pm 4.25$) four weeks after the intervention. Moreover, the rANOVA demonstrated that the differences between the two groups in their level of depression before, two and four weeks after the intervention were not statistically significant (Table 3).

### Table 1 Socio-demographic and clinical characteristics of haemodialysis patients

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>[N(%)]</th>
<th>Group</th>
<th>[N(%)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>23 (65.7%)</td>
<td>Male</td>
<td>27 (75%)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>12 (34.3%)</td>
<td>Female</td>
<td>10 (25%)</td>
</tr>
<tr>
<td>Underlying Disease</td>
<td>Diabetes</td>
<td>6 (17.1%)</td>
<td>Diabetes</td>
<td>5 (13.5%)</td>
</tr>
<tr>
<td></td>
<td>Hypertension</td>
<td>8 (22.9%)</td>
<td>Hypertension</td>
<td>12 (32.4%)</td>
</tr>
<tr>
<td></td>
<td>Diabetes and Hypertension</td>
<td>12 (34.3%)</td>
<td>Diabetes and Hypertension</td>
<td>10 (27.1%)</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>5 (14.3%)</td>
<td>None</td>
<td>5 (13.5%)</td>
</tr>
<tr>
<td></td>
<td>*Other</td>
<td>4 (13.4%)</td>
<td>*Other</td>
<td>5 (13.5%)</td>
</tr>
<tr>
<td>Place of Residence</td>
<td>Metropolitan areas</td>
<td>25 (71.4%)</td>
<td>Metropolitan areas</td>
<td>20 (55.6%)</td>
</tr>
<tr>
<td></td>
<td>Rural areas</td>
<td>10 (28.6%)</td>
<td>Rural areas</td>
<td>17 (44.4%)</td>
</tr>
<tr>
<td>Marital status</td>
<td>Married</td>
<td>31 (88.6%)</td>
<td>Married</td>
<td>32 (86.1%)</td>
</tr>
<tr>
<td></td>
<td>Single</td>
<td>1 (2.9%)</td>
<td>Single</td>
<td>3 (8.3%)</td>
</tr>
<tr>
<td></td>
<td>Widow</td>
<td>3 (8.6%)</td>
<td>Widow</td>
<td>2 (5.6%)</td>
</tr>
</tbody>
</table>

### Table 2 Frequency of anxiety and depression score in experimental and control groups before study

<table>
<thead>
<tr>
<th>Group</th>
<th>Experimental Frequency (%)</th>
<th>Control Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-7</td>
<td>25 (7.4%)</td>
<td>28 (25.7%)</td>
</tr>
<tr>
<td>8-10</td>
<td>7 (20%)</td>
<td>5 (13.5%)</td>
</tr>
<tr>
<td>11-21</td>
<td>3 (8.6%)</td>
<td>4 (10.8%)</td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-7</td>
<td>27 (77.1%)</td>
<td>30 (81.1%)</td>
</tr>
<tr>
<td>8-10</td>
<td>5 (14.3%)</td>
<td>1 (2.7%)</td>
</tr>
<tr>
<td>11-21</td>
<td>3 (8.6%)</td>
<td>6 (16.2%)</td>
</tr>
</tbody>
</table>

### Table 3 Intensity of anxiety before, two and four weeks after intervention

<table>
<thead>
<tr>
<th>Group</th>
<th>Experimental group (mean ± SD)</th>
<th>Control group (mean ± SD)</th>
<th>rANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety Before intervention</td>
<td>4.42 ± 4.04</td>
<td>4.75 ± 4.39</td>
<td>$F = 0.783$ P = 0.245</td>
</tr>
<tr>
<td>Two weeks after intervention</td>
<td>3.71 ± 3.95</td>
<td>4.55 ± 4.19</td>
<td></td>
</tr>
<tr>
<td>Four weeks after intervention</td>
<td>3.77 ± 4.10</td>
<td>3.69 ± 4.14</td>
<td></td>
</tr>
<tr>
<td>rANOVA</td>
<td>F = 0.972 P = 0.383</td>
<td>F = 0.136 P = 0.873</td>
<td></td>
</tr>
</tbody>
</table>
The present study showed that the severity of anxiety did not differ significantly between the two groups before, two and four weeks after the intervention. However, the two groups differed significantly in the severity of depression before, two and four weeks after the intervention. The effects of different concentrations of lavender essential oil on anxiety and depression have been examined in a number of studies, yielding conflicting results. With respect to anxiety levels, our results are consistent with our study, Muzzarelli et al. used diluted lavender essential oil. Shiina et al. investigated the effects of diluted lavender essential oil on blood pressure in participants scheduled for colonoscopy or esophagogastrroduodenoscopy (37). Consistent with our study, Muzzarelli et al. used diluted lavender essential oil. Shiina et al. investigated the effects of diluted lavender essential oil on blood pressure in patients scheduled for colonoscopy or esophagogastrroduodenoscopy (37). 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Reduction in anxiety appears to require higher concentrations of lavender essential oil. Many different elements can affect levels of anxiety and depression in haemodialysis patients, including marital, sexual and financial problems and lack of social support. The study's primary limitation is the inability to eliminate or control these confounding factors. Meanwhile, our participants may have had taken medications for the treatment of anxiety and/or depression disorders, which may hinder the interpretation of the results. We could not match patients for current medication use for anxiety and/or depression, and all patients who met the eligibility criteria were recruited in this study, irrespective of their score levels of anxiety and depression.

Conclusion
Our findings point to the need for various concentrations of lavender essential oil in order to relieve anxiety and depression. In sum, future studies are required to investigate different concentrations of lavender essential oil at different times during haemodialysis sessions (the last 20 minutes or half way through the dialysis session) to obtain specific doses for lavender essential oil to be used on haemodialysis patients suffering from anxiety and/or depression.

Acknowledgements
This study has been approved by the Traditional and Complementary Medicine Research Center at Mazandaran University of Medical Sciences (approval number: 898/1392), registered under IRTC201407077494N9 at the Iranian Registry of Clinical Trials.

Conflict of interest
The authors have no conflict of interest to declare.

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