

## The Effect of Massage With Lavender Oil on Restless Leg Syndrome in Hemodialysis Patients: A Randomized Controlled Trial

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### Abstract

**Background:** Restless leg syndrome (RLS) is a common problem in patients with chronic renal failure. It can reduce the quality of life and sleep disturbances. This disorder is usually treated pharmacologically. Recently, complementary medicine methods have been suggested because of chemical drugs adverse effects. There is not enough evidence about the effect of aromatherapy on RLS.

**Objectives:** The aim of this study was to determine the effects of massage with lavender oil on RLS symptoms in hemodialysis patients.

**Patients and Methods:** This randomized clinical trial study included 70 hemodialysis patients with RLS that were randomly assigned into two groups in 2014. The experimental group received effleurage massage using lavender oil and control group received routine care for three weeks. Data was collected with RLS questionnaire and analyzed using independent and paired t-test and Chi-square test.

**Results:** The mean RLS scores were not significantly different in the two groups at the start of study ( $22.41 \pm 7.67$  vs.  $22.90 \pm 4.38$ ,  $P = 0.76$ ). At the end of study, the mean RLS score significantly decreased in the intervention group, while this score remained relatively un-changed in the control group ( $12.41 \pm 5.49$  vs.  $23.23 \pm 4.52$ ,  $P < 0.0001$ ).

**Conclusions:** Lavender oil massage was effective to improve RLS in hemodialysis patients. It has no adverse effects, is practical and cost-effective. It is suggested to be used along with routine treatment of RLS in hemodialysis patients.

**Keywords:** Massage, Lavender Oil, Restless Leg Syndrome, Hemodialysis

## 1. Background

Restless leg syndrome (RLS) or the Willis-Ekbom disease is a neurological disorder characterized by a compulsory need to move legs (1). Patients with this syndrome, experience an intensely uncomfortable sensation in their legs that compels them to move their legs involuntarily (2). Patients with RLS usually experience several complications including reduced quality of life (QOL) and sleep disturbances (3, 4). After mental disorders, drug abuse, and breathing-related sleep disorders, RLS is the fourth-leading cause of insomnia (5). Although RLS is not as life threatening as diabetes or cardiac disorders, it is crucial to be treated, because it results in chronic insomnia and daytime drowsiness that consequently decreases patient's QOL (6). Patients with chronic renal insufficiency who undergo hemodialysis may commonly encounter various complications including RLS, which might be experienced frequently (7). Approximately 20 - 80% of hemodialysis patients experience RLS, while its prevalence in general population is 2 to 15% (8, 9). International restless leg syndrome study group has identified four main criteria for diagnosis of RLS including: a) urge to move the legs, usually accompanied by discomfort in legs, b) start or exacerbation of symptoms at rest or after inactivity, c) complete or partial

relief of symptoms by activity, d) emergence of symptoms only at night or exacerbation of symptoms in the evening and night (10). Because the etiology of this syndrome is not completely understood, there is no definite treatment for it and current therapies can only reduce symptoms. Currently, some pharmacological and non-pharmacological treatments are used for the treatment of RLS. Dopaminergic drugs are commonly used for the treatment of RLS. However, these medications can cause serious complications (11). In a review on the pathophysiology and genetics of RLS, Trott et al. reported that only 13% of patients with this syndrome can be treated with pharmacological treatments (12). Therefore, non-pharmacologic therapies are increasingly being used for the treatment of this syndrome (11). Complementary and alternative therapies are increasingly used by nurses in many treatment centers due to their safeness, affordability, easiness, and minimal adverse effects (13, 14). Massage therapy and aromatherapy are among the most commonly used complementary and alternative therapies (13). Massage therapy, as a well-known traditional remedy, induces a feeling of health and sense of well-being and therefore has gained popularity (15). Several studies have shown beneficial effects of massage on pain,

anxiety, blood pressure, heart rate, serum cortisol level, depression, and negative mood (15). In aromatherapy, some aromatic oils extracted from plants are used through inhalation or accompanying with massage to prevent or treat some discomforting symptoms (16). Lavender (*Lavandula stoechas*) belongs to the *Lamiaceae* species from the spearmint family and is among the most commonly herbal aromas used in a wide variety of disorders. The active ingredients of essential oil of lavender can quickly be absorbed through skin and their sedative, antidepressant, and muscular relaxant effects, as well as their positive effects on the quality of sleep and feeling of wellbeing have been shown (17). Lavender is a safe herb and no toxicity has been reported (18). Moreover, beneficial effects of lavender essence on reducing agitation in Alzheimer (19), reducing the risk of post-partum depression and anxiety (20), decreasing stress and pain of needling (21), decreasing dysmenorrhea (22) and reducing pain after cesarean section (23), and tonsillectomy (24) have been confirmed. However, Kim et al. did not report significant difference after aromatherapy with lavender oil in relieving pain after surgery (25). Soden et al. showed that aromatherapy with massage is not effective in reducing anxiety of patients with cancer hospitalized in hospital (26). Wilcock et al. in study of the effect of massage with aromatic oil in patients with cancer did not report significant differences in mood, quality of life, and physical signs (27). Also in a review study, Mitchell investigated non-pharmacological treatments available for RLS and reported that few studies have been performed to measure the effect of complementary therapies on RLS (28). A recent study about the effect of Swedish effleurage massage in RLS reported that the method was temporarily effective in relieving RLS. However, symptoms returned after two weeks (29). According to literature search, no study is available on the effect of simultaneous usage of massage and aromatherapy on RLS. Therefore, this study aimed to assess the effect of massage with lavender oil on RLS in hemodialysis patients.

## 2. Objectives

The aim of this study was to determine the effects of massage with lavender oil on RLS symptoms in hemodialysis patients.

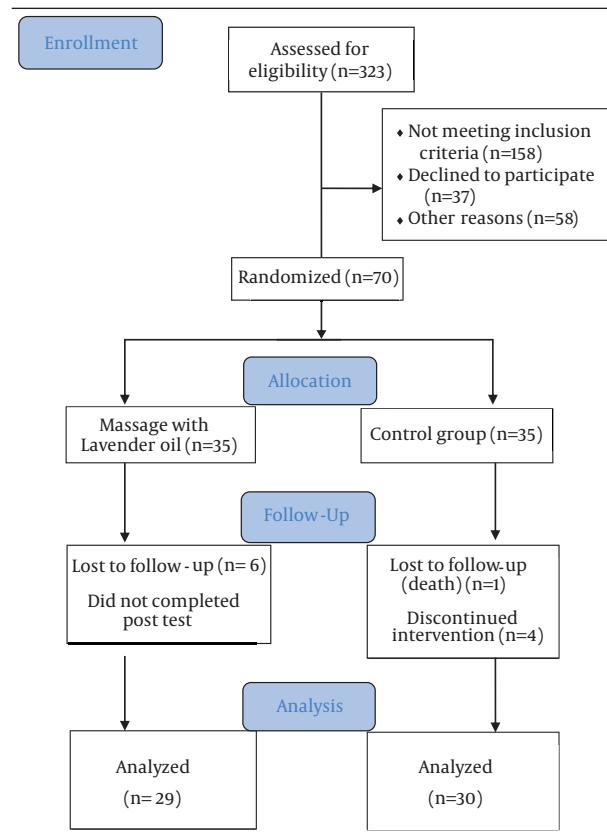
## 3. Patients and Methods

### 3.1. Design and Participants

This was a single blind randomized clinical trial study conducted in 2014 on patients with chronic renal failure undergoing hemodialysis referred to two hemodialysis centers in Kashan (the Hemodialysis Center of Akhavan Hospital with 24 hemodialysis beds) and Qom (the Hemodialysis Center of Qom's Kamkar Hospital with 48 hemodialysis beds) cities, Iran. Sample size was calculated based on a previous study (30). Based on the results of previous research, the average of anxiety was 32.78 in intervention (received massage with aromatic oil) and

39.25 in control group. Therefore, the sample size estimated as 60, considering the following parameters ( $\beta = 0.20$ ,  $\alpha = 0.05$ ,  $S_1 = 10$ ,  $S_2 = 10$ ,  $\mu_1 - \mu_2 = 7$ ).

However, 70 samples were selected to compensate the possible attrition. Sampling was performed sequentially during three weeks. Inclusion criteria included age 18 to 65 years, having a medical diagnosis of chronic renal failure, performing regular hemodialysis for a minimum of 6 months and at least twice a week, not having a history of allergy to plants, having no active wound below the knee, having no addiction to any substances, not having a known psychiatric disorder, dementia and mental retardation, and being able to walk on his or her feet. Exclusion criteria included death of a patient, being uncooperative or a patient's decision to withdraw from the study, occurrence of any allergic reaction to lavender, or interference of the study intervention with patient's current treatments (according the physician's diagnosis). The severity of RLS was determined by the first researcher using international questionnaire for restless legs syndrome. Then patients with inclusion criteria were allocated in the intervention ( $n = 35$ ) or the control group ( $n = 35$ ) using a blocked randomization method (Figure 1). The patients were selected by blocked randomized method. Each block consisted of four patients. We had two groups and each group consisted of 35 patients selected based on the table of random numbers. One of the groups considered as intervention and the other as control.



**Figure 1.** The Sampling Framework of the Study

### 3.2. Intervention

In the intervention group, simple effleurage massage using lavender oil was performed on both legs from the plantar surface of the foot up to the knee. The trained researcher nurse performed the intervention for males and a trained female assistant did the intervention for females. Each patient received the intervention for three weeks, twice a week, and each session lasted 10 minutes. All interventions were performed one hour after starting the dialysis session. On each leg, effleurage massage was started from the plantar surface of the foot which massaged with movements of the thumbs from the fingers toward heel. Then, the posterior sides of the legs were massaged by deep pressing with palm of hands and thumbs from ankle up to the knee and back down to the foot with light pressure. Massage was performed using enough lavender oil with 1.5% concentration of essence made from unopened lavender blossoms (approximately 10 to 15 mL). The essence was prepared by Barij Essence Pharmaceutical Company (Kashan, Iran). The intervention time was adjusted when patients referred for their routine hemodialysis session (i.e. morning, evening or night shift). To prevent smelling of odor of oil by patients in the intervention and control groups, they received massage in different work shifts.

### 3.3. Measurement

The research instrument was consisted of two parts, including a demographic questionnaire and the RLS international questionnaire. The demographic questionnaire consisted of questions about age, sex, education, marital status, occupational status, and anemia. The RLS questionnaire consists of ten questions. Each question has five options with scores from zero to four. Then, the total score would be between zero and 40. The higher the scores, the greater the severity of the RLS. Validity and reliability of the Persian version of RLS questionnaire were previously assessed by Habibzade et al. and the Cronbach's alpha coefficient was 0.97 (31). The instrument was answered through self-report or interviews conducted by two trained co-researchers not aware of patients grouping (if a patient was illiterate or unable to fill the questionnaire by him or herself). Routine care was the same in the both groups. Patients in the control group received their routine hemodialysis without any classic massage or aromatherapy. The both groups answered the questionnaire at the start of study and then after one week in end of the study.

### 3.4. Ethical Considerations

The study was approved by the ethics committee of Kashan University of Medical Sciences with the grant number 93139. Patients received information about the objectives of study and all of them signed an informed consent before participation. Massage was performed by two nurses of the same sex with patient and were trained and tested before the study.

### 3.5. Statistical Analysis

Data was analyzed using SPSS software, version 13 (SPSS Inc. Chicago, IL, USA). Kolmogorov-Smirnov test was used to test the normality of variables. Chi-square test and t-test were used to compare demographic variables and the RLS scores in the two groups. Paired t-test was used to compare RLS scores in each group before and after the intervention. The significance level was considered less than 0.05 in all tests.

## 4. Results

From total participants, 11 were excluded due to lack of cooperation. Finally, 59 patients completed the study. From the remaining participants, 52.5% were females and 47.5% males. The mean age was  $57.5 \pm 14.6$  years in the intervention group and  $56.10 \pm 13.56$  years in the control group ( $P = 0.69$ ). No gender difference was observed between the two groups ( $P = 0.11$ ). No significant differences were observed between the two groups for other demographic and clinical variables (Table 1). The mean RLS scores were not significantly different in the two groups at the start of study ( $22.41 \pm 7.67$  vs.  $22.90 \pm 4.38$ ,  $P = 0.76$ ). However, at the end of study, the mean RLS score significantly decreased in the intervention group, while this score remained relatively unchanged in the control group ( $12.41 \pm 5.49$  vs.  $23.23 \pm 4.52$ ,  $P < 0.0001$ ) (Table 2).

**Table 1.** Baseline Characteristics of Participants Completing the Study

Variable	Groups <sup>a</sup>		Test Results	
	Intervention	Control	t	P
Age, y	$57.5 \pm 14.6$	$56.10 \pm 13.56$	0.39	0.69
Hemodialysis history	$3.78 \pm 0.25$	$3.82 \pm 0.32$	0.34	0.7
Gender				0.11
Female	18 (62.1)	13 (43.3)		
Male	11 (37.9)	17 (56.7)		
Education				0.35
Elementary	27 (93.1)	26 (86.7)		
Intermediate and high school	2 (6.9)	4 (13.3)		
Marital status				0.16
Single	9 (31)	14 (66.7)		
Married	20 (69)	16 (53.3)		
Occupational status				0.12
Workless	13 (44.8)	19 (37.3)		
Employed	16 (55.2)	11 (36.7)		
Anemia				0.51
Yes	2 (7)	3 (10)		
No	27 (93)	27 (90)		

<sup>a</sup>Data are presented as mean  $\pm$  SD or No. (%).

**Table 2.** Restless Leg Syndrome Scores in Intervention and Control Groups at Baseline and the End of Study<sup>a</sup>

RLS	Before	After	t	P
<b>Intervention</b>	22.41 ± 7.67	12.41 ± 5.49	9.31	< 0.0001
<b>Control</b>	22.90 ± 4.38	23.23 ± 4.52	0.85	0.40
<b>t</b>	0.3	8.27		
<b>P</b>	0.76	< 0.0001		

<sup>a</sup>Data are presented as mean ± SD.

## 5. Discussion

The results showed that effleurage aroma leg massage using lavender oil could effectively reduce the severity of RLS in the intervention group. Although no similar study is available, two studies showed that hand massage with lavender oil was positively effective on cognitive function, emotion and aggressive behavioral symptoms of elderly with dementia (19, 32). Lee and Lee investigated the effect of lavender aromatherapy on insomnia and depression and reported that the intervention improved the quality of sleep and reduced depressive symptoms in female college students (33). Han et al. reported that aroma massage using a combination of lavender oil, *Salvia sclarea*, and *Rosa centifolia* could effectively reduce the symptoms of dysmenorrhea in college students (34). Similar effect has been reported by Ou et al. who applied abdominal massage with a combination of lavender, sage and marjoram in outpatients with primary dysmenorrhea (22). All these studies are consistent with our results and confirm the beneficial effects of lavender on anxiety, dysmenorrhea, insomnia, and behavioral agitation. Although the cause of RLS is not clearly known, it seems that relaxant effects of massage therapy in combination with muscle relaxant and sedative effects of lavender were effective in reducing the symptoms of RLS in hemodialysis patients. There are also conflicting studies. Lewith et al. studied the effect of inhaled lavender on mild insomnia and reported no significantly different effect in comparison with the control group (35). Kuriyama et al. reported that aromatherapy massage was not effective on anxiety (36). Moreover, Muzzarelli et al. could not find any evidence on effectiveness of aromatherapy with lavender oil on anxiety before colonoscopy and gastroscopy (37). In addition, some of the studies could not find any significant effect of lavender aromatherapy on pain of breast biopsies (38), mood, quality of life, and physical symptoms of patients with cancer (27), sleep quality of patients admitted to CCU (39), and surgical pain in patients with cancer (26). Several factors such as the type of patients and their underlying disorders (40, 41), the duration and method of intervention, patient's psychological conditions (42), or the amount of aroma used might be contributed to controversies on the effects of lavender or other therapeutic methods.

For instance, Fismer and Pilkington only used one drop of lavender for one night (39). However, our intervention was repeated frequently and continued for three weeks. In the present study, the control group received routine care of hemodialysis patients.

Therefore, RLS was not improved in this group. In conclusion, lavender oil massage was effective to improve RLS in hemodialysis patients. Therefore, it seems that it can be used along with routine treatments of RLS in hemodialysis patients.

The intervention used in the present study had no adverse effects and can be used in routine care of hemodialysis patients as an easy, inexpensive, applicable, and patient friendly method. Therefore, it is suggested to include a course of alternative and complementary therapies in the nursing curriculum and nurses' in-service and continual education programs.

One of the limitations of the study was performing the intervention only during the dialysis session and inability to change the environment and transferring patients from dialysis unit to a suitable environment to perform the intervention. Other limitations included not following up the results of massage in long-term, not continuing the massage for the patient and not assessing the effect of massage when the patient was at home and lack of flexibility in blinding. Therefore, it is recommended to perform further studies with eliminating mentioned limitations. It is suggested to perform future studies to transfer patients from dialysis unit to a suitable and calm environment to perform the intervention. Also, it is suggested to follow up the results of massage for at least one month after the intervention.

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## Footnotes

**Authors' Contribution:** All authors contributed equally in this study.

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## References

1. Rist PM, Tzourio C, Elbaz A, Soumare A, Dufouil C, Mazoyer B, et al. Structural brain lesions and restless legs syndrome: a cross-sectional population-based study. *BMJ Open*. 2014;4(11):e005938. [PubMed: 25421338] doi: 10.1136/bmjopen-2014-005938.
2. Kushida C, Martin M, Nikam P, Blaisdell B, Wallenstein G, Ferini-Strambi L, et al. Burden of restless legs syndrome on health-related quality of life. *Qual Life Res*. 2007;16(4):617-24. doi: 10.1007/s11136-006-9142-8. [PubMed: 17268935]
3. Winkelmann J, Prager M, Lieb R, Pfister H, Spiegel B, Wittchen HU,

- et al. "Anxietas tibiarum". Depression and anxiety disorders in patients with restless legs syndrome. *J Neurol*. 2005; **252**(1):67-71. doi: 10.1007/s00415-005-0604-7. [PubMed: 15654556]
4. Lee J. A review of restless legs syndrome in patients on hemodialysis. *Kidney*. 2009; **18**(1):9-13. doi: 10.1007/s00596-008-0055-0.
  5. Saletu M, Anderer P, Saletu-Zyhlarz G, Hauer C, Saletu B. Acute placebo-controlled sleep laboratory studies and clinical follow-up with pramipexole in restless legs syndrome. *Eur Arch Psychiatry Clin Neurosci*. 2002; **252**(4):185-94. doi: 10.1007/s00406-002-0380-7. [PubMed: 12242580]
  6. Chatterjee SS, Mitra S, Guha P, Chakraborty K. Prevalence of restless legs syndrome in somatoform pain disorder and its effect on quality of life. *J Neurosci Rural Pract*. 2015; **6**(2):160-4. doi: 10.4103/0976-3147.153219. [PubMed: 25883472]
  7. Jenabi A, Amani M, Mouraki A, Jabbari M, Osareh SH, Fereshteh Nejad SM. Correlation between Serum C-Reactive Protein (CRP) Level and Sleep Disorders in Chronic Hemodialysis Patients. [in Persian]. *Razi J Med Sci*. 2007; **14**(56):79-89.
  8. Rye DB, Trott LM. Restless legs syndrome and periodic leg movements of sleep. *Neurol Clin*. 2012; **30**(4):1137-66. doi: 10.1016/j.ncl.2012.08.004. [PubMed: 23099132]
  9. Winkelmann J. Genetics of restless legs syndrome. *Curr Neurol Neurosci Rep*. 2008; **8**(3):211-6. [PubMed: 18541116]
  10. Einollahi B, Izadianmehr N. Restless leg syndrome: a neglected diagnosis. *Nephrourol Mon*. 2014; **6**(5):e22009. doi: 10.5812/nu-monthly.22009. [PubMed: 25695039]
  11. Innes KE, Selfe TK. The Effects of a Gentle Yoga Program on Sleep, Mood, and Blood Pressure in Older Women with Restless Legs Syndrome (RLS): A Preliminary Randomized Controlled Trial. *Evid Based Complement Alternat Med*. 2012; **2012**:294058. doi: 10.1155/2012/294058. [PubMed: 22474497]
  12. Trott LM, Bhadriraju S, Rye DB. An update on the pathophysiology and genetics of restless legs syndrome. *Curr Neurol Neurosci Rep*. 2008; **8**(4):281-7. [PubMed: 18590611]
  13. Burns E, Zobbi V, Panzeri D, Oskrochi R, Regalía A. Aromatherapy in childbirth: a pilot randomised controlled trial. *BjOG*. 2007; **114**(7):838-44. doi: 10.1111/j.1471-0528.2007.01381.x. [PubMed: 17506789]
  14. Maddocks-Jennings W, Wilkinson JM. Aromatherapy practice in nursing: literature review. *J Adv Nurs*. 2004; **48**(1):93-103. doi: 10.1111/j.1365-2648.2004.03172.x. [PubMed: 15347415]
  15. Moyer CA, Rounds J, Hannum JW. A meta-analysis of massage therapy research. *Psychol Bull*. 2004; **130**(1):3-18. doi: 10.1037/0033-2909.130.1.3. [PubMed: 14717648]
  16. Pritchard MJ. Managing anxiety in the elective surgical patient. *Br J Nurs*. 2009; **18**(7):416-9. doi: 10.12968/bjon.2009.18.7.41655. [PubMed: 19373185]
  17. Gedney JJ, Glover TL, Fillingim RB. Sensory and affective pain discrimination after inhalation of essential oils. *Psychosom Med*. 2004; **66**(4):599-606. doi: 10.1097/01.psy.0000132875.01986.47. [PubMed: 15272109]
  18. Cavanagh HM, Wilkinson JM. Biological activities of lavender essential oil. *Phytother Res*. 2002; **16**(4):301-8. doi: 10.1002/ptr.1103. [PubMed: 12112282]
  19. Lee SY. [The effect of lavender aromatherapy on cognitive function, emotion, and aggressive behavior of elderly with dementia]. *Taehan Kanho Hakhoe Chi*. 2005; **35**(2):303-12. [PubMed: 15860944]
  20. Conrad P, Adams C. The effects of clinical aromatherapy for anxiety and depression in the high risk postpartum woman - a pilot study. *Complement Ther Clin Pract*. 2012; **18**(3):164-8. doi: 10.1016/j.ctcp.2012.05.002. [PubMed: 22789792]
  21. Kim S, Kim HJ, Yeo JS, Hong SJ, Lee JM, Jeon Y. The effect of lavender oil on stress, bispectral index values, and needle insertion pain in volunteers. *J Altern Complement Med*. 2011; **17**(9):823-6. doi: 10.1089/acm.2010.0644. [PubMed: 21854199]
  22. Ou MC, Hsu TF, Lai AC, Lin YT, Lin CC. Pain relief assessment by aromatic essential oil massage on outpatients with primary dysmenorrhea: a randomized, double-blind clinical trial. *J Obstet Gynaecol Res*. 2012; **38**(5):817-22. doi: 10.1111/j.1447-0756.2011.01802.x. [PubMed: 22435409]
  23. Olapour A, Behaeen K, Akhondzadeh R, Soltani F, Al Sadat Razavi F, Bekhradi R. The Effect of Inhalation of Aromatherapy Blend containing Lavender Essential Oil on Cesarean Postoperative Pain. *Anesth Pain Med*. 2013; **3**(1):203-7. doi: 10.5812/aapm.9570. [PubMed: 24223363]
  24. Soltani R, Soheilipour S, Hajhashemi V, Asghari G, Bagheri M, Molavi M. Evaluation of the effect of aromatherapy with lavender essential oil on post-tonsillectomy pain in pediatric patients: a randomized controlled trial. *Int J Pediatr Otorhinolaryngol*. 2013; **77**(9):1579-81. doi: 10.1016/j.ijporl.2013.07.014. [PubMed: 23932834]
  25. Kim MA, Sakong JK, Kim EJ, Kim EH, Kim EH. [Effect of aromatherapy massage for the relief of constipation in the elderly]. *Taehan Kanho Hakhoe Chi*. 2005; **35**(1):56-64. [PubMed: 15778557]
  26. Soden K, Vincent K, Craske S, Lucas C, Ashley S. A randomized controlled trial of aromatherapy massage in a hospice setting. *Palliat Med*. 2004; **18**(2):87-92. [PubMed: 15046404]
  27. Wilcock A, Manderson C, Weller R, Walker G, Carr D, Carey AM, et al. Does aromatherapy massage benefit patients with cancer attending a specialist palliative care day centre? *Palliat Med*. 2004; **18**(4):287-90. [PubMed: 15198118]
  28. Mitchell UH. Nondrug-related aspect of treating Ekbom disease, formerly known as restless legs syndrome. *Neuropsychiatr Dis Treat*. 2011; **7**:251-7. doi: 10.2147/NDT.S19177. [PubMed: 21654870]
  29. Russell M. Massage therapy and restless legs syndrome. *J Bodywork Mov Ther*. 2007; **11**(2):146-50.
  30. Babashahi M, Kahangi LS, Babashahi F, Fayazi S. Comparing the effect of massage Aromatherapy and massage on anxiety level of the patients in the preoperative period: a clinical trial. *NJMNSM*. 2012; **2**(2):7747.
  31. Habibzade H, Khalkhalie HR, Ghanei R. Study of the relationship between restless legs syndrome and sleep disturbance among patients in Critical Care Units. *Iran J Crit Care Nurs*. 2011; **4**(3):153-8.
  32. van der Ploeg ES, Eppingstall B, O'Connor DW. The study protocol of a blinded randomised-controlled cross-over trial of lavender oil as a treatment of behavioural symptoms in dementia. *BMC Geriatr*. 2010; **10**:49. doi: 10.1186/1471-2318-10-49. [PubMed: 20649945]
  33. Lee IS, Lee GJ. [Effects of lavender aromatherapy on insomnia and depression in women college students]. *Taehan Kanho Hakhoe Chi*. 2006; **36**(1):136-43. [PubMed: 16520572]
  34. Han SH, Hur MH, Buckle J, Choi J, Lee MS. Effect of aromatherapy on symptoms of dysmenorrhea in college students: A randomized placebo-controlled clinical trial. *J Altern Complement Med*. 2006; **12**(6):535-41. doi: 10.1089/acm.2006.12.535. [PubMed: 16884344]
  35. Lewith GT, Godfrey AD, Prescott P. A single-blinded, randomized pilot study evaluating the aroma of Lavandula angustifolia as a treatment for mild insomnia. *J Altern Complement Med*. 2005; **11**(4):631-7. doi: 10.1089/acm.2005.11.631. [PubMed: 16131287]
  36. Kuriyama H, Watanabe S, Nakaya T, Shigemori I, Kita M, Yoshida N, et al. Immunological and Psychological Benefits of Aromatherapy Massage. *Evid Based Complement Alternat Med*. 2005; **2**(2):179-84. doi: 10.1093/ecam/neh087. [PubMed: 15937558]
  37. Muzzarelli L, Force M, Sebold M. Aromatherapy and reducing preprocedural anxiety: A controlled prospective study. *Gastroenterol Nurs*. 2006; **29**(6):466-71. [PubMed: 17273013]
  38. Kim JT, Wajda M, Cuff G, Serota D, Schlaime M, Axelrod DM, et al. Evaluation of aromatherapy in treating postoperative pain: pilot study. *Pain Pract*. 2006; **6**(4):273-7. doi: 10.1111/j.1533-2500.2006.00095.x. [PubMed: 17129308]
  39. Fisman KL, Pilkington K. Lavender and sleep: A systematic review of the evidence. *Euro J Integr Med*. 2012; **4**(4):e436-e47.
  40. Earley CJ. Clinical practice. Restless legs syndrome. *N Engl J Med*. 2003; **348**(21):2103-9. doi: 10.1056/NEJMcp021288. [PubMed: 12761367]
  41. Rasmussen GL, Steckner K, Hogue C, Torri S, Hubbard RC. Intravenous parecoxib sodium for acute pain after orthopedic knee surgery. *Am J Orthop (Belle Mead NJ)*. 2002; **31**(6):336-43. [PubMed: 12083587]
  42. Kyle G. Evaluating the effectiveness of aromatherapy in reducing levels of anxiety in palliative care patients: results of a pilot study. *Complement Ther Clin Pract*. 2006; **12**(2):148-55. doi: 10.1016/j.ctcp.2005.11.003. [PubMed: 16648093]