

Table 1. List of Evidence for Essential Oils in Treating Fatigue in Various Patient Populations

Reference	Study Design/Population/Location	Plant & Most Active Compound in EO	Dose of EO And Administration	Comparison	Measurement of Fatigue	Impact on Fatigue
Choi and Park (2016)	Double blind RCT/54 perennial allergic rhinitis Adult Patient/ Seoul, South Korea	Ravensara (1,8-cineole, Alpha-terpineol), Frankincense (Alpha-pinene) and Sandalwood (Santalol),	A 0.2% (v/v) concentration of EO was dissolved in almond oil. For a week, breathe in for five minutes twice everyday.	Treatment group: Mixture of Sandalwood, Frankincense, Ravensara EO in Almond Oil Control group: almond carrier oil (placebo)	Chalder Fatigue Scale (CFS)	Fatigue (mean±SD) Treatment group: Pre (35.000 ± 7.000); Post (23.741 ± 4.703) Control group: Pre (33.481 ± 7.678); post (27.778 ± 5.938) [Treatment group improved significantly more than the placebo group (p= 0.021)]
Majdinasab <i>et al.</i> (2018)	Double-blind RCT/52 patients with MS/Jundisha pur, Iran	Evening primrose/ <i>Oenothera biennis</i> (gamma-linolenic acid)	every 12 hours for three months, take a 1 g oral capsule containing EPO.	Treatment group: EPO oral capsule and MS standard treatment Control group: Placebo and MS standard treatment	Modified Fatigue Impact Scale (MFIS).	Fatigue (Mean) Treatment group: Pre (32.08); Post (11.96) Control Group: Pre (24.42); Post (20.69) [Significant difference between the average scores on the MFIS after treatment in both control and treatment groups (P<0.001)]
Ahmady <i>et al.</i> (2019)	RCT/90 Hemodialysis Patient/ Kermanshah, Iran	Lavender/ <i>Lavandula angustifolia</i> Miller (Linalool and Linalyl acetate) and Orange/ <i>Citrus sinensis</i> (Linalool, Linalyl acetate and Limonen)	Five drops of each essential oil—lavender in one group and orange in the other—were placed on a cotton ball, which was then pinned to the patient's collar for 30 minutes.	Treatment group: 1 group EO Lavender and 1 group EO Orange Control group: Distilled Water	Fatigue Severity Scale (FSS)	Fatigue (Mean± SD) Treatment group: Lavender group Pre (47.83±14.81); Post (30.27±13.88)* Orange Group Pre (48.8±12.8) Post (33.06±14.55)* Control Group: Pre (37.57±16.42); Post (34.7±15.09)** *p = 0.001

**p = 0.71						
Hassanzadeh <i>et al.</i> (2018)	RCT/105 Hemodialysis patient/Zahedan city, Iran	Lavender/ <i>Lavandula angustifolia</i> Miller (Linalool and Linalyl acetate)	A cotton ball with two drops of 5% lavender essential oil inoculated in sweet almond oil was placed on it and fastened to the subject's collar for 15 to 20 minutes while they continued to breathe normally. Two times daily for four weeks, both at home and in the dialysis unit.	Treatment group: 1 group Relaxation (Benson muscle relaxation techniques and 1 group EO Lavender Control group: Received regular healthcare actions	Brief Fatigue Inventory (BFI)	Fatigue (Mean± SD) Treatment group: EO lavender group Pre (6.49 ± 1.11); Post (3.64 ± 0.79)* Relaxation group Pre (6.8 ± 1.45) Post (5.12 ± 1.05)* *p = 0.01 Control Group: Pre (6.44 ± 1.27); Post (6.21 ± 1.29)** **p = 0.329 ANOVA showed that the changes in the mean score of fatigue in the aromatherapy group were significantly higher than Relaxation and Control Group (p = 0.001).
Karadag and Samancioglu (2019)	RCT/60 Hemodialysis patient/Turkey	Lavender/ <i>Lavandula angustifolia</i> Miller (Linalool and Linalyl acetate)	Lavender EO was inhaled in the following amounts: 2 drops, 20 minutes, and 2-mL lavender in 98 mL water (2%). Procedure carried out throughout the course of 30 days of dialysis (2 or 3 times each week).	Treatment group: EO Lavender Control group: No Intervention	Fatigue Severity Scale (FSS)	Fatigue Mean (SD) Treatment group: Pre 41.23 (8.51); Post 35.23 (5.21)* Control Group: Pre 37.60 (10.12); Post 38.46 (9.12)** *p = 0.001 **p = 0.208
Varaei <i>et al.</i> (2021)	Three-group single-blind RCT/69 Hemodialysis patient/Tehran, Iran	Lavender/ <i>Lavandula angustifolia</i> and Sweet Orange	Inhalation group: Each eligible patient had a 2×2 cm piece of gauze with 1 drop of lavender and 1 drop of sweet orange EO on it. The gauze was placed on the shirt collar	Treatment group: Group 1: Lavender and sweet orange inhalation EO group, Lavender and sweet orange EO massage group	Rhoten Fatigue Scale (RFS)	Fatigue Mean (SD) Treatment group: Inhalation Group Pre 5.72 (2.19); Post 8 weeks 4 (1.67); Post 16 weeks 5.19 (1.71)* Massage Group Pre 6.22 (2.09); Post 8 weeks 2.56 (1.87); Post 16 weeks 3.94 (1.27)*

			for 20 minutes while the patient slowly breathed. process carried out three times every week for eight weeks. Massage Group: In a 1:1 ratio, Lavender and sweet orange EO were combined. Sweet almond oil was then used to dilute the mixture to a 3% concentration. Each foot received 5 mL of the substance, which was rubbed in from the toes to the ankle. 10 minutes of massage were given three times each week for eight weeks in a row..	Control group: Received the routine care services		Control Group: Pre 5.70 (1.70); Post 8 weeks 6.22 (1.36); Post 16 weeks 7.06 (1.29)** *p<0.05 **p = 0.54 [Effects of aromatherapy massage on fatigue are stronger than the effects of inhalation aromatherapy]
Hawkins <i>et al.</i> (2020)	Randomized, blinded, placebo-controlled clinical trial/54 Hypothyroidism Patient/United States	Leaves of peppermint EO/ <i>Mentha x piperita</i> Blend with small amount of Black pepper/ <i>Piper nigrum</i> EO, Clove bud/ <i>Eugenia caryophyllus</i> EO, White grapefruit/ <i>Citrus x paradisi</i> EO, and Bergamot/ <i>Citrus Arantium bergamia</i> EO	Inhale the oils for exactly 15 minutes after adding three drops of the mixture to the inhaler stick (keep it at least one and two feet from your body). everyday inhaled the mixture for 14 days.	Treatment group: Peppermint-based essential oil blend Control group: Avocado vegetable oil	Multidimensional Fatigue Symptom Inventory (MFSI)	Fatigue Mean (SD) Treatment group: Pre 2.27 (0.95); Post 1.00 (0.69) Control Group: Pre 2.27 (1.16); Post 1.85 (1.56) [Significant difference was found between the aromatherapy group and the placebo group on the global scale (p = 0.019)]

		(Limonene and Eugenol)				
Muz and Tasci (2017)	RCT/62 Hemodialysis patient/Turkey	Lavender and sweet orange oils	Oils of lavender and sweet orange were applied in a ratio of one to one on a gauze bandage that was held 5 cm from the nose for two minutes. After the patients finished smelling the concoction, they were instructed to take three deep breaths.	Treatment group: Sweet orange + lavender oil Control group: No Intervention of Aromatherapy	Piper Fatigue Scale (PFS)	Fatigue (Mean± SD) Treatment group: Sweet Orange + Lavender Oil Group: Pre 8.22 ± 1.27; Post 3.09 ± 2.01* Control Group: Pre 7.25 ± 1.16; Post 7.38 ± 1.33** (*p<0.001) (**P=0.320)
Gok Metin and Ozdemir (2016)	RCT/54 rheumatoid arthritis Patient/Ankara, Turkey	<i>Lavandula augustifolia</i> (Linalool), <i>Juniperus communis</i> (α-Pinene), <i>Cananga odorata</i> Germacren-D), and <i>Rosmarinus officinalis</i> (1,8 cineol)	100 mL of coconut carrier oil with a 5% mixture in the ratio 3:3:2:2. Both knees received topically administered EO.	Treatment group: Aromatherapy massage with EO: <i>Lavandula augustifolia</i> , <i>Juniperus communis</i> , <i>Cananga odorata</i> , and <i>Rosmarinus officinalis</i> Reflexology Control group: Routine care no intervention	Fatigue Severity Scale (FSS)	Fatigue (Mean± SD) Treatment group: Aromatherapy massage Group: Pre 5.86 ± 0.71*; Post 6 weeks 2.94 ± 1.13** Reflexology group Pre 5.58 ± 0.98*; Post 6 weeks 1.88 ± 1.18** Control Group: Pre 5.37 ± 0.82*; Post 6 weeks 4.41 ± 1.79** (*p=0.245) (**P=0.001)
Shirzadegan et al. (2020)	Triple blind RCT/40 Acute myocardial infarction/Helsinki, Finland	<i>Citrus aurantium</i> EO (Limonene, Myrcene, Camphene, Pinene, Ocimene and Cymene)	Procedure carried out during home visit: The patient was instructed to inhale the scent for 20 minutes, twice daily (10-11 AM and 6-7 PM) for two days in a row, by	Treatment group: <i>C. aurantium</i> EO Control group: Sunflower oil 12%	Multidimensional Fatigue Inventory (MFI-20)	Fatigue (Mean± SD) Treatment group: Pre 77.12 ± 22.86; Post 26.4 ± 17.85* Control Group: Pre 71.13 ± 8.69; Post 71.13 ± 32.42* (*P < 0.001)

			placing three drops of <i>C. aurantium</i> EO on absorbable patches attached to the inside of their breathing masks.			
Hassanzadeh <i>et al.</i> (2021)	Single blinded three arm-RCT/40 Heart Failure NYHA class 2 or 3/Tabriz,Iran	Lavender/ <i>Lavandula angustifolia</i> (Linalool and Linalyl acetate)	A cotton ball soaked in two drops of 100% pure oil for 15 days, Lavender EO was placed on the patient's pillow cover at night (10:30 pm), and it was taken the next morning after the patient had awakened.	Treatment group: Group 1: C. Lavender EO Group 2: Sedamin Control group: Routin Care	Fatigue Severity Scale (FSS)	Fatigue (Mean± SD) Treatment group: Sedamin Group Pre 5.44 ± 0.80*; Post 1 week 4.2 ± 0.96**; Post 2 weeks 3.41 ± 0.60** Lavender EO group Pre 5.16 ± 0.63*; Post 1 week 4.1 ± 0.52**; Post 2 weeks 3.40 ± 0.42** Control Group: Pre 5.13 ± 0.64*; Post 1 week 5.04 ± 0.54**; Post 2 weeks 5.85 ± 0.39** (*p=0.215) (**P<0.0001)

EO: Essential Oils, EPO: Evening Primrose Oil, MS: Multiple Sclerosis, NYHA: New York Heart Association, RCT: Randomized Clinical Trial, SD: Standard Deviation