



Effectiveness of Non-Pharmacological Manual Therapies for Reducing Fatigue and Muscle Cramps in Hemodialysis Patients: A Systematic Review

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ABSTRACT

Background: Fatigue and muscle cramps are common symptoms among patients undergoing maintenance hemodialysis and may impair daily functioning, treatment tolerance, sleep, and quality of life. Manual therapy-based interventions have been explored as supportive non-pharmacological strategies, but the evidence remains heterogeneous.

Purpose: This systematic review aimed to synthesize evidence on the effectiveness of non-pharmacological manual therapies for reducing fatigue and muscle cramps in adults receiving maintenance hemodialysis. **Methods:** A systematic search was conducted in Scopus. Eligible studies included adult hemodialysis patients receiving manual therapy-based interventions and reporting fatigue and/or muscle cramp outcomes. Interventions included acupressure, auricular acupressure or auriculotherapy, massage, reflexology, aromatherapy massage, and combined manual therapy protocols. Methodological quality was assessed using Joanna Briggs Institute critical appraisal tools. Narrative synthesis was applied due to heterogeneity in interventions, comparators, outcome measures, and follow-up timing. **Results:** From 689 records, 14 studies were included. Most studies reported improvement in fatigue, although consistency and statistical significance varied. Auricular interventions and reflexology showed relatively more consistent favorable findings, while massage and acupressure showed mixed results. Evidence for muscle cramps was limited to two studies, both reporting reductions, but the small evidence base and methodological limitations require cautious interpretation. Overall study quality was mostly low. **Conclusion:** Manual therapies may support fatigue management in hemodialysis patients, but the certainty of evidence remains limited. Evidence for muscle cramp reduction is insufficient. **Implications for Nursing:** Manual therapies may be considered as adjunctive, low-cost, and nurse-deliverable interventions when guided by patient safety screening, standardized protocols, staff training, and outcome evaluation.

Keywords: Fatigue, Muscle cramp, Acupressure, Massage, Hemodialysis.

What does this paper add?

1. This review synthesizes current evidence on manual therapies for fatigue and muscle cramps in hemodialysis patients.
2. It shows that manual interventions are more consistently beneficial for fatigue than for muscle cramps.
3. Auricular interventions and reflexology demonstrated the most consistent favorable findings.
4. Evidence for muscle cramp reduction remains limited and should be interpreted cautiously.
5. The review highlights major methodological gaps to guide future nursing and clinical research.

Introduction

Patients receiving maintenance hemodialysis experience a persistent and multidimensional symptom burden despite the life-sustaining role of dialysis. Fatigue is one of the most common and debilitating symptoms in this population and may interfere with daily functioning, treatment tolerance, sleep quality, social participation, and overall quality of life (Natale et al., 2023; Parker et al., 2024; Rajabi et al., 2025). A recent narrative review published in the *Jordan Journal of Nursing Research* emphasized that patients undergoing hemodialysis experience interconnected physical, psychological, social, economic, and spiritual challenges, with fatigue, sleep disturbance, intradialysis complications, psychological distress, and reduced quality of life frequently reported as important concerns in nursing care (Ramadhan et al., 2026). These findings reinforce the need for symptom management strategies that are clinically meaningful, feasible, patient-centered, and compatible with holistic nursing practice.

Fatigue in hemodialysis is multifactorial and may be influenced by anemia, uremia, chronic inflammation, metabolic imbalance, dialysis-related fluid shifts, sleep disturbance, reduced physical activity, and psychological distress (Natale et al., 2023; Suandika et al., 2023). Muscle cramps are also clinically relevant, because they may occur during or after dialysis, cause pain and discomfort, interrupt dialysis sessions, impair post-dialysis recovery, and reduce patients' willingness to complete treatment (Mastnardo et al., 2016; Mohmadi et al., 2016). Together, fatigue and muscle cramps may undermine comfort, adherence, and quality of life among patients receiving maintenance hemodialysis (Parker et al., 2024; Rajabi et al., 2025).

Management of these symptoms remains challenging. Pharmacological approaches may be constrained by polypharmacy, comorbidities, adverse effects, and limited effectiveness for complex dialysis-related symptoms. Therefore, non-pharmacological interventions have increasingly been explored as supportive strategies for symptom control. A Cochrane review reported that exercise, aromatherapy, massage, and acupressure may improve fatigue in people requiring dialysis, although the certainty of evidence was generally low because of methodological limitations and heterogeneity across studies (Natale et al., 2023). Similarly, a meta-analysis of foot reflexology found that reflexology may reduce fatigue in

hemodialysis patients, while emphasizing the need for better standardization and reporting of intervention protocols (Şahan & Güler, 2023).

Manual therapy-based interventions, including acupressure, auricular acupressure or auriculotherapy, massage, reflexology, aromatherapy massage, and combined manual therapy protocols, are particularly relevant to nursing practice, because they are generally low-cost, non-invasive, and potentially feasible in dialysis units when implemented with safety screening, standardized procedures, infection control, and appropriate staff training (Çeçen & Lafcı, 2021; Habibzadeh et al., 2020; Suandika et al., 2023). However, evidence remains dispersed across intervention types, dosages, timing in relation to dialysis, comparators, outcome instruments, and follow-up periods. Therefore, this systematic review aimed to synthesize current evidence on non-pharmacological manual therapy-based interventions for reducing fatigue and muscle cramps among adults receiving maintenance hemodialysis.

Aims

This systematic review aimed to synthesize current evidence on the effectiveness of non-pharmacological manual therapy-based interventions for reducing fatigue and muscle cramps in adults receiving maintenance hemodialysis. Specifically, this review sought to identify the types of manual therapies evaluated, summarize their effects on fatigue and/or muscle cramp outcomes, examine the consistency of findings across intervention categories, and appraise methodological quality to inform nursing practice and future research.

Method

Design and Reporting

This study was conducted as a systematic literature review using a narrative synthesis approach. The review was reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement, which is available through the EQUATOR Network as a reporting guideline for systematic reviews. The study selection process is presented in Figure 1.

A narrative synthesis approach was selected, because the included studies were heterogeneous in terms of intervention type, intervention dosage, comparator, outcome measurement instrument, and follow-up timing. Therefore, statistical pooling was not considered appropriate.

Search Strategy and Information Sources

A systematic literature search was conducted in Scopus. Scopus was selected, because it provides broad multidisciplinary coverage of biomedical, nursing, and complementary therapy literature, allowing retrieval of studies across clinical, nursing, and integrative health fields. The search strategy used free-text terms related to hemodialysis and manual therapy-based interventions. The main population terms were “hemodialysis” OR “haemodialysis” OR “dialysis”. These were combined with intervention terms, including “acupressure”, “auricular acupressure”, “auriculotherapy”, “ear acupressure”, “massage”, “foot massage”, “hand massage”, “back massage”, “effleurage”, “petrissage”, “reflexology”, “foot reflexology”, “aromatherapy massage”, “lavender oil”, and “complementary therapy”. Boolean operators and phrase searching were used to improve search precision. The complete search string, filters, and search date are provided in the supplementary search log. All retrieved records were exported for duplicate removal and subsequent screening.

Eligibility Criteria

Studies were included if they met the following criteria: (1) involved adult patients receiving maintenance hemodialysis; (2) evaluated non-pharmacological manual therapy-based interventions, including acupressure, auricular acupressure or auriculotherapy, massage, reflexology, aromatherapy massage, or combined manual therapy protocols; (3) included usual care, no intervention, sham intervention, placebo, another active non-pharmacological intervention, or pre-post comparison as the comparator or comparison condition; (4) reported fatigue and/or muscle cramp outcomes using quantitative measures; and (5) used experimental or quasi-experimental designs, including randomized controlled trials, non-randomized controlled trials, controlled clinical trials, and pre-post intervention studies.

Studies were excluded if they involved non-hemodialysis populations, pediatric populations, pharmacological-only interventions, non-manual interventions, outcomes unrelated to fatigue or muscle cramps, non-original research, review articles, protocols, editorials, commentaries, conference abstracts without sufficient outcome data, or full texts that could not be retrieved.

Study Selection

After duplicate removal, titles and abstracts were screened against the predefined eligibility criteria, followed by full-text assessment of potentially eligible reports. From 689 records identified in Scopus, 103 duplicates were removed, leaving 586 records for title and abstract screening. A total of 547 records were excluded at this stage, because they did not meet one or more eligibility criteria. The most common reasons were irrelevant population, interventions outside the scope of manual therapy, outcomes unrelated to fatigue or muscle cramps, non-interventional designs, review articles, protocols, or conference abstracts without sufficient outcome data. Thirty-nine reports were then sought for retrieval; however, 19 reports could not be accessed, because full texts were not available through accessible online sources or institutional access available to the authors. To improve transparency, the bibliographic details of these 19 reports are provided in a Supplementary Table. Twenty full-text articles were assessed for eligibility, and six were excluded because of ineligible population, ineligible study design, or outcome not relevant to fatigue or muscle cramps. Finally, 14 studies were included in the review.

Data Extraction

Data was extracted using a structured extraction form. Extracted data included author (s), year of publication, country, study design, sample size, participant characteristics, intervention type and dosage, comparator, follow-up timing, outcome measures, and main findings related to fatigue and/or muscle cramps. When information was unclear or unavailable in the original article, it was recorded as “not reported” to maintain transparency in the extraction process.

Risk of Bias Assessment

Methodological quality was assessed using the Joanna Briggs Institute critical appraisal tools. Randomized controlled trials were appraised using the JBI checklist for randomized controlled trials (Barker et al., 2023), whereas quasi-experimental studies were appraised using the JBI checklist for quasi-experimental designs (Barker et al., 2024). Each study was assigned an overall score based on the number of applicable items rated “yes”. Studies were categorized as high quality when at least 75% of applicable criteria were met, moderate quality when 50%-74% were met, and low

quality when less than 50% were met. Appraisal results were not used to exclude studies, but were used to inform the interpretation of the narrative synthesis and support confidence in the review conclusions.

Data Synthesis

A narrative synthesis was conducted, because the included studies varied in intervention type, dosage, comparator, outcome instrument, and follow-up timing. Studies were grouped by intervention category, including acupressure, auricular acupressure or auriculotherapy, massage, reflexology, aromatherapy massage, and combined manual therapy protocols. Findings were summarized according to outcome type,

direction of effect, statistical significance, consistency across studies, and methodological quality. Methodological quality was considered when interpreting the strength of the evidence, particularly when findings came from studies with small sample sizes, limited blinding, incomplete reporting, or lower appraisal scores.

Ethical Considerations

Because this study was based exclusively on analysis of previously published literature and did not involve direct participation of human subjects, ethical approval and informed consent were not required.

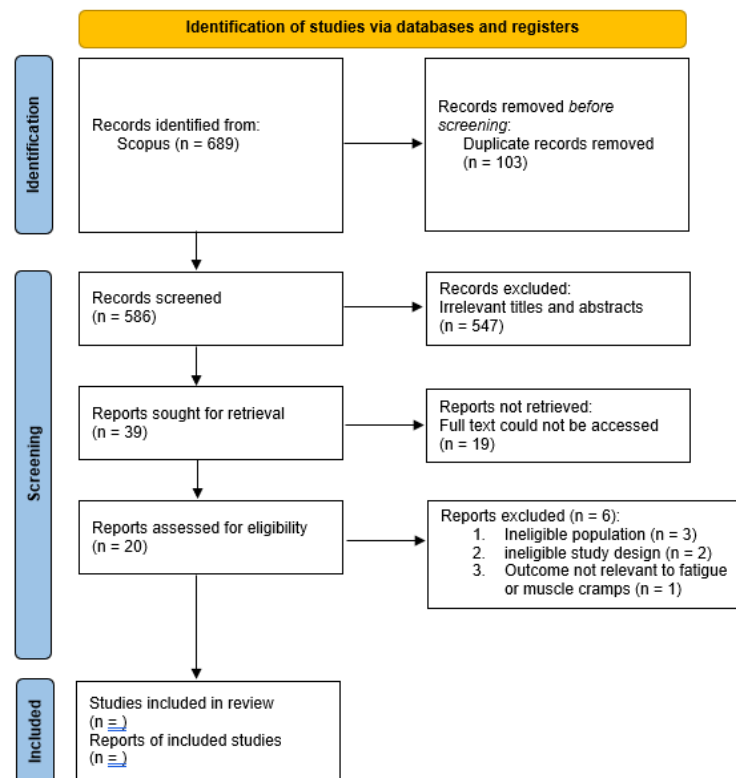


Figure 1. PRISMA-based flowchart

Results

Identification and Selection of Studies

The database search identified 689 records from Scopus. After removing 103 duplicates, 586 records were screened by title and abstract. Of these, 547 records were excluded, because they did not meet the predefined eligibility criteria, mainly due to irrelevant population, non-manual therapy interventions, unrelated outcomes,

non-interventional study designs, or ineligible publication types. Thirty-nine reports were sought for retrieval, of which 19 could not be accessed. Twenty full-text articles were assessed for eligibility, and six were excluded because of ineligible population ($n = 3$), ineligible study design ($n = 2$), or outcome not relevant to fatigue or muscle cramps ($n = 1$). Finally, 14 studies were included in the review (Figure 1).

Characteristics of the Included Studies

Fourteen studies were included in this review and were conducted in Canada, Iran, Turkey, the United States, Korea, India, and Indonesia. All studies enrolled adult patients receiving maintenance hemodialysis in dialysis units, outpatient dialysis clinics, or dialysis centers, although some setting details were variably reported across studies.

The evidence base was largely experimental. Most studies were randomized controlled trials, including parallel-group, single-blind, and pilot trials, while quasi-experimental and pre-post designs were also included. This variation in study design contributed to methodological heterogeneity. Sample sizes ranged from 26 to 120 participants, and several studies reported attrition, resulting in analyzed samples that were smaller than the number of participants initially enrolled or randomized.

The included interventions comprised body acupressure, self-acupressure, auricular acupressure or auriculotherapy, massage variants, reflexology, aromatherapy massage, and combined reflexology plus massage programs (Afrasiabifar et al., 2024; Asgari, Aghajani, & Nia, 2025; Çeçen & Lafcı, 2021; Chinnusamy, Subbarayalu, Mani, Purushothaman, Krishnan Vasanthi, et al., 2025; Chun & Park, 2016; Habibzadeh et al., 2020; Mastnardo et al., 2016; Mohmadi et al., 2016; Nasirizade et al., 2025; Parker et al., 2024; Rajabi et al., 2025; Suandika et al., 2023).

Comparators typically involved usual care, no manual therapy, sham intervention, placebo, massage-only control, or another active non-pharmacological

comparison. Intervention duration commonly lasted four weeks, but ranged from two to ten weeks, and follow-up timing varied across studies. Outcome reporting focused primarily on fatigue, whereas fewer studies assessed muscle cramps. Fatigue was measured using different instruments, including the Multidimensional Fatigue Inventory, Visual Analogue Scale for Fatigue, Piper Fatigue Scale, Fatigue Severity Scale, Brief Fatigue Inventory, and symptom-focused items, such as the IPOS-Renal weakness item. Muscle cramps were measured less consistently, including cramp frequency, cramp-related pain intensity, KDQOL-SF-derived cramping items, and pain scales. Overall, heterogeneity in intervention protocols, follow-up schedules, comparators, and outcome instruments supported the use of narrative synthesis rather than statistical pooling.

Risk of Bias Assessment

Methodological quality varied across the 14 included studies (Table 2). Based on the JBI critical appraisal results, two studies were rated as high quality, three as moderate quality, and nine as low quality. Scores for randomized controlled trials ranged from 4/13 to 10/13, while the quasi-experimental study scored 8/9. Common methodological limitations included unclear allocation concealment, limited blinding of participants or intervention providers, incomplete reporting of attrition, and insufficient detail on intervention fidelity and outcome assessment. Because most studies were rated as low quality, the overall findings were interpreted cautiously in the narrative synthesis.

Table 1. Characteristics of the included studies

Author (s) (year)	Country	Study design	Participants	Sample size	Outcome measurement
(Parker et al., 2024)	Canada	Pilot randomized controlled study	HD patients with at least one symptom (IPOS-Renal). Mean age 63.97±13.98, 37.5% female.	Total N=32; I=16; C=16	IPOS-Renal (weakness item); 0-4 scale (lower = better)
(Asgari et al., 2025)	Iran	Randomized controlled trial	HD patients with RLS. Mean age 55.8±9.95, 61.8% female.	Total N=60 (randomized); I=30; S=30 (sham); completed: I=27; S=28	Multidimensional Fatigue Inventory (MFI); 20-100 scale (higher = worse)
(Unal & Balci Akpinar, 2016)	Turkey	Randomized controlled experimental study	HD patients, mean age 54.33±12.96, 47.6% female.	Total N=110 randomized; FR (foot reflexology)=36; BM (back massage)=37; control=37; completed: 105	Visual Analogue Scale for Fatigue (VASF) - fatigue subscale; 0-100 scale (higher = worse)

(Çeçen & Lafcı, 2021)	Turkey	Randomized controlled trial	HD patients, mean age 56.12±16.62, 52.4% female.	Total N=84 randomized; HM=28; FM=28; C=28; completed: 82	Visual Analogue Scale for Fatigue (VASF) - fatigue subscale; 0-100 scale (higher = worse)
(Mohmadi et al., 2016)	Iran	Single-blind clinical trial (RCT)	Hemodialysis patients with chronic kidney failure. Mean age 55.3±12.2.	Total N=64; I=32; C=32	Numerical scale for pain intensity (0-10, higher worse); Researcher-made questionnaire for frequency
(Rajabi et al., 2025)	Iran	Quasi-experimental	HD patients; mean age 55.8±9.6; 57.5% male.	Total N=60; I=30; C=30	Piper Fatigue Scale (score 1-10, higher worse)
(Nasirizade et al., 2025)	Iran	Randomized controlled trial	HD patients; mean age 49.0±11.8; 47.1% female.	Total N=68; I=34; C=34	Piper Fatigue Scale (total score, higher worse)
(Habibzadeh et al., 2020)	Iran	Randomized controlled trial (4 parallel groups)	HD patients; mean age 48.6±11.1; 53% male.	Total N=64; massage=16; exercise=16; massage+exercise=16; control=16	Fatigue Severity Scale (FSS) (score 1-7, higher worse)
(Mohammadpourhodki et al., 2021)	Iran	Parallel randomized clinical trial	HD patients; mean age 49.3±11.2; 44.3% female.	Total N=70; I=35; C=35	Fatigue Severity Scale (FSS), 9 items, 1-7 (higher = worse)
Mastnardo, 2016 (Mastnardo et al., 2016)	USA	Pilot randomized controlled trial	HD patients; mean age 64.2±12.5; 50% male.	Total N=26; I=13; C=13	Adapted from KDQOL-SF, self-reported cramp frequency (episodes per week); Wong-Baker FACES pain rating scale
(Afrasiabifar et al., 2024)	Iran	Clinical trial (randomized block allocation)	HD patients; mean age 52.7±10.3; 43.8% female.	Total N=44; I=22; C=22	Multidimensional Fatigue Inventory (MFI) global score, range 20-100, higher = more fatigue
(Chun & Park, 2016)	Korea	Randomized control group pre-post test design	HD patients; mean age 53.0±10.2; 54.2% male.	Total N=36; I=18; C=18	Multidimensional Fatigue Scale (Tack, 1991) adapted by Choi, 2005 (11 items; 10-point scale; higher = more fatigue)
(Chinnusamy et al., 2025)	India	RCT (parallel-group, single-blind outcome assessor)	HD patients; mean age 48.3±9.5; 60% male.	Total N=60; I=30; C=30	Fatigue Severity Scale (FSS); range 9-63, higher score = worse fatigue
(Suandika et al., 2023)	Indonesia	RCT (parallel-group, single-blind participant)	HD patients; mean age 51.5±9.7; 52.8% male.	Total N=106; I=53; C=53	Brief Fatigue Inventory (BFI); range 0-10, higher score = worse fatigue

Table 2. Risk of bias assessment of each included study (n=14)

Authors (Reference)	Design	Checklist Used	Total score	Quality
(Parker et al., 2024)	RCT	JBIChecklist for RCTs	4/13 (30.77%)	Low
(Asgari et al., 2025)	RCT	JBIChecklist for RCTs	10/13 (76.92%)	High
(Unal & Balci Akpinar, 2016)	RCT	JBIChecklist for RCTs	6/13 (46.15%)	Low
(Çeçen & Lafcı, 2021)	RCT	JBIChecklist for RCTs	6/13 (46.15%)	Low
(Rajabi et al., 2025)	Quasi-experimental	JBIChecklist for Quasi-Experimental	8/9 (88.89%)	High
(Afrasiabifar et al., 2024)	RCT	JBIChecklist for RCTs	5/13 (38.5%)	Low

(Nasirizade et al., 2025)	RCT	JBIChecklist for RCTs	7/13 (53.8%)	Moderate
(Habibzadeh et al., 2020)	RCT	JBIChecklist for RCTs	4/13 (30.8%)	Low
(Mohmadi et al., 2016)	RCT	JBIChecklist for RCTs	6/13 (46.2%)	Low
(Mastnardo et al., 2016)	RCT	JBIChecklist for RCTs	5/13 (38.5%)	Low
(Suandika et al., 2023)	RCT	JBIChecklist for RCTs	9/13 (69.2%)	Moderate
(Chun & Park, 2016)	RCT	JBIChecklist for RCTs	5/13 (38.5%)	Low
(Mohammadpourhodki et al., 2021)	RCT	JBIChecklist for RCTs	7/13 (53.8%)	Moderate
(Chinnusamy et al., 2025)	RCT	JBIChecklist for RCTs	6/13 (46.2%)	Low

Reported Outcomes across Intervention Categories

Table 3 summarizes reported outcomes for fatigue and muscle cramps across six manual therapy categories in hemodialysis patients. Of the 14 included studies, fatigue was reported in 12 studies, whereas muscle cramps were reported in only two studies. This distribution indicates that the evidence base is broader for fatigue management, but remains limited for cramp-related outcomes.

Acupressure

Four studies assessed acupressure. Three trials evaluated fatigue and showed generally favorable trends, although statistical significance was not consistent. Parker et al. (2024) reported lower weakness-related fatigue at 4 weeks in the self-acupressure group compared with control, alongside a greater improvement from baseline. Suandika et al. (2023) demonstrated a statistically significant reduction in fatigue after 4 weeks of acupressure delivered during hemodialysis, with a clear effect estimate and narrow confidence interval. In contrast, Nasirizade et al. (2025) reported lower fatigue scores in the acupressure group at one month post-intervention, but the between-group difference did not reach statistical significance ($p=0.063$), suggesting either a smaller effect, limited power, or outcome variability. One additional acupressure study targeted muscle cramps: Mohmadi et al. (2016) and Mastnardo et al. (2016) reported significantly lower cramp intensity after nine sessions compared with a sham condition; however, values were approximated from a graph, which reduces precision and should be interpreted cautiously.

Auricular Acupressure

Two RCTs evaluated auricular acupressure/auriculotherapy and both reported significant reductions in fatigue at 10 weeks. Asgari et al. (2025) found

substantially lower MFI scores at week 10 compared with sham, while Chun and Park (2016) also observed significantly lower fatigue in the intervention group with a significant group-by-time interaction. Together, these studies showed consistent direction of effect favoring auricular interventions for fatigue, with sham-controlled evidence strengthening confidence in the findings.

Massage

Four studies contributed massage-related outcomes, covering fatigue and muscle cramps. For fatigue, Cecen and Lafcı (2021) showed significantly lower fatigue in the foot massage group at 4 weeks versus control. Habibzadeh et al. (2020) reported a non-significant reduction in fatigue at two months for foot massage without oil compared with control ($p=0.18$), indicating mixed evidence within massage trials. Afrasiabifar et al. (2024) reported a significant within-group reduction in fatigue over two months following effleurage (back massage), but the absence of a non-intervention control limits causal attribution. For muscle cramps, Mastnardo et al. (2016) found a significant reduction in cramp frequency at 2 weeks with intradialytic lower extremity massage compared with control, supporting a potential benefit of massage for cramp outcomes, although evidence remains limited to a single small pilot trial.

Reflexology

Two studies examined reflexology and both reported statistically significant reductions in fatigue. Unal and Balci Akpınar (2016) found significantly lower fatigue after four weeks of foot reflexology compared with control using a visual analogue fatigue scale. Rajabi et al. (2025) reported significantly lower fatigue scores at two weeks post-intervention using the Piper Fatigue Scale. Despite consistency in direction, comparisons across studies are constrained by differences in outcome instruments and follow-up timing.

Aromatherapy Massage

One parallel RCT evaluated aromatherapy massage with lavender oil and reported significantly lower fatigue at four weeks compared with a massage-only control (Mohammadpourhodki et al., 2021). This finding suggests that the aromatherapy component may add incremental benefit beyond massage alone, although conclusions are limited by reliance on a single study.

Combined Reflexology Plus Massage

One RCT assessed combined foot reflexology plus back massage delivered pre-dialysis and reported significantly lower fatigue at four weeks compared with back massage alone (Chinnusamy et al., 2025). This suggests a potential additive effect of combining

modalities; however, evidence remains preliminary due to single-study support.

Cross-cutting Patterns and Heterogeneity

Across interventions, most studies reported improvements in fatigue outcomes, but heterogeneity was substantial in intervention dose (frequency and duration), timing (intradialytic, pre-dialysis, or unspecified), and measurement instruments (IPOS-Renal weakness item, MFI, VASf, Piper Fatigue Scale, FSS, BFI). This heterogeneity supports narrative synthesis rather than quantitative pooling. For muscle cramps, the evidence base is notably sparse (two studies) and includes one trial with values estimated from a graph, highlighting an important evidence gap.

Table 3. Reported outcomes associated with included studies

Authors (Design)	Intervention	Outcome measures	Outcome domains	Reported outcomes
Acupressure				
(Parker et al., 2024) (RCT)	Self-acupressure (6 points) with wooden tool, 2 min per point, twice daily (duration: 4 weeks)	IPOS-Renal (weakness item)	Fatigue	Fatigue (weakness): Lower in intervention group at 4 weeks (mean 1.5±1.2) vs. control (2.0±1.1). Improvement from baseline was greater in the intervention group (change -0.4) compared to control (change +0.2).
(Nasirizade et al., 2025) (RCT)	Acupressure, 3×/week (duration: 4 weeks)	Piper Fatigue Scale	Fatigue	Fatigue: Lower in acupressure group at 1 month post-intervention (131.94±37.04) vs. control (150.09±23.04), but the difference was not statistically significant (p=0.063).
(Suandika et al., 2023) (RCT)	Acupressure on K1, ST36, SP6 (3x/week, 4 weeks, during HD)	Brief Fatigue Inventory (BFI)	Fatigue	Fatigue: Significantly lower in acupressure group at 4 weeks (adjusted mean difference b = -1.71, 95% CI -1.90 to -1.51, p=0.000).
(Mohmadi et al., 2016) (RCT)	Acupressure on specific points (15 min before HD, 2 min/point, 9 sessions)	Numerical scale for pain intensity (for cramps)	Muscle cramps	Muscle cramp intensity: Significantly lower in intervention group (approx mean 2.8) vs. sham (approx mean 4.5) after 9 sessions, p<0.001 (data from graph).
Auricular Acupressure				
(Asgari et al., 2025) (RCT)	Self-auriculotherapy (Vaccaria seeds) on 5 points, 3×/week	Multidimensional Fatigue Inventory (MFI)	Fatigue	Fatigue (MFI): Significantly lower in intervention group at week

	(duration: 6 weeks)			10 (53.75±11.96) vs. sham (73.04±6.97), $p<0.0001$.
(Chun & Park, 2016) (RCT)	Auricular acupressure (Sinbansuk stickers on specific points, self-pressure 3x/day, applied weekly for 3 days), 10 weeks	Multidimensional Fatigue Scale (Tack/Choi)	Fatigue	Fatigue: Significantly lower in intervention group at 10 weeks (3.15±0.74) vs. control (5.26±1.41), $p<0.001$ for group*time interaction.
Massage				
(Çeçen & Lafcı, 2021) (RCT)	hand massage (8 min) or foot massage, 3x/week (duration: 4 weeks)	Visual Analogue Scale for Fatigue (VASF)	Fatigue	Fatigue (VASF): Foot massage group had significantly lower fatigue at week 4 (57.44±21.30) vs. control (70.00±19.54), $p<0.05$.
(Habibzadeh et al., 2020) (RCT)	Foot massage with/without oils (20 min, 3x/week, 2 months)	Fatigue Severity Scale (FSS)	Fatigue	• Fatigue (FSS): Lower in foot massage without oil group at 2 months (5.21±1.22) vs. control (5.51±1.17), but not significant ($p=0.18$).
(Afrasiabifar et al., 2024) (Clinical trial)	Effleurage (back massage), 15 min, 2x/week, 2 months	Multidimensional Fatigue Inventory (MFI)	Fatigue	Fatigue (MFI global): Significantly reduced from baseline (77.1±8) to 2 months (42.8±9.2) in effleurage group ($p<0.001$). (No non-intervention control).
(Mastnardo et al., 2016) (RCT)	Lower extremity massage (20 min, 3x/week, 2 weeks, intradialytic)	Adapted KDQOL-SF cramping questions (frequency)	Muscle cramps	Muscle cramp frequency: Significant reduction in intervention group (mean change -1.3 episodes/week) vs. control (-0.2 episodes/week) at 2 weeks ($p=0.005$).
Reflexology				
(Unal & Balci Akpinar, 2016) (RCT)	foot reflexology 30 min/session, 3x/week (duration: 4 weeks)	Visual Analogue Scale for Fatigue (VASF)	Fatigue	Fatigue (VASF): Significantly lower in foot reflexology group at 4 weeks (58.51±18.81) vs. control (80.74±21.11), $p<0.001$.
(Rajabi et al., 2025) (Quasi-experimental)	foot reflexology, 3x/week (duration: 4 weeks)	Piper Fatigue Scale	Fatigue	Fatigue: Significantly lower in intervention group at 2 weeks post-intervention (3.11±1.11) vs. control (6.96±1.98), $p<0.001$.
Aromatherapy Massage				
(Mohammadpourhodki et al., 2021) (RCT)	aromatherapy massage with lavender oil, 3x/week (duration: 4 weeks)	Fatigue Severity Scale (FSS)	Fatigue	Fatigue (FSS): Significantly lower in lavender massage group (35.4±15.7) vs. massage-only control (45.1±14.1) at 4 weeks, $p=0.035$.
Combined (Reflexology+Massage)				
(Chinnusamy et al.,	Foot Reflexology	Fatigue Severity	Fatigue	Fatigue (FSS):

2025) (RCT)	(30 min) + Back Massage (30 min), 2x/week, 4 weeks, pre-dialysis	Scale (FSS)		Significantly lower in combined FR+BM group (33.39±10.65) vs. BM only group (40.0±11.21) at 4 weeks, $p<0.05$.
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Discussion

This review synthesized evidence from 14 studies examining manual therapy-based interventions for symptom management among hemodialysis patients, with fatigue as the dominant outcome and muscle cramps addressed in only two studies

Overall, most interventions showed improvements in fatigue, although the consistency of statistically significant effects varied across studies and intervention types. Evidence for muscle cramps was promising, but limited by the small number of studies and, in one case, reliance on values estimated from graphical results (Mastnardo et al., 2016; Mohmadi et al., 2016). Appraisal findings indicated considerable methodological variability, where most studies rated low quality, which reduces certainty and supports cautious interpretation of effect direction and magnitude (Asgari et al., 2025; Parker et al., 2024; Rajabi et al., 2025).

Interpretation of Findings by Intervention Category

Across acupressure studies, findings were generally favorable for fatigue, but not uniformly statistically significant. Self-acupressure (Parker et al., 2024) and intradialytic point acupressure (Suandika et al., 2023) suggested improvements at four weeks, while another trial reported lower fatigue scores without reaching statistical significance at one month post intervention ($p=0.063$) (Nasirizade et al., 2025). Differences in delivery mode, dose, timing relative to dialysis, and fatigue instruments likely contributed to variability across trials (Nasirizade et al., 2025; Parker et al., 2024; Suandika et al., 2023)

Auricular acupressure and auriculotherapy produced consistently significant reductions in fatigue across two RCTs, including a sham controlled design, strengthening confidence in a true intervention effect (Asgari et al., 2025; Chun & Park, 2016) The use of sham comparators partially addresses expectancy and attention effects that can influence symptom outcomes, supporting interpretability in routine care contexts (Asgari et al., 2025) Massage interventions showed mixed results for fatigue. One trial reported significantly lower fatigue following foot massage compared with control at week four (Çeçen & Lafcı, 2021),

whereas another found a non-significant difference at two months ($p=0.18$) (Habibzadeh et al., 2020). A separate clinical trial reported substantial within-group reduction over two months, but the lack of a non-intervention control limits causal attribution (Afrasiabifar et al., 2024). Heterogeneity in massage type, dosage, co-interventions, such as oils, and follow up duration, may explain these differences (Çeçen & Lafcı, 2021; Habibzadeh et al., 2020).

Reflexology findings were consistently favorable for fatigue across two studies, although designs included both randomized and quasi-experimental approaches (Rajabi et al., 2025; Unal & Balci Akpinar, 2016). While both studies reported significant reductions, comparability is limited by differing instruments and follow-up timing. Nonetheless, consistent direction of effect suggests that reflexology may be promising when delivered in structured protocols over approximately four weeks (Rajabi et al., 2025; Unal & Balci Akpinar, 2016).

Aromatherapy massage was supported by one parallel RCT, which reported significantly lower fatigue compared with a massage-only control at four weeks (Mohammadpourhodki et al., 2021) This design isolates the incremental contribution of the aromatherapy component above massage alone, but single study evidence remains preliminary (Mohammadpourhodki et al., 2021) Evidence for combined modalities was limited to one RCT, where reflexology plus back massage improved fatigue compared with back massage alone, suggesting possible additive effects that require replication (Chinnusamy et al., 2025).

Heterogeneity and Measurement Considerations

A central finding of this review is substantial heterogeneity across interventions and outcome measurement approaches. Fatigue was assessed using multiple instruments capturing overlapping, but non-identical constructs, including MFI, VASf, Piper Fatigue Scale, FSS, BFI, and symptom-focused items (Asgari et al., 2025; Çeçen & Lafcı, 2021; Parker et al., 2024; Rajabi et al., 2025; Suandika et al., 2023). Intervention timing relative to hemodialysis and follow

up duration also varied, which may moderate effects and complicate cross-study comparison, supporting the choice of narrative synthesis (Chun & Park, 2016; Nasirizade et al., 2025).

Conclusion

This systematic review included 14 studies evaluating manual therapy-based interventions for symptom management in adults receiving maintenance hemodialysis. Overall, the evidence suggests potential benefits for reducing fatigue across several modalities, particularly auricular approaches, reflexology, and selected acupressure and massage protocols, although effects were not consistently statistically significant across all trials. Evidence for muscle cramps was limited to two studies, indicating a possible benefit, but insufficient breadth for firm conclusions. Given the substantial heterogeneity in intervention protocols, timing, and fatigue measurement instruments, and the predominance of low-quality studies in the risk of bias appraisal, conclusions should be interpreted cautiously. Manual therapies may be considered as supportive, low-cost adjuncts within hemodialysis care, especially approaches that facilitate patient self-management, but stronger recommendations require adequately powered trials with standardized outcomes, clearer reporting, and longer follow up.

Implications for Nursing

Manual therapies may represent feasible, low cost, patient centered adjuncts to usual care for fatigue management in hemodialysis units. Interventions, such as self-acupressure and auricular approaches support patient self-management and may be integrated into education and routine symptom management pathways (Asgari et al., 2025; Parker et al., 2024). Where staffing allows, structured massage or reflexology protocols can be considered, with attention to patient preferences, contraindications, and infection control (Çeçen & Lafcı, 2021; Unal & Balci Akpınar, 2016).

For muscle cramps, evidence remains limited and should be viewed as exploratory until further studies are available (Mastnardo et al., 2016; Mohmadi et al., 2016). Future research should prioritize adequately powered RCTs with standardized reporting of randomization and blinding procedures, consistent fatigue measurement using validated tools, clearer specification of intervention timing relative to dialysis, longer follow up to assess

durability, and standardized assessment of cramps with complete numerical reporting (Chinnusamy et al., 2025; Mohammadpourhodki et al., 2021).

Study Limitations

This review has several limitations. First, the search was limited to Scopus. Although Scopus provides broad multidisciplinary coverage of biomedical, nursing, and complementary therapy literature, relevant studies indexed only in other databases may have been missed. Second, 19 reports could not be retrieved for full-text assessment despite retrieval attempts through accessible online sources or institutional access available to the authors. These reports are listed in a Supplementary Table; however, their absence may have introduced selection bias and reduced the comprehensiveness of the evidence base.

Third, heterogeneity in intervention protocols, timing of intervention delivery, comparators, follow-up periods, and fatigue measurement instruments limited comparability across studies and precluded quantitative pooling. Fourth, the evidence base for muscle cramps was sparse, with only two studies available, which limited confidence in cramp-related conclusions. Fifth, the overall methodological quality of the included studies was limited, with several concerns related to allocation procedures, blinding, follow-up, and reporting; therefore, the certainty of the findings should be interpreted cautiously. Finally, several studies provided incomplete details on adherence, co-interventions, intervention fidelity, adverse events, and follow-up handling, which may have contributed to unmeasured bias.

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AI-assisted tools were used during the review and manuscript revision process. AI-assisted features were used to support title and abstract screening, while final screening decisions and eligibility judgments were independently reviewed, verified, and approved by the authors. ChatGPT was used to support paraphrasing, language editing, wording refinement, formatting consistency, and readability during manuscript revision. All methodological decisions, full-text assessments, data extraction, risk-of-bias appraisal, synthesis, interpretation, and conclusions were developed, verified, and finalized by the authors. No AI-assisted tool was used to generate study data, fabricate references, or replace author judgment.

Conflict of Interests

The authors declare no conflict of interests.

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Author Contributions

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Supplementary Table. Reports Not Retrieved

No.	Author (s) (Year)	Title	Reason for Non-Retrieval
1	Varaei et al. (2020)	Comparison the effects of inhalation and massage aromatherapy with lavender and sweet orange on fatigue in hemodialysis patients: a randomized clinical trial	Full text behind publisher paywall and unavailable through institutional access.
2	Unal and Balci Akpınar (2016)	The effect of foot reflexology and back massage on hemodialysis patients' fatigue and sleep quality	Full text behind publisher paywall and unavailable through institutional access.
3	Ahmadidarrehshima et al. (2018)	Effect of foot reflexology and slow stroke back massage on the severity of fatigue in patients undergoing hemodialysis: A semi-experimental study	Full text behind publisher paywall and unavailable through institutional access.
4	Cetin et al. (2025)	The Effect of Aromatherapy Massage on Cramp Frequency, Pain Intensity, and Quality of Life in Hemodialysis Patients With Muscle Cramps: A Randomized, Placebo-Controlled, Mixed Study	Full text behind publisher paywall and unavailable through institutional access.
5	Naseri-Salahshour et al. (2019)	Reflexology as an adjunctive nursing intervention for management of nausea in hemodialysis patients: A randomized clinical trial	Full text behind publisher paywall and unavailable through institutional access.
6	Komariah and Rochmawati (2022)	The Effect of Listening to the Holy Qur'an and a Back Massage on Fatigue and Quality of Life for Participants Undergoing Hemodialysis: A Quasi-Experimental Study	Full text behind publisher paywall and unavailable through institutional access.
7	Asgari et al. (2025)	The effect of self-auriculotherapy on the severity of restless leg syndrome, sleep quality, and fatigue in hemodialysis patients: A randomized controlled clinical trial	Full text behind publisher paywall and unavailable through institutional access.
8	Wu et al. (2026)	Auricular Acupressure Helps Improve Sleep Quality for Severe Insomnia in Maintenance Hemodialysis Patients: A Pilot Study	Full text behind publisher paywall and unavailable through institutional access.
9	Yang et al. (2017)	Auricular Acupressure Helps Alleviate Xerostomia in Maintenance Hemodialysis Patients: A Pilot Study	Full text behind publisher paywall and unavailable through institutional access.
10	Wu et al. (2022)	Auricular Acupressure for Hemodialysis Patients with Insomnia: A Multicenter Double-Blind Randomized Sham-Controlled Trial	Full text behind publisher paywall and unavailable through institutional access.
11	Kilic and Kavurmaci (2022)	Hemodialysis Patients' Knowledge of, Beliefs about, and Practices in Using Complementary and Alternative Medicine: An Exploratory Study	Full text behind publisher paywall and unavailable through institutional access.
12	Kılıç Akça and Taşcı (2016)	Acupressure and Transcutaneous Electrical Acupoint Stimulation for Improving Uremic Pruritus: A Randomized, Controlled Trial	Full text behind publisher paywall and unavailable through institutional access.
13	Göktuna and Gürol Arslan (2024)	Effect of foot reflexology massage on sleep, anxiety and quality of life in hemodialysis patients: A single-blind, randomized, placebo-controlled trial	Full text behind publisher paywall and unavailable through institutional access.

14	Oshvandi et al. (2020)	The effects of foot massage on hemodialysis patients' sleep quality and restless leg syndrome: a comparison of lavender and sweet orange essential oil topical application	Full text behind publisher paywall and unavailable through institutional access.
15	Lazarus et al. (2021)	The effects of an olive-oil massage on hemodialysis patients suffering from fatigue at a hemodialysis unit in southern India - a randomized controlled trial	Full text behind publisher paywall and unavailable through institutional access.
16	Biçer and Taşcı (2022)	The Effect of Body Acupressure on Blood Pressure and Fatigue Levels in Individuals Suffering From Hypotension During Hemodialysis: A Randomized Controlled Trial	Full text behind publisher paywall and unavailable through institutional access.
17	Zeidabadi et al. (2022)	The Effect of Foot Reflexology on the Quality of Sexual Life in Hemodialysis Patients: A Randomized Controlled Clinical Trial	Full text behind publisher paywall and unavailable through institutional access.
18	Sutarno (2019)	The effect of acupressure and praying on physical comfort and psychological comfort in hemodialysis patients	Full text was not available through accessible online sources or institutional access.
19	Çevik and Taşcı (2020)	The effect of acupressure on upper extremity pain and quality of life in patients hemodialysis treatment: A Randomized Controlled Trial	Full text behind publisher paywall and unavailable through institutional access.

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