



# Complementary and Integrative Interventions for Improving Fatigue and Quality of Life in Adults Receiving Hemodialysis: A Scoping Review

Ade Komariah\* and Erna Rochmawati

Master of Nursing Study Program, Muhammadiyah University of Yogyakarta, Yogyakarta, Indonesia



## Abstract

**Background:** Fatigue is as a common symptom experienced by patients receiving hemodialysis and can significantly decrease patients' quality of life. Some studies have been conducted using complementary and integrative interventions but evidence on available interventions is still limited.

The review aimed to map complementary and integrative interventions and summaries the potential benefit in fatigue and quality of life.

**Method:** Scoping review framework from Joanna Briggs Institute was adopted. A defined search strategy was used in reviewing literature from Emerald, Pro Quest, PubMed, Science Direct, and Scopus. Studies were selected for further evaluation based on relevancy with the inclusion criteria.

Findings then were summarized and the reported based on PRISMA for Scoping Review guidelines.

**Results:** 14 studies with 1128 participants were included in the review. Non-pharmaceutical interventions included educational based interventions, aromatherapy, massage, exercise and breathing exercise. Many studies demonstrated that the interventions improved fatigue status and quality of life.

**Conclusion:** Complementary interventions provide benefits for patients in managing fatigue and improving quality of life. The findings of this review will contribute to integration of complementary therapy in the nursing practice. Additional studies are needed to clarify the potential value of available complementary and integrative interventions in the hemodialysis setting.

## Keywords

Fatigue, Chronic kidney disease, Complementary therapy, Haemodialysis, Symptom management, Scoping review, Quality of life

## Introduction

Chronic kidney disease (CKD) is a progressive and irreversible abnormality in renal functions [1]. Peritoneal dialysis, hemodialysis and renal transplantation are renal replacement therapy that used to manage CKD [2]. Hemodialysis is the widely used type of renal replacement therapy that widely used to improve physical condition and prevent complications due to uremia [3].

Adult patients with CKD who receive haemodialysis treatment often experience physiological problems and psychological problems. Patients receiving maintenance hemodialysis described fatigue as a debilitating symptom that prevent them participate in social and recreational activities, which can lead to decrements in mental health and poor satisfaction with life [4]. Fatigue is a prevalent and debilitating symptom affecting 62%-72% patients undergoing hemodialysis [5-7]. Fatigue is negatively associated with

patient's quality of life, general health and well-being [8]. Therefore, effective interventions should be implemented to adults experiencing fatigue to decrease its level and negative effects [9]. Nurses have important role to assist patients to manage fatigue and improve quality of life. Fatigue management could be in the form of pharmacological and

**\*Corresponding author:** Ade Komariah, Master of Nursing Study Program, Muhammadiyah University of Yogyakarta, Yogyakarta, 55184, Indonesia

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non-pharmacological. Complementary-based therapy that can be used by nurses to manage fatigue that can lead to an increase of patient's quality of life.

Available interventions include range of motion exercise [10]; relaxation [11] and cognitive behaviour therapy [12]. The available interventions potentially have positive impact on fatigue in terms of safe and cost effective [13]. However, to date there is no available summary of potential complementary and integrative interventions for managing fatigue of patients receiving hemodialysis. Therefore, there is a need to map and summarise available evidence on complementary and integrative therapies for managing such symptom. This scoping review aimed to map and summarise available literature on complementary and integrative interventions for fatigue management.

## Methods

A scoping review was conducted to map published research and provide an overview of evidence to provide contextual information or concepts. A scoping review may be utilised to range or variety of the evidence on a particular topic or question [14]. The scoping review applied the structure of Participants/Concept/Context to define the scoping review search strategy:

(P) Population: Patients experiencing fatigue and decreased quality of life

(C) Concept: Complementary and integrative interventions

(C) Context: Hemodialysis setting

A scoping review guideline from Joanna Briggs Institute was used as a frame for this review [15]. The six steps in the guideline include: (a) Identifying research questions, (b) Identifying relevant studies, (c) Selecting studies, (d) mapping data, and (e) Compiling, summarising and reporting results. For example, in the first step a well-defined research question was developed to guide the scope of the review. The review questions: "What observational or randomized controlled studies have been performed to manage fatigue and quality of life in the hemodialysis setting?"

## Search Strategy

A comprehensive search is required to enable identifying relevant literatures. In the scoping review, five electronic databases were searched: Emerald, Pro Quest, PubMed, Science direct, and Scopus to identify published studies meeting the inclusion criteria. We determined keywords based on the research questions before identifying the relevant journal articles. MeSH search keywords were then used jointly: "fatigue", "quality of life", "hemodialysis", "chronic kidney disease", "non-pharmacological", "exercise", "relaxation", "massage" and "complementary therapy". The keywords were searched individually then combined using the Boolean term.

## Study Selection

In the third steps of scoping review, we exported all identified records in the initial search to Endnote 20 Software

(Clarivate Analytics, PA, USA) and removed duplicates. A total of 3812 were reached in the search. Each article abstract was evaluated by the first author (AK) for relevance according to predetermined inclusion criteria: (i) Studies or interventions that addressed quality of life and dialysis related fatigue; (ii) Adult patients receiving hemodialysis as participants, (iii) Studies published from 2000 onwards and (iv) Studies published in English language. We excluded qualitative studies, review paper and non-research paper. Two reviewers (AK and ER) independently read and assessed the 21 full texts based on the relevance of the inclusion criteria. Fourteen studies were considered suitable for inclusion in the final dataset after reading the full text and assessing against the review questions. The selection of relevant articles was based on research questions and inclusion criteria, in addition to minimum quality standards [16].

## Extraction of Results

In the fourth stage of the review, we extracted the data. The reviewers developed a table based on the Joanna Briggs model for extracting details including characteristics and result of studies [15]. In order to capture all of the relevant information and ensure that no important information was missed, the two authors thoroughly read each of the 14 selected full-text papers. The dataset from the included papers was built by extracting the results relevant to the questions asked. Categories included in the data extraction tool and spreadsheet were as follows: (a) Author and publication year; (b) Aim of the study; (c) Study design; (d) Setting for study (country, hospital, clinic), (e) Characteristics of participants (number of participants, age, length of dialysis), (f) Intervention (type, duration, length), (g) Study outcomes, and (h) Strengths of the study and (i) Implications. The detailed findings are displayed in Table 1.

## Result

### Characteristics of studies

Of 3812 studies identified, 14 eligible studies involving 1128 participants receiving hemodialysis across seven countries were included. These included 10 (71.4%) randomized controlled trials, and 4 (28.6%) quasi experimental studies. Study characteristics are shown in Table 1.

Among the 14 studies, six different measures were utilised to measure fatigue and three different measures to assess quality of life. The measurement of fatigue include Piper Fatigue Scale [17], Novel Fatigue Scale for Hemodialysis [18]; Fatigue Severity Scale [19-21], Fatigue Scale [22]; Rothen Fatigue Scale [23], and visual analog scale [24]. Quality of life were assessed using PROMIS [18,25,26] and KDQOL-SF 3 [19-24,27-30].

### Characteristics of samples

The participants' age in the included studies range from 40-60 years-old. Regarding length of dialysis, seven articles included patients with minimum three months of receiving dialysis and the frequency of hemodialysis was two to three times per week [18,24,27-30]. Five studies included patients

**Table 1:** Data extraction.

Name of Researcher & Year	Aims of the study	Design	Setting	Characteristics of respondents	Non-pharmacological interventions	Outcome	Strength	Implication
Kao, et al. [25]	To measure effects of exercise education intervention on the patients' behavior, depression, and fatigue status	A quasi experimental design	Taiwan, Nephrology outpatients clinic	94 patients, 45 intervention and 49 control. Dialysis > 6 month Average age 71.18 years	exercise education Duration of 12 weeks 2x-4x/month education for 90 minutes Measuring instruments: FS	Interventions based on education have an effect on lowering fatigue	Number of samples quasi experimental	Exercise programs using methods that are limited to intervention group health education, The research time is 3 months.
Zhianfar, et al. [27]	To measure the effectiveness of a Multifaceted Educational Intervention to patients' Quality of Life	A randomized controlled trial (RCT)	North Iran, Two hemodialysis wards	70 patients 35 interventions 35 control. Dialysis > 3 month Age 40-60 years	Educational Enhance Therapeutic Regimen Duration 12 weeks by 2x/week for 90 minutes Measuring instruments: SF - 36	Education based Intervention increases QOL	Multifaceted intervention, randomized controlled trial	Therapeutic interventions given in the short term, The data Collection instrument used has the potential to be a source of bias
Muz & Tasci [24]	To investigate the effect of Aromatherapy via Inhalation on the Sleep Quality and Fatigue Level in People Undergoing Hemodialysis	A randomized controlled trial (RCT)	Turkey, Five HD units in two cities	62 patients, 27 interventions and 35 controls Dialysis > 3 month Average age 52.6 years	Aromatherapy via Inhalation Duration of 4 weeks with 1x a week for 2 minutes Measuring instruments: 'LL PFS	Aromatherapy Based Interventions have an effect on lowering fatigue	Number of research places	Individual sleep and fatigue levels were only measured for 1 month
Mohammadpou Rhdokie, et al. [28]	The measure the effect of Aromatherapy Massage with Lavender and Citrus Aurantium Essential Oil on Quality of Life of Patients with Chronic kidney disease	A Parallel Randomized Clinical Trial Study	Iran, Hemodialysis ward, April- July 2019	105 patients 2 interdependence, 1 control consisting of 35 patients Dialysis > 3 month Average age 50.42 years	Aromatherapy Massage Duration 4 weeks by 3x a week for 20 minutes Measuring instruments: Survey SF-36	Aromatherapy and massage based Interventions have an effect on increasing QOL	Sum Respond Randomized controlled	There is no provision as to whether aromatherapy massage treatments have long term effects

Varaei, et al. [23]	To compare the effects of inhalation and massage aromatherapy with lavender and sweet orange on fatigue in hemodialysis patients	A randomized controlled trial (RCT)	Iran, HD in Three teaching hospitals	96 patients 2 interventions, 1 control consists of 32 patients Dialysis > 1 years Ages 41-59	inhalation and massage aromatherapy duration of 16 weeks with 3x a week for 20 minutes Measuring instruments: Rothen Fatigue Scale	Aromatherapy and massage based interventions that have the effect of reducing Fatigue	Number of research places  Randomized controlled	Unable to verify accuracy of patient response to fatigue
Chang, et al. [22]	The measure effectiveness of intradialytic leg ergometry exercise for improving sedentary life style and fatigue among patients with chronic kidney disease	A randomized controlled trial (RCT).	Northern Taiwan, Two hemodialysis units	71 patients, 36 interventions, 35 controls Dialysis > 3 month Average age 50.8 years	intradialytic leg ergometry exercise Duration 8 weeks with 3x a week for 30 minutes Measuring instrument: Fatigue Scale	Exercise- based intervention lowers fatigue	Intervention security	Study was a single site with a small sample size which limits its generalizability
Figueiredo, et al. [29]	To investigate the effects of the inspiratory muscle training and aerobic training on the quality of life in hemodialysis patient	A randomized controlled trial (RCT)	Brazil, Hemodialysis ward January or december, 2015	37 patients 3 groups 11 CT, 13 AT, & 13 CT Dialysis > 3 month Average age 52.8 years	inspiratory muscle training and aerobic training Duration 8-16 weeks with 3x a week for 180 minutes Measuring instrument: KDQOL-SF 36	Intervention based on muscle training and aerobic training increasing effect on QOL	First study that combined the effects of BMI and aerobic training randomized controlled	The volume and capacity of the lungs were not evaluated for the rate of respiratory distress in the sample
Shahdadi, et al. [20]	To measure the effect of slow stroke back massage on fatigue in patients undergoing hemodialysis	A randomized controlled trial (RCT)	Iran, Hemodialysis ward	52 patients 26 interventions, 26 controls Dialysis > 6 month Average age 47	Slow stroke back massage Duration of 4 weeks with 2x a week for 10 minutes Measuring instruments: Fatigue Severity Scale	Intervention based massage lowers fatigue	randomized controlled	Small sample size which limits its generalizability.

Chang, et al. [22]	To investigate the effects of a Tai Chi exercise intervention on the quality of life of patients receiving hemodialysis	Pre-post experimental design	Taiwan, a hemodialysis unit	46 patients: a control group (n = 25) and an intervention group (n = 21). Older than 20 years old	A weekly Tai chi was conducted for 12 weeks Measures: KDQOL	Interventions based to improve QOL	Pre-post experimental study	The five dimensions of the KDQOL are significantly higher in the intervention group, except the SF-12 physical health score
Bullen, et al. [26]	To investigate the effect of Acupuncture or Massage on Health-Related Quality of Life of Hemodialysis Patients	A quasi experimental Pre-posttest design	USA Unit (HD)	101 patients 80 patients were selected for massage and 21 were selected for acupuncture Dialysis > 1 years Average age 57.6 years	Acupuncture or Massage Duration 8 weeks with 1x a week for 20 minutes Measuring instrument: Survey PROMIS	Intervention based acupuncture and massage effect on increasing QOL	Therapy is given early HD The therapies have licensed	single center study and lacked randomization and blinding
Ahmadirrehsi Ma, et al. [21]	To measure the effect of foot reflexology and slow stroke back massage (SSBM) on the severity of fatigue in patients undergoing hemodialysis	A randomized controlled trial (RCT)	Iran, Dialysis Center	52 patient, 26 SSBM & 26 foot reflexology Dialysis > 6 month Average age 47.04 years	foot reflexology and slow stroke back massage Duration 4 weeks with 2x a week for 30 minutes Measuring instrument: FSC	Intervention based massage lowers fatigue	Participant random New research with a combination of SSBM and foot reflexology	Further research is needed to be able to implement broader interventions

Lazarus, et al. [19]	The investigate the effects of an olive-oil massage on hemodialysis patients suffering from fatigue at a hemodialysis unit	A randomized controlled trial (RCT)	India, Unit HD	200 patients, 100 interventions 100 control Dialysis > 6 month Age > 50 years	olive-oil massage Duration of 8 weeks is done before HD and during HD 4 hours Measuring instruments: Fatigue Severity Scale	Intervention based massage lowers fatigue	randomized controlled Number of patients	It is not clear the detailed timing of the intervention
Chou & Sohng [18]	The measure the effect of a Virtual Reality Exercise Program on Physical Fitness, Body Composition, and Fatigue in Hemodialysis Patients	Semi experimental pretest-	South Korea. Dialysis Clinic posttest design	46 patients, 32 interventions, 23 controls Dialysis > 3 month Average age 57.7 - 60.8 years	Virtual Reality Exercise Program Duration 8 weeks by 3x a week for 40 minutes Measuring instruments: Novel Fatigue Scale for Hemodialysis	Exercise based intervention lowers fatigue	Intervention security	Because VREP is relatively new and doesn't have many clinical studies of precedent
Kaplan Serin & Owayulo [17]	The investigate the effect of Progressive Relaxation Exercises on Pain, Fatigue, and Quality of Life in Dialysis Patients	randomized, controlled, and experimental	Turkey, Two hospital Unit HD	96 patients: 48 control and 48 intervention Dialysis > 6 month Age > 55 years old	Relaxation Exercises Duration of 6 weeks with 1x per week for 30-40 minutes Measuring instruments: Piper Fatigue Scale SF-36	Relaxation based interventions lower fatigue and increase QOL	randomized, controlled intervention security	longer periods and larger sample groups



receiving dialysis at least six months prior to the study [17,20,21,25]. The other two studies included patients who has received hemodialysis at least one year [23,26].

## Characteristics of interventions

There are several types of intervention in the included studies such as: education-based intervention, aroma therapy, combination of aroma therapy and massage, exercise, and massage, and breathing exercise. Two studies utilized education-intervention [25,27]. The education-based intervention was conducted for 12 weeks, with the duration twice per week and 2-4 per months. Each session was approximately 90 minutes intervention [25,27].

Aromatherapy-based interventions in the included study using lavender and citrus. The aroma therapy was conducted for once a week in four weeks, 2 minutes in each intervention [24], and 3x/week for eight weeks with the duration 20 minutes in each session [23]. Both studies performed aroma therapy inhalation using lavender and citrus. A study combined aromatherapy and massage to the intervention group [28]. A combination of aroma therapy inhalation using lavender and citrus, and massage was performed three times per week, which each session lasting 20 minutes.

Three studies performed exercise-based intervention to manage fatigue and improve quality of life of patients receiving hemodialysis [18,22,30]. One-hour short-form Yang style Tai Chi session was performed each week for a total of 12 weeks [30]. The other studies involved exercise-based intervention that were conducted for 8 weeks with a frequency of three times per week which each session lasting between 30 minutes and 40 minutes [18,22]. Intradialytic leg ergometry exercise was performed in Chang, et al. [22] study, while Chou, et al. conducted virtual reality training using Nintendo® Wii Fit to promote exercises such as pitching, swinging, and punching [18].

Massage based interventions was performed in three studies [20,21,26]. A slow back stroke massage was conducted in three weeks, two sessions per weeks that lasting 10 minutes for each session in both studies. One study compares the effectiveness of massage and acupuncture [26]. Patients who undergoing their usual hemodialysis session were given the option to choose between 20 min sessions of massage or acupuncture therapy once a week for 8 weeks. Patients in both groups improve their quality of life particularly in the mental domain.

Two studies performed breathing exercise to manage fatigue and improve quality of life [17,29]. The breathing exercises combined with aerobic training were performed during the first two hours of dialysis, three times a week for eight weeks [29]. Another study provided the patients with compact disk containing progressive breathing exercise. The patients were asked to practice the exercises at home for at least once a day for 6 weeks [17].

## Discussion

In the scoping review, we map several non-pharmaceutical interventions to address fatigue and improve quality of

life of patients receiving hemodialysis. Therefore, such interventions can be considered as an option according to patients' preference and abilities.

Two included studies that performed education-based interventions show a significant improvement in quality of life and a reduce fatigue level [25,27]. In line with this study, a systematic review found that educational interventions can improve quality of life and outcome of patients with chronic kidney disease [31]. It was suggested further that effective interventions should be interactive and workshops/practical skills, integrated negotiated goal setting, involved groups of patients and their families and had frequent participant/educator encounters [31].

We found various type of exercise that can be performed by patients that include leg ergometry exercise, Tai Chi, and virtual reality training. Exercise based interventions showed a significant impact on patient's fatigue [18,22,30]. Previous studies confirm the benefit of exercise in reducing fatigue and improve quality of life. For example, twice a week range of motion exercise can improve patient's quality of life [10]. A previous review shows the benefit of exercise in managing fatigue on patients receiving hemodialysis [32].

Complementary and integrative interventions using massage were used in three studies and show a significant reduced of fatigue [20,21,26]. Previous review showed significant effect of massage in reducing fatigue of patients with cancer [33]. Therefore, massage can be considered as an option according to patients' preference and abilities to address fatigue.

We found three studies involving aromatherapy inhalation using lavender and citrus that performed from 2 to 20 minutes in eight week [23,24,28]. In the three studies, patients' fatigue significantly decreased. This confirms findings from a systematic review that show large effect of aromatherapy on fatigue in adults receiving hemodialysis treatment [34]. Aromatherapy can be used as an alternative and effective intervention in the management of fatigue.

Two papers reported the use of breathing exercise [17,29]. One study combined intradialytic breathing exercise with aerobic training three times a week for eight weeks [29], while another study asking the patients practice the progressive breathing exercises at home for at least once a day for 6 weeks [17]. Both studies show benefit in managing patients' fatigue.

This confirms previous review that suggests breathing exercise as one of complementary medicines that have short term benefit in symptom improvement [35].

The scoping review has several limitations. We searched using several key words, the number of terms under "non-pharmacological" varied greatly. Although we added specific terms such as exercise, relaxation, aromatherapy and massage, potential studies that did not list our search terms may have not populated in the search results. We limit our search and inclusion criteria for literature published in English. This may cause relevant studies excluded from our review.

## Conclusion

This scoping maps out the state of current research in the complementary and integrative interventions to manage fatigue of adults receiving haemodialysis. These interventions provide benefits for patients in managing fatigue and improving quality of life. Such interventions can be applied to patients during dialysis sessions to help reduce the effects of symptoms in dialysis patients, with interventions that are easy, inexpensive, and effective. The findings of this review will contribute to integration of complementary therapy in the nursing practice. Additional studies are needed to clarify the potential value of available complementary and integrative intervention in the hemodialysis setting.

## Conflict of Interest

No conflicts of interest have been declared by the authors.

## References

1. Aseneh JB, Kemah B-L A, Mabouna S, et al. (2020) Chronic kidney disease in Cameroon: A scoping review. *BMC Nephrol* 21: 409.
2. Vassalotti JA, Centor R, Turner BJ, et al. (2016) Practical approach to detection and management of chronic kidney disease for the primary care clinician. *Am J Med* 129: 153-162.
3. Reindl-Schwaighofer R, Kainz A, Kammer M, et al. (2017) Survival analysis of conservative vs. dialysis treatment of elderly patients with CKD stage 5. *PLoS One* 12: e0181345-e0181345.
4. Salehi F, Dehghan M, Shahrabaki PM, et al. (2020) Effectiveness of exercise on fatigue in hemodialysis patients: A randomized controlled trial. *BMC Sports Science, Medicine and Rehabilitation* 12: 19.
5. Gregg LP, Jain N, Carmody T, et al. (2019) Fatigue in nondialysis chronic kidney disease: Correlates and association with kidney outcomes. *Am J Nephrol* 50: 37-47.
6. Bossola M, Di Stasio E, Siroli V, et al. (2018) Prevalence and severity of postdialysis fatigue are higher in patients on chronic hemodialysis with functional disability. *Ther Apher Dial* 22: 635-640.
7. Guerraoui A, Prezelin-Reydit M, Kolko A, et al. (2021) Patient-reported outcome measures in hemodialysis patients: Results of the first multicenter cross-sectional ePROMs study in France. *BMC Nephrology* 22: 357.
8. Debnath S, Rueda R, Bansal S, et al. (2021) Fatigue characteristics on dialysis and non-dialysis days in patients with chronic kidney failure on maintenance hemodialysis. *BMC Nephrology* 22: 112.
9. Jacobson J, Ju A, Baumgart A, et al. (2019) Patient perspectives on the meaning and impact of fatigue in hemodialysis: A systematic review and thematic analysis of qualitative studies. *Am J Kidney Dis* 74: 179-192.
10. Rochmawati E, Utomo EK, Makiyah SNN (2022) Improving dialysis adequacy and quality of life in patients undergoing hemodialysis with twice a week range of motion exercise. *Ther Apher Dial* 26: 140-146.
11. Hassanzadeh M, Kiani F, Bouya S, et al. (2018) Comparing the effects of relaxation technique and inhalation aromatherapy on fatigue in patients undergoing hemodialysis. *Complement Ther Clin Pract* 31: 210-214.
12. Picariello F, Moss-Morris R, Norton S, et al. (2021) Feasibility trial of cognitive behavioral therapy for fatigue in hemodialysis (BReF Intervention). *J Pain Symptom Manage* 61: 1234-1246.
13. Donald M, Kahlon BK, Beanlands H, et al. (2018) Self-management interventions for adults with chronic kidney disease: A scoping review. *BMJ Open* 8: e019814-e019814.
14. Tricco AC, Lillie E, Zarin W, et al. (2018) PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Ann Intern Med* 169: 467-473.
15. Peters MDJ, Godfrey C, McInerney P, et al. (2020) Chapter 11: Scoping reviews. Aromataris E, Munn Z, JBI manual for evidence synthesis. The Joanna Briggs Institute.
16. Pollock D, Davies EL, Peters MDJ, et al. (2021) Undertaking a scoping review: A practical guide for nursing and midwifery students, clinicians, researchers, and academics. *J Adv Nurs* 77: 2102-2113.
17. Kaplan Serin E, Vayolu N, Ovayolu O (2020) The effect of progressive relaxation exercises on pain, fatigue, and quality of life in dialysis patients. *Holist Nurs Pract* 34: 121-128.
18. Chou HY, Chen SH, Yen TH, et al. (2020) Effect of a virtual reality-based exercise program on fatigue in hospitalized taiwanese end-stage renal disease patients undergoing hemodialysis. *Clin Nurs Res* 29: 368-374.
19. Lazarus ER, Amirtharaj AD, Jacob D, et al. (2020) The effects of an olive-oil massage on hemodialysis patients suffering from fatigue at a hemodialysis unit in southern India - a randomized controlled trial. *J Complement Integr Med* 18: 397-403.
20. Shahdadi H, Molavynejad S, Raiesifar A, et al. (2016) The effect of slow stroke back massage on fatigue in patients undergoing hemodialysis: A randomized clinical trial. *International Journal of Pharmacy and Technology* 8: 16016-16023.
21. Ahmadidarrehshima S, Mohammadpourhodki R, Ebrahimi H, 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. *J Complement Integr Med* 15.
22. Chang Y, Cheng SY, Lin M, et al. (2010) The effectiveness of intradialytic leg ergometry exercise for improving sedentary life style and fatigue among patients with chronic kidney disease: A randomized clinical trial. *International Journal of Nursing Studies* 47: 1383-1388.
23. Varaei S, Jalalian Z, Nejad MSY, 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. *J Complement Integr Med* 18: 193-200.
24. Muz G, Tasc S (2017) Effect of aromatherapy via inhalation on the sleep quality and fatigue level in people undergoing hemodialysis. *Appl Nurs Res* 37: 28-35.
25. Kao YH, Huang YC, Chen PY, et al. (2012) The effects of exercise education intervention on the exercise behaviour, depression, and fatigue status of chronic kidney disease patients. *Health Education* 112: 472-484.
26. Bullen A, Awdishu L, Lester W, et al. (2018) Effect of acupuncture or massage on health-related quality of life of hemodialysis patients. *J Altern Complement Med* 24: 1069-1075.
27. Zhianfar L, Nadrian H, Jafarabadi MA, et al. (2020) Effectiveness of a multifaceted educational intervention to enhance therapeutic regimen adherence and quality of life amongst Iranian hemodialysis patients: A randomized controlled trial (MEITRA study). *J Multidiscip Health*. 13: 361-372.



28. Mohammadpourhodki R, Sadeghnezhad H, Ebrahimi H, et al. (2021) The effect of aromatherapy massage with lavender and citrus aurantium essential oil on quality of life of patients on chronic hemodialysis: A parallel randomized clinical trial study. *J Pain Symptom Manage* 61: 456-463.e1.
29. Figueiredo PHS, Lime MMO, Costa HS, et al. (2018) Effects of the inspiratory muscle training and aerobic training on respiratory and functional parameters, inflammatory biomarkers, redox status and quality of life in hemodialysis patients: A randomized clinical trial. *PLoS One* 13: e0200727.
30. Chang JH, Koo M, Wu SW, et al. (2017) Effects of a 12-week program of Tai Chi exercise on the kidney disease quality of life and physical functioning of patients with end-stage renal disease on hemodialysis. *Complementary Therapies in Medicine* 30: 79-83.
31. Lopez-Vargas PA, Tong A, Howell M, et al. (2016) Educational interventions for patients with CKD: A systematic review. *Am J Kidney Dis* 68: 353-370.
32. Nurmansyah N, Arofiati F (2019) Pengaruh intradialytic exercise terhadap fatigue pada pasien hemodialisa: Literature review. *Jurnal Edu Nursing* 3.
33. Hilfiker R, Meichtry A, Eicher M, et al. (2018) Exercise and other non-pharmaceutical interventions for cancer-related fatigue in patients during or after cancer treatment: A systematic review incorporating an indirect-comparisons meta-analysis. *Br J Sports Med* 52: 651-658.
34. Yangöz ŞT, Turan Kavradım S, Özer Z (2021) The effect of aromatherapy on fatigue in adults receiving haemodialysis treatment: A systematic review and meta-analysis of randomised controlled trials. *J Adv Nurs* 77: 4371-4386.
35. Zeng YS, Wang C, Ward KE, et al. (2018) Complementary and alternative medicine in hospice and palliative care: A systematic review. *J Pain Symptom Manage* 56: 781-794.e4.

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